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Original research

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To cite: Anbar R, Sultan SR,
Al Saikhan L, et al. Is carotid
artery atherosclerosis
associated with poor cognitive
function assessed using the
Mini-­Mental State Examination?
A systematic review and
meta-a­ nalysis. BMJ Open
2022;12:e055131. doi:10.1136/
bmjopen-2021-055131
► Prepublication history and
additional supplemental material
for this paper are available
online. To view these files,
please visit the journal online
(http://dx.doi.org/10.1136/​
bmjopen-2021-055131).

Received 04 July 2021
Accepted 29 March 2022

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Published by BMJ.
For numbered affiliations see
end of article.
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ABSTRACT
Objectives To determine associations between carotid
atherosclerosis assessed by ultrasound and the Mini-­
Mental State Examination (MMSE), a measure of global
cognitive function.
Design Systematic review and meta-­analysis.
Methods MEDLINE and EMBASE databases were
searched up to 1 May 2020 to identify studies assessed
the associations between asymptomatic carotid
atherosclerosis and the MMSE. Studies reporting OR for
associations between carotid plaque or intima-­media
thickness (cIMT) and dichotomised MMSE were meta-­
analysed. Publication bias of included studies was
assessed.
Results A total of 31 of 378 reviewed articles met
the inclusion criteria; together they included 27 738
participants (age 35–95 years). Fifteen studies reported
some evidence of a positive association between
measures of atherosclerosis and poorer cognitive
performance in either cross-­sectional or longitudinal
studies. The remaining 16 studies found no evidence of
an association. Seven cross-­sectional studies provided
data suitable for meta-­analysis. Meta-­analysis of three
studies that assessed carotid plaque (n=3549) showed an
association between the presence of plaque and impaired
MMSE with pooled estimate for the OR (95% CI) being
2.72 (0.85 to 4.59). An association between cIMT and
impaired MMSE was reported in six studies (n=4443) with
a pooled estimate for the OR (95% CI) being 1.13 (1.04
to 1.22). Heterogeneity across studies was moderate to
small (carotid plaque with MMSE, I2=40.9%; cIMT with
MMSE, I2=4.9%). There was evidence of publication bias
for carotid plaque studies (p=0.02), but not cIMT studies
(p=0.2).
Conclusions There is some, limited cross-­sectional
evidence indicating an association between cIMT and
poorer global cognitive function assessed with MMSE.
Estimates of the association between plaques and poor
cognition are too imprecise to draw firm conclusions and
evidence from studies of longitudinal associations between
carotid atherosclerosis and MMSE is limited.
PROSPERO registration number CRD42021240077.

STRENGTHS AND LIMITATIONS OF THIS STUDY
⇒ We performed a systematic review on 31 published

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studies assessed the association between carotid
atherosclerosis and global cognition.
The association between carotid atherosclerosis
and global cognition was meta-­analysed on 7992
asymptomatic patients.
There was some evidence from cross-­
sectional
studies that carotid plaque and carotid intima–media thickness were associated with impaired Mini-­
Mental State Examination (MMSE).
Methods used and characteristics of participants
across studies were different which makes it difficult to compare all studies.
This review only included studies which used MMSE
as a cognitive function test which may result in bias
or an underestimation of decline in cognitive state.

INTRODUCTION
Improvements in life expectancy have led to a
dramatic increase in the worldwide burden of
age-­related diseases, notably atherosclerotic
cardiovascular disease, and cognitive decline
and dementia.1
Atherosclerosis is a chronic inflammatory
disease, which begins in childhood.2 With time
and progression of disease, fibrofatty plaques
develop which may result in alterations in the
elastic properties of the artery, narrowing of
the lumen and resultant effects on haemodynamics, or thromboembolic consequences.
Atherosclerosis affects most large arteries,
including the common carotid artery (CCA)
and its major branch, the internal carotid
artery.3 Carotid artery atherosclerosis is
common4 and may be an important cause
of cerebral ischaemia and cognitive impairment. In carotid stenosis, embolisation and
hypoperfusion are thought to be the major


1

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Is carotid artery atherosclerosis
associated with poor cognitive function
assessed using the Mini-­Mental State
Examination? A systematic review
and meta-­analysis


processes that cause cognitive impairment,5 but alterations in cerebral haemodynamics secondary to atherosclerosis could also make a contribution that is potentially reversible.6 7 The assessment of carotid disease can be performed using a range of imaging methods, (eg, MRI, CT, angiography and ultrasound),3 ultrasound is the most commonly used,9–12 as it is inexpensive, non-invasive and widely available.

Cognitive function refers to internal mental processes which help people to think, make decisions and solve problems,13 and a decline in cognitive function can affect patients’ health, daily routine, learning new things, speech and writing abilities, and their ability to live independently. A decline in cognitive function is common with advancing age,14 and severe cognitive impairment and dementia are placing an increasingly heavy social, emotional and economic burden on society.15 Dementia is a syndrome that results from diseases of the brain which are usually chronic or progressive.15 Dementia is characterised by severe deficits in cognition that have a substantial effect on the activities of daily life. These impairments in cognition are also often accompanied by changes in emotional control, social behaviour and motivation.15 Mild cognitive impairment (MCI) is defined as an impairment of cognition that is greater than expected based on an individual’s age and education which does not appreciably affect daily functioning. Nevertheless, despite its denomination as mild, it is well established that people with MCI are at a high risk of developing dementia, particularly of the Alzheimer type.16 A comprehensive assessment of neuropsychological cognitive performance at the domain level is time consuming and most studies use brief cognitive screening tools.17

The most widely used tool for cognitive testing is the Mini-Mental State Examination (MMSE).18–20 MMSE contains 11 tasks and covers 7 domains: visuospatial skills, language, concentration, working memory, memory recall and orientation and is scored out of a maximum 30 points.21 The most common cut-points to detect dementia with the MMSE are ≤23 or ≤24, although higher and lower cut-points have been used in some studies.19 20

Several studies have used a combination of carotid ultrasound and MMSE to examine the associations between carotid atherosclerosis and cognitive performance, either cross-sectionally or longitudinally; however, these studies have yielded conflicting results. For example, the Rotterdam Study22 reported that CCA intima–media thickness (cIMT) was associated with increased risk of Alzheimer’s disease, but not vascular dementia, whereas carotid plaques were not associated with either Alzheimer’s disease or vascular dementia. In contrast, the Framingham Offspring Cohort study23 reported that cIMT was not associated with any measure of cognition, although there was evidence of an association between cIMT and impaired verbal memory and nonverbal memory, and that carotid stenosis ≥50% was associated with impaired executive function, but not verbal and non-verbal memory.

The aim of this study, therefore, was to systematically review evidence of an association between carotid atherosclerosis assessed by ultrasound and global cognitive function assessed using the MMSE, also to perform a meta-analysis of quantitative measures of association between carotid atherosclerosis and global cognitive function.

METHODS

This study was conducted according to the ‘Preferred Reporting Items for Systematic Reviews and Meta-Analyses’ (PRISMA) statement.24 Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Search strategy

The search was conducted systematically (up to 1 May 2020) by two authors independently in two online databases: MEDLINE and EMBASE Classic+EMBASE following training and support from a information specialist. A combination of synonyms and related words and text word searching was used to comprehensively extract all relevant articles. A combination of indexed (MesH) terms and keyword searches in titles and abstracts was used - (1) cognition, cognitive function, dementia, Alzheimer disease; (2) atherosclerosis, IMT, plaque; (3) carotid arteries and (4) all searches were limited to (English language and humans). The results from databases were exported to an Endnote library, and any duplicates results were identified and removed before screening the records. The records of non-relevant articles were excluded by screening titles and abstracts by three authors working independently. The remaining publications were assessed by screening the full texts for eligibility and were retrieved and double screened. Discrepancies were reviewed and resolved through consensus. Full search strategies for all databases are available in online supplemental files 1 and 2.

Inclusion criteria

Relevant studies were required to include the following: (1) Human adults (ie, a person older than 19 years of age)25 (2) cIMT and/or carotid artery plaque measured using ultrasound and (3) MMSE as a global cognitive function test.

Exclusion criteria

The exclusion criteria as follows: (1) Adults following stroke (if results in stroke patients were reported separately these were excluded, or if the study only included participants with stroke the entire study was excluded); (2) Patients who had undergone carotid surgical and non-surgical intervention; (3) Studies that used medical imaging modalities other than ultrasound to assess the presence of plaque and to measure carotid atherosclerosis; (4) Review articles, conference abstracts, case reports, letters to the editor or commentary articles.
Data extraction
Data extraction from the included studies were performed by three researchers independently using standardised forms; any discrepancies were resolved by consensus. The extracted data from the eligible studies consisted of study characteristics such as author, year of publication, sample size, characteristics of participants (age and gender), study region, MMSE cognitive function test score and cIMT measurements. Means and SD and sample size of cIMT and MMSE were extracted from the included papers. If mean and SD were not provided, median and range or other measures of central tendency and dispersion were extracted. Maximum cIMT was extracted if the mean value was not reported in the studies. If necessary, ORs for cIMT were converted to be per 1 mm IMT. If the percentage of people with plaques was reported, the total number was calculated. For studies in which stroke sufferers were included in the sample size, the total number of subjects were recalculated by removing subjects with stroke. The sample size was extracted for which cIMT and MMSE were measured. If different numbers of subject underwent cIMT and MMSE assessments, the lower number was recorded. The percentage of female subjects was extracted. If the total number of females was provided, the percentage of females from the overall sample size was calculated. The data were collected from baseline values or nearest value to the baseline if baseline was not available. If there were data from the article that was deficient, the authors were contacted by email. The form for eligibility of papers is available in online supplemental file 3.

Patient and public involvement
This study does not involve human participants and did not require ethical review.

Meta-analysis
A meta-analysis was planned using OR with 95% CI as the estimates of the strength of association between carotid atherosclerosis and MMSE. If other measures of dispersion were reported these were converted into 95% CI. ORs were chosen as recommended by Borenstein et al. as this was the effect size measure most commonly presented in the identified studies and also has the advantage of symmetry for outcome definition. The two measures of carotid atherosclerosis used for meta-analysis were presence of carotid plaque and cIMT as these were the most common exposures examined in identified studies. The outcome, MMSE was categorised into normal or impaired based on a cut-point of 24, since this was the most common threshold used for analysis in the papers identified. To facilitate comparison of effect sizes from longitudinal studies with those reported by cross-sectional studies HRs or risk ratios were converted to OR using the equation described by Grant. Random effects meta-analysis was performed using Stata/SE Statistical Software V.16.1 (StataCorp) using the meta suite of commands; weighting was by the inverse variance method. Q-test and I² statistics were used to assessed heterogeneity between studies. We used the Egger’s test and funnel plots to look for the possibility of publication bias.

Quality assessment
The quality of included studies was scored using a modified seven-point criteria were derived from Newcastle-Ottawa scale. Scores covered the (1) representativeness of the target sample, (2) non-response satisfactorily dealt with, (3) use of a validated measurement tool, (4) relevant confounders measured, (5) appropriate assessment of outcome, (6) appropriate statistical analysis clearly described and (7) reporting missing data if present. Each criterion was assigned one point if met. The quality assessment was performed by two researchers independently using standardised forms and any discrepancies were resolved by consensus. The Newcastle-Ottawa scale is provided in online supplemental file 4.

RESULTS
The PRISMA flow chart illustrating the study selection process is shown in figure 1. We identified 378 potential studies from the electronic databases (Medline and Embase) after exclusion of duplicates. Title and abstract screening resulted in 48 records remaining to be reviewed for eligibility in full text. Of those studies, 17 were excluded with reasons. The reasons were: no cIMT measurement (n=4), or no MMSE test data (n=9) or use of a modified version of MMSE (n=3), review articles, conference abstract, letters to the editor or case reports (n=1).

Characteristics studies included in the systematic review
The total number of participants in the 31 included studies was 26,178, with an age range from 35 to 95 years. Twenty of the studies were cross-sectional (online supplemental table S1A); eight were longitudinal (online supplemental table S1B). The remaining three studies included a mixture of cross-sectional and longitudinal data (online supplemental table S1C). The geographical distribution of the studies was diverse: with five from Italy, five from Japan, five from USA, three from France, two from Brazil, two from China, three from UK and one from each of Egypt, Netherlands, Norway, Serbia, Sweden and Uganda. One study failed to mention the geographical location. Only one study failed to report the patients’ health conditions and risk factors, such as diabetes mellitus, hypertension and chronic kidney disease. Two studies included only male participants, and one study included only female participants, the remaining studies included both male and female participants. Details of the key exposure measures are shown in online supplemental table S2. Twenty-nine studies reported the mean of cIMT measurement. Fourteen studies did not mention the presence of carotid plaques. Seven studies did not provide MMSE scores.


3
Associations between atherosclerosis measures and MMSE score

Cross-sectional associations

Presence of carotid plaques was associated with poorer cognitive function in three studies. Another study concluded that the association between cIMT and cognitive function was observed only in a low socioeconomic status group. Another study found a significant correlation between higher cIMT and plaques with poor MMSE score in people with evidence of vascular cognitive decline, but not in a group of people with Alzheimer’s disease, and Watanabe et al reported that vascular dementia patients were more likely to have low MMSE score with thicker cIMT and frequent presences of carotid plaques. Ten cross-sectional studies reported that cIMT was not associated with MMSE, although some of these studies reported associations with a selected aspect of cognitive performance.

Longitudinal associations

Zhong et al reported an association between higher cIMT and a reduction in MMSE score after 10 years of follow-up but not after 5 years; a similar association between presence of carotid plaque and change in MMSE was not observed at any follow-up interval. Rouch et al found that cIMT and presence of carotid plaques were associated with progression to dementia in univariable analyses, but neither predicted progression after multivariable adjustment. Another study found that the plaque index, and cIMT was predictive of an increased risk of conversion of MCI to dementia including after multivariable adjustment using a backwards stepwise method. While Carcaillon et al reported that there was an association between presence of carotid plaque in two sites or more and incidence of dementia, they observed no association between cIMT measured at plaque-free sites with incident dementia. Silvestrini et al found that baseline cIMT and increase in cIMT adjusted for baseline were associated with decline in MMSE. Wendell et al found no association between baseline cIMT and change in MMSE, but observed that higher cIMT was associated with future changes in selected aspects of cognitive performance.

Quality

One study received quality scores of 6 out of 7; 5 received a quality score of 5 out of 7; 20 a quality score of 4 out of 7; 31 32 44 46 48 51–54 61; 4 a quality score of 3 out of 7; and 1 a quality score of 2 out of 7. Among the 31 included studies, 24 studies were adequately designed to represent the target sample. Nine publications used validated ultrasound measurement tools, 6 reported blinded assessment of outcome and blinded of outcome measurements, 29 described the statistical

Figure 1 PRISMA flow chart of the strategy used to select articles for review. IMT, intima–media thickness; MMSE, Mini-Mental State Examination; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
analysis satisfactorily. Further details are provided in online supplemental table S3.

### Meta-analysis

Seven of the 31 studies reported data that were suitable for inclusion in a meta-analysis. All included studies were cross-sectional, and all but one drew from population samples. Of all studies, three reported associations between carotid plaque and impaired MMSE, and six reported the association between cIMT and impaired MMSE. There was only one suitable longitudinal study, so a meta-analysis was not attempted for this category of study.

### Carotid plaque and MMSE meta-analysis

Meta-analysis showed an association between presence of carotid plaque and impaired MMSE. The overall OR for the association between carotid plaque and impaired MMSE was 2.06 (95% CI 1.16 to 2.96) for presence of plaque, and with Z-score=4.49, p<0.01 (figure 2).

### Association between cIMT and MMSE

Meta-analysis showed an association between cIMT and impaired MMSE. The overall OR for the association between cIMT and impaired MMSE was 1.13 (95% CI 1.04 to 1.22) per 1 mm cIMT, with Z-score=24.7, p<0.01 (figure 3).

### Publication bias

Egger's test showed evidence of bias in studies assessing between carotid plaque and MMSE (p=0.02), but not in cIMT with MMSE (p=0.2) (figure 4A,B).

### DISCUSSION

This systematic review examined and quantitated the evidence regarding a possible association between measures of atherosclerosis in the carotid arteries by ultrasound and generalised impairment of cognitive function assessed using the MMSE. From the limited studies available, our analysis showed there is some evidence of a cross-sectional association between carotid artery atherosclerosis and poorer MMSE, with the majority of studies finding an association. However, a sizable proportion of studies did not find evidence for an association between cIMT and MMSE score. These discrepancies could be due to inadequate sample size, sample selection or the low sensitivity of MMSE for detection of MCI.
Risk factors for CVD are related to changes in cognitive function and many factors could link carotid atherosclerosis with cognition. These include thromboembolic consequences of carotid disease, small vessel disease and cerebral perfusion abnormalities, shared genetic predisposition, or shared risk factors over the life course. A recent study that observed a relationship between cIMT and MMSE, memory and executive function, also found an association between cIMT and decrease in brain matter volumes and cerebral hypoperfusion.

Few studies provided information regarding factors, such as age, gender, socioeconomic position (SEP) or pre-existing CVD, that might modify any relationship between carotid atherosclerosis and cognitive impairment, so it was not possible to formally examine effect modification by meta-analysis. One study reported that there was a moderate association between presence of plaques and impaired MMSE in men, but no association in women.30 In contrast, many studies failed to report evidence of sex differences in the association between carotid atherosclerosis and cognitive impairment,67–69 although it was often not clear whether such an interaction was sought. Limited evidence suggests that SEP, which may include income, education and social supports may modify the association between atherosclerosis and cognitive performance. In the Whitehall II study of UK-based civil servants,35 an association between higher cIMT and poorer cognitive function was only observed in individuals classified as low SEP. Another study done in USA,52 reported that the association between cIMT and measures of cognition differed as a function of race and socioeconomic status.

**Limitations**

Our systematic review has several limitations. Restricting the search to literature published in the English language only may have reduced the number of citations identified. The search was performed to cover publications up to 1 May 2020 and information published after that date will not have been included. The studies included in the review were drawn from diverse geographical locations, but while there was no obvious difference by location it was not possible to formally examine this question. Relatedly most studies did not report on the ethnicity of the participants, and it was therefore not possible to conclude anything about potential ethnic differences in associations. Similarly the lack of availability of individual participant data and the limitation of the summary data available restricted the analyses that could be performed. The primary aim of some of the studies reviewed was not to assess the association between atherosclerosis in carotid arteries and cognitive function. Adjustment for potential confounders was quite variable and inconsistent across studies and it is likely that this will contribute to heterogeneity between studies. There was also substantial heterogeneity with regard to atherosclerosis measurements; for example, some studies provided more information on plaque burden (e.g., number, thickness or location of plaques) but this analysis was too infrequent and inconsistent across studies to allow synthesis of these data and consequently presence of plaque was chosen as the exposure of interest. There were also differences in scanning techniques between studies, and most of studies reviewed did not perform a comprehensive carotid scan. The use of B-mode ultrasound to detect carotid atherosclerosis has well-recognised limitations10 12 and more advanced ultrasound imaging including three-dimensional ultrasound,70 or other imaging techniques, such as MRT71 or PET,72 that better quantify and characterise vulnerable atherosclerosis may have advantages. Similarly, use of the MMSE has several limitations, including non-linearity, a floor effect in advanced dementia, a ceiling effect in very mild disease, and bias in people with little formal education or in non-English-speaking groups.18–20 Also, MMSE only provides a limited insight into the complex process of cognitive decline and use of a wider range of tools, for example assessment of a wider range of cognitive domains including executive functioning and psychomotor speed, would be worthwhile in future studies.
CONCLUSION
This meta-analysis and systematic review provide some evidence in favour of an association between cIMT and cognitive function in cross-sectional studies. Estimates of the association between plaques and poor cognition in cross-sectional studies were too imprecise to draw firm conclusions; while evidence from studies of longitudinal associations between carotid atherosclerosis and cognitive function is limited.

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Database: Embase <1974 to 2020 February 28>

Search Strategy:

--------------------------------------------------------------------------------
1 cognition/ (229751)
2 cognitive function*.tw. (86107)
3 dementia/ (113610)
4 Alzheimer disease/ (195937)
5 1 or 2 or 3 or 4 (508101)
6 (atherosclerosis or intima media thickness or plaque).mp. (166750)
7 atherosclerosis/ (145056)
8 6 or 7 (287040)
9 5 and 8 (18670)
10 Carotid Arteries/ (47931)
11 carotid arter*.mp. (149782)
12 10 or 11 (149782)
13 9 and 12 (409)

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2.

Meshram N.H., Jackson D., Varghese T., Mitchell C.C., Wilbrand S.M., Dempsey R.J., Hermann B.P.
AN: 630722963

OBJECTIVE: We examine the relationship between variability in the plaque strain distribution estimated using ultrasound with multiple cognitive domains including executive, language, visuospatial reasoning, and memory function.

METHOD(S): Asymptomatic (n = 42) and symptomatic (n = 34) patients with significant (>60%) carotid artery stenosis were studied for plaque instability using ultrasound strain imaging and multiple cognitive domains including executive, language, visuospatial reasoning, and memory
function. Correlation and ROC analyses were performed between ultrasound strain indices and
cognitive function. Strain indices and cognition scores were also compared between symptomatic
and asymptomatic patients to determine whether there are significant group differences.
RESULT(S): Association of high-strain distributions with dysexecutive function was observed in both
asymptomatic and symptomatic patients. For memory, visuospatial, and language functions, the
correlations between strain and cognition were weaker for the asymptomatic compared to
symptomatic group.
CONCLUSION(S): Both asymptomatic and symptomatic patients demonstrate a relationship
between vessel strain indices and executive function indicating that silent strokes and micro-
emboli could initially contribute to a decline in executive function, whereas strokes and transient
ischemic attacks may cause the further decline in other cognitive functions.
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test [m]; reasoning [m]; receiver operating characteristic [m]; *transient ischemic attack [m];
*ultrasound [m].

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4.

Association of blood lipids, atherosclerosis and statin use with dementia and cognitive impairment
after stroke: A systematic review and meta-analysis.
Yang Z., Wang H., Edwards D., Ding C., Yan L., Brayne C., Mant J.
Ageing Research Reviews. 57 (no pagination), 2020. Article Number: 100962. Date of Publication:
January 2020.
AN: 2003369983
Background: Trial and observational evidence is conflicting in terms of the association of blood
lipids, atherosclerosis and statin use with dementia and cognitive impairment in the general
population. It is uncertain whether the associations occur in stroke patients, who are at known
higher risk of cognitive decline. This systematic review was to synthesize the evidence for these
associations among stroke patients.
Method(s): MEDLINE, EMBASE, the Cochrane Library and trial registries were searched. We
included randomized controlled trials (RCTs) or observational cohort studies conducted among
patients with stroke and reported on the association of blood lipids, atherosclerosis or statin use
with dementia or cognitive impairment. Meta-analysis was conducted separately for crude and
maximally adjusted odds ratios (ORs) and hazard ratios (HRs).
Result(s): Of 18,026 records retrieved, 56 studies (one RCT and 55 cohort studies) comprising
38,423 stroke patients were included. For coronary heart disease, the pooled OR of dementia and
cognitive impairment was 1.32 (95%CI 1.10-1.58, n = 15 studies, I² = 0%) and 1.23 (95%CI 0.99-1.54,
n = 14, I² = 26.9%), respectively. Peripheral artery disease was associated with dementia (OR 3.59,
95%CI 1.47-8.76, n = 2, I² = 0%) and cognitive impairment (OR 2.70, 95%CI 1.09-6.69, n = 1). For
carotid stenosis, the pooled OR of dementia and cognitive impairment was 2.67 (95%CI 0.83-8.62,
n = 3, I² = 77.9%) and 3.34 (95% CI 0.79-14.1, n = 4, I² = 96.6%), respectively. For post-stroke statin use, the pooled OR of dementia and cognitive impairment was 0.89 (95% CI 0.65-1.21, n = 1) and 0.56 (95% CI 0.46-0.69, n = 3, I² = 0%), respectively. No association was observed for hypercholesterolemia. These results were mostly consistent with adjusted ORs or HRs, which were reported from limited evidence.

Conclusion(s): Atherosclerosis was associated with an increased risk of post-stroke dementia. Post-stroke statin use was associated with decreased risk of cognitive impairment. To confirm whether or not statins confer advantages in the post-stroke population in terms of preventing cognitive decline over and above their known effectiveness in reducing risk of further vascular events, further stroke trials including cognitive assessment and observational analyses adjusted for key confounders, focusing on key subgroups or statin use patterns are required.

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6.

Carotid Intima-media Thickness, Cognitive Performance and Cognitive Decline in Stroke-free Middle-aged and Older Adults. The Atahualpa Project.
Del Brutto O.H., Mera R.M., Recalde B.Y., Del Brutto V.J.
AN: 2004217925

Background: Little is known on factors influencing cognitive function in rural communities. Using the Atahualpa Project cohort, we aimed to assess whether the carotid intima-media thickness (cIMT) - used as a surrogate of extracranial carotid atherosclerosis - is associated with cognitive performance and further decline in community-dwelling adults living in a rural setting.

Method(s): The study included Atahualpa residents aged greater than or equal to 40 years who had ultrasound examination of the extracranial carotid arteries and a baseline Montreal Cognitive Assessment (MoCA), as well as the subset of individuals who also had a follow-up MoCA at least 1 year after baseline. Relationship between cIMT and cognitive function was assessed by means of generalized linear and longitudinal models, adjusted for relevant covariates. Mediation analysis was utilized to establish the proportion of the effect between increased cIMT and cognitive performance, which is mediated by age.

Result(s): A total of 561 individuals were included for the cross-sectional study, and 510 of them were assessed for the prospective cohort. Univariate analysis showed a significant association
between increased cIMT and worse cognitive performance (P < .001), which vanishes after considering the effect of age and low scholarity. Causal mediation analysis confirms that age captures 82.6% (95% C.I.: 63.9% to 100%) of the effect of this association. There was no relationship between increased cIMT and cognitive decline in the follow-up.

Conclusion(s): In this rural population, the association between increased cIMT and cognitive dysfunction is mostly mediated by increasing age.

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Publisher
W.B. Saunders

Emtree Heading
adult; age; aged; *arterial wall thickness; article; carotid artery; *cerebrovascular accident; *cognition; *cognitive defect; cohort analysis; cross-sectional study; Ecuador; female; follow up; human; longitudinal study; major clinical study; male; Montreal cognitive assessment; priority journal; univariate analysis.

Other Index Terms
adult; age; aged; *arterial wall thickness; Article; carotid artery; *cerebrovascular accident; *cognition; *cognitive defect; cohort analysis; cross-sectional study; Ecuador; female; follow up; human; longitudinal study; major clinical study; male; Montreal cognitive assessment; priority journal; univariate analysis.

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8.

Cerebral hemodynamics and cognitive function in patients with atherosclerotic lesions of brachiocephalic arteries.

Mushba A., Vinogradov O., Kuznetsov A., Vachromeeva M., Kankia-Denisenco E., Batrashov V.
United Arab Emirates. 405 (Supplement) (pp 71), 2019. Date of Publication: 15 October 2019.
AN: 2003654554

Introduction: Steno-occlusive atherosclerotic lesions of extra- and intracranial cerebral arteries is regarded as the most significant factor for ischemic stroke risk. The greater the percentage of stenosis, the higher the risk of stroke. However it is unclear the impact of macroangiopathy (stenos in the carotid arteries) in the inhibition of cognitive functions.

Material(s) and Method(s): In study were included 2 groups of patients: group 1 - patients with asymptomatic carotid stenosis >50% (30 patients); group 2 - patients with carotid stenosis <50% (30 patients). In the group with asymptomatic carotid stenosis >50% were 22 (73.3%) male and 8 (26.7%) women; mean age of patients was 62.5 +/- 1.3 years. In the group with carotid stenosis <50% - 19 (63.3%) male and 11 (36.6%) women; mean age of patients was 64.5 +/- 1.4 years. All patients underwent assessment of scale of cognitive impairment (MMSE, MoCa), cognitive evoked potentials (P-300), duplex scanning of brachiocephalic arteries, transcranial duplex scan, brain MRI and Single-photon emission computed tomography (SPECT) with 99mTc-HMPAO.

Result(s): Cerebral perfusion according to SPECT in groups 1 and 2 were 76.2% and 79.2%, respectively; differences were not statistically significant (p > 0.05). MMSE and MoCa in groups 1 and 2 appeared to be 25.7 +/- 0.5 and 26.8 +/- 0.5 (p > 0.05); 26.5 +/- 0.4 and 27.5 +/- 0.4 (p > 0.05), respectively. According to cognitive evoked potentials, latencyP-300 in groups were 406 +/- 0.6 ms and 371 +/- 0.6 ms, respectively (p > 0.05). No correlation between severity of stenosis and cognitive functions in groups 1 and 2 were seen (r < 0.3).

Conclusion(s): Macroangiopathy of cerebral arteries (carotid stenosis) is not associated with cognitive deterioration.

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Publisher
Cortical cerebral microinfarcts on 3t magnetic resonance imaging in patients with carotid artery stenosis.

Takasugi J., Miwa K., Watanabe Y., Okazaki S., Todo K., Sasaki T., Sakaguchi M., Mochizuki H.
Stroke. 50 (3) (pp 639-644), 2019. Date of Publication: 01 Mar 2019.
AN: 627432469

Background and Purpose - Carotid artery stenosis is common in the elderly and contributes to cognitive impairment and dementia. Cortical cerebral microinfarcts (CMI) play an important role in vascular cognitive impairment and dementia. We aimed to investigate the association between
CMIs on 3T magnetic resonance imaging and clinical and radiological features, including plaque morphology, and cognitive function in patients with carotid stenosis. Methods - Eighty-nine patients with >30% carotid stenosis on ultrasound were prospectively enrolled, and underwent brain and carotid artery magnetic resonance imaging. CMIs were rated according to predetermined criteria based on 3D-double inversion recovery and fluid-attenuated inversion recovery images. Results - CMIs were identified in 26 patients (29%; median number 0, range 0-9). Poisson regression models adjusted for age and sex revealed that CMIs were associated with intraplaque hemorrhage (rate ratio, 1.95; 95% CI, 1.26-3.18), lacunar infarcts (rate ratio, 1.54; 95% CI, 1.00-2.44), and cortical infarcts (rate ratio, 3.22; 95% CI, 2.20-5.00). These associations were also observed in asymptomatic patients (n=64). Of 81 patients with unilateral carotid stenosis, the prevalence and number of CMIs were significantly higher in the hemisphere ipsilateral to the carotid stenosis than in the contralateral hemisphere (P=0.005 and P<0.001, respectively). The presence of CMIs was associated with poor cognitive function. Conclusions - Our results indicate that vulnerable carotid plaque increases the risk of CMIs and subsequent cognitive impairment. Carotid atherosclerosis could be a potential therapeutic target for cognitive impairment.

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Publisher
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Emtree Heading
aged; article; atherosclerotic plaque; atrial fibrillation; brain function; *brain infarction/co [Complication]; *brain infarction/di [Diagnosis]; carotid artery; *carotid artery obstruction; carotid atherosclerosis; cognitive defect; dementia; diabetes mellitus; female; human; hyperlipidemia; hypertension; ischemic heart disease; major clinical study; male; morphology; neuroimaging; neuropsychological test; *nuclear magnetic resonance imaging; priority journal; transient ischemic attack; ultrasound; antithrombocytic agent; hydroxymethylglutaryl coenzyme A reductase inhibitor; nuclear magnetic resonance scanner; *cortical cerebral microinfarct/co [Complication]; *cortical cerebral microinfarct/di [Diagnosis].

Candidate Terms
*cortical cerebral microinfarct / *complication / *diagnosis [other term].

Device Index Terms
nuclear magnetic resonance scanner.

Drug Index Terms
antithrombocytic agent; hydroxymethylglutaryl coenzyme A reductase inhibitor.

Other Index Terms
aged; Article; atherosclerotic plaque; atrial fibrillation; brain function; *brain infarction / *complication / *diagnosis; carotid artery; *carotid artery obstruction; carotid atherosclerosis; cognitive defect; dementia; diabetes mellitus; female; human; hyperlipidemia; hypertension; ischemic heart disease; major clinical study; male; morphology; neuroimaging; neuropsychological test; *nuclear magnetic resonance imaging; priority journal; transient ischemic attack; ultrasound.

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SFX

14.

Carotid atherosclerosis and dementia - Inflammatory markers and marker of macrophage activation. MIAZDZYCA TETNIC SZYJNYCH A OTEPIENIE - CZYNNIKI ZAPALNE I WSKAZNIK AKTYWACJI MAKROFAGOW <MIAZDZYCA TETNIC SZYJNYCH A OTEPIENIE - CZYNNIKI ZAPALNE I WSKAZNIK AKTYWACJI MAKROFAGOW.>


Postepy Psychiatrii i Neurologii. 28 (3) (pp 169-175), 2019. Date of Publication: 2019.
AN: 2003669181
Purpose: To assess the relationship between serum inflammatory markers (interleukin 6, high sensitivity C-reactive protein [hsCRP] and chitotriosidase activity) and the extent of carotid atherosclerotic lesions in subjects with various types of dementia.
Method(s): Four hundreds persons with dementia (166 diagnosed as probable Alzheimer’s disease, 85 as vascular dementia [VaD], 149 as mixed dementia [MD] and 180 controls) were observed. In all persons carotid intima-media thickness (IMT) was measured and all were subjected to a general medical and neurological evaluation, neuroimaging examination (computed tomography and magnetic resonance) and comprehensive neuropsychological examination. The pro-inflammatory markers interleukin-6 (IL-6) and hsCRP, and anti-inflammatory markers (paraoxonase-1 activity and HDL cholesterol level), were determined in blood serum. Chitotriosidase activity - an indicator of chronic macrophage activation - was also determined.

Result(s): A higher frequency of carotid atherosclerosis was observed in the whole group of dementia and in the VaD and MD groups as compared to the controls. A significant positive correlation of IMT with the inflammatory indicators IL-6 and hsCRP was found. A negative correlation of IMT with inflammatory markers (paraoxonase-1 activity and HDL cholesterol level) was observed. Chitotriosidase activity was significantly elevated, as compared with the controls, in the whole group with dementia and in the MD group, and depended on the degree of carotid stenosis.

Conclusion(s): Serum IL-6, hsCRP and chitotriosidase activity can be considered as markers of the extent of carotid arteriosclerosis in dementia, especially in patients with dementia with vascular lesions. High chitotriosidase activity may indicate chronic macrophage activation in the course of dementia development.
Drug Index Terms
*aryldialkylphosphatase 1 / *endogenous compound; *C reactive protein / *endogenous compound; *chitotriosidase / *endogenous compound; *high density lipoprotein cholesterol / *endogenous compound; *interleukin 6 / *endogenous compound.

Other Index Terms
adult; aged; Alzheimer disease; arterial wall thickness; Article; carotid artery bifurcation; carotid artery obstruction; *carotid atherosclerosis; clinical assessment; computer assisted tomography; controlled study; *dementia; DSM-IV; enzyme activity; female; high density lipoprotein cholesterol level; human; ICD-10; *macrophage activation; major clinical study; male; Mini Mental State Examination; multiinfarct dementia; neuroimaging; neuropsychological test; nuclear magnetic resonance imaging; very elderly.

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15.

Assessment of cognitive function in female rheumatoid arthritis patients: associations with cerebrovascular pathology, depression and anxiety.
AN: 2003469015

We assessed cognitive function of female rheumatoid arthritis (RA) patients and analyze the determinants, with special focus on cerebrovascular morphology. Sixty methotrexate (MTX-) or biologic-treated RA patients and 39 healthy controls were included in a cross-sectional study. Smoking habits, alcohol intake and time spent in education were recorded. Standard measures were performed to assess cognitive function (Montreal Cognitive Assessment, MOCA; Trail Making Test, TMT; Victoria Stroop Test, VST; Wechsler Adult Intelligence Scale, WAIS; Benton Visual
Retention test, BVRT), depression (Beck Depression Inventory, BDI), anxiety (State-Trait Anxiety Inventory, STAIT/S) and general health status (Short Form 36, SF-36). Mean disease activity (28-joint Disease Activity Score, mDAS28; erythrocyte sedimentation rate, mESR; C-reactive protein, mCRP) of the past 12 months was calculated; anti-cyclic citrullinated peptide (CCP) and rheumatoid factor (RF) were assessed. Cerebral vascular lesions and atrophy, carotid intima-media thickness (cIMT) and plaques, as well as median cerebral artery (MCA) circulatory reserve capacity (CRC) were assessed by brain magnetic resonance imaging (MRI), carotid ultrasound and transcranial Doppler, respectively. Cognitive function tests showed impairment in RA vs controls. Biologic- vs MTX-treated subgroups differed in TMT-A. Correlations were identified between cognitive function and depression/anxiety tests. WAIS, STAIS, STAIT and BDI correlated with most SF-36 domains. Numerous cognitive tests correlated with age and lower education. Some also correlated with disease duration, mESR and mDAS28. Regarding vascular pathophysiology, cerebral vascular lesions were associated with VST-A, carotid plaques with multiple cognitive parameters, while MCA and CRC with MOCA, BVRT and BDI. RA patients have significant cognitive impairment. Cognitive dysfunction may occur together with or independently of depression/anxiety. Older patients and those with lower education are at higher risk to develop cognitive impairment. Cognitive screening might be a useful tool to identify subgroups to be further investigated for cerebrovascular pathologies.

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Carotid atherosclerotic plaque instability and cognition determined by ultrasound-measured plaque strain in asymptomatic patients with significant stenosis.
AN: 620124652
OBJECTIVE This article describes the use of ultrasound measurements of physical strain within carotid atherosclerotic plaques as a measure of instability and the potential for vascular cognitive decline, microemboli, and white matter changes. METHODS Asymptomatic patients with significant (>60%) carotid artery stenosis were studied for dynamic measures of plaque instability, presence of microemboli, white matter changes, and vascular cognitive decline in comparison with normative controls and premorbid state. RESULTS Although classically asymptomatic, these patients showed vascular cognitive decline. The degree of strain instability measured within the atherosclerotic plaque directly predicted vascular cognitive decline in these patients thought previously to be asymptomatic according to classic criteria. Furthermore, 26% of patients showed microemboli, and patients had twice as much white matter hyperintensity as controls.
CONCLUSIONS These data show that physical measures of plaque instability are possible through interpretation of ultrasound strain data during pulsation, which may be more clinically relevant than solely measuring degree of stenosis. The data also highlight the importance of understanding that the definition of symptoms should not be limited to motor, speech, and vision function but underscore the role of vascular cognitive decline in the pathophysiology of carotid atherosclerotic disease.
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Association between carotid artery intima-media thickness and combinations of mild cognitive impairment and pre-frailty in older adults.

Park J., Park J.-H., Park H.


AN: 2002471160

Carotid intima-media thickness (CIMT) has been proposed as a surrogate marker of cardiovascular disease. Mild cognitive impairment (MCI) and pre-frailty are reportedly associated with increased CIMT. As the evidence on the association of CIMT with combinations of MCI and pre-frailty is limited, this association is examined. A total of 231 older adults participated. MCI was defined according to clinical consensus or psychometric criteria by a dementia specialist, and considering detailed neuropsychological assessments. Also, pre-frailty was defined as subjects with frail component of 1 or 2. Carotid variables were measured using a B-mode ultrasound. The analysis of covariance (ANCOVA) was performed to assess independent differences in CIMT among the four groups, according to the cognitive function and frailty status after a multivariate adjustment. Increased CIMT is associated with combinations of MCI and pre-frailty. ANCOVA showed that CIMTs were significantly different among the four groups according to the cognitive function and frailty status. CIMTmax combined with MCI and pre-frailty was the thickest (1.04 +/- 0.3 mm), whereas the CIMT of no MCI and no pre-frailty was the thinnest (0.82 +/- 0.2 mm). The results suggest that combinations of MCI and pre-frailty are associated with increased CIMT in older adults.

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Publisher
MDPI AG (Postfach, Basel CH-4005, Switzerland. E-mail: indexing@mdpi.com)

Emtree Heading
aged; *arterial wall thickness; article; B scan; body mass; body weight; cognition; controlled study; cross-sectional study; fat mass; female; *frailty; grip strength; human; major clinical study; male; *mild cognitive impairment; Mini Mental State Examination; physical activity; systolic blood pressure; waist circumference; walking distance; walking speed.

Arntzen K.A., Schirmer H., Johnsen S.H., Wilsgaard T., Mathiesen E.B.
Cerebrovascular Diseases. 33 (2) (pp 159-165), 2012. Date of Publication: 05 Jan 2012.
AN: 51802572

Background: Carotid artery atherosclerosis is a major risk factor for stroke and subsequent cognitive impairment. Prospective population studies have shown associations between carotid intima-media thickness (IMT) and stenosis and cognitive decline and dementia in elderly stroke-free persons, whereas results in the middle-aged are conflicting.

Method(s): In this prospective population-based study, 4,371 stroke-free middle-aged participants underwent carotid ultrasound examination and assessment of vascular risk factors at baseline and were tested for cognitive function 7 years later. Associations between IMT, number of plaques and total plaque area and cognitive test scores on verbal memory test, digit symbol-coding test and tapping test were assessed in linear regression models.

Result(s): In the multivariable analyses adjusted for sex, age, education, depression and vascular risk factors, the presence of plaques was significantly associated with lower test scores on the verbal memory test (p = 0.01) and on the digit symbol-coding test (p = 0.03). The number of plaques (p = 0.01) and the total plaque area (p = 0.02) were associated with lower scores on the...
verbal memory test. No significant association was seen between common carotid artery IMT and
cognitive test scores. The tapping test was not associated with the carotid ultrasound variables.
Conclusion(s): In this middle-aged general population, subclinical carotid atherosclerosis measured
as the presence of plaques, number of plaques and total plaque area were independent long-term
predictors of lower cognitive test scores. Copyright © 2012 S. Karger AG, Basel.

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Publisher
S. Karger AG

Emtree Heading
*stroke; *carotid atherosclerosis; *follow up; middle aged; verbal memory; human; risk factor;
ultrasound; population; carotid artery; cognition; linear regression analysis; model; education;
common carotid artery; cognitive defect; population research; arterial wall thickness; stenosis;
dementia; aged; examination.

Other Index Terms
*stroke; *carotid atherosclerosis; *follow up; middle aged; verbal memory; human; risk factor;
ultrasound; population; carotid artery; cognition; linear regression analysis; model; education;
common carotid artery; cognitive defect; population research; arterial wall thickness; stenosis;
dementia; aged; examination.

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25.

Effects of Carotid Endarterectomy on the Dynamics of Cognitive Impairments in Patients with
Atherosclerotic Stenosis of the Carotid Arteries.
Neuroscience and Behavioral Physiology. (pp 1-7), 2012. Date of Publication: 2012.
AN: 52135697
The clinical and neurochemical characteristics of non-dementia cognitive disorders were studied in 102 patients with atherosclerotic carotid sclerosis, with assessment of their dynamics after carotid endarterectomy (CEAE). Mild cognitive disorders were seen in 37 patients (36.3 %) and moderate cognitive disorders in 36 patients (35.3 %). Moderate cognitive impairments were significantly more common in patients with symptoms of carotid stenosis, dominated by structural changes in the brain on neuroimaging (leukoaraiosis and infarcts); unstable atherosclerotic plaques, with a predominance of the hypodense component, were also more frequent. This suggests that cognitive dysfunction in patients with atherosclerotic carotid stenosis results not only from decreased perfusion, but also from arterio-arterial microembolism. CEAE was found to have favorable effects on cognitive functions. Positive changes were marked in patients with asymptomatic carotid stenosis. However, CEAE could also have adverse influences on cognitive functions in patients with moderate cognitive disorders of dysmneletic type and symptoms of carotid stenosis. © 2012 Springer Science+Business Media, Inc.

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Publisher
Springer US

Emtree Heading
*cognitive defect; *carotid endarterectomy; *human; *carotid artery obstruction; *dynamics; *patient; *carotid artery; *stenosis; *atherosclerosis; cognition; perfusion; atherosclerotic plaque; infarction; leukoaraiosis; neuroimaging; brain; sclerosis; dementia; commercial phenomena; microembolism.

Other Index Terms
*cognitive defect; *carotid endarterectomy; *human; *carotid artery obstruction; *dynamics; *patient; *carotid artery; *stenosis; *atherosclerosis; cognition; perfusion; atherosclerotic plaque; infarction; leukoaraiosis; neuroimaging; brain; sclerosis; dementia; commercial phenomena; microembolism.

Link to the Ovid Full Text or citation:
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Atherosclerosis and dementia: A cross-sectional study with pathological analysis of the carotid arteries.
AN: 51631125
BACKGROUND AND PURPOSE: Previous ultrasound-based studies have shown an association between carotid artery atherosclerosis and dementia. Our aim was to investigate this association using postmortem examination.
METHOD(S): Postmortem morphometric measurements of carotid stenosis and intima-media thickness were performed in individuals with dementia (n=112) and control subjects (n=577). Multivariate logistic regression models were applied.
RESULT(S): High-grade left internal carotid stenosis (>=70%) was associated with increased odds for dementia (OR, 2.30; 95% CI, 1.14-4.74; P=0.02). Intima-media thickness was not associated with dementia.
CONCLUSION(S): The likelihood of dementia is increased with high-grade left internal carotid artery atherosclerosis after adjusting for demographic and cardiovascular risk factors.
Emtree Heading
*dementia; *carotid artery; *atherosclerosis; *cross-sectional study; carotid artery obstruction; arterial wall thickness; carotid atherosclerosis; cardiovascular risk; ultrasound; autopsy; logistic regression analysis; model; internal carotid artery.
Other Index Terms
*dementia; *carotid artery; *atherosclerosis; *cross-sectional study; carotid artery obstruction; arterial wall thickness; carotid atherosclerosis; cardiovascular risk; ultrasound; autopsy; logistic regression analysis; model; internal carotid artery.
Carotid atherosclerosis and a reduced likelihood for lowered cognitive Performance in a Canadian first nations population.
Fergenbaum J.H., Bruce S., Spence J.D., Lou W., Hanley A.J.G., Greenwood C., Young T.K.
Neuroepidemiology. 33 (4) (pp 321-328), 2009. Date of Publication: December 2009.
AN: 50693794
Background: We investigated the associations among cardiovascular risk factors, carotid atherosclerosis and cognitive function in a Canadian First Nations population.
Method(s): Individuals aged >=18 years, without stroke, nonpregnant and with First Nations status were assessed by the Trail Making Test Parts A and B. Results were combined into a Trail Making Test executive function score (TMT-exec). Doppler ultrasonography assessed carotid stenosis and plaque volume. Anthropometric, vascular and metabolic risk factors were assessed by interview, clinical examinations and blood tests.
Result(s): For 190 individuals with TMT-exec scores, the median age of the population was 39 years. Compared to the reference group, individuals with elevated levels of left carotid stenosis (LCS) and total carotid stenosis (TCS) were less likely to demonstrate lowered cognitive performance [LCS, odds ratio (OR): 0.47, 95% confidence interval (CI): 0.24-0.96; TCS, OR: 0.40, 95% CI: 0.20-0.80]. No effect was shown for plaque volume. In structural equation modeling, we found that for every 1-unit change in the anthropometric factor in kg/m2, there was a 0.86-fold decrease in the percent of TCS (p < 0.05).
Conclusion(s): Individuals with elevated levels of LCS and TCS were less likely to demonstrate lowered performance. There was some suggestion that TCS mediates the effect of anthropometric risk factors on cognitive function. Copyright © 2009 S. Karger AG, Basel.
32.


Carotid artery disease which includes carotid artery stenosis, plaques, clots and increased intima media thickness, have been reported by many studies to be associated with dementia. Dementia is an end stage of usually asymptomatic cognitive impairment. Risk factors of carotid artery disease include; age, atherosclerosis, arteriosclerosis, shorter years in school, history of hypertension, diabetes mellitus, stroke and depression. This study set out to determine the prevalence of abnormal carotid ultrasound findings and their association with cognitive function among the adults >=60 years in Wakiso district, Uganda in 2018. A total of 210 participants were included.
Carotid artery stenosis, presence of plaque, stenosis and intima-media thickness were assessed by ultrasound. Cognitive status was assessed using a Mini Mental State Exam (MMSE) test. The prevalence of plaque was 21.4%. Variables which included; presence of plaque, age, education, gender, marital status, whether participant stayed alone or with someone else, care for self, occupation status, division of staying and history of smoking. The presence of plaque was associated with an abnormal cognitive function at both univariate and multivariate analysis with respective OR = 3.8 (95% CI = 1.90-7.54, p-value = 0.0001) and OR = 3.4 (95% CI = 1.38-8.15, p-value = 0.007). The cognitive function distribution was 43.8%, 19%, 34.3% and 2.9% within the normal, mild, moderate, and severe cognitive function status respectively. This study showed that prevalence of carotid artery plaque was high in this elderly population in Wakiso district Uganda. Also, carotid artery plaque was associated with abnormal cognitive function.

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Emtree Heading
age; aged; arterial wall thickness; article; *carotid artery disease/di [Diagnosis]; carotid artery obstruction/di [Diagnosis]; *cognitive defect; *disease association; *echography; education; female; gender; human; major clinical study; male; marriage; Mini Mental State Examination; occupation; population research; prevalence; priority journal; self care; smoking; Uganda; very elderly; *carotid artery plaque/di [Diagnosis].

Candidate Terms
*carotid artery plaque / *diagnosis [other term].

Other Index Terms
age; aged; arterial wall thickness; Article; *carotid artery disease / *diagnosis; carotid artery obstruction / diagnosis; *cognitive defect; *disease association; *echography; education; female; gender; human; major clinical study; male; marriage; Mini Mental State Examination; occupation; population research; prevalence; priority journal; self care; smoking; Uganda; very elderly.
Association between carotid atheroma and cerebral cortex structure at age 73 years.
AN: 624251907

Objective: To examine the relationship between carotid atherosclerosis and cerebral cortical thickness and investigate whether cortical thickness mediates the association between carotid atheroma and relative cognitive decline.

Method(s): We assessed 554 community-dwelling subjects (male/female: 296/258) from the Lothian Birth Cohort 1936 who underwent brain magnetic resonance imaging and carotid Doppler ultrasound studies at age 73 years. The relationship between carotid atherosclerosis markers (internal carotid artery stenosis, intima-media thickness, velocity, pulsatility, and resistivity indexes) and vertex-wide cerebral cortical thickness was examined cross-sectionally, controlling for gender, extensive vascular risk factors (VRFs), and intelligence quotient at age 11 (IQ-11). We also determined the association between carotid stenosis and a composite measure of fluid intelligence at age 73 years. A mediation model was applied to examine whether cortical thickness mediated the relationship between carotid stenosis and cognitive function.

Result(s): A widespread negative association was identified between carotid stenosis (median = 15%) and cerebral cortical thickness at age 73 years, independent of the side of carotid stenosis, other carotid measures, VRFs, and IQ-11. This association increased in an almost dose-response relationship from mild to severe degrees of carotid stenosis, across the anterior and posterior circulation territories. A negative association was also noted between carotid stenosis and fluid intelligence (standardized beta coefficient = -0.151, p = 0.001), which appeared partly (approximately 22%) mediated by carotid stenosis-related thinning of the cerebral cortex.
Interpretation(s): The findings suggest that carotid stenosis represents a marker of processes that accelerate aging of the cerebral cortex and cognition that is in part independent of measurable VRFs. Cortical thinning within the anterior and posterior circulation territories partially mediated the relationship between carotid atheroma and fluid intelligence. Ann Neurol 2018;84:576-587.


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Publisher
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Emtree Heading
aged; arterial wall thickness; article; brain circulation; cardiovascular risk; carotid artery obstruction; *carotid atherosclerosis; clinical assessment; cognition; *cognitive defect; cohort analysis; *cortical thickness (brain); disease association; disease severity; Doppler ultrasonography; female; human;
Carotid circumferential wall stress is not associated with cognitive performance among individuals in late middle age: The Maastricht Study.
AN: 2000935317
Background and aims: Arterial remodelling aims at normalising circumferential wall stress (CWS). Greater CWS in the carotid artery has previously been associated with the prevalence and severity of cerebral small vessel disease, a major cause of ageing-related cognitive decline. Here we test the hypothesis that greater carotid CWS is associated with poorer cognitive performance.
Method(s): We studied 722 individuals (60 +/- 8 years, 55% men, 42.5% highly educated, blood pressure 137 +/- 19/77 +/- 11 mmHg, n = 197 with type 2 diabetes) who completed a neuropsychological assessment and underwent vascular ultrasound to measure the intima-media
thickness (IMT) and interadventitial diameter (IAD) of the left common carotid artery at a plaque-free site. From IMT and IAD, lumen diameter (LD) was calculated. These structural measures were then combined with local carotid pulse pressure and brachial mean arterial pressure to obtain a measure of pulsatile (CWSpulsatile) and average (CWSmean) mechanical load on the vessel wall. Cognitive domains assessed were memory, executive function and attention, and processing speed.

Result(s): After adjustment for age, sex, and education, regression analyses showed that neither CWSpulsatile nor CWSmean were associated with measures of cognitive performance (p-values >=0.31). This null association did not differ by age or educational level, and was observed in both individuals with and without carotid plaque, diabetes and/or hypertension. In addition, none of the individual measures of carotid structure (i.e. IMT, IAD, and LD) was related to cognitive performance.

Conclusion(s): The present cross-sectional study shows that carotid CWS is not associated with cognitive performance, at least not among relatively highly educated individuals in late middle age with adequately controlled cardiovascular risk factors.

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Publisher
Elsevier Ireland Ltd

Emtree Heading

adult; aged; arterial wall thickness; article; atherosclerotic plaque; attention; brachial artery; cardiovascular disease/dt [Drug Therapy]; *carotid artery; carotid artery pulse; *carotid atherosclerosis/di [Diagnosis]; *carotid atherosclerosis/dt [Drug Therapy]; *cognition; *cognitive defect; controlled study; cross-sectional study; depression; diabetic patient; echography; educational status; executive function; female; human; hypertension/dt [Drug Therapy]; information processing; left common carotid artery; major clinical study; male; mean arterial pressure; memory; middle aged; neuropsychological test; non insulin dependent diabetes mellitus; null hypothesis; priority journal; pulse pressure; regression analysis; *wall stress; antihypertensive agent/dt [Drug Therapy]; antithrombocytic agent/dt [Drug Therapy]; beta adrenergic receptor blocking agent/dt [Drug Therapy]; calcium antagonist/dt [Drug Therapy]; diuretic agent/dt [Drug Therapy]; renin inhibitor/dt [Drug Therapy]; *carotid circumferential wall stress.

Candidate Terms

*carotid circumferential wall stress [other term].

Drug Index Terms

antihypertensive agent / drug therapy; antithrombocytic agent / drug therapy; beta adrenergic receptor blocking agent / drug therapy; calcium antagonist / drug therapy; diuretic agent / drug therapy; renin inhibitor / drug therapy.

Other Index Terms

adult; aged; arterial wall thickness; Article; atherosclerotic plaque; attention; brachial artery; cardiovascular disease / drug therapy; *carotid artery; carotid artery pulse; *carotid atherosclerosis / *diagnosis / *drug therapy; *cognition; *cognitive defect; controlled study; cross-sectional study; depression; diabetic patient; echography; educational status; executive function; female; human; hypertension / drug therapy; information processing; left common carotid artery; major clinical study; male; mean arterial pressure; memory; middle aged; neuropsychological test; non insulin dependent diabetes mellitus; null hypothesis; priority journal; pulse pressure; regression analysis; *wall stress.

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40.

The preservation of cognition 1 year after carotid endarterectomy in patients with prior cognitive decline.
Neurosurgery. 82 (3) (pp 322-328), 2018. Date of Publication: 01 Mar 2018.
AN: 623354114
BACKGROUND: Vascular cognitive decline is critically important in the course of atherosclerosis and stroke.
OBJECTIVE(S): To explore the hypothesis that carotid endarterectomy (CEA) by removing an unstable plaque may slow the course of vascular cognitive decline in both symptomatic and asymptomatic patients.
METHOD(S): Patients with clinically significant (>60%) carotid stenosis were studied preop and 1 yr post-CEA for clinical symptoms, vascular cognitive decline, instability of carotid plaque-presence of microemboli, brain white matter changes, and medical risk factors.
RESULT(S): Forty-six percent were classically symptomatic. All patients showed vascular cognitive decline at presentation which correlated with degree of plaque instability. Significant white matter hyperintensity changes (48.7%) and cerebral emboli (25%) were also seen at baseline in both classically symptomatic and asymptomatic. One year after CEA, both groups showed no decline in cognitive function and significant improvement in 2 tests (P = .028 and P = .013). Brain white matter hyperintensities were unchanged. Microemboli were reduced but remained present (17.86%). Improvement was predicted by the presence of hypertension (P = .001), or less advanced cognitive decline preoperatively (P = .009).
CONCLUSION(S): This study demonstrates the importance of vascular cognitive decline in atherosclerotic disease. This is a function of the degree of instability of the atherosclerotic plaque more than the presence of stroke symptoms. It further suggests that atherosclerotic vascular cognitive decline need not be inevitable, and may be modified by treating hypertension and removal of the unstable plaque. This highlights the need for continued research on the cognitive effects of cerebrovascular disease and the synergistic benefits of intensive medical and surgical therapy.
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Response to "carotid flow velocities and endothelial function in cognitive ability of hypertension".
Chuang S.-Y., Cheng H.-M.
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Publisher
Oxford University Press
Emtree Heading
arterial wall thickness; atherosclerosis; *blood flow velocity; blood vessel tone; brain tissue; cardiovascular risk; carotid artery; *carotid artery flow; *cognition; cognitive defect; diastolic blood pressure; disease association; *endothelial dysfunction; *endothelium; heart tissue; hemodynamic parameters; human; *hypertension; letter; Mini Mental State Examination; peak systolic velocity; priority journal; risk assessment; risk factor; systolic blood pressure; vascular endothelium; white matter.
Other Index Terms
arterial wall thickness; atherosclerosis; *blood flow velocity; blood vessel tone; brain tissue; cardiovascular risk; carotid artery; *carotid artery flow; *cognition; cognitive defect; diastolic blood pressure; disease association; *endothelial dysfunction; *endothelium; heart tissue; hemodynamic parameters; human; *hypertension; Letter; Mini Mental State Examination; peak systolic velocity; priority journal; risk assessment; risk factor; systolic blood pressure; vascular endothelium; white matter.

Link to the Ovid Full Text or citation:
Higher arterial stiffness is associated with lower cognitive performance in patients with hypertension.


Cognitive impairment and elevated arterial stiffness have been described in patients with arterial hypertension, but their association has not been well studied. We evaluated the correlation of arterial stiffness and different cognitive domains in patients with hypertension compared with those with normotension. We evaluated 211 patients (69 with normotension and 142 with hypertension). Patients were age matched and distributed according to their blood pressure: normotension, hypertension stage 1, and hypertension stage 2. Cognitive function was assessed using the Mini-Mental State Examination, Montreal Cognitive Assessment, and a battery of neuropsychological evaluations that assessed six main cognitive domains. Pulse wave velocity was measured using a Complior device, and carotid properties were assessed by radiofrequency ultrasound. Central arterial pressure and augmentation index were obtained using applanation tonometry. The hypertension stage 2 group had higher arterial stiffness and worse performance either by Mini-Mental State Examination (26.8+/-2.1 vs 27.3+/-2.1 vs 28.0+/-2.0, P=.003) or the Montreal Cognitive Assessment test (23.4+/-3.5 vs 24.9+/-2.9 vs 25.6+/-3.0, P<.001). On multivariable regression analysis, augmentation index, intima-media thickness, and pulse wave velocity were the variables mainly associated with lower cognitive performance at different cognitive domains. Cognitive impairment in different domains was associated with higher arterial stiffness.

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Pulse wave velocity is associated with greater risk of dementia in mild cognitive impairment patients.
Hypertension. 72 (5) (pp 1109-1116), 2018. Date of Publication: 2018.
AN: 627080314
To investigate the association between pulse wave velocity, intima-media thickness, carotid artery diameter, carotid plaques, and conversion from mild cognitive impairment to dementia. Three hundred and seventy-five elderly ambulatory subjects with mild cognitive impairment were followed yearly to examine potential conversion to dementia. Vascular function was assessed by carotid-femoral pulse wave velocity. Vascular structure was evaluated by intima-media thickness, carotid artery diameter, and carotid plaques using an ultrasonographic assessment of carotid arteries. One hundred and five patients (28%) converted to dementia during a mean follow-up period of 4.5 years. Higher pulse wave velocity was associated with greater risk of conversion to dementia (1-SD increase of pulse wave velocity: Hazard ratio, 1.33; 95% CI, 1.04-1.71; P=0.02) independently of age, sex, educational level, systolic blood pressure, cardiovascular diseases, body mass index, calcium channel blockers intake, Mini-Mental State Examination at baseline, and apoE a4 status. Intima-media thickness, carotid plaques, and carotid artery diameter did not predict conversion to dementia (1-SD increase of intima-media thickness: Hazard ratio, 0.93; 95% CI, 0.73-1.18; P=0.55; presence of carotid plaques: Hazard ratio, 1.08; 95% CI, 0.62-1.87; P=0.79; 1-SD increase of carotid artery diameter: Hazard ratio, 1.08; 95% CI, 0.89-1.31; P=0.44). Pulse wave velocity was associated with conversion to dementia, whereas intima-media thickness, carotid plaques, or carotid artery diameter were not after controlling for age and other confounding factors. Arterial stiffness could identify mild cognitive impairment patients at higher risk of dementia and may be a therapeutic target to delay or prevent the onset of dementia.
Copyright © 2018 American Heart Association, Inc.
PMID
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(Rouch, Bailly, Beunardeau, Cohen, Dubail, Hernandorena, Seux, Vidal, Hanon) Universite Paris Descartes, Sorbonne Paris Cite, France (Cestac, Sallerin, Andrieu) Unite INSERM, Toulouse 1027, France
(Cestac, Sallerin, Andrieu) University Paul Sabatier Toulouse, France
Abstract

Vascular, cognitive, and psychomental survey on elderly recycling volunteers in northern Taiwan.

Link to the Ovid Full Text or citation:
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Chen G.-C., Chen P.-Y., Su Y.-C., Hsiao C.-L., Yang F.-Y., Hsu P.-J., Lin S.-K.
AN: 627647510

Background: Stroke and dementia represent frequent causes of psychophysical and socioeconomic burdens. We conducted a vascular, cognitive, and psychomental survey involving elderly volunteers at community-based recycling stations in Northern Taiwan.

Method(s): Recycling volunteers aged >=60 years were surveyed. We recorded seven parameters, namely (1) body mass index (BMI), (2) fasting glucose, (3) fasting cholesterol, (4) ankle-brachial index (ABI), (5) carotid duplex sonography, (6) five-item Brief Symptom Rating Scale (BSRS-5) score, and (7) eight-item Interview to Differentiate Aging and Dementia (AD8). During the carotid duplex study, we measured the carotid intima-media thickness (CIMT) and the carotid total plaque score (CTPS) of the common and internal carotid arteries.

Result(s): In total, 985 subjects (mean age: 70.8 years) participated in this study. Among these, 81% were women, and 52% were vegetarians. The average ABI, CIMT, and CTPS were higher in men, whereas women had higher cholesterol levels and BSRS-5 scores. Obesity, hypertension, hyperglycemia, and hyperlipidemia were present in 21, 38, 9, and 27% of all subjects, respectively. Carotid plaques with mild (CTPS 1-5), moderate (CTPS 5.1-10), and severe (CTPS > 10) atherosclerosis were detected in 45, 16, and 7% of the subjects, respectively. Mild cognitive impairment (AD8 > 2) was observed in 13% of the subjects, whereas moderate mood disorder (BSRS-510) was observed in only 1% of subjects. Vegetarians had a lower BMI, systolic blood pressure (SBP), cholesterol, CIMT, and CTPS than did non-vegetarians. Substantial predictors of severe atherosclerosis were advanced age (>70 years), male sex, history of heart disease, hyperlipidemia, and currently elevated SBP and cholesterol levels. Predictors of mild cognitive impairment were illiteracy, history of hypertension, hyperlipidemia, and moderate mood disorder.

Conclusion(s): Subclinical carotid atherosclerosis was common in elderly recycling volunteers, with 23% having moderate to severe stenosis. Vegetarians had a reduced risk of atherosclerosis. The low incidence of moderate mood disorder might indicate that recycling work enhances psychomental health. In addition, a healthier lifestyle, better mood condition, and vegetarian diet might contribute to lower incidence of mild cognitive impairment.

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(Su, Lin) School of Medicine, Tzu Chi University, Hualien, Taiwan (Republic of China)

Publisher
Frontiers Media S.A. (E-mail: info@frontiersin.org)
Common Carotid Artery Calcification Impacts on Cognitive Function in Older Patients.
Di Daniele N., Celotto R., Alunni Fegatelli D., Gabriele M., Rovella V., Scuteri A.
High Blood Pressure and Cardiovascular Prevention. 26 (2) (pp 127-134), 2019. Date of Publication: 01 Apr 2019.
AN: 627071939
Introduction: Cognitive impairment and dementia represent an emerging health problem. Cardiovascular (CV) risk factors contribute to cognitive impairment.

Aim(s): To investigate the effect of vascular calcification on cognitive impairment and dementia, independently of plaque and traditional CV risk factors.

Method(s): Four hundred and sixty-nine patients (age of 78.6 +/- 6.1 years, 74.4% women) were studied. Traditional CV risk factors levels, cognitive function (MMSE), brain CT scan, and other vascular parameters were measured. Common Carotid Artery (CCA) plaque and calcification were evaluated by ultrasound.

Result(s): CCA calcification was associated with a lower MMSE score than in subjects with no CCA calcification (23.7 +/- 0.3 versus 25.5 +/- 0.8; p = 0.015), after controlling for age, sex, education, blood pressure levels, diabetes, creatinine, lipid lowering therapy, neuroimaging alteration, and CCA plaque. Similarly, CCA calcification was associated with higher odds of dementia regardless of the presence of CCA plaque (OR 1.70, 95% CI 1.01-2.94, p < 0.05). This trend was not observed when stratifying patients according to the presence of CCA plaque.

Conclusion(s): CCA calcification is associated with cognitive impairment and dementia, independently of established CV risk factors and CCA plaque. The impact of arterial calcification on cognition seems largely independent of arterial stiffness.

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cholesterol/ec [Endogenous Compound]; hydroxymethylglutaryl coenzyme A reductase inhibitor/pv [Special Situation for Pharmacovigilance]; low density lipoprotein cholesterol/ec [Endogenous Compound]; nitric acid derivative/pv [Special Situation for Pharmacovigilance]; triacylglycerol/ec [Endogenous Compound].

Drug Index Terms
albumin / endogenous compound; antidiabetic agent / special situation for pharmacovigilance; antihypertensive agent / special situation for pharmacovigilance; antilipemic agent; antithrombocytic agent / special situation for pharmacovigilance; creatinine / endogenous compound; high density lipoprotein cholesterol / endogenous compound; hydroxymethylglutaryl coenzyme A reductase inhibitor / special situation for pharmacovigilance; low density lipoprotein cholesterol / endogenous compound; nitric acid derivative / special situation for pharmacovigilance; triacylglycerol / endogenous compound.

Other Index Terms
aged; albumin blood level; arterial stiffness; *artery calcification; Article; blood pressure; cholesterol blood level; *cognition; *cognitive defect; *common carotid artery; creatinine blood level; dementia; diabetes mellitus; education; female; human; hypotension; major clinical study; male; Mini Mental State Examination; neuroimaging; priority journal; pulse wave; white matter lesion; x-ray computed tomography.

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51.

Study on the correlation between vascular lesions and cognitive function in native tibetan with h-type hypertension in plateau.
Li Y, Wu S.
AN: 627024764
Objective: To explore characteristics of vascular lesions and the correlation between vascular lesions and cognitive function in native Tibetan patients with H-type hypertension in Qinghai-Tibetan Plateau of China.

Method(s): Sixty-two cases with H-type hypertension and 178 cases with non-H-type hypertension were enrolled in native Tibetan patients at high altitude (Yushu city, Qinghai Province, China; 3800 m). All the subjects detected carotid artery atherosclerotic plaques and carotid intima-media thickness (CIMT) with the color Doppler ultrasound, examined the cognitive function with the minimental state examination (MMSE), and measured the brachial-ankle pulse wave velocity (BaPWV), and ankle brachial index (ABI) with the Colin-VP1000 type artery stiff diagnosis apparatus.

Result(s): Comparing with non-H-type hypertension, the incidence of carotid artery atherosclerotic plaques, CIMT, and BaPWV was significantly higher in the native Tibetan with H-type hypertension (p < 0.05), whereas MMSE and ABI were significantly decreased (p < 0.05). MMSE were positively correlated with BaPWV, CIMT, and plaques, MMSE was negatively correlated with ABI and plaques.

Conclusion(s): The patients with H-type hypertension are more likely to have the peripheral artery structure and function impairments and more severe the cognition impaired, which closely correlate with high altitude and hypoxia. Hypoxia and special national diet (less vegetables and more meat) affect the metabolism of homocysteine. Elevated plasma Hcy level may aggravate vascular lesions and cognitive impairment in native Tibetan patients with high blood pressure in the plateau.

Institution
(Li, Wu) Qinghai Provincial People's Hospital, Xining, China
Publisher
Mary Ann Liebert Inc.

Emtree Heading
adult; *altitude disease; ankle brachial index; arterial wall thickness; carotid atherosclerosis; China; *cognitive defect; color Doppler flowmetry; controlled study; diet; female; human; human tissue; *hypertension; incidence; major clinical study; male; metabolism; plasma; pulse wave; structure activity relation; *vascular lesion; vegetable; homocysteine; conference abstract.

Candidate Terms
cconference abstract [other term].

Drug Index Terms
homocysteine.

Other Index Terms
adult; *altitude disease; ankle brachial index; arterial wall thickness; carotid atherosclerosis; China; *cognitive defect; color Doppler flowmetry; controlled study; diet; female; human; human tissue; *hypertension; incidence; major clinical study; male; metabolism; plasma; pulse wave; structure activity relation; *vascular lesion; vegetable.
AN: 626955898
Atherosclerosis occurs with age and has been associated with increased risk of cognitive decline, dementia, and declines in physical function. We aimed to estimate both the phenotypic and genetic correlation between vascular disease, and cognitive and physical functioning in 2060 participants in the Long Life Family Study (LLFS), which recruited families with at least 2 long-lived siblings. Participants underwent B-mode carotid artery ultrasound to assess common carotid artery intimamedia thickness (IMT; mm) and interadventitial diameter (mm), as well as, multiple tests of cognitive and physical functioning: digit symbol substitution test (DSST), semantic fluency score, trail making time (s), working memory/attention score, time to complete 5 chair stands (s), gait speed from 4- meter walk (m/s), and maximum grip strength (kg). We tested for phenotypic and genetic correlation between each vascular and functional measure using the variance covariance methods implemented in SOLAR. All models were adjusted for age, age , sex, site, height, weight, hypertension, diabetes, smoking, and physical activity. Greater carotid IMT and diameter were correlated with lower grip strength, and greater carotid diameter was correlated with poorer chair stand test performance (all phenotypic P < 0.05). While there was no phenotypic correlation between vascular measures and cognitive function, there was significant genetic correlation between working memory and carotid IMT. The current analysis provides further evidence for an association between vascular aging and functional decline, and also highlights the possibility of a
shared genetic link between atherosclerosis and cognitive decline in exceptionally long-lived families.

Institution
(Kuipers, Minster, Barinas-Mitchell, Cristensen, Feitosa, Cosentino, Andersen-Toomey, Newman)
1Epidemiology, Univ of Pittsburgh, Pittsburgh, PA2Human Genetics, Univ of Pittsburgh, Pittsburgh, PA3Epidemiology, Biostatistics and Biodemography, Danish Aging Rsch Cntr, Odense C, Denmark4Genetics, Washington Univ of St. Louis, St. Louis, MO5Neuropsychology, Columbia Univ, New York, NY6Medicine, Boston Univ Sch of Medicine, Boston, MA

Publisher
Lippincott Williams and Wilkins

Emtree Heading
adult; *aging; arterial wall thickness; atherosclerosis; attention; cognitive defect; common carotid artery; controlled study; covariance; diabetes mellitus; digit symbol substitution test; female; genetic correlation; grip strength; height; human; hypertension; major clinical study; male; sibling; smoking; task performance; ultrasound; walking speed; working memory; conference abstract.

Candidate Terms
conference abstract [other term].

Other Index Terms
adult; *aging; arterial wall thickness; atherosclerosis; attention; cognitive defect; common carotid artery; controlled study; covariance; diabetes mellitus; digit symbol substitution test; female; genetic correlation; grip strength; height; human; hypertension; major clinical study; male; sibling; smoking; task performance; ultrasound; walking speed; working memory.

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53.
Impact of carotid artery revascularization on the cognitive and functional outcome, as well as cerebral flow on TCD and brain MRI in patients with symptomatic carotid artery stenosis: A preliminary report.


BACKGROUND About one third of patients develop cognitive dementia following cerebral ischemic event (CIE), while 20-50% of subjects with symptomatic carotid artery stenosis (CAS) suffer from CIE recurrence during 6 months. On the other hand, prompt carotid artery revascularization (CAR) may prevent CIE recurrence, however, at the cost of cognitive function decline or new acute micro embolic lesions (MES) on brain diffusion-weighted magnetic resonance imaging (DWI-MRI). We investigated whether CAR in recent survivors of CIE related to high risk CAS may contribute to functional and cognitive outcomes. METHODS Thirteen consecutive patients (mean age 67+/-7.8y.o., 8 male) with recent CIE (18.3+/-10.5 days to CAR) related to severe CAS (mean stenosis degree: 89.8+/-7.9%, range 80-99%) were prospectively assessed with transcranial doppler (TCD) of the Willis Circle, DWI-MRI, cognitive outcome using the Montreal Cognitive Assessment (MoCA), Mini Mental Skills Examination (MMSE), and functional outcome using the modified Rankin Scale (Rs) and National Institutes of Health Stroke Scale (NIHSS) at 24 hours before CAR, at 48-72 hours and at 1 month following CAR. RESULTS Most plaques were high risk: thrombotic in 5, lipid-rich in 1, lipid-fibrotic in 5 and calcified in 2 patients, including string stenosis in 5 and ulcerations in 9 subjects, as evidenced by ultrasonography and post-CAR histological assessment of plaque debris captured by the filter in 9 subjects or plaques removed during endarterectomy in 4 subjects. One (7.7%) minor stroke was observed following CAR. Acute and subacute multiple cerebral ischemic lesions were observed in all subjects before CAR (mean lesion size of 13.5+/-10mm, range 4-37mm), while new MES following CAR were found in 5 (38.5%) subjects. After 1 month, MES persisted in 3 (23%), resolved in 2 (15.4%), decreased in 8 (61.5%) patients respectively. There was a significant increase of cerebral flow velocity in the middle and the anterior cerebral artery on the site of CAR following intervention (from 72+/-20 to 106+/-24cm/s, p=0.0008 and from 75+/-23.4 to 94+/-18.2 cm/s, p=0.056; respectively). This flow increase was correlated with cerebral perfusion increase on MRI. NIHSS and Rs significantly improved after CAR (from 3.0+/-1.2 to 1.8+/-1.1 p=0.013 and from 1.5+/-0.8 to 0.7+/-0.9 p=0.034 respectively). There was no cognitive decline as assessed by MMSE and MoCA at 1 month vs before procedure (MMSE: 27.7+/-2.5, range 22-30, vs 26.8+/-1.9, range 26-29, p=0.027; MoCa: 23.5+/-3.5, range 19-28 vs, 23.3+/-2.5, range 20-27, p=0.356). Improvement of cognitive function was found in 9 (69.2%) by MMSE and in 7 (53.8%) subjects by MoCa. CONCLUSIONS This
preliminary pilot study concerning many aspects of CAR following CIE indicated immediate improvement of cerebral flow seen on TCD and perfusion MRI. Furthermore, we did not find cognitive decline when urgent CAR was performed for secondary stroke prevention in this high risk group. Large studies are necessary.

Institution

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Publisher

Via Medica

Emtree Heading

aged; *angiogenesis; *anterior cerebral artery; brain circulus arteriosus; brain perfusion; cancer size; *carotid artery obstruction; cerebrovascular accident; clinical article; cognitive defect; controlled study; *diffusion weighted imaging; endarterectomy; filter; flow rate; high risk population; human; ischemia; male; Montreal cognitive assessment; National Institutes of Health Stroke Scale; perfusion weighted imaging; pilot study; prevention; Rankin scale; skill; survivor; thrombosis; transcranial doppler; ulcer; lipid.

Drug Index Terms

lipid.

Other Index Terms

aged; *angiogenesis; *anterior cerebral artery; brain circulus arteriosus; brain perfusion; cancer size; *carotid artery obstruction; cerebrovascular accident; clinical article; cognitive defect; controlled study; *diffusion weighted imaging; endarterectomy; filter; flow rate; high risk population; human; ischemia; male; Montreal cognitive assessment; National Institutes of Health Stroke Scale; perfusion weighted imaging; pilot study; prevention; Rankin scale; skill; survivor; thrombosis; transcranial doppler; ulcer.

Link to the Ovid Full Text or citation:

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Link to the External Link Resolver:
Cognitive function and cerebrovascular reserve in patients with severe steno-occlusive disease of an internal carotid artery or a middle cerebral artery.
AN: 611615325

Objectives: Patients with severe steno-occlusive disease of a main cerebral artery may demonstrate cognitive impairment without focal neurological deficits and without identification of causative lesions on magnetic resonance imaging (MRI), but the pathophysiology of this condition has not been characterized. We investigated whether cognitive impairment in these patients is associated with cerebral blood flow (CBF), cerebrovascular reserve (CVR), leukoaraiosis, and risk factors of atherosclerosis and whether the CVR decreases widespread-nonspecifically on both sides.

Method(s): In 65 patients with severe steno-occlusive disease of an internal carotid artery (ICA) or a middle cerebral artery (MCA), we examined cognitive function with COGNISTAT (the Japanese version of the neurobehavioral cognitive status examination), grades of periventricular hyperintensity (PVH) and deep subcortical white matter hyperintensity (DSWMH) as measured by MRI and cerebral blood flow (CBF) and cerebral vascular reserve (CVR) as calculated by iodine-123-N-isopropyl-p-iodoamphetamine single photon emission computed tomography (123IMP-SPECT) and blood data (hemoglobin A1c [HbA1c], total cholesterol, triglycerides, low-density lipoprotein [LDL] cholesterol, high-density lipoprotein [HDL] cholesterol). In 15 patients who underwent superficial temporal artery (STA)-middle cerebral artery (MCA) anastomosis, the measured values were compared with those collected postoperatively.

Result(s): Logistic regression analysis revealed that both CVR and DWFMH correlated with cognitive impairment. There was no significant difference in CBF, CVR, or COGNISTAT score when comparing the left side and right side. There were good correlations between CBF or CVR of the ipsilateral MCA area and those of all other areas. For example, in the CBFs of ipsilateral MCA area and contralateral MCA area at the anterior horn level of the lateral ventricle, the regression equation was \( Y = 0.70x + 14.3 \), the correlation coefficient was 0.81, and the \( p \) value was < 0.0001. In
the CVRs between ipsilateral MCA area and contralateral MCA area at the anterior horn level of the lateral ventricle, the regression equation was \( Y = 0.52x + 33.4 \), the correlation coefficient was 0.64 and the p value was < 0.0001. In patients who underwent STA-MCA anastomosis, both postoperative CVR and cognitive impairment improved, and the correlations between CBF or CVR of the ipsilateral MCA area and those of all other areas were maintained. However, the COGNISTAT score did not change in the matched control group (without STA-MCA anastomosis)

Conclusion(s): Cognitive impairment is associated with CVR in the whole brain, and nonselective widespread disconnections may be a reason for cognitive impairment in patients with severe steno-occlusive disease of a main cerebral artery. Cognitive impairment and CVR improved after STA-MCA anastomosis, compared to preoperative values.

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Publisher
Nature Publishing Group

Emtree Heading
artery anastomosis; atherosclerosis; brain blood flow; cholesterol blood level; *cognitive defect; control group; controlled study; correlation coefficient; human; *internal carotid artery; lateral brain ventricle; leukoaraiosis; logistic regression analysis; major clinical study; *middle cerebral artery; nuclear magnetic resonance imaging; risk factor; single photon emission computer tomography; spinal cord ventral horn; statistical significance; superficial temporal artery; surgery; white matter; cholesterol; hemoglobin A1c; high density lipoprotein; low density lipoprotein; triacylglycerol.

Drug Index Terms
cholesterol; hemoglobin A1c; high density lipoprotein; low density lipoprotein; triacylglycerol.

Other Index Terms
artery anastomosis; atherosclerosis; brain blood flow; cholesterol blood level; *cognitive defect; control group; controlled study; correlation coefficient; human; *internal carotid artery; lateral brain ventricle; leukoaraiosis; logistic regression analysis; major clinical study; *middle cerebral artery; nuclear magnetic resonance imaging; risk factor; single photon emission computer tomography; spinal cord ventral horn; statistical significance; superficial temporal artery; surgery; white matter.
The preservation of cognition 1 year after carotid endarterectomy in patients with prior cognitive decline.
Clinical Neurosurgery. 82 (3) (pp 322-328), 2018. Date of Publication: 01 Mar 2018.
AN: 621480677
BACKGROUND: Vascular cognitive decline is critically important in the course of atherosclerosis and stroke.
OBJECTIVE(S): To explore the hypothesis that carotid endarterectomy (CEA) by removing an unstable plaque may slow the course of vascular cognitive decline in both symptomatic and asymptomatic patients.
METHOD(S): Patients with clinically significant (>60%) carotid stenosis were studied preop and 1 yr post-CEA for clinical symptoms, vascular cognitive decline, instability of carotid plaque-presence of microemboli, brain white matter changes, and medical risk factors.
RESULT(S): Forty-six percent were classically symptomatic. All patients showed vascular cognitive decline at presentation which correlated with degree of plaque instability. Significant white matter hyperintensity changes (48.7%) and cerebral emboli (25%) were also seen at baseline in both classically symptomatic and asymptomatic. One year after CEA, both groups showed no decline in cognitive function and significant improvement in 2 tests (P = .028 and P = .013). Brain white matter hyperintensities were unchanged. Microemboli were reduced but remained present (17.86%). Improvement was predicted by the presence of hypertension (P = .001), or less advanced cognitive decline preoperatively (P = .009).
CONCLUSION(S): This study demonstrates the importance of vascular cognitive decline in atherosclerotic disease. This is a function of the degree of instability of the atherosclerotic plaque more than the presence of stroke symptoms. It further suggests that atherosclerotic vascular cognitive decline need not be inevitable, and may be modified by treating hypertension and removal of the unstable plaque. This highlights the need for continued research on the cognitive effects of cerebrovascular disease and the synergistic benefits of intensive medical and surgical therapy.
Scientific reports. 7 (1) (pp 3066), 2017. Date of Publication: 08 Jun 2017.
AN: 625842339

We aimed to investigate the association between carotid plaques and cognitive impairment among patients with acute ischemic stroke, and to assess key clinical implications. In the Acute Ischemic Stroke Study, patients who received a cognitive testing and underwent complete carotid artery ultrasound scans were included. Cognitive function was measured by the mini-mental state examination. The cross-sectional relationships between cognitive impairment and carotid plaques were evaluated using multivariate logistic regression analysis. Of the 3116 patients included in this study, 826 (26.51%) patients were diagnosed with cognitive impairment. After adjusting for potential confounders, patients with >=2 carotid plaques (odds ratio [OR]=1.47; 95% confidence interval [CI]: 1.19-1.82), patients with >=2 number of carotid arteries with plaque (OR=1.48; 95% CI: 1.19-1.84) and patients with hypoechoic plaque (OR=2.05; 95% CI: 1.24-3.38) are more likely to have cognitive impairment. In this acute ischemic stroke population, the number of carotid plaques, the number of carotid arteries with plaque and plaque stability are all associated with cognitive impairment.

Cognitive function of patients with rheumatoid arthritis is associated with disease activity but not carotid atherosclerotic changes.

Clinical and Experimental Rheumatology. 36 (5) (pp 856-861), 2018. Date of Publication: 01 Sep 2018.
AN: 624109476

Objective Although the relationship between atherosclerosis and cognitive impairment has been studied and replicated, whether cognitive deficits in RA can be attributed to atherosclerotic changes is not well understood. This study investigated cognitive function in patients with RA and evaluated whether cognitive function was affected by carotid arterial atherosclerosis. Methods We examined 70 RA patients and 40 healthy controls. RA activity was assessed by disease activity score with 28 joint-erythrocyte sedimentation rate (DAS28-ESR). Cognitive function was assessed by the Korean version of the Consortium to Establish a Registry for Alzheimer's disease (CERAD-K) neuropsychological battery. Carotid arteries were scanned for the presence of plaques and to assess intima-media thickness (IMT). We assessed potential risk factors of cognitive impairment in
RA patients using regression analyses. Results There was a significant difference between RA patients and healthy controls in the verbal fluency \((p=0.004)\) and Boston naming test \((p=0.035)\). Carotid ultrasound revealed significantly more plaque in RA patients than in healthy controls \((p=0.017)\). RA patients with memory impairment had significantly higher DAS28-ESR scores \((p<0.001)\), age \((p=0.009)\), and mean cIMT \((p=0.027)\) than RA patients without memory impairment. In multivariable regression analysis, CERAD-K total score showed a significant negative correlation with age \((\beta=-0.415, p<0.001)\) or DAS28-ESR \((\beta=-4.685, p<0.001)\), but no correlation was found between CERAD-K total score and presence of plaque or cIMT. Conclusion Our results indicate that disease activity of RA and aging contribute to cognitive dysfunction, but there was no association between cognitive function and carotid atherosclerotic changes in RA patients.

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Emtree Heading
adult; age; aged; arterial wall thickness; article; atherosclerotic plaque; Boston naming test; *carotid atherosclerosis; *cognitive defect; controlled study; DAS28; *disease activity; echography; female; human; major clinical study; male; memory disorder; middle aged; neuropsychological test; priority journal; prospective study; *rheumatoid arthritis; risk factor; trail making test; C reactive protein/ec [Endogenous Compound].

Drug Index Terms
C reactive protein / endogenous compound.

Other Index Terms
adult; age; aged; arterial wall thickness; Article; atherosclerotic plaque; Boston naming test; *carotid atherosclerosis; *cognitive defect; controlled study; DAS28; *disease activity; echography; female; human; major clinical study; male; memory disorder; middle aged; neuropsychological test; priority journal; prospective study; *rheumatoid arthritis; risk factor; trail making test.
Pulse wave velocity is associated with greater risk of dementia in mild cognitive impairment patients.
AN: 625308676
Objectives: To investigate the association between pulse wave velocity (PWV), intima-media thickness (IMT), carotid artery diameter (CAD), carotid plaques (CP) and conversion from mild cognitive impairment (MCI) to dementia.
Method(s): 375 elderly ambulatory subjects with a diagnosis of MCI were followed yearly to examine potential conversion to dementia up to 6 years. Vascular function was assessed by PWV considered to be the gold standard measurement of aortic stiffness. Vascular structure was evaluated by IMT, CAD and CP using an ultra-sonographic assessment of carotid arteries.
Result(s): 105 patients (28%) converted from MCI to dementia during a mean follow-up period of 4.5 years. Higher PWV was associated with greater risk of conversion from MCI to dementia (1-SD increase of PWV: HR = 1.31; 95% CI [1.03-1.67]; p = 0.03). This relationship was independent of age, sex, educational level, systolic blood pressure, cardiovascular diseases, Mini Mental State Examination at baseline and Apolipoproteine 4 status. IMT, CP and CAD did not predict conversion from MCI to dementia (1-SD increase of IMT: HR = 0.96; 95% CI [0.76-1.21]; p = 0.74; presence of CP: HR = 1.08; 95% CI [0.63-1.86]; p = 0.77; 1-SD increase of CAD: HR = 1.08; 95% CI [0.89-1.31]; p = 0.44).
Conclusion(s): In the present study, arterial stiffness, measured as PWV, predicted conversion from MCI to dementia whereas IMT, CP nor CAD did not after controlling for age and other
confounding factors. Arterial stiffness could help to better predict MCI patients at higher risk of dementia and may be a therapeutic target to delay or prevent the onset of dementia.

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Publisher
Lippincott Williams and Wilkins

Entree Heading
aged; *arterial stiffness; *arterial wall thickness; *artery diameter; cardiovascular disease; controlled study; *dementia; diagnosis; female; follow up; gold standard; human; major clinical study; male; *mild cognitive impairment; Mini Mental State Examination; prevention; *pulse wave; *risk assessment; systolic blood pressure; conference abstract.

Candidate Terms
conference abstract [other term].

Other Index Terms
aged; *arterial stiffness; *arterial wall thickness; *artery diameter; cardiovascular disease; controlled study; *dementia; diagnosis; female; follow up; gold standard; human; major clinical study; male; *mild cognitive impairment; Mini Mental State Examination; prevention; *pulse wave; *risk assessment; systolic blood pressure.

72.

Impact of the hypertension and carotid intima-media thickness to the infarcts volume in the stroke patients.
Lobjanidze N., Chitauri N.
Objectives: Cognitive deficit among hypertensive elderly patients with brain in-farcts was established during last years, represents the basis of vascular dementia in late life still, but their link with intima media thickness (IMT) remains controversially as well as the stroke volume The aim of this study was assesment of IMT among hypertensive poststroke patients(PSL) with lacunar lesions(ML) Methods: Prospective study of 147(mean age 71,4) patients was carried out. The patients were divided in two groups: I group(85)-moderate stroke patients without hypertension.Type, side and site of stroke was assesed by conventional MRI. II group(62)-moderate/severe hypertensive stroke patients, who had multiple lacunar lesions in MRI. Cognitive function was investigated in both groups by neuropsychological battey (letter fluency, Stroop test, Wisconsin Card Sorting Test, digit span, letter number sequencing), MMSE. Ultrasonographically assessed carotid artery IMT. They were compaired due to vascular risk factors, clinical, demographic and radiological variables. Statistical evaluation was perform by SPSS Results: From 85 PSL patients dementia was diagnosed in 13(15,2%). cases, depression in 24(28,2%). This group often had damage of the left hemisphere, prevalence of ischemic with basal ganglia lesions. No one from the 65 MSL patients had dementia, but 29(44,6%) had mild cognitive impairment and 36(55,3%) had depression. Atherogenic index and Crotid Intima-Media Sickness was significantly higher in patients with multiple lacunar infarction lesion and associated with hypertension, age and female gender
Conclusion(s): Carotid IMT predicts an increased risk for cognitive impairment, particularly poor memory and cognitive speed, in elderly women, and leads to multiple lacunar silent infarct lesions.
Institution
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Publisher
Lippincott Williams and Wilkins
Emtree Heading
aged; amnesia; *arterial wall thickness; basal ganglion; cardiovascular risk; diagnosis; female; gender; heart stroke volume; human; *hypertension; *lacunar stroke; left hemisphere; major clinical study; male; mild cognitive impairment; Mini Mental State Examination; *multiinfarct dementia; nerve biopsy; nuclear magnetic resonance imaging; prevalence; prospective study; risk assessment; *stroke patient; Stroop test; velocity; Wisconsin Card Sorting Test; conference abstract.
Candidate Terms
conference abstract [other term].
Other Index Terms
Study on the correlation of vascular lesions and cognitive function in native Tibetan with h-type hypertension in plateau.
Li Y.L., Lou M.Y., Feng J.H., Yang Y., Xu L.F.
Date of Publication: September 2018.
AN: 623841410

Objective: To explore characteristics of Vascular Lesions, the correlation of vascular lesions and cognitive function in native Tibetan patients with H-type hypertension (Hcy >= 15umol/L) in Qinghai Plateau of China.

Method(s): Sixty-two cases with H-type hypertension (Hcy >= 15 mumol /L) and 178 cases with non-H-type hypertension (Hcy < 15 mumol /L) were enrolled from native Tibetan patients at high altitude (Yushu city, Qinghai Province, 3800m). All the subjects were detected with the color Doppler ultrasound, the Colin-VP1000 type artery stiff diagnosis apparatus and the mini-mental state examination (MMSE) for the Carotid artery atherosclerotic plaques, carotid intima-media thickness (CIMT), the brachial-ankle pulse wave velocity (BaPWV) and ankle brachial index (ABI).

Result(s): The incidence of Carotid artery atherosclerotic plaques, CIMT and BaPWV were significantly higher in the group with H-type as compared with non-H-type hypertension (chi2 = 21.35, P < .05), while MMSE and ABI were significantly decreased (P < .05). MMSE were positively
correlated with BaPWV, CIMT and plaques amounts, and MMSE was negatively correlated with ABI and plaques amounts.

Conclusion(s): The patients with H-type hypertension are more likely to have the peripheral artery structure and function impairments and have more severe cognition impairment, which closely correlate with high altitude and hypoxia. Hypoxia and special national diet (less vegetables and more meat) affect the metabolism of homocysteine. Elevated plasma Hcy level may aggravate vascular lesions and cognitive impairment in native Tibetan patients with high blood pressure in plateau. (Table Presented).

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Publisher
Blackwell Publishing Inc.
Carotid plaque MRI features embolic complications and effects on cognition after carotid artery stenting.
Eraslan C., Cinar C., Guler A., Dogan O.S., Akkus D.E., Kitis O., Calli M.C., Oran I.
AN: 623700019

Aim To put forth the relationship between the plaque tissue features assessed with MRI before carotid artery stenting (CAS) and the embolic complications-cognitive changes that develop after the procedure. Methods Thirty-one patients for whom CAS was planned were included in the study. Conventional plaque MRI, susceptibility weighted imaging (SWI) for plaque and diffusion weighted images (DWI) for both plaque and cranium were obtained in 3T MR system before the procedure. In the first day after CAS, cranial DWI was repeated to search the existence of new appearing ischemia. Cognitive tests were conducted to all patients before the procedure, in the first 48 hours and three months after the procedure. Plaques which has partially or completely rich fat content or the ones have intraplaque haemorrhage was accepted as vulnerable. Results Thirteen patients had vulnerable plaques according to the MRI findings. Acute ischemic changes of the patients with vulnerable plaque were found to be significantly higher than the patients with stable plaque after the procedure (p<0.001). A significant difference was also found in the patient group with vulnerable plaque between the cognitive tests conducted before and after CAS and in the third month (p=0.011 and p=0.006 respectively). In the patient group with stable plaque, there was no statistically significant difference. Conclusion According to the results of our study, through assessing the plaque features with plaque MRI obtained with SWI and DWI before CAS procedure, it is possible to predict the development of embolic complications and cognitive changes that can arise after the procedure.

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Publisher
Springer Verlag

Emtree Heading
The association between carotid flow and cognitive function in the community elderly population. Chuang S.Y., Cheng H.M., Yip B.S., Chen C.H., Pan W.H.
AN: 623097110
Objective: Carotid hemodynamics, such as intima-media thickness and carotid flow velocity were associated with stroke events. However, the association between carotid hemodynamics and cognitive function remains not fully clear. We aimed to investigate the relationship between carotid flow velocity and cognitive function. Design and method: A total of 744 elderly (more than 60 years) subjects completed the baseline and followed ultrasound examinations and those were evaluated cognitive function. Cognitive function was evaluated by MMSE and cognitive function impairment was defined by the MMSE less than 26. The peak-systolic velocity, end-diastolic velocity were measured in the common carotid arteries. Logistic regression was used to evaluate the association between carotid flow velocities, carotid diameters and cognitive function.
Result(s): A total of 744 elderly subjects completed all examinations during the followed period. The prevalence Cognitive function impairment (MMSE less than 26) was 13.3% (n = 99). The peak systolic velocity (PSV) and diastolic end velocity (EDV) were lower in those with cognitive function.
impairment (60.5 vs. 65.5 cm/sec, p-value < 0.001 for PSV and 19.7 vs. 22.1 cm/sec, p-value < 0.001 for EDV), and only peak-systolic velocity remains significant in the multivariable models. Moreover, those with lower carotid flow velocities (the lowest 10th of peak systolic velocity) had 9.69 fold risk (95% confidence intervals: 2.75-34.21) of cognitive function impairment, compared to those with the highest 10th of peak systolic velocity. The significant association remains in the multivariable model by adjusting for age, gender, education, brachial systolic BP, fasting glucose, and low density lipoprotein cholesterol.

Conclusion(s): Low carotid flow velocity, especially peak-systolic velocity was associated with cognitive function impairment. Lower carotid flow may involve the pathogen of cognitive function impairment in the general elderly population.

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Publisher
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Emtree Heading
aged; *carotid artery flow; clinical assessment; *cognition; common carotid artery; controlled study; education; female; gender; glucose blood level; human; human experiment; infectious agent; major clinical study; male; Mini Mental State Examination; nonhuman; peak systolic velocity; prevalence; statistical significance; systolic blood pressure; ultrasound; low density lipoprotein cholesterol; conference abstract.

Candidate Terms
conference abstract [other term].

Drug Index Terms
low density lipoprotein cholesterol.

Other Index Terms
aged; *carotid artery flow; clinical assessment; *cognition; common carotid artery; controlled study; education; female; gender; glucose blood level; human; human experiment; infectious agent; major clinical study; male; Mini Mental State Examination; nonhuman; peak systolic velocity; prevalence; statistical significance; systolic blood pressure; ultrasound.

Link to the Ovid Full Text or citation:
Asymptomatic carotid stenosis is associated with cognitive impairment.
Lal B.K., Dux M.C., Sikdar S., Goldstein C., Khan A.A., Yokemick J., Zhao L.
AN: 617342339

Background Cerebrovascular risk factors (eg, hypertension, coronary artery disease) and stroke can lead to vascular cognitive impairment. The Asymptomatic Carotid Stenosis and Cognitive Function study evaluated the isolated impact of asymptomatic carotid stenosis (no prior ipsilateral or contralateral stroke or transient ischemic attack) on cognitive function. Cerebrovascular hemodynamic and carotid plaque characteristics were analyzed to elucidate potential mechanisms affecting cognition. Methods There were 82 patients with >=50% asymptomatic carotid stenosis and 62 controls without stenosis but matched for vascular comorbidities who underwent neurologic, National Institutes of Health Stroke Scale, and comprehensive neuropsychological examination. Overall cognitive function and five domain-specific scores were computed. Duplex ultrasound with Doppler waveform and B-mode imaging defined the degree of stenosis, least luminal diameter, plaque area, and plaque gray-scale median. Breath-holding index (BHI) and microembolization were measured using transcranial Doppler. We assessed cognitive differences between stenosis patients and control patients and of stenosis patients with low vs high BHI and correlated cognitive function with microembolic counts and plaque characteristics. Results Stenosis and control patients did not differ in vascular risk factors, education, estimated intelligence, or depressive symptoms. Stenosis patients had worse composite cognitive scores (P = .02; Cohen's d = 0.43) and domain-specific scores for learning/memory (P = .02; d = 0.42) and motor/processing speed (P = .01; d = 0.65), whereas scores for executive function were numerically lower (P = .08). Approximately 49.4% of all stenosis patients were impaired in at least two cognitive domains. Precisely 50% of stenosis patients demonstrated a reduced BHI. Stenosis patients with reduced BHI performed worse on the overall composite cognitive score (t = -2.1; P = .02; d = 0.53) and tests for learning/memory (t = -2.7; P = .01; d = 0.66). Cognitive function did not correlate with measures of plaque burden (degree of stenosis, least luminal diameter, and plaque area) or with plaque gray-
scale median. Conclusions Asymptomatic carotid stenosis is associated with cognitive impairment independent of known vascular risk factors for vascular cognitive impairment. Approximately 49.4% of these patients demonstrate impairment in at least two neuropsychological domains. The deficit is driven primarily by reduced motor/processing speed and learning/memory and is mild to moderate in severity. The mechanism for impairment is likely to be hemodynamic as evidenced by reduced cerebrovascular reserve and the likely result of hypoperfusion from a pressure drop across the stenosis in the presence of inadequate collateralization.

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Emtree Heading

aged; artery embolism; *asymptomatic disease; atherosclerotic plaque; carotid artery; *carotid artery obstruction; cognition; *cognitive defect; cognitive function test; comorbidity; conference paper; controlled study; depression; disease association; echography; education; executive function; female; hemodynamics; human; intelligence; learning; major clinical study; male; medical parameters; memory; motor performance; National Institutes of Health Stroke Scale; priority journal; prospective study; risk factor; transcranial doppler; transcranial Doppler ultrasonography; ultrasound transducer; breath holding index; SonixMDP system; ST3 TCD machine.

Candidate Terms

breath holding index [other term]; SonixMDP system [device term]; ST3 TCD machine [device term].

Other Index Terms

aged; artery embolism; *asymptomatic disease; atherosclerotic plaque; carotid artery; *carotid artery obstruction; cognition; *cognitive defect; cognitive function test; comorbidity; Conference Paper; controlled study; depression; disease association; echography; education; executive function; female; hemodynamics; human; intelligence; learning; major clinical study; male; medical parameters; memory; motor performance; National Institutes of Health Stroke Scale; priority journal; prospective study; risk factor; transcranial doppler; transcranial Doppler ultrasonography; ultrasound transducer.
86.

Carotid atherosclerosis and cognitive impairment in nonstroke patients.
AN: 618496993
Objective: As a vascular risk factor, carotid atherosclerosis is crucial to cognitive impairment. While carotid intima-media thickness, carotid artery plaque, and carotid stenosis can reflect carotid atherosclerosis in different stages, this review aimed to explore researches on the role of carotid intima-media thickness, carotid artery plaque, and carotid stenosis in the progress of cognitive impairment in nonstroke patients and tried to illustrate the possible mechanisms.
Data Sources: We searched the PubMed database for recently published research articles up to July 2017, with the key words of “carotid atherosclerosis,” “carotid intima-media thickness,” “carotid plaque,” “carotid stenosis,” “nonstroke,” and “cognitive impairment.” Study Selection: Articles were obtained and reviewed to analyze the role of carotid atherosclerosis such as carotid intima-thickness, carotid plaque, and carotid stenosis in the progress of cognitive impairment in nonstroke patients and the possible mechanisms.
Result(s): In recent years, most studies proved that by evaluating carotid atherosclerosis with ultrasonography, carotid atherosclerosis accounts for the development of cognitive decline in nonstroke patients. Carotid atherosclerosis not only impairs the subtle general cognitive function but also decreases the specific domains of cognitive function, such as memory, motor function, visual perception, attention, and executive function. But, it is still controversial. The possible mechanisms of cognitive impairment in nonstroke patients with carotid atherosclerosis can be classified as systemic global cerebrovascular function, small-vessel diseases, and the mixed lesions.
Conclusion(s): Carotid atherosclerosis can be used to predict the risk of cognitive impairment. Furthermore, diagnosing and treating carotid atherosclerosis at early stage might help clinicians prevent and treat vascular cognitive impairment in nonstroke patients.

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PMID

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Emtree Heading
arterial wall thickness; article; attention; brain function; cardiovascular function; carotid artery disease; carotid artery obstruction; *carotid atherosclerosis; cerebrovascular accident; cerebrovascular disease; *cognitive defect/et [Etiology]; degenerative disease; disease association; disease severity; executive function; human; memory; motor performance; nonhuman; pathogenesis; risk assessment; vision; carotid artery plaque; cerebrovascular function.

Candidate Terms
carotid artery plaque [other term]; cerebrovascular function [other term].

Other Index Terms
arterial wall thickness; Article; attention; brain function; cardiovascular function; carotid artery disease; carotid artery obstruction; *carotid atherosclerosis; cerebrovascular accident; cerebrovascular disease; *cognitive defect / *etiology; degenerative disease; disease association; disease severity; executive function; human; memory; motor performance; nonhuman; pathogenesis; risk assessment; vision.

Link to the Ovid Full Text or citation:
Click here for full text options

Link to the External Link Resolver:
SFX
Reduced Cardiovascular Functions in Patients with Alzheimer's Disease.
AN: 616714109
Previous studies have suggested that cardiovascular functions might play a critical role in Alzheimer's disease (AD) pathogenesis. However, the relationship among heart function, blood flow of cerebral vessels, and AD remains unclear. In the present study, AD patients (n=34) and age- and gender-matched cognitively normal controls (n=34) were recruited. Demographic and comorbidity information was collected. The ejection fraction was measured using echocardiography, and the mean velocity, pulsatility index (PI), and resistance index (RI) of the basilar artery (BA), left terminal internal carotid artery (LTICA), and right terminal internal carotid artery (RTICA) were measured using transcranial Doppler. The data of lacunae, white matter changes, and plaques in the aortic arch and carotid arteries were collected from brain magnetic resonance imaging and computed tomography angiography images. Compared with normal controls, AD patients had lower ejection fractions and cerebral blood flow velocities and higher RI and PI in the BA, LTICA, and RTICA, as well as more plaques in the aortic and carotid arteries. In the multivariate logistic regression analysis, the ejection fraction and the mean velocity of the BA and LTICA were independently associated with AD after adjusting for age, gender, education, vascular risk factors, arterial plaques, and brain ischemic lesions detected in the brain images. These findings suggest that heart function and vascular condition may play important roles in AD pathogenesis. Improving cardiovascular functions could be a promising approach for the prevention and treatment of AD.
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Publisher
IOS Press (Nieuwe Hemweg 6B, Amsterdam 1013 BG, Netherlands)
Emtree Heading
Cognitive function of patients with rheumatoid arthritis is associated with disease activity but not carotid atherosclerotic changes.

AN: 621421856

Background: Rheumatoid arthritis (RA) is a complex inflammatory disease that has features of atherosclerosis and cognitive decline. Although the relationship between atherosclerosis and cognitive impairment has been studied and replicated, whether cognitive deficits in RA can be attributed to their atherosclerotic changes is not well understood.
Objective(s): This study investigated the cognitive function in patients with RA using the Korean version of the Consortium to Establish a Registry for Alzheimer’s disease (CERAD-K) neuropsychological battery and evaluated whether cognitive function was affected by the carotid arterial atherosclerosis.

Method(s): We examined seventy RA patients and forty healthy controls. RA activity was assessed by disease activity score with 28 joints-erythrocyte sedimentation rate (DAS28-ESR) and objective memory impairment was defined as a performance score of 1.5 standard deviations below the respective agespecific, education-specific, and sex-specific normative means for at least one of the four episodic memory tests in CERAD-K; the Word List Memory, Word List Recall, Word List Recognition, and Constructional Recall tests [1]. Carotid arteries were scanned for the presence of plaque and intima-media thickness (IMT). We assessed potential risk factors of cognitive impairment in RA patients using regression analyses.

Result(s): Of the CERAD-K subtests, there were a significant difference between the RA patients and healthy controls in verbal fluency (12.97+/-3.73 vs 15.48+/-4.57, respectively; p=0.004) and Boston Naming Test (11.50+/-2.08 vs 12.30+/-1.77, respectively; p=0.035). Carotid ultrasound revealed significantly more plaques in the RA patients than in the healthy controls (39% vs 15%, respectively; p=0.017). RA patients with memory impairment have significantly higher score of DAS28-ESR (4.14+/-0.99 vs 2.60+/-0.88, respectively; p<0.001), age (65.71+/-7.71 vs 58.50+/-11.33, respectively; p=0.009), and mean cIMT (0.56+/-0.10 vs 0.50+/-0.08, respectively; p=0.027) compared to RA patients without memory impairment. In multivariable regression analysis, CERAD-K total score showed a significant negative correlation with age (beta=-0.415, p<0.001) or DAS28-ESR (beta=-4.685, p<0.001), but no correlation was found between CERAD-K total score and presence of plaque or cIMT (Table 1).

Conclusion(s): Our results indicate that disease activity of RA and aging contribute to cognitive impairment, but there was no association between cognitive function and clinical or subclinical carotid atherosclerotic changes in RA patients.

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Background and aims: Systolic arterial hypertension (SAH) in midlife is a risk factor for cognitive impairment (CI) but the relationship of asymptomatic carotid stenosis (ACS>=50%) to CI is still a matter of debate. The aim of this epidemiological study is to estimate the significance of ACS>=50% for CI in hypertensive and non-hypertensive persons without signs and symptoms of stroke or TIA.
Method(s): A total of 500 volunteers, aged 50-79 years, were enrolled and followed-up for cognitive performance. CI has been defined as a score between 24 and 27 of MMSE. A battery of additional neuropsychological tests has also been conducted.

Result(s): Multiple logistic regression analysis has shown that ACS≥50% attributes to CI (OR=10.7; 95%CI: 3.36-34.14; p=0.0001) only in hypertensive patients with SAH but not in normotensives. Logistic regression analysis has revealed that the abnormal scores of neuropsychological tests (MMSE, DFS, DBS and VF) are significantly associated with ACS≥50% (OR 2.121; 95%CI: 1.048-4.292; p=0.036). The strongest relationship has been established between ACS≥50% and DBS (OR 10.818; 95%CI: 1.165-100.439; p=0.037). CI has presented as an executive dysfunction and decline of attention, verbal fluency and working memory.

Conclusion(s): ACS≥50% might be attributable to CI in patients with SAH. This suggests a complexity of a large and small artery dysfunction, caused by both atherosclerosis and hypertension, underlying the CI pathogenesis.
111.

Carotid atherosclerosis, cytomegalovirus infection, and cognitive decline in the very old: a community-based prospective cohort study.
Kawasaki M., Arai Y., Hirata T., Takayama M., Abe Y., Niimura H., Mimura M., Takebayashi T., Hirose N.
Age. 38 (2) (pp 1-13), 2016. Article Number: 29. Date of Publication: 01 Apr 2016.
AN: 608461844
To investigate various risk factors of cognitive decline in the very old, we studied 494 subjects over 85 years old without diagnosis of dementia at baseline from the Tokyo Oldest Old Survey on Total Health, an ongoing, community-based cohort in Japan. Cognitive function was assessed at baseline and at 3-year follow-up using Mini-Mental State Examination (MMSE). Plasma samples were assayed for levels of cytomegalovirus (CMV) immunoglobulin G (IgG) antibodies, tumor necrosis factor-alpha, interleukin-6, and blood chemistry. Carotid artery plaques were measured using an ultrasonography. In the cross-sectional analyses using Tobit regression, individuals with high carotid artery plaque score (≥5.0) had MMSE scores that were 1.08 points lower compared to those with no plaque (95% confidence interval (CI) -1.95 to -0.20; p = 0.016), adjusted for age, sex, and education. Individuals with CMV IgG titers in the highest quartile had MMSE scores that were 1.47 points lower compared to individuals in the lowest quartile (95% CI -2.44 to -0.50; p = 0.003). CMV and carotid atherosclerosis showed evidence of an interaction, where the association between CMV and MMSE was present only in subjects with carotid artery plaque. In the longitudinal analyses using linear regression, carotid atherosclerosis, smoking, low grip strength, and poor activities of daily living (ADL) status were associated with faster cognitive decline, adjusted for age, sex, education, and baseline cognitive function. Our findings suggest that carotid atherosclerosis is consistently associated with low cognitive function in the very old and modifies the association between latent CMV infection and cognition.

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Classification of Symptomatic and Asymptomatic Patients with and without Cognitive Decline Using Non-invasive Carotid Plaque Strain Indices as Biomarkers.


Ultrasound in Medicine and Biology. 42 (4) (pp 909-918), 2016. Date of Publication: 01 Apr 2016.
AN: 607555070

Vascular cognitive decline may be caused by micro-emboli generated by carotid plaque instability. We previously found that maximum strain indices in carotid plaque were significantly correlated with cognitive function. In the work described here, we examined these associations with a larger sample size, as well as evaluated the performance of these maximum strain indices in predicting cognitive impairment. Ultrasound-based strain imaging and cognition assessment were conducted on 75 human patients. Patients underwent one of two standardized cognitive test batteries, either the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) or the National Institute of Neurologic Disorder and Stroke-Canadian Stroke Network (NINDS-CSN) Vascular Cognitive Impairment Harmonization Standards (60 min). Scores were standardized within each battery to allow these data to be combined across all participants. Radiofrequency signals for ultrasound strain imaging were acquired on the carotid arteries using either a Siemens Antares with a VFX 13-5 linear array transducer or a Siemens S2000 with an 18 L6 linear array transducer. The same hierarchical block-matching motion tracking algorithm developed in our laboratory was used to estimate accumulated axial, lateral, and shear strain indices in carotid plaque, with inclusion of adventitia regardless of the ultrasound system and transducer used. Associations between cognitive z-scores and maximum strain indices were examined using Pearson's correlation coefficients. Maximum strain indices were also employed to predict cognitive impairment using receiver operating characteristic analysis. All correlations between maximum strain indices and total cognition were statistically significant (p < 0.05), indicating that these indices have good utility in predicting cognitive impairment. Maximum lateral strain indices provided an area under the curve of 0.85 for symptomatic patients and 0.68 for asymptomatic patients. Our results indicate the important relationship of maximum strain indices to cognitive function and the feasibility of using maximum strain indices to predict cognitive decline with inclusion of the adventitia layer into the segmentation of plaque.

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Improved Correlation of Strain Indices with Cognitive Dysfunction with Inclusion of Adventitial Layer with Carotid Plaque.

Wang X., Mitchell C.C., Varghese T., Jackson D.C., Rocque B.G., Hermann B.P., Dempsey R.J.

Ultrasonic imaging. 38 (3) (pp 194-208), 2016. Date of Publication: 01 May 2016.

AN: 615862406

Plaque instability may lead to chronic embolization, which in turn may contribute to progressive cognitive decline. Accumulated strain tensor indices over a cardiac cycle within a pulsating carotid plaque may be viable biomarkers for the diagnosis of plaque instability. Using plaque-only carotid
artery segmentations, we recently demonstrated that impaired cognitive function correlated significantly with maximum axial and lateral strain indices within a localized region of interest in plaque. Inclusion of the adventitial layer focuses our strain or instability measures on the vessel wall-plaque interface hypothesized to be a region with increased shearing forces and measurable instability. A hierarchical block-matching motion tracking algorithm developed in our laboratory was used to estimate accumulated axial, lateral, and shear strain distribution in plaques identified with the plaque-with-adventitia segmentation. Correlations of strain indices to the Repeatable Battery for the Assessment of Neuropsychological Status Total score were performed and compared with previous results. Overall, correlation coefficients (r) and significance (p) values improved for axial, lateral, and shear strain indices. Shear strain indices, however, demonstrated the largest improvement. The Pearson correlation coefficients for maximum shear strain and cognition improved from the previous plaque-only analyses of -0.432 and -0.345 to -0.795 and -0.717 with the plaque-with-adventitia segmentation for the symptomatic group and for all patients combined, respectively. Our results demonstrate the advantage of including adventitia for ultrasound carotid strain imaging providing improved association to parameters assessing cognitive impairment in patients. This supports theories of the importance of the vessel wall plaque interface in the pathophysiology of embolic disease.

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Emtree Heading
adult; adventitia; aged; carotid artery obstruction; computer assisted diagnosis; *diagnostic imaging; elastography; female; human; male; middle aged; neuropsychological test; *procedures;
Cognitive Dysfunction / etiology [Etiology].
Candidate Terms
Cognitive Dysfunction / etiology [other term].
Other Index Terms
adult; adventitia; aged; carotid artery obstruction; computer assisted diagnosis; *diagnostic imaging; elastography; female; human; male; middle aged; neuropsychological test; *procedures.

Badacz R., Kablak-Ziembicka A., Urbanczyk-Zawadzka M., Banys R.P., Musialek P., Pieniazek P., Mleczko S., Zmudka K., Przewlocki T.
AN: 624570711

Background. About one third of patients develop cognitive dementia following cerebral ischemic event (CIE), while 20-50% of subjects with symptomatic carotid artery stenosis (CAS) suffer from CIE recurrence during 6 months. On the other hand, prompt carotid artery revascularization (CAR) may prevent CIE recurrence, however, at the cost of cognitive function decline or new acute microembolic lesions (MES) on brain diffusion-weighted magnetic resonance imaging (DWI-MRI). We investigated whether CAR in recent survivors of CIE related to high risk CAS may contribute to functional and cognitive outcomes. Methods. Thirteen consecutive patients (mean age 67+/-7.8y.o., 8 male) with recent CIE (18.3+/-10.5 days to CAR) related to severe CAS (mean stenosis degree: 89.8+/-7.9%, range 80-99%) were prospectively assessed with transcranial doppler (TCD) of the Willis Circle, DWI-MRI, cognitive outcome using the Montreal Cognitive Assessment (MoCA), Mini Mental Skills Examination (MMSE), and functional outcome using the modified Rankin Scale (Rs) and National Institutes of Health Stroke Scale (NIHSS) at 24 hours before CAR, at 48-72 hours and at 1 month following CAR. Results. Most plaques were high risk: thrombotic in 5, lipid-rich in 1, lipid-fibrotic in 5 and calcified in 2 patients, including string stenosis in 5 and ulcerations in 9 subjects, as evidenced by ultrasonography and post-CAR histological assessment of plaque debris.
captured by the filter in 9 subjects or plaques removed during endarterectomy in 4 subjects. One (7.7%) minor stroke was observed following CAR. Acute and subacute multiple cerebral ischemic lesions were observed in all subjects before CAR (mean lesion size of 13.5 +/- 10mm, range 4-37mm), while new MES following CAR were found in 5 (38.5%) subjects. After 1 month, MES persisted in 3 (23%), resolved in 2 (15.4%), decreased in 8 (61.5%) patients respectively. There was a significant increase of cerebral flow velocity in the middle and the anterior cerebral artery on the site of CAR following intervention (from 72 +/- 20 to 106 +/- 24cm/s, p=0.0008 and from 75 +/- 23.4 to 94 +/- 18.2 cm/s, p=0.056 respectively). This flow increase was correlated with cerebral perfusion increase on MRI. NIHSS and Rs significantly improved after CAR (from 3.0 +/- 1.2 to 1.8 +/- 1.1 p=0.013 and from 1.5 +/- 0.8 to 0.7 +/- 0.9 p=0.034 respectively). There was no cognitive decline as assessed by MMSE and MoCA at 1 month vs before procedure (MMSE: 27.7 +/- 2.5, range 22-30, vs 26.8 +/- 1.9, range 26-29, p=0.027 MoCa: 23.5 +/- 3.5, range 19-28 vs, 23.3 +/- 2.5, range 20-27, p=0.356). Improvement of cognitive function was found in 9 (69.2%) by MMSE and in 7 (53.8%) subjects by MoCa. Conclusions. This preliminary pilot study concerning many aspects of CAR following CIE indicated immediate improvement of cerebral flow seen on TCD and perfusion MRI. Furthermore, we did not find cognitive decline when urgent CAR was performed for secondary stroke prevention in this high risk group. Large studies are necessary.

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Oxford University Press

Emtree Heading
aged; *anterior cerebral artery; *artery formation (physiology); brain circulus arteriosus; brain perfusion; *carotid artery obstruction; case report; cerebrovascular accident; clinical article; cognitive defect; *diffusion weighted imaging; endarterectomy; filter; flow rate; high risk population; histopathology; human; ischemia; male; Montreal cognitive assessment; National Institutes of Health Stroke Scale; perfusion weighted imaging; pilot study; prevention; prospective study; Rankin scale; risk assessment; skill; survivor; thrombosis; transcranial doppler; ulcer; lipid; conference abstract.

Candidate Terms
conference abstract [other term].

Drug Index Terms
lipid.
Cerebral perfusion and cognitive functions in patients after carotid endarterectomy for symptomatic carotid stenosis.
Mushba A., Vinogradov O., Tsvetkova A., Kuznetsov A.
Spain. 1 (1 Supplement 1) (pp 519-520), 2016. Date of Publication: May 2016.
AN: 616987885

Background: 25% of ischemic strokes are associated with atherosclerosis of extracranial and intracranial arteries. Carotid endarterectomy (CEA) is used for secondary prophylaxis of ischemic strokes in patients with symptomatic stenosis of internal carotid artery over 70%. Nevertheless, it is still unknown whether the removal of atherosclerotic plaque from internal carotid artery (ICA) improves perfusion of hemisphere and, as a consequence, cognitive function, or not.

Method(s): 30 patients with atherotrombotic type of ischemic stroke who undergone CEA were included in study. 22 (73.3%) of them were male and 8 (26.7%) were women; mean age of patients was 62.5 +/- 1.3 years. Preoperatively and 10-14 days postoperatively patients were studied with cognitive impairment scales (MMSE, MoCa), cognitive evoked potentials (P-300), duplex scanning of brachiocephalic arteries, transcranial duplex scan, brain MRI and Single-photon emission computed tomography (SPECT) with 99mTc-HMPAO.
Result(s): Improvement of cerebral perfusion in affected hemisphere after CEA was demonstrated: SPECT showed increasing of perfusion in medial cerebral artery system from 87.3% to 92.1% (p < 0.05). Improvement of cerebral perfusion did not result to improvement of cognitive functions: mean MMSE score pre-op and post-op were 25.1 +/-0.5 and 25.9 +/-0.2, respectively (p > 0.05); MoCa score pre-op and post-op were 26.3 +/- 0.4 and 26.7 +/-0.3, respectively (p > 0.05). Differences in neuro-functional data pre- and postoperatively were not statistically significant. Cognitive evoked potentials showed pre-op and post-op latency of P-300 399.7 +/-8.7 msec and 360.3 +/- 9.6 MC msec, respectively (p > 0.05).

Conclusion(s): CEA for symptomatic stenosis of ICA improves cerebral perfusion in affected hemisphere but do not improve cognitive functions.

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Publisher
SAGE Publications Ltd

Emtree Heading
adult; brachiocephalic trunk; brain ischemia; *brain perfusion; *carotid artery obstruction; *carotid endarterectomy; clinical article; *cognitive defect; evoked response; female; human; internal carotid artery; male; middle aged; middle cerebral artery; Mini Mental State Examination; nuclear magnetic resonance imaging; single photon emission computed tomography; hexamethylpropylene amine oxime technetium tc 99m; polyacrylamide.

Drug Index Terms
hexamethylpropylene amine oxime technetium tc 99m; polyacrylamide.

Other Index Terms
adult; brachiocephalic trunk; brain ischemia; *brain perfusion; *carotid artery obstruction; *carotid endarterectomy; clinical article; *cognitive defect; evoked response; female; human; internal carotid artery; male; middle aged; middle cerebral artery; Mini Mental State Examination; nuclear magnetic resonance imaging; single photon emission computed tomography.
Lower carotid flow velocities were associated with impaired cognitive function in a community-based elderly population.

AN: 612283991

Background: Carotid atherosclerosis (high intima-media thickness) was recognized to associate with stroke and cognitive function impairment. However, few studies investigated the association between carotid flow velocities and cognitive function. This study investigated the association between carotid flow velocities and cognitive function.

Material(s) and Method(s): A total of 1684 seniors aged more than 65 years and without dementia was recruited for this aging study. All seniors were receiving the physical and mental examinations and drawing fasting blood sample for testing biochemical markers. The Mini-Mental State Examination (MMSE) was used to evaluate the global cognitive function. We classified the subjects with poor (MMSE<24), normal (MMSE: 24-27) and well (MMSE: >=28) cognitive function. We used the linear regression and logistic regression to evaluate the association between carotid flow velocity and cognitive function. Multivariate linear regression and ordinal logistic regression were used to evaluate the association between carotid flow velocities and cognitive function.

Result(s): Old age, women gender, low education and high systolic blood pressure, poor nutritional status, worse glucose control and inflammation status were associated with cognitive function. We also found that the peak systolic velocity (PSV) in common carotid artery and in internal carotid artery (ICA), and end-diastolic velocity in the ICA were positively associated with well cognitive function. The multivariate linear regression showed low systolic blood pressure (beta=−0.010, p-value= 0.0145) and high CCA PSV (beta = 0.026, p-value=0.026, p-value = 0.014) were independently associated with higher MMSE, after controlling the age, sex, education, nutritional status and smoking. Compared to the referent group with higher CCA-PSV (> =68 cm/sec), the group with lowest CCA-PSV (<60 cm/sec) significantly increased 54% risk (OR=1.54; 95% CI: 1.14-2.08), and those seniors with middle CCA-PWV slightly increased 27% risk (OR=1.28; 95% CI: 0.998- 1.63) for impaired cognitive function in the multivariate logistic regression.

Conclusion(s): Low carotid flow velocities were significantly associated with impaired cognitive function and this relationship needs further prospective studies to confirm.

Institution
Carotid intima-media thickness, plaque, and cognition: The Northern manhattan study.
Caunca M.R., Gardener H., Dong C., Gervasi-Franklin P., Cheung Y.K., Elkind M.S.V., Sacco R.L., Rundek T., Wright C.B.
AN: 612892399
Carotid artery intima media thickness (cIMT) and nonstenotic carotid plaque are suggested markers of carotid atherosclerosis and may be related to cognition in the elderly. We hypothesized that individuals with greater cIMT or with carotid plaques would exhibit worse cognition at baseline and have greater cognitive decline. Stroke-free Northern Manhattan Study (NOMAS) participants had carotid ultrasound and repeated neuropsychological (NP) testing. Carotid IMT and plaques were imaged with standardized B-mode ultrasound protocols and analyzed by a certified sonographer. We used multivariable linear regression to examine cIMT, plaque presence, and plaque area as correlates of domain-specific NP Zscores cross-sectionally and after six years follow-up. We also investigated effect modification by APOE e4 allele status. Neuropsychological testing was performed among 1166 participants at baseline and among 826 participants at follow-up (mean=6.2 years). The mean cIMT was 0.93 +/- 0.09 mm (mean age= 71 +/- 9 years; 60% women; 15% white; 18% black; 67% Hispanic white). Participants with greater cIMT had worse episodic memory at baseline after adjustment for demographics and vascular risk factors (beta=-0.60, P=0.04). APOE e4 carriers with greater cIMT exhibited worse episodic memory (beta=-1.26, P=0.04), semantic memory (beta=-1.35, P=0.01), and processing speed (beta=-1.22, P=0.02) at baseline. Participants with greater cIMT at baseline did not exhibit cognitive decline in episodic or semantic memory, but did exhibit decline in executive function and processing speed, though these associations did not reach significance. The APOE e4 allele was a significant effect modifier: participants without an APOE e4 allele who had greater cIMT at baseline exhibited more decline in executive function (beta=-1.03, P=0.05). Neither plaque presence nor area was significantly associated with cognitive performance in any domain in cross-sectional or longitudinal analyses. Results remained similar after restricting the analysis to those who were categorized as cognitively unimpaired at baseline based on their Mini-Mental Status Examination score. Our cross-sectional findings in this race/ethnically diverse community-based urban sample suggest that being at elevated genetic risk of Alzheimer disease as well as having a greater vascular disease burden may have cognitive consequences. A greater burden of vascular disease may have domain-specific cognitive consequences in the absence of genetic Alzheimer disease risk. Atherosclerotic lesions may be less important in the pathology of vascular cognitive changes, but larger studies are needed. Arterial wall thickening due to compensatory and inflammatory arterial remodeling are mechanisms that should be explored in future studies.

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Publisher
John Wiley and Sons Inc.

Emtree Heading
Subclinical carotid atherosclerosis associates with impairment in immediate memory.
AN: 72252214
Objective: To clarify whether carotid atherosclerosis and its risk factors contribute to cognitive function.
Background(s): Both of two major types of dementia: vascular dementia and Alzheimer's disease shares pathogenesis related to atherosclerosis. Carotid intima-media thickness (IMT) is widely used for assessing atherosclerosis. Some study has reported association of increased carotid IMT and cognitive function, but it remains controversial.

Method(s): Two hundred and six individuals who visited our center for health screening were evaluated with physical examination, blood test, carotid ultrasonography, brain MRI scanning, and cognitive function tests. Cognitive function assessment included Mini-Mental State Examination (MMSE), Clock Drawing Test (CDT), and logical memory of Wechsler Memory Scale (WMS-R). Thirty individuals with cerebrovascular lesions by MRI scanning were excluded. To detect early cognitive decline, we defined "cognitive impairment (CI)" when an individual satisfied at least one of three criteria; 1)MMSE score under 24, 2) CDT score under 4 coexistent with forgetfulness, and 3) WMS-R delayed recall score under normal range for each educational length (over 16 years: 9, 10-15 years: 5, 0-9 years: 3), according to Alzheimer's Disease Neuroimaging Initiative (ADNI) late MCI criteria.

Result(s): Among 176 individuals, 27 were classified as CI group. Maximum IMT was significantly increased in CI group than in non-CI group (meanSD: 2.01.0 vs 1.70.7, p=0.018) by student t-test. Other atherosclerotic risk factors; blood pressure, LDL-cholesterol, and HbA1c were not significantly different between two groups. In multivariate analysis, no single risk factor of atherosclerosis contributed to each cognitive function assessment. However, carotid IMT was associated with impaired immediate recall score of WMS-R independently to deep white matter hyperintensity on MRI scan.

Conclusion(s): Subclinical carotid atherosclerosis assessed as thickened IMT can be a marker of early stage of cognitive impairment especially immediate memory recall presumably by cerebral microvascular dysfunction in frontal lobe.

Publisher
Lippincott Williams and Wilkins

Emtree Heading
*carotid atherosclerosis; *short term memory; *American; *neurology; Wechsler memory scale; cognition; atherosclerosis; carotid artery; recall; risk factor; multiinfarct dementia; cognitive defect; human; Alzheimer disease; Mini Mental State Examination; nuclear magnetic resonance imaging; blood; multivariate analysis; physical examination; mass screening; blood pressure; student; neuroimaging; cerebrovascular disease; memory; clock drawing test; echography; arterial wall thickness; white matter; cognitive function test; frontal lobe; brain; pathogenesis; hemoglobin A1c; low density lipoprotein cholesterol; marker; low density lipoprotein.

Drug Index Terms
hemoglobin A1c; low density lipoprotein cholesterol; marker; low density lipoprotein.

Other Index Terms
Arterial stiffness and pressure amplification are associated with lower cognition among older Caucasian adults: The atherosclerosis risk in communities (ARIC) study.


AN: 72231686

Introduction: Accelerated cognitive decline is influenced by vascular aging. Arterial stiffness and pressure amplification, measures of vascular aging, are associated with lower cognitive performance though their association with cognitive domains has been understudied. Hypothesis: Arterial stiffness and pressure amplification are associated with lower global and domain-specific cognition among a sample of Caucasian and African American (AA) older adults. Methods: In a cross-sectional study of 4618 members from visit 5 (2011-2013) of ARIC (mean age: 75 years, 41% men, 20% AA), we measured arterial stiffness (carotid-femoral pulse wave velocity (cfPWV)) and pressure amplification (pulse pressure amplification (PPA), central pulse pressure (cPP) and carotid systolic blood pressure (cSBP)) using the Omron VP-1000 Plus device. Race-specific 25th percentile cut points were estimated for each measure. Domain-specific cognitive function was examined.
using the Delayed Word Recall Test (memory), Digit Symbol Substitution Test (executive function/processing speed), and Word Fluency Test (language). Test-specific z scores were calculated from sample means and standard deviations. A global cognition z score was generated by averaging the test-specific z scores. Linear regression was used to estimate the associations between race-specific 25th percentile dichotomies for arterial stiffness and pressure amplification measures with test-specific and global cognition z scores, adjusted for age, sex, education, ApoE4, heart rate, smoking and body mass index Results: Among AAs, there was no significant association between measures of arterial stiffness and pressure amplification with either global or the domain-specific measures of cognition. Among Caucasians, all measures of arterial stiffness and pressure amplification were associated with lower global cognitive z scores (cfPWV: Beta (beta) = -0.11, 95% Confidence Interval (CI): -0.19, -0.04; PPA: beta=-0.11, 95% CI: -0.19, -0.03; cPP: beta=-0.11, 95% CI: -0.18, -0.04; cSBP: beta=-0.12, 95% CI: -0.20, -0.05). All measures of arterial stiffness and pressure amplification also were associated with lower executive function/processing speed (cfPWV: beta=-0.09, 95% CI: -0.16, -0.03; PPA: beta=-0.15, 95% CI: -0.22, -0.08; cPP: beta=-0.14, 95% CI: -0.21, -0.07; cSBP: beta=-0.13, 95% CI: -0.20, -0.07). High cfPWV was associated with lower memory (beta=-0.12, 95% CI: -0.20, -0.04); and high cSBP was associated with lower language (beta=-0.12, 95% CI: -0.20, -0.04).

Conclusion(s): Arterial stiffness and measures of pressure amplification are inversely associated with global and domain-specific cognition in Caucasian older adults, but not in a smaller sample of AAs. Further study of the role of modifiable components of arterial aging on the preservation of cognition, particularly executive function/psychomotor speed, in older adulthood is warranted.

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Lippincott Williams and Wilkins

Emtree Heading
*cognition; *arterial stiffness; *community; *adult; *atherosclerosis; *risk; *Caucasian; *medical society; *epidemiology; *health; human; manager; velocity; aging; pulse pressure; carotid artery; memory; language; digit symbol substitution test; word recognition; male; devices; systolic blood pressure; preservation; cross-sectional study; body mass; smoking; heart rate; African American; sexual education; linear regression analysis; pulse wave; hypothesis; confidence interval; adulthood.
Association of arterial stiffness and pressure amplification with mild cognitive impairment and dementia: The atherosclerosis risk in communities study-neurocognitive study (ARIC-NCS).
Publication: (var.pagings). 133 (SUPPL. 1) (no pagination), 2016. Date of Publication: 01 Mar 2016.
AN: 72231532
Abstract Background: As a high-flow, low-impedance organ, the brain is sensitive to excessive pressure and flow pulsatility. Increased pulsatility and arterial stiffness are hypothesized to contribute to cerebral microvascular damage linked to cognitive impairment. The association of arterial stiffness with mild cognitive impairment (MCI) and dementia in a biethnic population is not well characterized, and the association of pressure amplification with MCI and dementia is relatively unexplored.
Objective(s): To quantify the cross-sectional association of arterial stiffness, measured by aortic pulse wave velocity (PWV), and pressure amplification with MCI and dementia in a biethnic population of older adults.
Method(s): We included 4,945 adults (2,903 females; 1,069 African Americans; mean age 75 years) from the population-based ARIC-NCS. The Omron VP-1000 plus system was used to measure arterial stiffness (carotid-femoral PWV (cfPWV)) and pressure amplification measures (central systolic blood pressure (cSBP), central pulse pressure (cPP), and pulse pressure amplification (PPA)). A neurologist and neuropsychologist classified MCI and dementia using psychometric assessments, medical history, cerebral magnetic resonance imaging, and physical examinations, with adjudication by a third reviewer. We used multinomial logistic regression to evaluate associations of race-specific 25th percentile cut points of PWV and pressure amplification with normal cognition (reference), MCI and dementia. We stratified by race and adjusted for age, sex, and heart rate, ApoE4, education, smoking status, and study center.

Result(s): There were 760 Caucasians with MCI and 110 with dementia, and 201 African Americans with MCI and 47 with dementia. Among Caucasians, those with lower PPA had a higher prevalence of dementia, odds ratio (OR)=1.84 (95% confidence interval (CI): 1.15, 2.97), comparing participants below the 25th percentile to those above it, and those with higher cSBP had a higher prevalence of MCI, OR=1.33 (95% CI: 1.09, 1.63), comparing participants above the 75th percentile to those below it. Also among Caucasians, those with higher cPP had a higher prevalence of MCI, OR=1.25 (95%CI: 1.01, 1.55), and dementia, OR=1.66 (95% CI: 1.00, 2.73), comparing participants above the 75th percentile to those below it. There were no statistically significant associations with cfPWV, among African Americans, and no evidence for effect modification by hypertension or diabetes.

Conclusion(s): Arterial stiffness and components of pressure amplification were associated with MCI and dementia in Caucasians but not in African Americans, possibly due to the limited sample size. Longitudinal characterization of the observed associations is warranted to determine whether these measures are independent predictors of MCI and dementia among Caucasian and African American older adults.
Background/Objective: Carotid artery intima media thickness (cIMT) may be a marker of cerebral atherosclerotic disease and therefore related to cognitive status in the elderly. We hypothesized that those with greater cIMT would exhibit worse cognition at baseline and have greater cognitive decline over time.

Method(s): A sample of 1166 stroke-free community participants from the Northern Manhattan Study (NOMAS) underwent carotid ultrasound and repeated neuropsychological (NP) testing. cIMT
was imaged with a standardized B-mode ultrasound protocol and analyzed by a trained sonographer. We used multivariable linear regression to examine cIMT as a correlate of domain-specific NP Z-scores cross-sectionally and over time; we investigated possible effect modification by APOE epsilon4 allele, adjusting for demographics and vascular risk factors.

Result(s): The mean age of participants was 71+/-9 years, 60% were women, 15% white, 18% black, 67% Hispanic, and mean cIMT was 0.93 +/- 0.09 mm. NP testing was performed among 1166 participants at baseline and among 826 participants with NP follow-up at a mean of 6.2 years apart. Participants with greater cIMT exhibited worse episodic memory at baseline after adjustment for demographics and vascular risk factors (beta=-0.60, P=0.04). APOE epsilon4 allele presence was a significant effect modifier, and after stratification, APOE epsilon4 carriers with greater cIMT exhibited worse episodic memory (beta=-1.26, P=0.04), semantic memory (beta=-1.35, P=0.01), and processing speed (beta=-1.22, P=0.02) at baseline. In longitudinal analysis, participants with greater cIMT at baseline did not exhibit cognitive decline after adjustment for demographics and vascular risk factors, but APOE epsilon4 allele presence was a significant effect modifier. After stratification, APOE epsilon4 non-carriers with greater cIMT at baseline exhibited greater declines in executive function (beta=-1.03, P=0.05).

Conclusion(s): cIMT may be associated with worse cognition and greater cognitive decline in multiple domains among those at high risk for Alzheimer disease, and with worsening executive function in APOE epsilon4 non-carriers. Interventions that target early stages of atherosclerosis may modify the course of cognitive aging and prevent cognitive decline.

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Publisher
Lippincott Williams and Wilkins

Emtree Heading
*cerebrovascular accident; *ultrasound; *imaging; *cognition; *arterial wall thickness; *American; *heart; *cognitive defect; *nursing; human; risk factor; allele; carotid artery; stratification; executive function; episodic memory; follow up; aged; artery intima; linear regression analysis; Hispanic;
Background and aims: Carotid artery intima-media thickness (CIMT) may be used as a biomarker for early cognitive impairment. However, the results of the association between CIMT and cognitive function in middle-aged subjects are mixed. We aimed to investigate this association in a large Brazilian sample with no history of stroke at baseline. Additionally, we tested the effect of interactions between CIMT and cardiovascular risk factors on cognitive performance.

Method(s): In this cross-sectional study, cognition was evaluated using the delayed word recall (DWRT), the category fluency, and the trail making tests (TMT). CIMT was measured at the common carotid artery. The association between CIMT and cognitive tests was investigated using linear regression analysis.

137.

Subclinical carotid artery atherosclerosis and performance on cognitive tests in middle-aged adults: Baseline results from the ELSA-Brasil.
Suemoto C.K., Santos I.S., Bittencourt M.S., Pereira A.C., Goulart A.C., Rundek T., Passos V.M., Lotufo P., Bensenor I.M.
Atherosclerosis. 243 (2) (pp 510-515), 2015. Date of Publication: December 01, 2015.
AN: 606735660
linear regression models, adjusted for an extensive set of possible confounding variables. We also included interaction terms with selected risk factors.

Result(s): The mean age of the 8208 participants was 49.6 +/- 7.3 years, 44% were male, and 56% White. Increase in CIMT was associated with worse performance on the DWRT (beta = -0.433, 95%CI = -0.724;-0.142, p = 0.004). We found effect modification of the association between cognitive function and CMIT by self-reported heart failure and alcohol intake. Participants had worse performance in the TMT if they had greater CIMT and current alcohol use (p < 0.0001). The interaction between CIMT and heart failure on TMT performance was not significant after adjustment for multiple comparisons (p = 0.07).

Conclusion(s): In this sample of middle-aged adults, CIMT was inversely associated with memory function. Additionally, the presence of alcohol use resulted in a stronger association of CIMT with worse performance on an executive function test.

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Differential influence of carotid stenosis and white matter disease on motor and cognitive activation.


AN: 605531948

Background: Cognitive and motor performance can be supported, especially in older subjects, by different types of brain activations, which can be accurately studied by functional magnetic resonance imaging (fMRI). Vascular risk factors (VRFs) are extremely important in the development of cognitive impairment, but few studies have focused on the fMRI cortical activation characteristics of healthy subjects with and without silent cerebrovascular disease including white matter hyperintensities (WMH) and carotid stenosis (CS) performing cognitive tasks.
Method(s): Thirty-five volunteers with and without asymptomatic unilateral carotid stenosis above 70% and variable degrees of WMH underwent performance of a simple motor and cognitive task during an fMRI session.

Result(s): While the performance of the motor task resulted in a cortical activation dependent of age but not of WMH and carotid stenosis, performance of the cognitive task was accompanied by a significantly increased activation independently correlated with age, presence of WMH as well as of carotid stenosis.

Conclusion(s): in this study, cognitive domains regulating attention and working memory appear to be activated with a pattern influenced by the presence of carotid stenosis as well as by white matter hyperintensities. The impairment of these cognitive abilities is of high relevance in Alzheimer’s disease pathology. The fMRI pattern shown in patients with asymptomatic but significant carotid stenosis might be related to chronic cerebrovascular hypoperfusion, a critical pathophysiological mechanisms in AD. In these patients, carotid endarterectomy should be considered also for AD prevention and might be recommended.

Copyright © 2015 Bentham Science Publishers.
Atherosclerotic calcification is related to a higher risk of dementia and cognitive decline.
Alzheimer's and Dementia. 11 (6) (pp 639-647.e1), 2015. Date of Publication: 01 Jun 2015.
AN: 53298505

Background: Longitudinal data on the role of atherosclerosis in different vessel beds in the etiology of cognitive impairment and dementia are scarce and inconsistent.
Method(s): Between 2003-2006, 2364 nondemented persons underwent computed tomography of the coronaries, aortic arch, extracranial, and intracranial carotid arteries to quantify atherosclerotic calcification. Participants were followed for incident dementia (n = 90) until April 2012. At baseline and follow-up participants also underwent a cognitive test battery.
Result(s): Larger calcification volume in all vessels, except in the coronaries, was associated with a higher risk of dementia. After adjustment for relevant confounders, extracranial carotid artery calcification remained significantly associated with a higher risk of dementia [hazard ratio per standard deviation increase in calcification volume: 1.37 (1.05, 1.79)]. Additional analyses for Alzheimer's disease only or censoring for stroke showed similar results. Larger calcification volumes were also associated with cognitive decline.
Conclusion(s): Atherosclerosis, in particular in the extracranial carotid arteries, is related to a higher risk of dementia and cognitive decline.

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BACKGROUND AND PURPOSE: The relationship between carotid artery intima-media thickness (IMT) and cognitive function in midlife remains relatively unexplored. We examined the association between IMT and cognitive function in a middle-aged epidemiological cohort of 2618 stroke-free participants.

METHODS: At the year 20 visit (our study baseline), participants from the Coronary Artery Risk Development in Young Adults study had IMT measured by ultrasound at the common carotid artery. Five years later, participants completed a cognitive battery consisting of the Rey Auditory-Verbal Learning Test of verbal memory, the Digit Symbol Substitution Test of processing speed, and the Stroop test of executive function. We transformed cognitive scores into standardized z scores, with negative values indicating worse performance.

RESULTS: Mean age at baseline was 45.3 years (SD, 3.6). Greater IMT (per 1 SD difference of 0.12 mm) was significantly associated with worse performance on all cognitive tests (z scores) in unadjusted linear regression models (verbal memory, -0.16; 95% confidence interval [CI], -0.20 to -0.13; processing speed, -0.23; 95% CI, -0.27 to -0.19; and executive function, -0.17; 95% CI, -0.20 to -0.13). In models adjusted for sociodemographics and vascular risk factors that lie earlier in the causal pathway, greater IMT remained negatively associated with processing speed (-0.06; 95% CI, -0.09 to -0.02; P, 0.003) and borderline associated with executive function (-0.03; 95% CI, -0.07 to 0.00; P, 0.07) but not with verbal memory.

CONCLUSIONS: We observed an association between greater IMT and worse processing speed-a key component of cognitive functioning-at middle age above and beyond traditional vascular risk factors. Efforts targeted at preventing early stages of atherosclerosis may modify the course of cognitive aging.

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Ankle-brachial index but neither intima media thickness nor coronary artery calcification is associated with mild cognitive impairment.


AN: 72125287

Background: Several studies have reported an association of atherosclerosis with mild cognitive impairment (MCI) and dementia independent of cardiovascular risk factors. As several clinical indicators of atherosclerosis exist, it is of interest if there is any variation in the association between the different indicators and MCI and its subtypes, amnestic MCI (aMCI) and non-amnestic MCI (naMCI). We therefore compared the cross-sectional association of the anklebrachial index (ABI), intimamedia thickness (IMT), and coronary artery calcification (CAC) with MCI, aMCI and naMCI in the population-based Heinz Nixdorf Recall cohort study.

Method(s): 4086 participants performed a validated brief cognitive assessment at the first follow-up examination (2006-2008). MCI was diagnosed according to previously published criteria. Logistic
regression models adjusted for age, gender, education, cardiovascular risk factors, and APOE genotype were used to compare the association of the ABI (ratio of the highest ankle artery systolic pressure and the highest systolic pressure measured in the right and left arm), the CAC - Agatston score (computed by summing weighted CAC scores of all foci in the epicardial coronary system) and the IMT (measured by ultrasound of the left and right common carotid artery) with MCI and its subtypes.

Result(s): We identified 490 participants with MCI (mean age 66.1 6 7.8, 46.9% male, aMCI n=249, naMCI n=241) and 1242 cognitively normal participants. A decreasing ABI (per 0.1) was significantly associated with a higher MCI prevalence in fully adjusted models (odds ratio (OR) 1.06 95% confidence interval (CI) 1.01-1.12), whereas an increasing CAC (log(CAC+1)) or IMT (per 0.1 mm) were not significantly associated after adjustment. In middle-aged participants (50-65 years), the association between ABI and both aMCI (1.13 95%CI 1.01-1.28) and naMCI (OR 1.15 95%CI 1.00-1.33) subtypes remained significant after adjustment for age and education but not in fully adjusted models. In old-aged participants (66-80 years), only the association between ABI and naMCI remained significant in fully adjusted models (OR 1.12 95%CI 1.01-1.23).

Conclusion(s): Our data show that the degree of generalized atherosclerosis as measured by the ABI is associated with MCI and both MCI subtypes in middle-aged participants and with naMCI in old-aged participants.
Cerebral perfusion and cognitive status before and in early period after carotid endarterectomy for symptomatic internal carotid stenosis.

Mushba A., Tsvetkova A., Vinogradov O., Kuznetsov A.


AN: 72092469

Background: Atherosclerosis of extracranial and intracranial arteries is regarded as an origin of 25% of ischemic strokes. Carotid endarterectomy (CEA) is a routine surgery for secondary prophylaxis of stroke in patients with symptomatic internal carotid artery stenosis. Nevertheless, it is still unclear, if the removal of atherosclerosis plaque from internal carotid artery (ICA) leads to improvement of cerebral perfusion and cognitive functions. Goal of our study was to estimate cerebral perfusion and cognitive status before and after CEA for atherothrombotic ischemic stroke.

Material(s) and Method(s): 23 patients (20 [86%] male, 3 [14%] female, mean age 61.5 +/-6.7) operated by CEA for atherothrombotic ischemic stroke were included in our study. Pre- and postoperatively all patients were studied by cognitive status scale (MMSE, MoCa), cognitive evoke potentials (P-300), ultrasound scan of brachiocephalic arteries, transcranial duplex scan of intracranial arteries, MRI of brain, SPECT with 99mTc-HMPAO.
Result(s): Improvement of cerebral perfusion in affected hemisphere was demonstrated after CEA. SPECT of affected hemisphere showed that perfusion index in gyrus temporale superior, gyrus temporale medium and thalamus increased from 70.73% to 78.66% (p=0.01), from 82.20% to 87.37% (p=0.04), and from 58.7% to 68.99% (p=0.009), respectively. Improvement of cerebral perfusion in our study has not resulted in cognitive improvement: mean MMSE pre- and postoperatively appeared to be 26.1+/−2.24 and 26.1+/−1.14 (p > 0.05), respectively; mean MoCa pre- and postoperatively were 27+/− 2 and 27.3+/− 1.1 (p > 0.05), respectively. This data corresponded results of neurofunctional study: P- 300 latency of cognitive evoke potentials pre- and postoperatively were 392.1+/−49.5 msec and 37.8+/−46.1 msec (p > 0.05), respectively.

Conclusion(s): CEA for symptomatic ICA stenosis results in improvement of cerebral perfusion in affected hemisphere, but not associated with cognitive improvement in early period after surgery.

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Publisher
Elsevier

Emtree Heading
*brain perfusion; *carotid endarterectomy; *carotid artery obstruction; *neurology; human; patient; brain ischemia; hemisphere; internal carotid artery; artery; atherosclerosis; surgery; brachiocephalic trunk; ultrasound; single photon emission computer tomography; cognition; female; cerebrovascular accident; prophylaxis; stenosis; latent period; thalamus; perfusion; male; brain; Mini Mental State Examination; nuclear magnetic resonance imaging; carcinoembryonic antigen; technetium 99m.

Drug Index Terms
 carcinoembryonic antigen; technetium 99m.

Other Index Terms
*brain perfusion; *carotid endarterectomy; *carotid artery obstruction; *neurology; human; patient; brain ischemia; hemisphere; internal carotid artery; artery; atherosclerosis; surgery; brachiocephalic trunk; ultrasound; single photon emission computer tomography; cognition; female; cerebrovascular accident; prophylaxis; stenosis; latent period; thalamus; perfusion; male; brain; Mini Mental State Examination; nuclear magnetic resonance imaging.
Dynamics of cognitive functions condition in patients after bilateral carotid endarterectomy.
Ataniyazov M., Tadjenov M., Rakhimbaeva G.
AN: 71970727
Aim: The primary aim of our study was to establish cerebral hemodynamics and cognitive functions in patients with total carotid artery stenosis who underwent carotid endarterectomy (CEA).
Method(s): We examined 117 patients with different level of chronic vascular cerebral insufficiency (CVCI). All patients had a bilateral hemodynamically significant stenosis of the carotid artery bifurcation and varying degrees of cognitive impairment. The average age of the patients was 62,1 +/- 4,2 years. Among the comorbidities of IHD was observed 68.5% of the patients, 15.6% of patients with early myocardial infarction, hypertension was present in 78.5% of patients, diabetes mellitus in 11.2%, atherosclerotic lesions of extremity arteries - 21.4%.
Result(s): Before CEA, MMSE score was 18,3 +/- 0.64; 3 months after the first CEA it was 22,2 +/- 0.78. 3 months after the second CEAMMSE average score increased to 26,4 +/- 0.54. Before surgery, the patient's linear blood flow velocity (BFV) of ACA at TCD was 42,14 +/- 3.6 cm/s, MCA - 54,1 +/- 2.3 cm/sec and PCA - 50,8 +/- 1.2 cm/sec. 3 months after the first operation, BFV in ACA increased to 52,4 +/- 3.4 cm/sec, in MCA to 66,1 +/- 5.3 cm/sec and in PCA to 64,6 +/- -2.3cm/sec. 3 months after the second operation CEA, BFV in ACA increased to 62,4 +/- -2.1cm/sec, in MCA to 78,1+/-6.3cm/sec and in PCA to 72,4+/--4.1cm/sec.
Conclusion(s): To sum up, bilateral hemodynamically significant stenotic lesion of carotid artery contributes to the development of moderate to severe cognitive impairment.
Institution (Ataniyazov, Tadjenov, Rakhimbaeva) Neurology, Tashkent Medical Academy, Tashkent, Uzbekistan
Publisher Elsevier Ireland Ltd
Emtree Heading
*cognition; *patient; *human; *carotid endarterectomy; *European; *atherosclerosis; *society;  
*dynamics; cognitive defect; brain dysfunction; diabetes mellitus; carotid artery obstruction; 
hypertension; heart infarction; hemodynamics; artery; surgery; blood flow velocity; carotid artery 
bifurcation; carotid artery; stenosis; Mini Mental State Examination; carcinoembryonic antigen. 

Drugs Index Terms: 
carcinoembryonic antigen. 

Other Index Terms: 
cognition; *patient; *human; *carotid endarterectomy; *European; *atherosclerosis; *society;  
dynamics; cognitive defect; brain dysfunction; diabetes mellitus; carotid artery obstruction;  
hypertension; heart infarction; hemodynamics; artery; surgery; blood flow velocity; carotid artery 
bifurcation; carotid artery; stenosis; Mini Mental State Examination.

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150.

Training and environmental enrichment to counteract cognitive decline: Train the brain effects on 
carotid structure and function. 
Stea F., Bruno R., Ghiadoni L., Faita F., Di Lascio N., Del Turco S., Maffei L., Tognoni G., Taddei S., 
Picano E., Sicari R. 
Journal of Hypertension. Conference: 25th European Meeting on Hypertension and Cardiovascular 
Protection, ESH 2015. Milan Italy. Conference Publication: (var.pagings). 33 (SUPPL. 1) (pp e96), 
2015. Date of Publication: June 2015. 
AN: 71934878

Objective: Physical activity is beneficial to vascular health; on the other hand, vascular damage is 
associated with cognitive impairment. Both physical activity and a cognitively stimulating 
environment are known to delay the onset of dementia. The Train The Brain study evaluates the 
effectiveness of a comprehensive program of physical training and mental activity in delaying 
cognitive decline in elderly people with mild cognitive impairment, at the same time investigating...
the relationship between physical, vascular, neurological, and cognitive fitness. Design and method:
Elders age 65-89 were recruited with the help of family physicians and territorial services. All participants underwent a neurological and cardiologic evaluation. In the vascular study, carotid pressure was measured with the SphygmoCor system (AtCor, Australia); longitudinal ultrasound scans of the common carotid were performed and 10-second video clips were recorded to be analyzed offline through the Cardiovascular Suite software (Quipu srl, Italy), with the computation of diameter, intima-media thickness, wall cross-sectional area, distensibility coefficient, compliance, stiffness, and elastic modulus. Subjects classified as mild cognitive impairment at the neurological examination were randomized either to standard care, or a 7-month program of physical training and environmental stimulation (lectures, games, music, social activities) three hours a week. The evaluation was then repeated.

Result(s): Data were obtained for 57 patients who underwent training (T) and 30 controls (C). The only significant difference at baseline was in the distensibility coefficient (p = 0.045). (Table Presented) Vessel diameter increased in C and decreased in T; distensibility decreased in C; all carotid parameters were influenced by the combination of time and treatment, in a diverging trend, at a statistically significant level, while there was no effect on pressure. Introducing arterial pressures as covariates did not affect the findings.

Conclusion(s): There was a significant difference in behavior in time of the two groups as for vessel enlargement, wall thickening and arterial stiffening. The proposed program of physical training and environmental enrichening seems to oppose the typical harmful effects of aging on the wall of the common carotid in elderly people with mild cognitive impairment.

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Publisher
Lippincott Williams and Wilkins

Emtree Heading
*environmental enrichment; *brain; *carotid artery; *European; *hypertension; *protection; human; mild cognitive impairment; training; compliance (physical); aged; physical activity; videorecording; Australia; dementia; fitness; environment; health; parameters; social behavior; cognitive defect; arterial pressure; general practitioner; ultrasound; music; clip; stimulation; neurologic examination; Young modulus; rigidity; blood vessel injury; arterial wall thickness; Italy; computer program; patient; mental performance; arterial stiffness; aging.

Other Index Terms
Subclinical atherosclerosis and 20-year cognitive decline: The atherosclerosis risk in communities (ARIC) neurocognitive study.


Introduction: Cardiovascular risk factors are reportedly predictive of cognitive decline and dementia but the association between the extent and severity of subclinical atherosclerosis with cognitive decline remains understudied. Hypothesis: The systemic burden of atherosclerosis measured non-invasively is associated with the rate of decline in domain-specific (memory, executive function and language) and global cognition from mid-life to late life.

Method(s): Members of the ARIC cohort (N=12313; 58% women, 24% African American (AA), 76% white) aged 46-70 years at their 1990-1992 examination were followed through 2011-2013. Participants with prevalent stroke, myocardial infarction or coronary heart disease were excluded. Atherosclerosis at baseline (n=5217) was assessed by carotid artery b-mode ultrasound (presence and number of plaques, bilaterally) and by ankle-brachial index <0.9 measured with an
oscillometric device. Tests of memory (Delayed Word Recall Test), executive function (Digit Symbol Substitution Test), and language (Word Fluency Test) were administered in 1990-92, 1996-98 and 2011-13. Test-specific z scores were calculated at each exam based on the means and standard deviations at baseline. A global cognition z score was estimated by averaging the 3 test-specific z scores and standardizing to baseline. Race-stratified linear random effects regression was used to estimate the association between subclinical atherosclerosis and 20-year declines in domain-specific cognition and global cognition. We adjusted for age, sex and level of education. Inverse probability weighting (IPW) was used to limit bias due to attrition.

Result(s): In AA, the presence of carotid plaque and/or ABI <0.90 (n=490) was associated with a lower memory z score (Beta=-0.10, 95% confidence interval, CI: -0.18, -0.02), a lower language z score (Beta=-0.07, 95% CI: -0.14, -0.002) and a lower global cognition z score at baseline (Beta=-0.09, 95% CI: -0.16, -0.02), but not with rates of change in any cognitive score. Among whites at baseline, individuals with subclinical atherosclerosis (n=4099) exhibited lower executive function (Beta=-0.05, 95% CI: -0.08, -0.02) and global cognition (Beta=-0.04, 95% CI: -0.07, -0.01). White participants with subclinical atherosclerosis had a greater 20-year rate of decline in global cognition (Beta=-0.06, 95% CI: -0.10, -0.00) compared to those without subclinical atherosclerosis.

Conclusion(s): Baseline memory, language, and global cognition in AA and executive function and global cognition in whites were lower among those with non-invasively ascertained atherosclerosis compared to those without, independent of covariates in the model. Among whites, subclinical clinical measures of atherosclerosis in mid-life may be indicative of modest, but measurable declines in cognition after additional adjustment for potential bias due to attrition.
Correlation of cognitive function with ultrasound strain indices in carotid plaque.
Ultrasound in Medicine and Biology. 40 (1) (pp 78-89), 2014. Date of Publication: January 2014.
AN: 52807319
Instability in carotid vulnerable plaque can generate cerebral micro-emboli, which may be related to both stroke and eventual cognitive abnormality. Strain imaging to detect plaque vulnerability based on regions with large strain fluctuations, with arterial pulsation, may be able to determine the risk of cognitive impairment. Plaque instability may be characterized by increased strain variations over a cardiac cycle. Radiofrequency signals for ultrasound strain imaging were acquired from the carotid arteries of 24 human patients using a Siemens Antares with a VFX 13-5 linear array transducer. These patients underwent standardized cognitive assessment (Repeatable Battery for the Assessment of Neuropsychological Status [RBANS]). Plaque regions were segmented by a radiologist at end-diastole using the Medical Imaging Interaction Toolkit. A hierarchical block-matching motion tracking algorithm was used to estimate the cumulated axial, lateral and shear strains within the imaging plane. The maximum, minimum and peak-to-peak strain indices in the plaque computed from the mean cumulated strain over a small region of interest in the plaque with large deformations were obtained. The maximum and peak-to-peak mean cumulated strain indices over the entire plaque region were also computed. All strain indices were then correlated with RBANS Total performance. Overall cognitive performance (RBANS Total) was negatively
associated with values of the maximum strain and the peak-to-peak for axial and lateral strains, respectively. There was no significant correlation between the RBANS Total score and shear strain and strain indices averaged over the entire identified plaque for this group of patients. However, correlation of maximum lateral strain was higher for symptomatic patients ($r = -0.650, p = 0.006$) than for asymptomatic patients ($r = -0.115, p = 0.803$). On the other hand, correlation of maximum axial strain averaged over the entire plaque region was significantly higher for asymptomatic patients ($r = -0.817, p = 0.016$) than for symptomatic patients ($r = -0.224, p = 0.402$). The results reveal a direct relationship between the maximum axial and lateral strain indices in carotid plaque and cognitive impairment. © 2014 World Federation for Ultrasound in Medicine & Biology.


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Elsevier USA

Emtree Heading
adult; aged; algorithm; article; carotid artery; carotid atherosclerosis/diagnosis; clinical article; *cognition; cognitive defect; controlled study; diagnostic imaging; *echography; female; heart cycle; human; male; microembolism/diagnosis; middle aged; priority journal; pulse wave; radiofrequency radiation; transducer; transient ischemic attack/diagnosis; young adult.

Other Index Terms
adult; aged; algorithm; article; carotid artery; carotid atherosclerosis / diagnosis; clinical article; *cognition; cognitive defect; controlled study; diagnostic imaging; *echography; female; heart cycle; human; male; microembolism / diagnosis; middle aged; priority journal; pulse wave; radiofrequency radiation; transducer; transient ischemic attack / diagnosis; young adult.

Link to the Ovid Full Text or citation:
[Click here for full text options](http://www.ncbi.nlm.nih.gov/pubmed/?term=24120415)
The role of carotid intima-media thickness in predicting longitudinal cognitive function in an older adult cohort.

Frazier D.T., Seider T., Bettcher B.M., Mack W.J., Jastrzab L., Chao L., Weiner M.W., Decarli C., Reed B.R., Mungas D., Chui H.C., Kramer J.H.


AN: 600782243

Background and Purpose: Carotid atherosclerosis is a risk factor for cerebrovascular disease in older adults. Although age-related cognitive decline has been associated with cerebrovascular disease, not much is known about the consequences of carotid atherosclerosis on longitudinal cognitive function. This study examines the longitudinal relationship between atherosclerosis and cognition in a sample of non-demented older subjects using baseline measurements of carotid intima media thickness (CIMT) and annual cognitive measures of executive function (EXEC) and verbal memory (MEM).

Method(s): Baseline measurements included CIMT derived from B-mode carotid artery ultrasound, structural T1-weighted images of white matter hypointensities (WMH), white matter lesions (WML), and cerebral infarct. Hypertension, low-density lipoprotein (LDL), diabetes, and waist to hip ratios (WHR) were included as covariates in our models to control for cerebrovascular risks and central adiposity. Annual composite scores of EXEC and MEM functions were derived from item response theory. Linear mixed models were used to model longitudinal cognitive change.

Result(s): A significant inverse relationship was found between baseline CIMT and annual EXEC score, but not annual MEM score. Subjects included in the highest 4th quartile of CIMT showed a rate of annual decline in EXEC score that was significant relative to subjects in lower quartile groups (p < 0.01). The relationship between the 4th quartile of CIMT and annual EXEC score remained significant after independently adjusting for imaging measures of white matter injury and cerebral infarct.

Conclusion(s): Older adult subjects with the highest index of CIMT showed an annual decline in EXEC scores that was significant relative to subjects with lower quartile measurements of CIMT, independent of our measures of white matter injury and cerebral infarct. Our findings suggest that
elevated measures of CIMT may mark an atherosclerotic state, resulting in a decline in executive function and not memory in non-demented older adults.

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An inflammatory pathway links atherosclerotic cardiovascular disease risk to neural activity evoked by the cognitive regulation of emotion.
Biological Psychiatry. 75 (9) (pp 738-745), 2014. Date of Publication: 01 May 2014.
AN: 52875335
Background Cognitive reappraisal is a form of emotion regulation that alters emotional responding by changing the meaning of emotional stimuli. Reappraisal engages regions of the prefrontal cortex that support multiple functions, including visceral control functions implicated in regulating the immune system. Immune activity plays a role in the preclinical pathophysiology of atherosclerotic cardiovascular disease (CVD), an inflammatory condition that is highly comorbid with affective disorders characterized by problems with emotion regulation. Here, we tested whether prefrontal engagement by reappraisal would be associated with atherosclerotic CVD risk and whether this association would be mediated by inflammatory activity. Methods Community volunteers (n = 157; 30-54 years of age; 80 women) without DSM-IV Axis-1 psychiatric diagnoses or cardiovascular or immune disorders performed a functional neuroimaging task involving the reappraisal of negative emotional stimuli. Carotid artery intima-media thickness and inter-adventitial diameter were measured by ultrasonography and used as markers of preclinical atherosclerosis. Also measured were circulating levels of interleukin-6 (IL-6), an inflammatory cytokine linked to CVD risk and prefrontal neural activity. Results Greater reappraisal-related engagement of the dorsal anterior cingulate cortex was associated with greater preclinical atherosclerosis and IL-6. Moreover, IL-6 mediated the association of dorsal anterior cingulate cortex engagement with preclinical atherosclerosis. These results were independent of age, sex, race, smoking status, and other known CVD risk factors. Conclusions The cognitive regulation of emotion might relate to CVD risk through a pathway involving the functional interplay between the...
anterior cingulate region of the prefrontal cortex and inflammatory activity. © 2014 Society of Biological Psychiatry.

PMID

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Publisher
Elsevier USA

Emtree Heading
adult; anterior cingulate; arterial wall thickness; article; *atherosclerotic cardiovascular disease/diagnosis; BOLD signal; *cardiovascular risk; *cognition; controlled study; DSM-IV; echography; *electroencephalogram; *emotionality; facial expression; female; functional neuroimaging; human; *inflammatory disease; major clinical study; male; prefrontal cortex; priority journal; smoking; interleukin 6/ec [Endogenous Compound].

Drug Index Terms
interleukin 6 / endogenous compound.

Other Index Terms
adult; anterior cingulate; arterial wall thickness; article; *atherosclerotic cardiovascular disease / diagnosis; BOLD signal; *cardiovascular risk; *cognition; controlled study; DSM-IV; echography; *electroencephalogram; *emotionality; facial expression; female; functional neuroimaging; human; *inflammatory disease; major clinical study; male; prefrontal cortex; priority journal; smoking.

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Cognitive deterioration in bilateral asymptomatic severe carotid stenosis.
Stroke. 45 (7) (pp 2072-2077), 2014. Date of Publication: July 2014.
AN: 53180538

Background and Purpose - This study aimed to monitor cognitive performance during a 3-year period in subjects with bilateral asymptomatic severe internal carotid artery stenosis and to explore the role of cerebral hemodynamics and atherosclerotic disease in the development of cognitive dysfunction. Methods - One hundred fifty-nine subjects with bilateral asymptomatic severe internal carotid artery stenosis were included and prospectively evaluated for a 3-year period. At entry, demographics, vascular risk profile, and pharmacological treatments were defined. Cognitive status was evaluated using the Mini-Mental State Examination at baseline and at follow-up. Cerebral hemodynamics was assessed by transcranial Doppler-based breath-holding index test. As a measure of the extent of systemic atherosclerotic disease, common carotid artery intima-media thickness was measured. A cutoff for pathological values was set at 0.69 for breath-holding index and 1.0 mm for intima-media thickness. Results - The risk of decreasing in Mini-Mental State Examination score increased progressively from patients with bilaterally normal to those with unilaterally abnormal breath-holding index, reaching the highest probability in patients with bilaterally abnormal breath-holding index (P<0.0001). Pathological values of intima-media thickness did not influence the risk of Mini-Mental State Examination score change. Conclusions - Our findings suggest that patients with asymptomatic bilateral severe internal carotid artery stenosis may be at risk of developing cognitive impairment. The evaluation of the hemodynamic status, besides providing insights about the possible mechanism behind the cognitive dysfunction present in carotid atherosclerotic disease, may be of help for the individuation of subjects deserving earlier and more aggressive treatments. © 2014 American Heart Association, Inc.

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Association of cognitive dysfunction with cardiovascular disease events in elderly hypertensive patients.
Journal of Hypertension. 32 (2) (pp 423-431), 2014. Date of Publication: February 2014.
AN: 52921730

Objectives: This study assesses whether presence of cognitive dysfunction can be a marker associated with the development of cardiovascular disease (CVD) events independent of ambulatory blood pressure (BP) or other indices of target organ damage (TOD) in elderly hypertensive patients.
Method(s): We recruited 585 hypertensive patients (mean age, 73 years; 41% men) who were ambulatory, lived independently, and were without clinically overt dementia. Cognitive function was assessed by Mini-Mental State Examination (MMSE) at baseline, and CVD events (coronary artery disease, stroke, congestive heart failure, and sudden death) were prospectively ascertained. Cognitive dysfunction was defined as the lowest quartile of MMSE scores (n=183, median 24 points).

Result(s): CVD events occurred in 42 people over an average of 2.8 years (1644 person-years). The prevalence of cognitive dysfunction was higher in patients with CVD events than those without (57 vs. 29%; both P<0.001) at baseline. Cognitive dysfunction was associated with CVD events, after adjustment for nocturnal SBP and evidence of TOD [i.e. albuminuria, cardiac hypertrophy, and carotid-artery intima-media thickness (IMT)], hazard ratio 2.5-2.9 (all P<0.01). Incorporation of MMSE in the risk model (including age, estimated glomerular filtration rate, and preexisting CVD) improved the C-statistics (from 0.691 to 0.741) and resulted in a net reclassification improvement of 17.6% (P=0.02). In contrast, incorporation of albuminuria, cardiac hypertrophy, and high carotid-artery IMT added little further improvement in the risk prediction.

Conclusion(s): Cognitive dysfunction is an independent marker associated with increased risk of CVD events in elderly hypertensive patients. © 2014 Wolters Kluwer Health

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Publisher
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Emtree Heading
adult; age; aged; aged hospital patient; albuminuria; arterial wall thickness; article; *cardiovascular disease; cardiovascular risk; cerebrovascular accident; *cognitive defect/ep [Epidemiology];
Cardiovascular Biomarkers and Carotid IMT Scores as Predictors of Cognitive Function.
Masley S.C., Masley L.V., Gualtieri C.T.
AN: 372411102

Objective: Multiple cardiovascular risk factors are associated with early cognitive decline. Measures of complex information processing provide one of the earliest signs of cognitive decline and appear related to arterial plaque growth. The purpose of this study was to determine how cardiovascular risk factors and carotid intima-media thickness (IMT) scores are associated with cognitive function and complex information processing scores.

Method(s): This study used a retrospective, cross-sectional analysis of 536 men and women attending an executive evaluation program. Measurements were made of body composition,
cardiovascular status, fitness and diet, and laboratory measures, including carotid IMT. Each subject was tested with a computerized neurocognitive test battery.

Result(s): Complex information processing (CIP), also called executive function, is independently related to carotid IMT scores ($p < 0.01$), as are other cardiovascular biomarkers, including aerobic capacity fiber, B12, and long-chain n-3 fatty acid intake ($p < 0.01$ for each). However, after controlling for carotid IMT, only IMT showed a significant relationship with CIP scores.

Conclusion(s): Carotid IMT scores are the strongest independent cardiovascular biomarker for cognitive function, especially complex information processing. Greater intake of fiber, long-chain n-3 fatty acids (N3FAs), and vitamin B12, as well as measures of aerobic fitness, is associated with enhanced cognitive function, yet controlling for IMT scores diminished their association. Because decreasing CIP scores are linearly associated with cognitive decline, future randomized clinical trials that yield improvements in carotid IMT scores should also assess for changes in cognitive function. © 2014 Copyright Taylor and Francis Group, LLC.


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Emtree Heading
adult; aerobic capacity; aged; *arterial wall thickness; article; biometry; body mass; *cardiovascular risk; carotid artery; *cognition; cross-sectional study; dietary intake; electrocardiography; executive function; female; human; lung gas exchange; male; memory; nutrition; retrospective study; risk factor; caffeine; cholesterol; cyanocobalamin; folic acid; glucose; homocysteine; long chain fatty acid.

Drug Index Terms
caffeine; cholesterol; cyanocobalamin; folic acid; glucose; homocysteine; long chain fatty acid.

Other Index Terms
adult; aerobic capacity; aged; *arterial wall thickness; article; biometry; body mass; *cardiovascular risk; carotid artery; *cognition; cross-sectional study; dietary intake; electrocardiography; executive function; female; human; lung gas exchange; male; memory; nutrition; retrospective study; risk factor.

Link to the Ovid Full Text or citation:
Chronic cerebral hypoperfusion and dementia.
Yata K., Tomimoto H.
Neurology and Clinical Neuroscience. 2 (5) (pp 129-134), 2014. Date of Publication: 01 Sep 2014.
AN: 600173277
“Cerebral small vessel disease” is a general term featuring a group of disease conditions with characteristic lesions affecting mainly small vessels in the brain, such asBinswanger’s disease, leukoaraiosis and lacunar infarctions. Cerebral small vessels consist of a series of blood vessels, which originate from the pial arteries on the surface of the brain, and branch into arterioles, capillaries and postcapillary venules. Each of the blood vessels has a distinct structure and function. The blood-brain barrier, which does not exist in the other organs, functions in the brain. Dysfunction of the blood-brain barrier is thought to be a major cause of cerebral small vessel diseases. Recent findings have shown that maintenance of the blood-brain barrier is kept by various types of cells, such as vascular endothelial cells, astrocytes and pericytes, which work collaboratively as a neurovascular unit. Currently, larger vessels at the arteriolar level have been studied intensively; however, the pathological condition of the neurovascular unit at the capillary level still needs to be elucidated. The bilateral carotid artery stenosis model simulates chronic cerebral hypoperfusion, formation of white matter lesions and cognitive impairments seen in humans. Using this model, we found microcirculation disturbance especially in the postcapillary venule, and postulated it as a final step leading to white matter lesions and cognitive impairment. Taken together, we suggest that chronic cerebral hypoperfusion plays a pivotal role in the pathogenesis of cerebral small vessel diseases.
Copyright © 2014 Japanese Society of Neurology and Wiley Publishing Asia Pty Ltd.
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Blackwell Publishing Ltd (E-mail: customerservices@oxonblackwellpublishing.com)
Visit-to-visit blood pressure variability in the elderly: Associations with cognitive impairment and carotid artery remodeling.
Nagai M., Hoshide S., Nishikawa M., Masahisa S., Kario K.
Atherosclerosis. 233 (1) (pp 19-26), 2014. Date of Publication: March 2014.
AN: 372362301
Objective: Recently, visit-to-visit blood pressure (BP) variability has been shown to be associated with vascular remodeling and cognitive dysfunction. However, there have been no studies that focused on the relationship between visit-to-visit BP variability and cognitive dysfunction in relation to vascular remodeling. In this study, we investigated the relationships among visit-to-visit BP measures, carotid artery remodeling and cognitive function in the elderly at high risk of cardiovascular disease.
Method(s): The cognitive function was evaluated using a Mini-Mental State Examination (MMSE) and global deterioration scale (GDS) in 201 elderly subjects at high risk of cardiovascular disease (79.9+/−6.4 years old; female 75%). Based on 12 visits (once a month), visit-to-visit BP variability (expressed as the coefficient of variation [CV] and as delta [maximum-minimum] BP) were measured. Carotid ultrasound was performed to measure intima-media thickness (IMT) and the stiffness parameter beta.

Result(s): The patients having both high delta systolic BP (SBP) and high IMT had significantly higher prevalence of low MMSE score than those with both low delta SBP and low IMT (p<0.05), and the patients having both high delta SBP and high stiffness parameter beta also had significantly higher prevalence of low MMSE score than those with both low delta SBP and low stiffness parameter beta (p<0.01). In the logistic regression analysis adjusted for age, calcium channel blocker use, low density lipoprotein, average heart rate, and average SBP level, a significant interaction was found between delta SBP and stiffness parameter beta for the low MMSE score (p<0.05).

Conclusion(s): In the high risk elderly, exaggerated visit-to-visit BP variability and advanced carotid artery remodeling have a synergetic association with cognitive dysfunction. © 2013 Elsevier Ireland Ltd.


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Publisher Elsevier Ireland Ltd (P.O. Box 85, Limerick, Ireland)

Emtree Heading aged; arterial wall thickness; article; *blood pressure variability; blood sampling; cardiovascular disease; cardiovascular risk; carotid atherosclerosis; cholesterol blood level; clinical assessment tool; clinical feature; cognition; *cognitive defect; common carotid artery; cross-sectional study; disease association; echography; female; heart rate; human; hypertension; major clinical study; male; Mini Mental State Examination; prevalence; priority journal; rigidity; systolic blood pressure; calcium channel blocking agent; cholesterol/ec [Endogenous Compound]; glucose/ec [Endogenous Compound]; hemoglobin A1c/ec [Endogenous Compound]; high density lipoprotein/ec [Endogenous Compound]; low density lipoprotein/ec [Endogenous Compound]; triacylglycerol/ec [Endogenous Compound]; Global deterioration scale; *visit to visit blood pressure variability.

Candidate Terms global deterioration scale [other term]; *visit to visit blood pressure variability [other term].
Carotid plaque echolucency is associated with poor cognitive performance and future cognitive decline in patients with atherosclerotic disease.
Mastroiacovo D., Camerota A., Pinelli M., De Blasis G., Turco G.L., Andriulli M., Cipollone F., Raffaele A., Lechiara M.C., Grassi D., Necozione S., Marini C., Ferri C., Desideri G.
AN: 71990762
Introduction. Carotid plaque echolucency predicts both overt and silent cerebrovascular disease which in turn can affect cognition. Aim. This study evaluated, in a population-based, prospective design, whether carotid plaque morphology is associated with cognitive dysfunction and future cognitive decline. Methods. Grey-scale median (GSM), a computer-assisted index of echogenicity, was evaluated in carotid plaques in 113 subjects (72.6 +/- 5.6 years) with carotid atherosclerosis but
free of overt cerebrovascular disease or dementia. Cognitive functions were assessed by mini mental state examination, trail making test (TMT) A and B, and verbal fluency test (VFT). Fifty-five subjects were re-evaluated after a mean follow-up period of 4.27 years. Results. At baseline median, GSM was significantly associated with TMTA (r:-0.454, p<0.0001), TMTB (r:-0.429, p<0.0001), TMTB-A (r:-0.239, p = 0.011) and VFT (r:0.299, p = 0.001) scores, while no correlations were found between metabolic parameters, blood pressure and cognitive performance. During the follow-up period the median GSM did not significantly change (-0.145, p = 0.758). With regard to cognitive performances, a slight but significant worsening of TMTB (+26.09 s, p = 0.05) and TMTB-A (+26.25 s, p = 0.05) score was observed while neither MMSE (-0.2, p = 0.808) nor VFT (+1.0 words, p = 0.239) changed. Baseline median GSM was significantly associated with changes of TMTB (r:- 0.341, p = 0.011) and TMTB-A (r:-0.379, p = 0.004) during follow-up. No correlations were found between changes of metabolic parameters and blood pressure and variations of neuropsychological test scores. Conclusions. Carotid plaque echolucency is associated with poor cognitive performance and future cognitive decline in elderly subjects. Assessment of carotid plaque morphology may help identify subjects at increased risk for cognitive dysfunction.

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Publisher
Springer International Publishing

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Arterial thickening and stiffness and cognitive function: Singapore longitudinal ageing studies.
Lim S.L., Gao Q., Ling L.H., Ng T.P.

AN: 71798731

Introduction Cardiovascular ageing exacerbated by cardiovascular risk factors is marked by increased carotid intima-media thickness (IMT) and arterial stiffness. Previous studies suggested these vascular markers could be associated with cognitive decline and cognitive impairment. Objective In this population-based study, we determined the association between markers of vascular health and cognitive performance, and explored the differential associations of specific vascular indices on individual cognitive domains. Methods Cross-sectional analysis of 354 participants from the community-based sample of older persons without heart failure who were controls in the Singapore Heart Failure Outcomes and Phenotypes (SHOP) study. Cognitive function was measured by the Mini-Mental State Examination (MMSE) and a comprehensive neuropsychological test battery that assessed a wide range of cognitive domains. Arterial stiffness was measured by pulse wave velocity (PWV), augmentation index (AI), elasticity modulus (Ep), beta stiffness (beta) and arterial compliance (AC). Arterial thickening was measured by carotid IMT. Multiple linear regressions were performed with controlling of potential confounders (age, gender, education, and cardiovascular risk factors: hypertension, diabetes, dyslipidemia, smoking and BMI). Results The mean age of the study participants was 63.3 +/- 6.1 years, 45.2% were females and 39.3% had 6 or less years of education. In the total sample of 354 participants, there was a significant association between Ep and MMSE (beta = -0.127, P = 0.017) in the multivariate analysis. In the subgroup of 170 subjects with detailed neuropsychological data, central AI was associated with verbal memory domain after adjustment for cardiovascular risk factors (beta = -0.231, P = 0.002). All indices of arterial stiffness were associated with executive function in the unadjusted...
model, with higher stiffness associated with longer time taken to complete colour trails test \( Ep \) (beta = 0.244, P = 0.002), beta (beta = 0.24, P = 0.002), peripheral AI (beta = -0.169, P = 0.031), femoral-carotid PWV (beta = 0.311, P <0.001) and Aix (beta = 0.183, P = 0.019). Following adjustment for demographics and education, only femoral-carotid PWV remained significantly associated with executive function, albeit attenuated (beta = 0.151, P = 0.044). This association was not significant following adjustment for cardiovascular risk factors. Conclusion Different indices of vascular health were associated with different aspects of cognitive performance. High carotid stiffness was associated with impaired global cognition, aortic stiffness was inversely associated with verbal memory, and endothelial dysfunction was associated with reduced visuospatial ability. A larger study is necessary to confirm and refine our findings. In addition, extending this into a longitudinal study would allow us to correlate these indices of vascular health with the trajectories of cognitive decline, if any.

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Publisher
Academy of Medicine Singapore

Emtree Heading
*rigidity; *cognition; *Singapore; *aging; *psychiatry; *arterial wall thickening; cardiovascular risk; human; arterial stiffness; carotid artery; health; education; verbal memory; heart failure; executive function; Mini Mental State Examination; pulse wave; smoking; neuropsychological test; multivariate analysis; augmentation index; cognitive defect; dyslipidemia; diabetes mellitus; hypertension; gender; phenotype; multiple linear regression analysis; community; artery compliance; female; longitudinal study; color; model; elasticity; population; endothelial dysfunction; arterial wall thickness; marker.

Drug Index Terms
marker.

Other Index Terms
*rigidity; *cognition; *Singapore; *aging; *psychiatry; *arterial wall thickening; cardiovascular risk; human; arterial stiffness; carotid artery; health; education; verbal memory; heart failure; executive function; Mini Mental State Examination; pulse wave; smoking; neuropsychological test; multivariate analysis; augmentation index; cognitive defect; dyslipidemia; diabetes mellitus; hypertension; gender; phenotype; multiple linear regression analysis; community; artery compliance; female; longitudinal study; color; model; elasticity; population; endothelial dysfunction; arterial wall thickness.
The influence of dyslipidemia on cognitive function in patients with occlusive carotid disease.
Ogata T., Watanabe J., Kimura S., Oma S., Inoue T., Tsuboi Y.
AN: 71662042

Background and Objectives: The objective of the current study was to elucidate the influence of dyslipidemia on cognitive function in patients with carotid stenosis or occlusion.
Method(s): We prospectively registered the patients with carotid occlusion or stenosis of over 40 percent in the Fukuoka University Hospital between 2011 and 2013. The patients with Alzheimer disease or distinctive dysfunction of higher brain were excluded from this study. The Mini-mental state examination (MMSE) was used to estimate the cognitive function and the score of MMSE of less than 27 was defined as subnormal. Also, the risk factors of atherosclerosis, educational age, the degree of carotid stenosis, cerebral blood flow, the presence or absence of white matter lesion and microbleeds were evaluated. The LDL- and HDL-cholesterol level and the treatment of statin were reviewed and the associations of MMSE with LDL- and HDL-cholesterol level and statin use were assessed. Using the multivariate analysis, the factors associated with the subnormal cognitive function was tested.
Result(s): A total of 115 patients were registered (Age: 71.5+/6.8 years, male: 95 cases, female: 20 cases). The patients with statin (administration or use) scored higher MMSE (median: 27) compared with those without (median: 26, P = 0.025). HDL-cholesterol level was positively correlated with MMSE score. Multivariate analysis indicated that the nonuse of statin was significantly associated with the subnormal score of MMSE (Odds ratio: 0.33, P = 0.031), as well as lower educational age, male sex and the presence of diabetes.
Conclusion(s): In the patients with carotid occlusive disease, the treatment of statin was associated with higher score of MMSE than without. The nonuse of statin led to subnormal cognitive function. Statin might benefit for maintaining cognitive function in patients with carotid disease probably due to its protective effect of endothelium of artery or preventative effect of Alzheimer pathology.

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Emtree Heading
*dyslipidemia; *cognition; *patient; *human; *carotid artery; *Asia; *cerebrovascular accident; Mini Mental State Examination; carotid artery obstruction; multivariate analysis; male; implantable cardioverter defibrillator; Alzheimer disease; brain; university hospital; endothelium; stenosis; diabetes mellitus; risk; occlusion; white matter lesion; brain blood flow; atherosclerosis; artery; pathology; risk factor; female; statin (protein); high density lipoprotein cholesterol; high density lipoprotein; low density lipoprotein.

Drug Index Terms
statin (protein); high density lipoprotein cholesterol; high density lipoprotein; low density lipoprotein.

Other Index Terms
*dyslipidemia; *cognition; *patient; *human; *carotid artery; *Asia; *cerebrovascular accident; Mini Mental State Examination; carotid artery obstruction; multivariate analysis; male; implantable cardioverter defibrillator; Alzheimer disease; brain; university hospital; endothelium; stenosis; diabetes mellitus; risk; occlusion; white matter lesion; brain blood flow; atherosclerosis; artery; pathology; risk factor; female.

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SFX
Carotid inflammation is associated with white matter disease and cognitive impairment post stroke.
Goh O., Yeong Poh Y., Singh R., Kandiah N.
AN: 71628927

Background: Cognitive impairment in post small-vessel stroke patients has been demonstrated to be associated with the burden of white matter disease (WMD), location and distribution of acute infarcts, inflammation and demyelination. The role of inflammation in the pathogenesis of cognitive impairment and WMD in post-stroke patients has not been adequately studied. There is evidence to demonstrate that carotid intima media thickness (IMT) is associated with markers of inflammation. This study examines the relationship between carotid IMT, cognitive function and WMD in patients following acute lacunar stroke.

Method(s): We studied consecutive patients with MRI-confirmed acute lacunar infarcts at a tertiary neurology center between September 2009 and March 2010. Patients with acute cerebral hemorrhage, neuroimaging evidence of large-vessel strokes, and potential embolic etiology were excluded. All patients had carotid IMT determined by ultrasonography. WMH was scored using the modified Fazekas scale on axial T2-weighted images. The degree of carotid IMT was divided into tertiles based on side with the higher IMT. The association between carotid IMT, cognitive impairment and WMD was modeled using logistic regression analysis.

Result(s): 100 patients with a mean age of 56.2 +/- 11.7 years were studied. The tertile with the greatest carotid IMT had a mean IMT of 0.86 whereas the tertile with the smallest carotid IMT had a mean of 0.49. MMSE was lowest (27.58) in the highest carotid IMT tertile, and this association was approaching significance (p=0.0939). Total periventricular WMD was also highest (2.42) in the tertile with the highest IMT (p=0.0787). Logistic regression analyses showed an odds ratio (OR) 36.12, (confidence interval 1.91-682.51; p=0.017) for the association between periventricular WMD and IMT.

Conclusion(s): Carotid inflammation evidenced by IMT is an important risk factor for WMD and cognitive impairment post stroke. The role of anti-inflammatory markers among post-stroke patients warrants further studies.

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Publisher
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Cerebrovascular atherosclerosis and cognition in patients with Alzheimer's disease.
AN: 71627735

Background: Vascular risk factors are known to be associated with increased prevalence of Alzheimer's disease (AD) and poorer outcome of the disease. Most studies investigating, the relationship between the cerebrovascular diseases and AD focused on small vessel disease, however, the relationship between the large vessel disease and AD are relatively sparse. The objectives of this study were to compare the degree of atherosclerosis markers of large vessels
between AD patients and healthy controls and to investigate the relationship between these markers and neuropsychological test performances in patients with AD.

Method(s): A total of sixtythree AD patients, aged 55 to 90 (mean age 73.6 years, 41 women and 22 men), underwent carotid duplex sonography and magnetic resonance angiography (MRA). All the participants completed detailed neuropsychological evaluation with Seoul neuropsychological screening battery (SNSB) which examined attention, language and related functions, visuospatial functions, verbal and visual memory, frontal and executive functions, Korean version of mini- mental status examination (K-MMSE) and clinical dementia rating scale. A total of eighty-six healthy controls (mean age 60.7 years, 19 women and 67 men) who completed carotid duplex sonography were recruited for comparison. The severity of cerebrovascular atherosclerosis markers were measured by carotid plaque-score, intima-media thickness (IMT), and intracranial atherosclerotic stenosis. Statistical analyses were performed using SPSS version 21.0.

Result(s): The plaque-score of carotid artery (1.35 +/- 1.20 vs. 0.66 +/- 0.91) was significantly higher in patients with AD than healthy control (p=0.023) after adjustment of age, sex, hypertension, diabetes mellitus, and IMT. In AD patients, the presence of carotid plaque was associated with a lower Seoul Verbal Learning Test (SVLT) immediate recall score (p=0.026) and a lower Controlled Oral Word Association Test (COWAT) phonemic test score (p=0.044). Moreover, carotid IMT was associated with higher error rates (p=0.027) and lower correction rates (p=0.018) of the Stroop-word test in AD patients. A severity of intracranial arterial stenosis was associated with poorer performances on SVLT immediate recall (p=0.002), SVLT delayed recall (p=0.013), Ray Complex Figure Test (RCFT) immediate recall (p=0.000), RCFT delayed recall (p=0.000) and Stroop-color test correction rate (p=0.007).

Conclusion(s): The presence of carotid plaque is more common in AD patients than healthy controls. Carotid atherosclerosis influenced frontal executive functions, and intracranial atherosclerotic stenosis was associated with memory functions in AD patients. These findings suggest that large artery disease may impact on cognitive decline in patients with AD. Future studies are needed to clarify the mechanisms of how large artery disease interacts with AD and affects cognitive decline.

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Publisher
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Emtree Heading
*human; *atherosclerosis; *cognition; *patient; *Alzheimer disease; carotid artery; recall; echography; stenosis; female; artery disease; executive function; male; language; screening; cerebrovascular disease; magnetic resonance angiography; prevalence; hypertension; learning test; artery occlusion; carotid atherosclerosis; statistical analysis; arterial wall thickness; Clinical Dementia
Carotid intima thickness and cognitive function in middle-age adults.
Al Hazzouri A.Z., Jacobs D., Vittinghoff E., Reis J., Yaffe K., Sidney S.
AN: 71627269

Background: Carotid Intima Media thickness (IMT) is a marker of atherosclerosis and strongly related to vascular risk factors associated with cognitive impairment. We propose to determine if site-specific IMT is associated with cognitive performance in various domains measured in midlife.

Method(s): We determined the association between IMT and cognitive function 5 years later using data from the Coronary Artery Risk Development in Young Adults (CARDIA) study, a young to
middle-aged cohort of white and black adults. At the year 20 follow-up exam (study baseline),
participants underwent ultrasound studies to image the carotid artery resulting in site-specific IMT
measures: common carotid artery (CCA) IMT, internal carotid artery (ICA) IMT and ICA/bulb IMT.
Five years later, participants underwent a cognitive battery consisting of 3 tests: the Rey Auditory-
Verbal Learning Test (RAVLT, range 0 to 15), a test of verbal memory; the Digit Symbol Substitution
Test (DSST, range 8 to 119), a test of speed and working memory; and the Stroop (range -46 to
127), a test of executive skills. We excluded subjects with reported baseline coronary heart disease
(stroke, angina, heart attack) for a total of 2,576 participants included in this analysis (mean age
45.3 years, 43% blacks and 42.7% males).

Result(s): Being male, black, less educated, a smoker and having more co-morbidities such as
higher BMI, hypertension, and type-2 diabetes was associated with having higher site-specific IMT
from bivariate regressions. In linear regression models adjusted for socio-demographics (age, sex,
race and education) and behavioral risk factors and comorbidities (alcohol, smoking, BMI,
hypertension, diabetes, depression), 1 standard deviation difference in CCA IMT (0.123mm) was
associated with 0.81 lower points (worse performance) on the DSST (p=0.006) and 0.41 higher
points (worse performance) on the Stroop (p=0.05) but not on RAVLT. After adjustment for
covariates, IMT of other sites of the carotid artery were not associated with cognitive performance.

Conclusion(s): Having higher common carotid IMT, reflective of early adulthood burden of
atherosclerosis, was associated with worse cognitive performance in midlife. Atherosclerosis may
begin as early as in childhood; thus, interventions in earlier years may delay or prevent cognitive
impairment.

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Publisher
Elsevier Inc.
Emtree Heading
*carotid artery; *intima; *thickness; *cognition; *middle aged; *adult; human; atherosclerosis; male;
risk factor; hypertension; smoking; coronary artery; internal carotid artery; common carotid artery;
heart infarction; ultrasound; angina pectoris; morbidity; non insulin dependent diabetes mellitus;
learning; learning test; cerebrovascular accident; follow up; manager; working memory; skill;
ischemic heart disease; velocity; childhood; arterial wall thickness; digit symbol substitution test;
young adult; verbal memory; linear regression analysis; model; education; risk; diabetes mellitus;
adulthood; cognitive defect; marker; alcohol.
Drug Index Terms

marker; alcohol.
Other Index Terms
*carotid artery; *intima; *thickness; *cognition; *middle aged; *adult; human; atherosclerosis; male;
risk factor; hypertension; smoking; coronary artery; internal carotid artery; common carotid artery;
heart infarction; ultrasound; angina pectoris; morbidity; non insulin dependent diabetes mellitus;
learning; learning test; cerebrovascular accident; follow up; manager; working memory; skill;
ischemic heart disease; velocity; childhood; arterial wall thickness; digit symbol substitution test;
young adult; verbal memory; linear regression analysis; model; education; risk; diabetes mellitus;
adulthood; cognitive defect.

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187.

Carotid intima thickness and cognitive function in middle-age adults.
Al Hazzouri A.Z., Vittinghoff E., Sidney S., Reis J., Jacobs D., Yaffe K.
Copenhagen Denmark. Conference Publication: (var.pagings). 10 (SUPPL. 4) (pp P182), 2014. Date
of Publication: July 2014.
AN: 71627225
Project Description: Carotid Intima Media thickness (IMT) is a marker of atherosclerosis and
strongly related to vascular risk factors associated with cognitive impairment. We propose to
determine if site-specific IMT is associated with cognitive performance in various domains
measured in midlife. We determined the association between IMT and cognitive function 5 years
later using data from the Coronary Artery Risk Development in Young Adults (CARDIA) study, a
young to middle- aged cohort of white and black adults. At the year 20 follow-up exam (study
baseline), participants underwent ultrasound studies to image the carotid artery resulting in site-
specific IMT measures: common carotid artery (CCA) IMT, internal carotid artery (ICA) IMT and
ICA/bulb IMT. Five years later, participants underwent a cognitive battery consisting of 3 tests: the
The Rey Auditory-Verbal Learning Test (RAVLT, range 0 to 15), a test of verbal memory; the Digit Symbol Substitution Test (DSST, range 8 to 119), a test of speed and working memory; and the Stroop (range -46 to 127), a test of executive skills. We excluded subjects with reported baseline coronary heart disease (stroke, angina, heart attack) for a total of 2,576 participants included in this analysis (mean age 45.3 years, 43% blacks and 42.7% males). Being male, black, less educated, a smoker and having more co-morbidities such as higher BMI, hypertension, and type-2 diabetes was associated with having higher site-specific IMT from bivariate regressions. In linear regression models adjusted for socio-demographics (age, sex, race and education) and behavioral risk factors and co-morbidities (alcohol, smoking, BMI, hypertension, diabetes, depression), 1 standard deviation difference in CCA IMT (0.123 mm) was associated with 0.81 lower points (worse performance) on the DSST (p=0.006) and 0.41 higher points (worse performance) on the Stroop (p=0.05) but not on RAVLT. After adjustment for covariates, IMT of other sites of the carotid artery were not associated with cognitive performance. Higher common carotid IMT was associated with worse cognitive performance in midlife, among a cohort free of coronary heart disease. IMT, reflective of early adulthood burden of atherosclerosis, may begin as early as in childhood; thus, interventions in earlier years may delay or prevent cognitive impairment.

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Publisher
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Emtree Heading
*carotid artery; *intima; *thickness; *cognition; *middle aged; *adult; human; smoking; cognitive defect; atherosclerosis; risk factor; morbidity; hypertension; ischemic heart disease; male; internal carotid artery; common carotid artery; heart infarction; ultrasound; coronary artery; non insulin dependent diabetes mellitus; linear regression analysis; follow up; cerebrovascular accident; working memory; manager; skill; velocity; young adult; angina pectoris; digit symbol substitution test; adulthood; risk; arterial wall thickness; verbal memory; learning test; education; model; learning; diabetes mellitus; childhood; marker; alcohol.

Drug Index Terms
marker; alcohol.

Other Index Terms
*carotid artery; *intima; *thickness; *cognition; *middle aged; *adult; human; smoking; cognitive defect; atherosclerosis; risk factor; morbidity; hypertension; ischemic heart disease; male; internal
Association of inflammatory markers and intima - Media thickness in Mild Cognitive Impairment. Coteanu C., Gusti S., Coteanu A.
Archives of the Balkan Medical Union. 48 (2) (pp 192-195), 2013. Date of Publication: June 2013.
AN: 369606574

Background: The current definition of Mild Cognitive Impairment (MCI) is a term which characterizes either mild impairment or very early dementia, a intermediate state between the cognitive changes of normal cognitive aging and dementia. The plasma levels of inflammatory factors have an important role in the pathogenesis of cognitive impairments. The aim of this study was to assess the association between plasma fibrinogen levels and plasma C-reactive protein levels with intima-media thickness and cognitive decline to people with mild cognitive impairment.

Methods: We admitted in the study twenty-five patients with mild cognitive impairment, aged over 60. The inflammatory markers (plasma CRP and fibrinogen levels) and carotid IMT were measured at baseline and during follow-up at an interval of 6 to 12 months. The global cognitive functions were assessed at baseline and during follow-up periodically with Mini Mental State Examination (MMSE).

Result(s): In our study high CRP levels were significantly correlated with MMSE score and carotid IMT significantly increased according to the quartiles of CRP in both genders. We observed a significant association between hyperfibrinogenaemia and MMSE score as proven by chi-square
test and Spearman's coefficient. We say that hyperfibrinogenaemia and high CRP levels correlated with a raised IMT values are statistically significant in patients with MCI.

Conclusion(s): It can be concluded that plasma fibrinogen level and high plasma CRP level may be associated with IMT and cognitive decline. Our findings are consistent with the hypothesis that plasma levels of inflammatory factors have an important role in the pathogenesis of cognitive impairments. Abbreviations: CDR - Clinical Dementia Rating; CRP - C-reactive protein; GDS - Global Deterioration Scale; IMT - Intima-media thickness; MCI - Mild Cognitive Impairment; MMSE - Mini Mental State Examination.

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Publisher
Balkan medical union

Emtree Heading
adult; *arterial wall thickness; article; carotid artery; clinical article; disease association; female; fibrinogen blood level; follow up; human; human tissue; male; *mild cognitive impairment; Mini Mental State Examination; protein blood level; *C reactive protein/ec [Endogenous Compound]; *fibrinogen/ec [Endogenous Compound].

Drug Index Terms
*C reactive protein / *endogenous compound; *fibrinogen / *endogenous compound.

Other Index Terms
adult; *arterial wall thickness; article; carotid artery; clinical article; disease association; female; fibrinogen blood level; follow up; human; human tissue; male; *mild cognitive impairment; mini mental state examination; protein blood level.

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Carotid artery atherosclerosis is correlated with cognitive impairment in an elderly urban Chinese non-stroke population.


Carotid artery atherosclerosis may cause increased intima-media thickness (IMT), plaque formation, and vessel stenosis or occlusion. However, the association between carotid artery atherosclerosis and cognitive impairment remains uncertain. This study explored the effects of IMT and carotid artery stenosis on cognitive function in an elderly Chinese non-stroke population. A total of 2015 patients were recruited. The IMT of carotid arteries and the presence of plaques and stenosis in carotid arteries were assessed with B-mode ultrasound examination. Cognitive performance was evaluated with neuropsychological tests. The cross-sectional relationships between cognitive performance and carotid wall characteristics were analyzed. Carotid artery atherosclerosis (IMT > 1.0) and stenosis were found in 86% and 51% of patients, respectively. Cognitive impairment was found in 356 (17.7%) patients. After adjustment for possible confounders, IMT (odds ratio [OR] = 1.96; 95% confidence interval [CI] 1.23-3.16) and hyperdense plaque (OR = 4.72; 95% CI 2.56-11.2) were associated with poor cognitive performance. Patients with severe (≥70%) carotid artery stenosis had a lower Mini-Mental State Examination score compared with the mild to modest (40-70%) carotid artery stenosis group. Cognitive performance differed between patients with left and right carotid artery stenosis, but no differences were observed between patients with severe left and right carotid artery stenosis. This study indicates that carotid artery atherosclerosis is correlated with cognitive impairment in the elderly Chinese population. A larger sample size across multiple centers and a longitudinal study are required to further explore the impact of carotid artery atherosclerosis on cognition in the elderly population.

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Publisher
Churchill Livingstone (1-3 Baxter’s Place, Leith Walk, Edinburgh EH1 3AF, United Kingdom)

Emtree Heading
Relationship between common carotid artery intima media thickness and post-stroke cognitive impairment.

El-Shazli S., Selim K., Goda T.


AN: 372108358

Background: Common carotid artery intima-media thickness (CCA-IMT) has been associated with different cerebrovascular diseases, but its association with vascular cognitive impairment has not been clarified.

Objective(s): The purpose of this study was to investigate whether CCA-IMT is associated with cognitive impairment 6 months after an acute ischemic stroke.

Method(s): A total of 50 patients (32 males, 18 females) with a mean age 46.48 +/- 12.46, prospectively collected from neurology critical care unit in Zagazig university hospitals, with the first ever ischemic stroke, underwent brain imaging and carotid ultrasonography during
hospitalization. Patients' cognitive performance was assessed using the Mini-Mental State Examination (MMSE) during hospitalization and six months later.

Result(s): CCA-IMT was significantly associated with cognitive impairment. Older age, hypertension, were also independently associated with post-stroke cognitive impairment.

Conclusion(s): CCA-IMT was independently associated with cognitive impairment 6 months after an acute ischemic stroke. It might help in screening of stroke patients at risk of cognitive impairment.

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Publisher
Egyptian Society of Neurology, Psychiatry, and Neurosurgery (Egyptian Medical, Kasralainy, Cairo 11562, Egypt)

Emtree Heading
adult; age; aged; *arterial wall thickness; article; brain ischemia; clinical article; cognition; *cognitive defect/co [Complication]; *cognitive defect/di [Diagnosis]; *common carotid artery; controlled study; echography; Egypt; female; hospitalization; human; hypertension; intensive care unit; male; Mini Mental State Examination; neuroimaging; prospective study; screening; stroke patient; university hospital.

Other Index Terms
adult; age; aged; *arterial wall thickness; article; brain ischemia; clinical article; cognition; *cognitive defect / *complication / *diagnosis; *common carotid artery; controlled study; echography; Egypt; female; hospitalization; human; hypertension; intensive care unit; male; Mini Mental State Examination; neuroimaging; prospective study; screening; stroke patient; university hospital.

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Asymptomatic cervicocerebral atherosclerosis, intracranial vascular resistance and cognition: The AsIA-Neuropsychology Study.

Atherosclerosis. 230 (2) (pp 330-335), 2013. Date of Publication: October 2013.
AN: 369874323

Background and purpose: Carotid atherosclerosis has emerged as a relevant contributor to cognitive impairment and dementia whereas the role of intracranial stenosis and vascular resistance in cognition remains unknown. This study aims to assess the association of asymptomatic cervicocerebral atherosclerosis and intracranial vascular resistance with cognitive performance in a large dementia-free population.

Method(s): The Barcelona-AsIA (Asymptomatic Intracranial Atherosclerosis) Neuropsychology Study included 747 Caucasian subjects older than 50 with a moderate-high vascular risk (assessed by REGICOR score) and without history of neither symptomatic vascular disease nor dementia. Extracranial and transcranial color-coded duplex ultrasound examination was performed to assess carotid intima-media thickness (IMT), presence of carotid plaques (ECAD group), intracranial stenosis (ICAD group), and middle cerebral artery pulsatility index (MCA-PI) as a measure of intracranial vascular resistance. Neuropsychological assessment included tests in three cognitive domains: visuospatial skills and speed, verbal memory and verbal fluency.

Result(s): In univariate analyses, carotid IMT, ECAD and MCA-PI were associated with lower performance in almost all cognitive domains, and ICAD was associated with poor performance in some visuospatial and verbal cognitive tests. After adjustment for age, sex, vascular risk score, years of education and depressive symptoms, ECAD remained associated with poor performance in the three cognitive domains and elevated MCA-PI with worse performance in visuospatial skills and speed.

Conclusion(s): Carotid plaques and increased intracranial vascular resistance are independently associated with low cognitive functioning in Caucasian stroke and dementia-free subjects. We failed to find an independent association of intracranial large vessel stenosis with cognitive performance. © 2013 Elsevier Ireland Ltd.

PMID

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Publisher
Elsevier Ireland Ltd (P.O. Box 85, Limerick, Ireland)

Emtree Heading
adult; aged; article; *brain atherosclerosis; carotid artery; Caucasian; cerebrovascular accident; *cognition; dementia; depression; female; human; intima; major clinical study; male; middle cerebral artery; *neuropsychology; priority journal; risk; scoring system; skill; stenosis; ultrasound; *vascular resistance; velocity; verbal memory; *asymptomatic cervicocerebral atherosclerosis; *intracranial vascular resistance.

Candidate Terms
*asymptomatic cervicocerebral atherosclerosis [other term]; *intracranial vascular resistance [other term].

Other Index Terms
adult; aged; article; *brain atherosclerosis; carotid artery; Caucasian; cerebrovascular accident; *cognition; dementia; depression; female; human; intima; major clinical study; male; middle cerebral artery; *neuropsychology; priority journal; risk; scoring system; skill; stenosis; ultrasound; *vascular resistance; velocity; verbal memory.

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197.
Atherosclerosis and physical functioning in older men, a longitudinal study.
Lamberts S.W.J., Van Der Schouw Y.T.
AN: 52341644
Objective: Functional decline is a major threat to independency, progressing into functional
limitations and eventually leading to disability. Chronic diseases, especially cardiovascular diseases,
are important determinants of functional limitations and disability. Vascular damage exits long
before it is clinically manifest and can have adverse effects on health, physical and cognitive
functioning. The objective was to investigate the association between non-invasive atherosclerosis
measures and physical functioning in older men.
Design(s): Prospective cohort study.
Setting(s): The study was conducted in the general community.
Participant(s): 195 independently living older men. Measurements: Atherosclerosis was measured
by intima media thickness (CIMT) of the common carotid artery using ultrasonography and
assessment for presence of atherosclerotic plaques. Physical functioning was measured by
isometric handgrip strength and leg extensor strength using a hand held dynamometer, lower
extremity function using the physical performance score and ability to perform activities of daily
life using the modified Stanford Health Assessment Questionnaire. Linear regression analysis was
performed to estimate the associations between CIMT or plaques and physical functioning.
Result(s): After adjustment for confounders, higher baseline CIMT was associated with lower
isometric handgrip strength at follow up (betaCIMT = -7.21, 95% CI [-13.64; -0.77]). No other
associations were found between CIMT and physical functioning. In addition, no associations were
found for the presence of plaques and physical functioning either at baseline, or at follow-up.
Conclusion(s): Atherosclerosis, as measured by higher CIMT, is related to a lower isometric
handgrip strength at follow-up, but no further associations with physical functioning were found in
this longitudinal study among independently living older men. © 2013 Serdi and Springer-Verlag
France.
Atherosclerotic calcification is related to cognitive decline.
Vernooij M., Bos D., Hofman A., Witteman J., Van Der Lugt A., Ikram M.
Date of Publication: July 2013.
AN: 71417100

Background: Increasing evidence implicates atherosclerosis in the etiology of cognitive impairment and ultimately dementia, but longitudinal data are scarce. Also, it remains unclear whether atherosclerosis in different vessel beds affects cognitive decline differentially. In this study, we investigate the relationship between arterial calcification, as marker of atherosclerosis, in four vessel beds and cognitive decline over a 6 year interval.

Method(s): From the population-based Rotterdam Study, 1858 participants (mean age 68.4 +/- 5.9 years) underwent computed tomography of the coronaries, aortic arch, extracranial and intracranial carotid arteries to quantify atherosclerotic calcification. At baseline and after six years of follow-up, cognition was assessed using the MMSE and a neuropsychological test battery that comprised the following domains: global cognition, memory, executive function and information processing speed. Per participant, we calculated the difference between both time points in standardized scores for each cognitive domain. Relationships between atherosclerotic calcification and cognitive decline were assessed using linear regression models and adjusted for age, sex, education and additionally for APOE-epsilon4-status and cardiovascular risk factors.

Result(s): Larger load of calcification in the coronary arteries, aortic arch and intracranial carotid arteries, but not in the extracranial carotid arteries, was associated with a decline in MMSE scores and decline in global cognitive function (see Figure). These associations seemed primarily driven by decline in executive function.

Conclusion(s): Atherosclerosis is an important cause of cognitive decline and thus of interest as potential modifiable target for prevention of dementia. (Figure Presented).

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Elsevier Inc.

Emtree Heading
*calcification; atherosclerosis; cognition; carotid artery; aorta arch; human; executive function; dementia; memory; neuropsychological test; follow up; population; cardiovascular risk; prevention; model; artery calcification; cognitive defect; linear regression analysis; computer assisted tomography; velocity; information processing; sexual education; coronary artery; Mini Mental State Examination; etiology; marker.

Drug Index Terms
marketer.

Other Index Terms
*calcification; atherosclerosis; cognition; carotid artery; aorta arch; human; executive function; dementia; memory; neuropsychological test; follow up; population; cardiovascular risk; prevention;
model; artery calcification; cognitive defect; linear regression analysis; computer assisted
tomography; velocity; information processing; sexual education; coronary artery, Mini Mental State
Examination; etiology.

208.

Assessment of cerebral vasoreactivity using ultrasound techniques in Alzheimer’s disease.
Giubilei F., Cipollini V., Sette G., De Carolis A., Capone F.T., Bianchi V., Monti M.S.
Date of Publication: July 2013.
AN: 71416836
Background: Alzheimer’s Disease (AD) is the most important cause of neurodegenerative dementia
and its main pathological hallmarks include neuritic plaques and neurofibrillary tangles, involved in
the beta amyloid cascade. Nevertheless, changes in cerebral hemodynamic might play a role in the
cognitive decline. The aims of this study were to assess in AD subjects the cerebral vasomotor
reactivity and to evaluate the possible correlation between this reactivity and the cognitive deficit.
Method(s): Thirty-six subjects (mean age +/- SD, 68,58 +/- 6,16 years) were consecutively enrolled. We recruited twenty-five subjects affected by AD, matched for age and education to eleven healthy control. Subjects with a Mini Mental State Evaluation (MMSE) score less than 15, cerebrovascular disease history, severe leucoencephalopathy and carotid stenoses major than 40% were excluded. All the subjects underwent MRI imaging, Neuropsychological evaluation and Carotid Duplex Ultrasonography. Cerebral vasomotor reactivity was assessed using the transcranial Doppler-based breath-holding index test (BHI).
Result(s): Both Cerebral blood flow velocity at the steady-state (CBFV) and BHI values were
significantly lower in AD subject than in healthy control (46,34 +/- 7,61 cm/s vs 55,1 +/- 8,09 cm/s, p=0,007; 0,99 +/- 0,26 vs 1,21 +/- 0,24, p=0,031). Furthermore, we found a correlation between
CBFV value and MMSE score (p=0.003, r=0.654; Spearman's correlation), but no correlation between BHI value and MMSE score. No significant relationship was found between White Matter Lesions on MRI and both CBFV and BHI values. However, the AD subjects with carotid stenoses had a lower CBFV and BHI values than those without carotid stenoses (43.12 +/- 7.56 cm/s vs 48.68 +/- 7.07 cm/s, p=0.008; 0.9 +/- 0.23 vs 1.06 +/- 0.27, p=0.04; respectively). Considering the correlation between each neuropsychological test and the cerebrovascular reactivity indices, we only found a significant correlation with the Digit Span test score (CBFV: r=0.542, p=0.046; BHI: r=0.525, p=0.05; Spearman's correlation).

Conclusion(s): Our study suggests that AD subjects have changes in both dynamics and structure of their cerebral blood flow circulation. In particular, the CBFV reduction is correlated with the severity of the cognitive decline, suggesting that it can influence the cognitive decline in AD subjects.

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Publisher
Elsevier Inc.

Emtree Heading
*ultrasound; *Alzheimer disease; carotid artery; brain blood flow; neurofibrillary tangle; senile plaque; dementia; human; cognitive defect; education; cerebrovascular disease; leukoencephalopathy; Mini Mental State Examination; mental health; imaging; transcranial doppler; breath holding; neuropsychological test; blood flow velocity; steady state; white matter lesion; dynamics; nuclear magnetic resonance imaging; amyloid.

Drug Index Terms
amyloid.

Other Index Terms
*ultrasound; *Alzheimer disease; carotid artery; brain blood flow; neurofibrillary tangle; senile plaque; dementia; human; cognitive defect; education; cerebrovascular disease; leukoencephalopathy; Mini Mental State Examination; mental health; imaging; transcranial doppler; breath holding; neuropsychological test; blood flow velocity; steady state; white matter lesion; dynamics; nuclear magnetic resonance imaging.
Atherosclerotic calcification is related to cognitive decline.

Vernooij M., Bos D., Hofman A., Witteman J., Van Der Lugt A., Ikram M.
Date of Publication: July 2013.
AN: 71416003

Background: Increasing evidence implicates atherosclerosis in the etiology of cognitive impairment and ultimately dementia, but longitudinal data are scarce. Also, it remains unclear whether atherosclerosis in different vessel beds affects cognitive decline differentially. In this study, we investigate the relationship between arterial calcification, as marker of atherosclerosis, in four vessel beds and cognitive decline over a 6 year interval.

Method(s): From the population-based Rotterdam Study, 1858 participants (mean age 68.4 +/- 5.9 years) underwent computed tomography of the coronaries, aortic arch, extracranial and intracranial carotid arteries to quantify atherosclerotic calcification. At baseline and after six years of follow-up, cognition was assessed using the MMSE and a neuropsychological test battery that comprised the following domains: global cognition, memory, executive function and information processing speed. Per participant, we calculated the difference between both time points in standardized scores for each cognitive domain. Relationships between atherosclerotic calcification and cognitive decline were assessed using linear regression models and adjusted for age, sex, education and additionally for APOE-e4-status and cardiovascular risk factors.

Result(s): Larger load of calcification in the coronary arteries, aortic arch and intracranial carotid arteries, but not in the extracranial carotid arteries, was associated with a decline in MMSE scores and decline in global cognitive function (see Figure). These associations seemed primarily driven by decline in executive function.

Conclusion(s): Atherosclerosis is an important cause of cognitive decline and thus of interest as potential modifiable target for prevention of dementia.

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Publisher
Carotid atherosclerosis and dementia risk in older adults. The three-city study.  
AN: 71337927  
Background: While carotid atherosclerosis has been associated with cognitive decline or prevalent dementia, there is limited evidence relating carotid atherosclerosis with incident dementia on a prospective basis.
Objective(s): To study the respective association of baseline carotid plaques and carotid intima media thickness (IMT) with incident all-cause dementia and dementia subtypes. Furthermore, the added value of carotid atherosclerosis for individual dementia risk prediction is quantified.

Method(s): Within the population-based Three-City study, 6,025 dementia-free men and women aged 65-85 underwent a standardized high-resolution B-mode carotid ultrasound examination at baseline allowing to detect carotid plaques in the common carotid arteries (CCAs), the bifurcations and the origin of the internal carotid arteries and to quantify IMT per se in the CCAs. Incident all causes and dementia subtypes (Alzheimer disease (AD) and vascular/mixed dementia (VaD)) were validated by an independent expert committee. Hazards Ratio (HR) of the number of sites with carotid plaques (0, 1 and 2) and of 1 SD increase in CCA-IMT were estimated using Cox regression models. The added value of carotid atherosclerosis for dementia risk prediction was measured by the Harell’s C index and the continuous net reclassification improvement index (NRI).

Result(s): After a mean follow-up of 5.4 years, 421 subjects had incident dementia, including 272 AD and 83 VaD. In multivariate analyses, carotid plaques were independently related to VaD only (HR for 2 sites with plaques=1.93, 95% confidence interval (CI) 1.13-3.28; p for trend=0.013). CCA-IMT was not associated with dementia of any type (standardized HR for VaD=1.07, 95% CI: 0.85-1.33). Further adjustment for intercurrent stroke as time dependent variables or controlling for competing risk by death marginally modified the results. Adding carotid plaques to established dementia risk factors improved the Harell’s C index from 0.716 to 0.739 (p=0.07) and yielded a significant continuous NRI of 43% (95% CI= 20.2-66.2; p < 0.001) regarding VaD risk.

Conclusion(s): In elderly men and women, carotid plaques on 2 sites or more are independent predictors of incident VaD and may improve the individual risk prediction of VaD.

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(Rouaud) Cntr memoire de Ressource et de Recherche, CMRR CHU Dijon, Dijon, France
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Publisher
Lippincott Williams and Wilkins

Emtree Heading
Carotid intima-media thickness is associated with cognitive deficiency in hypertensive patients with elevated central systolic blood pressure.


AN: 52268008

Background: The role of hypertension in the loss of cognitive function is controversial. Relationships between hypertension and increases in cerebral vascular resistance, diffused lesions and multiple lacunar infarcts of the white matter are well known. Thus, the objectives of this study were: to evaluate the relationship between hypertension and cognitive dysfunction (CD), identify risk factors and determine the association between early markers of vascular disease and CD in
hypertensive individuals. Methods. Two hundred individuals aged between 40 and 80 years old were evaluated in this cross-sectional prospective study. Fifty participants were controls (CT). The remaining 150 hypertensive patients were subdivided into two groups, those with CD (HCD) and those without CD (HNCD). All participants underwent clinical evaluations and biochemical blood tests were performed. CD was investigated using the Mini Mental State Examination (MMSE) following the guidelines for its use in Brazil. The impact of hypertension on the arterial bed was assessed by identifying and measuring changes in the intima-media thickness (IMT) by vascular ultrasonography of the carotid arteries and analyses of the central blood pressure and Augmentation Index by applanation tonometry of the radial artery.

Result(s): There were no significant differences in the total cholesterol, high-density lipoprotein cholesterol and triglycerides plasma concentrations between the three groups. The serum creatinine and estimated glomerular filtration rate were within normal ranges for all three groups. A significantly lower MMSE score was recorded for the HCD Group compared to the HNCD and CT Groups (p-value<0.05). The IMT was significantly different between the HNCD and HCD Groups (p-value=0.0124). A significant difference in the IMT was also observed between hypertensive patients and the CT Group (p-value<0.0001). Age, low-density cholesterol, high-density cholesterol, triglycerides and IMT increased the Odds Ratio for cognitive dysfunction. The central systolic pressure was significantly higher in the HCD and HNCD Groups compared to CT Group (p-value<0.0001).

Conclusion(s): Hypertensive patients with CD have changes in the vascular morphology characterized by an increased carotid IMT, enhanced atherosclerotic lipid profile and impaired hemodynamic functional manifested by elevated central systolic blood pressure. © 2012 Dias et al.; licensee BioMed Central Ltd.

Arntzen K.A., Schirmer H., Johnsen S.H., Wilsgaard T., Mathiesen E.B.
AN: 51986146

Background: Carotid atherosclerosis is a risk factor for stroke and cognitive decline, but knowledge on how progression of carotid atherosclerosis affects cognitive function in stroke-free individuals is scarce.

Method(s): In the population-based Tromso study, we calculated the change in ultrasound-assessed carotid plaque number and total plaque area from baseline (survey 4) to follow-up 7 years later (survey 5) in 4274 middle-aged stroke-free subjects. Cognitive function was assessed at follow-up by the verbal memory test, the digit-symbol coding test, and the tapping test and
repeated after an additional 6 years in a subgroup of 2042 subjects (survey 6). Associations between the average of survey 4 and survey 5 plaque scores and the progression of plaque scores and cognitive test scores were assessed in regression analyses adjusted for baseline age, sex, education, depression, and cardiovascular risk factors.

Result(s): Progression of total plaque area was associated with lower scores in the digit-symbol coding test (multivariable adjusted standardized beta, -0.03; 95% CI, -0.05 to -0.00; P = 0.04) and the tapping test (beta, -0.03; 95% CI, -0.06 to -0.00; P = 0.03). Similar results were seen for progression of plaque number. The average plaque scores were associated with lower scores in all cognitive tests (P-values <= 0.01). No association was found between plaque scores and cognitive decline.

Conclusion(s): The average plaque scores were associated with lower scores in all cognitive tests. Progression of plaque scores was associated with lower scores in the digit-symbol coding test and the tapping test, but not with the verbal memory test or with cognitive decline. © 2012 EFNS.


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Publisher
Blackwell Publishing Ltd (9600 Garsington Road, Oxford OX4 2XG, United Kingdom)

Emtree Heading
adult; aged; article; atherosclerotic plaque; cardiovascular risk; *carotid atherosclerosis; clinical assessment; cognition; depression; disease association; echography; education; female; follow up; human; major clinical study; male; *mental deterioration; population research; priority journal; regression analysis; verbal memory.

Other Index Terms
adult; aged; article; atherosclerotic plaque; cardiovascular risk; *carotid atherosclerosis; clinical assessment; cognition; depression; disease association; echography; education; female; follow up; human; major clinical study; male; *mental deterioration; population research; priority journal; regression analysis; verbal memory.

Link to the Ovid Full Text or citation:
223.

Relationship between chronic stress and carotid intima-media thickness (IMT) in elderly Alzheimer's disease caregivers.
Stress. 15 (2) (pp 121-129), 2012. Date of Publication: March 2012.
AN: 364138799

The stress associated with providing care for a spouse diagnosed with Alzheimer's disease can have adverse effects on cardiovascular health. One potential explanation is that chronic caregiving stress may contribute to the development of atherosclerosis. The purpose of this study was to determine whether the duration that one has provided care is associated with the degree of atherosclerotic burden, as measured by carotid artery intima-media thickness (IMT). One hundred and ten Alzheimer caregivers [mean age 74 +/- 8 (SD) years, 69% female] underwent in-home assessment of carotid artery IMT via B-mode ultrasonography. Data regarding medical history, blood pressure, and multiple indicators of caregiving stress were also collected. Multiple regression indicated that duration of care was positively associated with IMT measured in the internal/bifurcation segments of the carotid artery (beta = 0.202, p = 0.044) independent of risk factors such as age, gender, body mass index, smoking history, sleep quality, hypertension status, and caregiving stressors. Duration of care was positively associated with IMT in the common carotid artery, but the relationship was not significant. These findings provide more evidence of the link between chronic caregiving stress and cardiovascular disease and indicate that enduring the experience of caregiving over a period of years might be associated with atherosclerotic burden.
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Emtree Heading
adult; aged; *Alzheimer disease; *arterial wall thickness; article; B scan; blood pressure; body mass; cardiovascular disease; *caregiver; carotid artery bifurcation; cholesterol blood level; *chronic stress; daily life activity; educational status; female; gender; health status; human; hypertension; income; major clinical study; male; medical history; priority journal; psychosocial care; risk factor; sleep quality; smoking; low density lipoprotein cholesterol/ec [Endogenous Compound].

Drug Index Terms
low density lipoprotein cholesterol / endogenous compound.

Other Index Terms
adult; aged; *Alzheimer disease; *arterial wall thickness; article; B scan; blood pressure; body mass; cardiovascular disease; *caregiver; carotid artery bifurcation; cholesterol blood level; *chronic stress; daily life activity; educational status; female; gender; health status; human; hypertension; income; major clinical study; male; medical history; priority journal; psychosocial care; risk factor; sleep quality; smoking.

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225.

Carotid atherosclerosis and 10-year changes in cognitive function.
Background: Carotid atherosclerosis has been suggested to be involved in cognitive decline.

Method(s): The Epidemiology of Hearing Loss Study is a longitudinal study of aging among Beaver Dam residents, WI. In 1998-2000, carotid intima-media thickness (IMT) and plaque were measured by ultrasound; cognitive function was measured by the Mini-Mental State Examination (MMSE). Follow-up examinations were conducted in 2003-2005 and 2009-2010. Incidence of cognitive impairment was defined as an MMSE score <24 or reported physician-diagnosed dementia during the follow-up. In the last examination, five additional cognitive tests were added. The associations of carotid atherosclerosis with incident cognitive impairment and cognitive test performance ten years later were evaluated.

Result(s): A total of 1651 participants (mean age 66.8 years, 41% men) without cognitive impairment at baseline were included in the incidence analysis. IMT was associated with incidence of cognitive impairment after multiple adjustments (hazard ratio: 1.09, p = 0.02 for each 0.1 mm increase in IMT). A total of 1311 participants with atherosclerosis data at baseline had the additional cognitive tests 10 years later. Larger IMT was associated with longer time to complete the Trail-Making Test-part B after multiple adjustments (0.1 mm IMT: 2.3 s longer, p = 0.02). Plaque was not associated with incident cognitive impairment or cognitive test performance 10 years later.

Conclusion(s): In this population-based longitudinal study, carotid IMT was associated with a higher risk of developing cognitive impairment during the 10-year follow-up, and was associated with poorer performance in a test of executive function 10 years later. © 2012.

intima media thickness [other term].

Drug Index Terms
apolipoprotein A4 / endogenous compound.

Other Index Terms
aged; aging; article; brain function; *carotid atherosclerosis / *diagnosis; cognition; *cognitive defect; common carotid artery; dementia / diagnosis; female; follow up; human; internal carotid artery; intima; longitudinal study; major clinical study; male; mini mental state examination; priority journal; thickness; tunica media; ultrasound.

Vascular predictors of cognitive decline in patients with mild cognitive impairment.

Our aim in this study was to assess the relationship between the state of cerebral vessels and the risk of conversion from mild cognitive impairment (MCI) to Alzheimer's disease (AD). We included 117 MCI patients. They underwent an ultrasonographic assessment of common carotid arteries intima-media thickness (IMT) and carotid plaque index. Cerebrovascular reactivity to hypercapnia in the middle cerebral arteries was calculated with the Breath-Holding Index (BHI). After a 12-month follow-up period, neuropsychological examinations demonstrated a progression to dementia in 21 patients. Pathological values of BHI and IMT significantly increased the risk of conversion (BHI: odds ratio, 5.80; 95% confidence interval, 1.83-18.37, p < 0.05; IMT: odds ratio, 3.08; 95% confidence interval, 1.02-9.33; p < 0.05, multinomial logistic regression analysis). Comparison between patients with all normal values and those with the simultaneous alteration of the 2 vascular indexes showed an increase in the risk of conversion from 9% to 33% (ordinal
regression analysis). Our findings show that alterations of cerebral vessel functional and anatomic status increase the risk of conversion from MCI to dementia. © 2012 IBRO.

PMID

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Emtree Heading
aged; *Alzheimer disease/di [Diagnosis]; arterial wall thickness; article; brain blood flow; brain blood vessel; carotid atherosclerosis; *cognitive defect; controlled study; echography; female; follow up; functional assessment; hemodynamics; human; logistic regression analysis; major clinical study; male; *mild cognitive impairment/di [Diagnosis]; morphology; *neuroimaging; neuropsychological test; priority journal.

Other Index Terms
aged; *Alzheimer disease / *diagnosis; arterial wall thickness; article; brain blood flow; brain blood vessel; carotid atherosclerosis; *cognitive defect; controlled study; echography; female; follow up; functional assessment; hemodynamics; human; logistic regression analysis; major clinical study; male; *mild cognitive impairment / *diagnosis; morphology; *neuroimaging; neuropsychological test; priority journal.

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228.
Impaired cognitive function in patients with atherosclerotic carotid stenosis and correlation with ultrasound strain measurements.

Rocque B.G., Jackson D., Varghese T., Hermann B., McCormick M., Kliewer M., Mitchell C., Dempsey R.J.


AN: 52041434

Introduction: It has been postulated that up to 11 million silent strokes occur annually. While these patients are without classic neurologic deficits, they may exhibit cognitive decline. In this study, we examine the cognitive function of patients with carotid stenosis. Additionally, we evaluate a noninvasive measure of strain in pulsating carotid artery plaques to determine its ability to predict cognitive decline.

Method(s): We administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to 44 patients with carotid stenosis. All patients had stenosis meeting NASCET or ACAS criteria for endarterectomy, and were classified as symptomatic or asymptomatic as defined by these publications. Age-adjusted scores for each of the 5 RBANS domains (immediate memory, visuospatial ability, language, attention, and delayed memory) were compared between symptomatic and asymptomatic patients. Mean score for each of the 5 domains was then compared to all other domains, regardless of symptom status. From this cohort, 23 patients underwent assessment of carotid plaque strain by tracking displacements in ultrasound radiofrequency data to estimate axial and principal strains over the cardiac cycle.

Result(s): Thirty symptomatic and 14 asymptomatic patients were studied. Visuospatial scores were significantly lower than any other domain regardless of symptoms (p < 0.05 for all pairwise comparisons). No other domain score was significantly different from any other. In the language domain, asymptomatic patients scored significantly higher than symptomatic patients (p < 0.05. For all other domains, no difference was found. Asymptomatic patients showed a relationship between plaque strain and immediate memory (r = -.61, p = ns). Left carotid disease was associated with poorer performance across multiple cognitive domains with increasing accumulated strain. This was not seen in right carotid disease.

Conclusion(s): Patients with large carotid plaques (> 70% stenosis) exhibit significant difficulties in mental status whether classically symptomatic or asymptomatic. While language deficits may be a non-specific marker for stroke symptoms, visuospatial deficits are seen before classic symptoms, suggesting that carotid disease may become symptomatic earlier and more subtly than previously suspected. Abnormal strain distribution with pulsation may be related to cognition. © 2012 Elsevier B.V.


Institution
Effects of carotid endarterectomy on the dynamics of cognitive impairments in patients with atherosclerotic stenosis of the carotid arteries.

Neuroscience and Behavioral Physiology. 42 (6) (pp 543-549), 2012. Date of Publication: July 2012. AN: 365619777

The clinical and neurochemical characteristics of non-dementia cognitive disorders were studied in 102 patients with atherosclerotic carotid sclerosis, with assessment of their dynamics after carotid endarterectomy (CEAE). Mild cognitive disorders were seen in 37 patients (36.3%) and moderate cognitive disorders in 36 patients (35.3%). Moderate cognitive impairments were significantly more common in patients with symptoms of carotid stenosis, dominated by structural changes in the brain on neuroimaging (leukoaraiosis and infarcts); unstable atherosclerotic plaques, with a predominance of the hypodense component, were also more frequent. This suggests that cognitive dysfunction in patients with atherosclerotic carotid stenosis results not only from decreased perfusion, but also from arterio-arterial microembolism. CEAE was found to have favorable effects on cognitive functions. Positive changes were marked in patients with asymptomatic carotid stenosis. However, CEAE could also have adverse influences on cognitive functions in patients with moderate cognitive disorders of dysmneletic type and symptoms of carotid stenosis. © 2012 Springer Science+Business Media, Inc.

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Publisher
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Emtree Heading
adult; article; atherosclerotic plaque; brain infarction; brain perfusion; *carotid artery obstruction; *carotid atherosclerosis/su [Surgery]; *carotid endarterectomy; *cognitive defect; deterioration; disease severity; female; human; internal carotid artery occlusion; leukoaraiosis; major clinical study; male; memory disorder; microembolism; neuroimaging; neuropsychological test; nuclear magnetic resonance imaging.

Other Index Terms
adult; article; atherosclerotic plaque; brain infarction; brain perfusion; *carotid artery obstruction; *carotid atherosclerosis / *surgery; *carotid endarterectomy; *cognitive defect; deterioration; disease severity; female; human; internal carotid artery occlusion; leukoaraiosis; major clinical study; male; memory disorder; microembolism; neuroimaging; neuropsychological test; nuclear magnetic resonance imaging.

Link to the Ovid Full Text or citation:
231.

AN: 71637254

Background: Mild cognitive impairment (MCI) is a subtle memory disorder, not matching criteria for dementia. There is evidence for vascular comorbidity, obviously in vascular dementia, but also in other types like Alzheimer's Disease. Increased carotid Intima-Media Thickness (IMT) and spontaneous cerebral microemboli have been found more frequently in different types. We hypothesised that ultrasound examination and MRI would detect a high degree of vascular disease, brain injury and degenerative changes in patients with MCI.

Method(s): In cooperation with our memory clinic, 12 patients aged 61 to 77 (median 69 years) with amnestic MCI were referred to our department for neurovascular investigation. All patients underwent ultrasound examination with carotid duplex including IMT measurement, and Transcranial Doppler (TCD) including one-hour emboli monitoring, vasoreactivity measurement and Bubble test. Cerebral MRI for evaluation of vascular and white matter lesions, brain atrophy, hippocampal volumes and Amyloid angiopathy was performed in 11 patients.

Result(s): Vascular risk factors were found in 8 patients (67%). 5 patients had atherosclerotic lesions, of which 4 had mild (33%) and one had moderate (8%) carotid stenosis. Distal CCA IMT >1 mm was found in 2 patients (17%), no patient had IMT > 1.11 mm. None of the 10 patients with acceptable bone window (83%) had intracranial stenosis in TCD. Vasoreactivity was low (18 %) in one patient (8%). Permanent rightleft shunt was found in 4 patients (33%), of which one (8%) showed spontaneous cerebral microemboli. Hippocampal volume reduction was present in 2 patients (17%), and 4 patients (33%) had cortical atrophy. Chronic ischemic changes were found in 4 patients (33%), of which one (8%) also had a cortical infarction and microbleedings. Amyloid Angiopathy was not found.
Conclusion(s): We suggest that pure amnestic MCI is less associated with cerebrovascular disease, and may be more consistent with evolving Alzheimer’s Disease.

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Publisher
S. Karger AG

Emtree Heading
*mild cognitive impairment; *adult; *pilot study; *cerebrovascular accident; patient; human; examination; ultrasound; vascular amyloidosis; multiinfarct dementia; dementia; brain injury; memory disorder; vascular disease; carotid artery obstruction; stenosis; brain infarction; memory; embolism; comorbidity; transcranial doppler; arterial wall thickness; monitoring; white matter lesion; brain; carotid artery; hospital; risk factor; bone; atrophy; cerebrovascular disease; Alzheimer disease; nuclear magnetic resonance imaging.

Other Index Terms
*mild cognitive impairment; *adult; *pilot study; *cerebrovascular accident; patient; human; examination; ultrasound; vascular amyloidosis; multiinfarct dementia; dementia; brain injury; memory disorder; vascular disease; carotid artery obstruction; stenosis; brain infarction; memory; embolism; comorbidity; transcranial doppler; arterial wall thickness; monitoring; white matter lesion; brain; carotid artery; hospital; risk factor; bone; atrophy; cerebrovascular disease; Alzheimer disease; nuclear magnetic resonance imaging.

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233.
Ultrasound characteristics of dementia in renal patients.
AN: 71637053
Background: It has been suggested that vascular ultrasound findings are associated with dementia. The aim of this study was to determine the association of carotid, femoral, middle cerebral artery (MCA) ultrasound findings with dementia.
Method(s): Analysis involved imaging by duplex of carotid and femoral arteries of 61 patients (43 male, 18 female, mean age: 63.14 years) in a longitudinal fashion, to detect the presence of plaque and to assess the intima media thickness (IMT). Each artery was assigned a score (presence of plaque=1, absence of plaque=0, IMT >=0.8 mm=1, IMT<0.8 mm=0) and the total score of the four vessels (two carotid and two femoral) was calculated per patient (atherosclerotic ultrasonic score - ATHUS). Subsequently the mean pulsatility index (PI) of both MCAs and the minimental state examination (MMSE) of every patient was evaluated. Brain CT scans were performed to ensure the small vessel disease as the cause for the intellectual decline of patients.
Result(s): Group A (ATHUS=0-2, 26 patients) was associated with median MMSE of 29 and interquartile range of 2. The corresponding values for Group B (ATHUS=3-5, 16 patients) and Group C (ATHUS=6-8, 19 patients) were: 28(3.75) and 25(5) respectively (p<0.01). PI of 0.97 separated the patients in terms of MMSE into: Group D (PI<=0.97, median MMSE=29, interquartile range=2) and Group E (PI>0.97) with corresponding values of 28(4) (p<0.01).
Conclusion(s): Our results suggested that the degree of atherosclerosis was inversely related to MMSE. This position might be clarified in larger studies of intellectually declined patients, aiming to establish the role of atherosclerosis detected on ultrasound in dementia.
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Publisher
S. Karger AG
Emtree Heading
234.


A rapidly emerging literature suggests that cardiovascular health may be as important to the pathogenesis of Alzheimer’s disease and all-cause dementia as it is to the development of vascular dementia. Though several studies have identified higher prevalence of carotid atherosclerosis among dementia patients vs. controls, very few have focused on carotid atherosclerosis as a predictor of dementia in a cognitively normal baseline sample. Here we examined prospective relations of common carotid artery plaque and intimal medial thickness (IMT) to incident dementia among 293 participants aged 60 and older (mean baseline age=73 years, 60% male, 81% white) from the Baltimore Longitudinal Study of Aging. Carotid studies were performed with high resolution B-mode ultrasonography, and cognitive status was determined by annual neuropsychological assessment and consensus conference. Cox proportional hazards models were adjusted for baseline age, sex, race, education, blood pressure, cholesterol, cardiovascular disease,
and smoking. The dependent measure was age at onset of dementia or the last observed (censored) age of cognitively normal participants. After up to 14 years of follow-up (median=7), 52 participants developed dementia. Presence of carotid plaque predicted dementia significantly (hazard ratio [HR] = 1.42; 95% confidence interval [CI], 1.02-1.98). Thirty-three percent of participants with bilateral carotid plaque developed dementia during the study period, versus 17% and 13% with unilateral and no plaque, respectively. Maximal carotid IMT also predicted dementia significantly, but in men only (HR=1.42; 95% CI, 1.02-1.97). Unadjusted descriptive analyses showed escalating dementia incidence with increasing baseline carotid IMT quintile (i.e., 17%, 19%, 26%, 21%, 31%, respectively). Results suggest possible dose-response relations between atherosclerosis severity and prospective dementia risk. Our findings provide indirect evidence that early intervention to reduce atherosclerosis may limit or delay the onset of dementia with aging.

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Publisher
Lippincott Williams and Wilkins

Emtree Heading
*carotid atherosclerosis; *dementia; *United States; *longitudinal study; *aging; *psychosomatics; *society; human; carotid artery; male; atherosclerosis; multiinfarct dementia; common carotid artery; patient; cardiovascular disease; onset age; follow up; hazard ratio; arterial wall thickness; dose response; blood pressure; prevalence; proportional hazards model; education; smoking; pathogenesis; health; consensus; confidence interval; early intervention; risk; echography; Alzheimer disease; cholesterol.

Drug Index Terms
cholesterol.

Other Index Terms
*carotid atherosclerosis; *dementia; *United States; *longitudinal study; *aging; *psychosomatics; *society; human; carotid artery; male; atherosclerosis; multiinfarct dementia; common carotid artery; patient; cardiovascular disease; onset age; follow up; hazard ratio; arterial wall thickness; dose response; blood pressure; prevalence; proportional hazards model; education; smoking; pathogenesis; health; consensus; confidence interval; early intervention; risk; echography; Alzheimer disease.

Link to the Ovid Full Text or citation:
Learning objectives: Atherosclerosis of carotid arteries, in many cases asymptomatic, not only increases the risk of severe central nervous system complication like transient ischaemic episodes (TIAs) and strokes but also decreases the quality of cognition. The aim of this study was to compare the effect on cognitive functions of carotid endarterectomy (CEA) and carotid artery stenting (CAS) for asymptomatic carotid artery stenosis.

Background(s): A prospective study was conducted among 32 asymptomatic patients with no neurological deficits, who were admitted for the treatment of carotid artery stenosis. 20 patients consented to participate in the study. 12 were classified for CEA and 8 for CAS. CAS and CEA were performed by vascular surgeons and endovascular specialist with high level of expertise. Before analyzing cognitive functions, quick test of intelligence (Wechsler Adult Intelligence Scale Test) was performed. 8 patients were excluded due to low intelligence quotient. Among the rest of the study group (12 patients: 6 women, 6 men) cognitive functions were evaluated by the Benton visual retention test (BVRT). The measurement was performed 12-24 hours before and 12-14 weeks after revascularization. Statistical analysis of numeric results of BVRT was performed with the use of chi2 test. Clinical Findings/Procedure: Among analyzed patients, 9 (4 women, 5 men) presented worse results in BVRT after revascularization (p<0,05). 1 patient presented better and 2 patients had the same results after treatment. There was no statistically significant difference between those who underwent CAS and CEA. Conclusion(s): CAS and CEA equally reduce cognitive functions. It can be explained by asymptomatic psycho-organic brain damage due to atherosclerosis itself and embolisation during interventions.
Elevated arterial stiffness and deepbrain white matter hyperintensity in patients with mild cognitive impairment.

Tseng B., Ayaz M., Brunk E., Armstrong K., Martin-Cook K., Diaz-Arrastia R., Weiner M., Cullum M., Levine B., Lu H., Zhang R.
Background: Brain white matter hyperintensity (WMH) is a measure of white matter damage which may be related to small cerebral vessel disease. Increases in arterial stiffness and carotid artery intima-media thickness (IMT) are the hallmark of arterial aging indicating the presence of subclinical atherosclerosis. The purpose of this study was to assess arterial stiffness, carotid artery IMT and WMH in patients with mild cognitive impairment (MCI).

Method(s): Twenty-eight MCI patients (14 males, age=67±6 yrs, clinical dementia rating score=0.5) and 30 age- and education-matched cognitively normal adults (14 males, age=67±6 yrs) participated. The carotid arterial (b) stiffness index and the intima-media thickness (IMT) were measured using high resolution 2D Doppler ultrasonography and applanation tonometry in the left and right common carotid arteries (CCA). Peripheral and central pulse-wave-velocity (PWV) were measured between the right common carotid artery and the right radial and left femoral artery, respectively. WMH was assessed in 22 patients with MCI (12 males, age=67±6 yrs) and 19 controls (5 males, age=67±6 yrs) using MRI Fluid-Attenuated-Inversion-Recovery (FLAIR) images on a 3T Philips Achieva MR system. Periventricular and deep-brain WMH volumes were quantified and differentiated using semi-automatic programs (MRICro and MatLab).

Result(s): MCI patients showed higher b-stiffness index (7.36±1.8 vs. 6.36±1.5 p<0.05) and decreased distensibility (0.31±0.07 vs. 0.37±0.09%mmHg, P = 0.01) in the CCA when compared to the cognitively normal subjects. No significant differences were found in the carotid artery IMT (0.70±0.11 vs. 0.66±0.10cm/s), peripheral (8.36±1.2 vs. 8.36±1.4cm/s) and central PWV (9.76±2.1 vs. 9.96±2.2cm/s) between the groups. Deep-brain WMH volume, normalized to the whole intracranium volume, was twice as high in the MCI group relative to the controls (dWMHx, 0.18±0.10 vs. 0.09±0.07%, P<0.01) although global WMH volume did not differ between the two groups.

Conclusion(s): Deep-brain WMH volume was increased in patients with MCI and was associated with increases in carotid arterial stiffness. The relationship between arterial stiffness and deep-brain WMH volume in MCI merits further investigation.

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Publisher

Elsevier Inc.
Increased intima-media thickness and central blood pressure in hypertensive individuals with cognitive impairment.

Vilela-Martin J.F., Cosenso-Martin L.N., Mota-Dias E., Giollo-Junior L.T., Cosenso-Sacomani C.N., Yugar-Toledo J.C., Moreno-Junior H.


AN: 70832504

Introduction: The role of hypertension in the loss of cognitive function is controversial. Relationships of hypertension with increases in cerebral vascular resistance, diffused lesions and multiple lacunar infarcts of the white matter are well known. Thus, the objectives of this study were:
To evaluate the relationship between hypertension and cognitive dysfunction (CD), identify risk
factors and determine the association between markers of early vascular disease and CD in hypertensive individuals.

Method(s): Two hundred individuals aged between 40 and 80 years old were evaluated in this cross-sectional study. Fifty participants were normotensive (NT). The remaining 150 hypertensive patients were subdivided into two groups, those with CD (HCD) and those without CD (HNCD). All participants underwent clinical evaluations and biochemical blood tests were performed. CD was investigated using the Mini Mental State Examination (MMSE) following the guidelines for its use in Brazil. The impact of hypertension on the arterial bed was assessed by identifying and measuring changes in the intima-media thickness (IMT) by vascular ultrasonography of the carotid arteries and analyses of the central blood pressure and Augmentation Index by applanation tonometry of the radial artery.

Result(s): There were no significant differences in the plasma concentrations of total cholesterol, high-density lipoprotein cholesterol and triglycerides of the three groups. The serum creatinine and estimated glomerular filtration rate were within normal ranges for all three groups. A significantly lower MMSE score was recorded for the HCD Group compared to the HNCD and NT Groups (p<0.05). The IMT was significantly different between the HNCD and HCD Groups (p=0.0124). A significant difference in the IMT was also observed between hypertensive patients and the NT Group (p<0.0001). The central systolic pressure was significantly higher in the HCD and HNCD Groups compared to NT Group (p<0.0001). There were no significant differences in the Augmentation Index (corrected for heart rate) between the three groups (HCD, HNCD and NT).

Conclusion(s): Hypertensive patients with CD have changes in the vascular morphology characterized by an increased carotid IMT and hemodynamic functional impairment manifested by elevated central systolic blood pressure.

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Emtree Heading
*blood pressure; *cognitive defect; *society; *arterial wall thickness; human; hypertension; patient; systolic blood pressure; augmentation index; carotid artery; Mini Mental State Examination; white matter; infarction; blood; morphology; heart rate; clinical evaluation; Brazil; echography; glomerulus filtration rate; cross-sectional study; brain vascular resistance; cholesterol blood level; blood level; vascular disease; creatinine blood level; radial artery; tonometry; risk factor; functional disease; cognition; high density lipoprotein cholesterol; triacylglycerol; marker.
Drug Index Terms
high density lipoprotein cholesterol; triacylglycerol; marker.

Other Index Terms
*blood pressure; *cognitive defect; *society; *arterial wall thickness; human; hypertension; patient; systolic blood pressure; augmentation index; carotid artery; mini mental state examination; white matter; infarction; blood; morphology; heart rate; clinical evaluation; Brazil; echography; glomerulus filtration rate; cross-sectional study; brain vascular resistance; cholesterol blood level; blood level; vascular disease; creatinine blood level; radial artery; tonometry; risk factor; functional disease; cognition.

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252.

The effect of carotid endarterectomy on cognitive disturbances in patients with atherosclerotic stenosis of carotid arteries.
AN: 362503147

Clinical and neuropsychological features of non-dementia cognitive disturbances were studied in 102 patients with atherosclerotic carotid stenosis. Cognitive disturbances were assessed after the carotid endarterectomy (CEAE). Mild cognitive impairment was found in 37 (36,3%) of patients, moderate cognitive impairment was diagnosed in 36 (35,3%) patients. Moderate cognitive impairment was found more often in patients with symptomatic carotid stenosis with structural brain changes confirmed by neuroimaging data and with instable atherosclerotic plaques with the predomination of hypodensity component. It allows to suggest that both the reduction of perfusion and arterio-arterial microemboli may cause cognitive dysfunction in patients with atherosclerotic carotid stenosis. The data on the positive effect of CEAE on cognitive functions
have been obtained. The positive changes were more distinct in patients with asymptomatic course of carotid stenosis. However CEAE may have a negative effect on cognitive functions in patients with moderate cognitive impairment of dysmnesic character and symptomatic carotid stenosis.

PMID

Publisher
Media Sfera (Dmitrovskoe shosse 46, korp 2, etazh 4, P.O. Box 54, Moscow 127238, Russian Federation)

Emtree Heading
amnesia/co [Complication]; article; atherosclerotic plaque/su [Surgery]; brain perfusion; brain region; *carotid artery obstruction/su [Surgery]; *carotid atherosclerosis/su [Surgery]; *carotid endarterectomy; clinical assessment; clinical feature; cognition; *cognitive defect/co [Complication]; controlled study; disease severity; human; major clinical study; microembolism; mild cognitive impairment/co [Complication]; neuroimaging; arterioarterial microembolus.

Candidate Terms
arterioarterial microembolus [other term].

Other Index Terms
amnesia / complication; article; atherosclerotic plaque / surgery; brain perfusion; brain region; *carotid artery obstruction / *surgery; *carotid atherosclerosis / *surgery; *carotid endarterectomy; clinical assessment; clinical feature; cognition; *cognitive defect / *complication; controlled study; disease severity; human; major clinical study; microembolism; mild cognitive impairment / complication; neuroimaging.

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253.

Subclinical carotid atherosclerosis and cognitive function.
Carotid artery atherosclerosis is a major risk factor for stroke and subsequent cognitive impairment. Recent studies indicate that carotid atherosclerosis without clinical stroke may also be an independent risk factor for cognitive decline and dementia. Ultrasonography is an easily assessable and non-invasive method to measure different stages of the carotid artery atherosclerotic process and is widely used in clinical assessment as well as in epidemiological and clinical research. We give a brief review of studies that have investigated degrees of the subclinical atherosclerosis in the carotid arteries in relation to cognitive function and dementia, and we discuss several possible mechanisms that could explain the association between atherosclerosis and cognitive impairment. © 2011 John Wiley & Sons A/S.

PMID

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Publisher
Blackwell Publishing Ltd (9600 Garsington Road, Oxford OX4 2XG, United Kingdom)

Emtree Heading
Alzheimer disease; arterial wall thickness; article; cardiovascular risk; carotid artery bifurcation; *carotid atherosclerosis; *cognition; dementia; disease association; human; mortality; nuclear magnetic resonance imaging.

Other Index Terms
Alzheimer disease; arterial wall thickness; article; cardiovascular risk; carotid artery bifurcation; *carotid atherosclerosis; *cognition; dementia; disease association; human; mortality; nuclear magnetic resonance imaging.

Link to the Ovid Full Text or citation:
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Carotid atherosclerosis and cognitive function in midlife: The beaver dam offspring study.
AN: 51563811
Background: Atherosclerosis may be associated with cognitive function; however the studies are few, especially among midlife adults.
Method(s): Participants in the beaver dam offspring study who had cognitive test data and gradable carotid artery ultrasound scans were included (n= 2794, mean age: 49 years). Atherosclerosis was measured by carotid intima-media thickness (IMT) and the presence of plaque. Cognitive function was measured by the trail making test (TMT), grooved pegboard test (GPT) and mini-mental state examination (MMSE). Generalized cognitive function was defined by a summary score calculated from the TMT and GPT. Linear regression was used to evaluate the associations between carotid atherosclerosis and cognitive function tests.
Result(s): Larger IMT was associated with lower GPT, MMSE and the summary score adjusting for multiple factors, the coefficients were: 13.8s (p< 0.0001), -0.6 (p= 0.007), and 0.47 (p= 0.01), respectively for 1. mm increase in IMT. Plaque scores were significantly associated with TMT-B, GPT, MMSE, and the summary score adjusting for age, sex and education. The associations remained statistically significant after further adjustments except for the association with TMT-B, which was attenuated and no longer significant.
Conclusion(s): Our results show the significant associations between markers of carotid atherosclerosis and cognitive function in a cohort of persons aged 21-84 years. Longitudinal studies are needed to further examine these associations. © 2011 Elsevier Ireland Ltd.

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(Pankow) University of Minnesota, MN 55454, United States

Publisher
Elsevier Ireland Ltd (P.O. Box 85, Limerick, Ireland)
Carotid atherosclerosis and incident cognitive impairment.
AN: 70699780
Aim: To determine the relationship between atherosclerosis and incident cognitive impairment.
Method(s): The Epidemiology of Hearing Loss Study (EHLS) is a population-based study among residents in Beaver Dam, WI. Participants had a carotid ultrasound scan (Biosound AU4) at the 1998-00 EHLS exam. The intima-media thickness (IMT) was evaluated at 12 sites in the carotid artery (the near and far walls of common carotid artery, the bifurcation and the internal carotid artery on the right and left sides); and the mean IMT of the 12 sites was used as an indicator of atherosclerosis. Cognitive function was measured at three EHLS exams (1998-00, 2003-05, 2009-10); and cognitive impairment was defined as the Mini-Mental State Examination (MMSE) score < 24 out of 30, or a proxy report of dementia. Participants without cognitive impairment at baseline and with at least one follow-up visit were included (n = 1651, mean age at baseline: 67 years) in the
analyses. The Cox proportional hazard model was used and the event's time was defined as the first examination at which a participant was cognitively impaired.

Result(s): There were 14,470 person-years of follow-up, with 143 cases of incident cognitive impairment. After adjusting for age, sex and education, IMT at baseline was associated with the 10-year cumulative incidence of cognitive impairment (hazard ratio: 1.08, 95% confidence interval: 1.01-1.16, per 100lm). The association was similar when further adjusting for smoking, drinking, serum HDL-cholesterol, A1C, and SF-36 mental score at baseline.

Conclusion(s): Carotid IMT was associated with the incidence of cognitive impairment, which suggests that interventions to prevent atherosclerosis may also have cognitive benefits.

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Publisher
Oxford University Press

Emtree Heading
*cognitive defect; *epidemiology; *carotid atherosclerosis; human; carotid artery; atherosclerosis; follow up; education; hazard ratio; confidence interval; smoking; drinking; serum; hearing loss; population; mare; ultrasound; arterial wall thickness; internal carotid artery; cognition; Mini Mental State Examination; custody; dementia; proportional hazards model; examination; common carotid artery; high density lipoprotein cholesterol; high density lipoprotein.

Drug Index Terms
high density lipoprotein cholesterol; high density lipoprotein.

Other Index Terms
*cognitive defect; *epidemiology; *carotid atherosclerosis; human; carotid artery; atherosclerosis; follow up; education; hazard ratio; confidence interval; smoking; drinking; serum; hearing loss; population; mare; ultrasound; arterial wall thickness; internal carotid artery; cognition; mini mental state examination; custody; dementia; proportional hazards model; examination; common carotid artery.

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Carotid plaque progression predicts lower cognitive test results in a stroke-free population. the tromso study.
Arntzen K.A., Schirmer H., Johnsen S.H., Wilsgaard T., Mathiesen E.
Conference Publication: (var.pagings). 18 (SUPPL. 2) (pp 64), 2011. Date of Publication: September 2011.
AN: 70602489
Background: Atherosclerosis of the carotid arteries is a major risk factor for stroke and subsequent cognitive impairment. Whether subclinical carotid atherosclerosis predicts cognitive function is less clear.
Method(s): We followed a stroke-free middle-aged population of 4198 subjects who underwent carotid ultrasound examination at baseline (mean age 59y) and was re-examined with carotid ultrasound and tested for cognitive function 7 years later. Presence of plaques, the number of plaques and the total plaque area (TPA) at baseline, the average plaque scores between the two examinations and the progression of plaque formation were tested in regression models in order to predict cognitive test scores on verbal memory test, digit-symbol coding test and tapping test. Standardized regression coefficients (z-scores) were made for the dependent and independent variables to compare results between models and each cognitive test.
Result(s): In multivariable analysis adjusted for sex, age, education, depression and cardiovascular risk factors, baseline number of plaques and TPA were associated with lower test scores on the verbal memory test. The average number of plaques and TPA between baseline and follow-up were associated with lower cognitive test scores on all tests, and progression of the number of plaques predicted lower scores on the coding test and the tapping test.
Conclusion(s): In this stroke-free middle-aged general population, carotid plaques at baseline and progression of plaques were predictors of lower cognitive test scores.
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Publisher
Blackwell Publishing Ltd
Atherosclerosis and progression of brain atrophy: The SMART-MR study.
Muller M., Van Der Graaf Y., Algra A., Hendrikse J., Mali W., Geerlings M.
AN: 70501570

Background: Atherosclerosis is believed to be involved in the etiology of dementia, including Alzheimer's disease. It is unknown to what extent neurodegenerative pathology underlies this association. Evidence from crosssectional studies associating atherosclerosis with brain atrophy is limited and no prospective studies examined this relation. We investigated whether presence and severity of carotid atherosclerosis was related to progression of global, cortical and subcortical brain atrophy.

Method(s): Within the Second manifestations of Arterial disease-Magnetic Resonance (SMART-MR) study, a prospective cohort study among patients (mean age 58 (10) year, 0% men) with vascular disease, MRI of the brain was performed in 1232 patients at baseline (2001-2005) and in 663 patients at follow-up (2006-009) after on average 3.9 years (range 3.0-5.8 years). At baseline,
measurements of carotid intima media thickness (CIMT) and carotid stenosis were performed. Carotid stenosis was classified into 0-50%, 50-70% (moderate), and >70% (severe) and into unilateral or bilateral stenosis. Brain segmentation as used to quantify total brain volume, cortical gray matter volume, and ventricular volume as indicators of global, cortical, and subcortical atrophy. All brain volumes were normalized for intracranial volume (ICV). Linear regression analysis was used to estimate cross-sectional and prospective associations of measures of carotid atherosclerosis with brain volumes, adjusted for age, sex, and vascular risk factors, and follow-up time in the respective analysis.

Result(s): Increased CIMT and carotid stenosis were associated with decreased total brain and cortical gray matter volume in cross-sectional analyses. Prospective analyses showed that CIMT and moderate stenosis were not related to progression of brain atrophy. Compared with patients with no or limited carotid stenosis, only severe or bilateral carotid stenosis was related to progression of global atrophy, cortical atrophy and subcortical atrophy.

Conclusion(s): We confirmed previous cross-sectional findings of more brain atrophy with CIMT and stenosis. However, our prospective findings in a study of patients with vascular disease with 4 years of follow-up showed that only severe or bilateral carotid stenosis, and not moderate aortic stenosis and increased CIMT, were associated with progression of brain atrophy. These findings suggest that high grade carotid artery narrowing contributes to the progression of neurodegeneration.

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Publisher Elsevier Inc.

Emtree Heading
*brain atrophy; *atherosclerosis; *nuclear magnetic resonance; carotid artery obstruction; human; patient; stenosis; atrophy; brain size; brain; follow up; carotid atherosclerosis; carotid artery; gray matter; vascular disease; etiology; pathology; prospective study; artery disease; cohort analysis; male; arterial wall thickness; linear regression analysis; artery occlusion; nerve degeneration; risk factor; Alzheimer disease; nuclear magnetic resonance imaging.

Other Index Terms
*brain atrophy; *atherosclerosis; *nuclear magnetic resonance; carotid artery obstruction; human; patient; stenosis; atrophy; brain size; brain; follow up; carotid atherosclerosis; carotid artery; gray matter; vascular disease; etiology; pathology; prospective study; artery disease; cohort analysis; male; arterial wall thickness; linear regression analysis; artery occlusion; nerve degeneration; risk factor; Alzheimer disease; nuclear magnetic resonance imaging.
Arterial calcifications in relation to cognitive function and structural brain changes.
Bos D., Van Der Lugt A., Witteman J., Krestin G., Hofman A., Vernooij M., Ikram M., Medical E.
Paris France. Conference Publication: (var.pagings). 7 (4 SUPPL. 1) (pp S295), 2011. Date of
Publication: July 2011.
AN: 70501568

Background: Atherosclerosis may play an important role in the etiology of cognitive decline and
dementia. This study investigates associations between atherosclerosis in four vessel beds outside
the brain, with cognition nd preclinical MRI-markers of dementia.

Method(s): From the general population, 863 participants (mean age 66.6 years) underwent non-
enhanced T of the coronaries, aortic arch, extracranial and intracranial carotid arteries to quantify
calcification volume as a measure of atherosclerosis. Cognitive function was assessed with a
neuropsychological test battery comprising the following domains: memory, executive function,
information processing speed, global cognition and motor speed. On brain MRI, total brain volume
(TBV), grey matter volume (GM), white matter volume (WM) and hippocampal volume were
assessed. Associations between arterial calcifications (stratified by gender), cognition and brain
issue volumes were assessed with linear regression, adjusted for relevant confounders.

Result(s): Higher CT-assessed calcification load in all vessel beds was associated with worse cognitive
scores in all domains. Adjustment for total brain volume attenuated these associations, except or
the associations between extracranial and intracranial carotid artery calcifications and motor speed
in men. A higher load of extracranial carotid artery calcifications in men and intracranial carotid
artery calcifications in women was significantly associated with smaller total brain volume nd
smaller white matter volume. In women, aortic calcifications were strongly associated with smaller
grey matter volume. Calcifications in ny vessel bed were not associated with hippocampal volume.
Adjustment for cardiovascular risk factors or carotid plaque did not change these associations.
Conclusions: A higher arterial calcification load is associated with worse cognitive function. Furthermore, calcification load in specific vessel beds is associated with smaller total brain volume, white matter volume and grey matter volume. The association between arterial calcification load and cognitive function is partly mediated by its effect on brain tissue volumes.

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Publisher
Elsevier Inc.

Emtree Heading
*artery calcification; *cognition; *brain; calcification; human; carotid artery; brain size; velocity; gray matter; white matter; atherosclerosis; dementia; female; male; nuclear magnetic resonance imaging; population; aorta arch; memory; executive function; gender; linear regression analysis; cardiovascular risk; brain tissue; etiology; marker.

Drug Index Terms
marker.

Other Index Terms
*artery calcification; *cognition; *brain; calcification; human; carotid artery; brain size; velocity; gray matter; white matter; atherosclerosis; dementia; female; male; nuclear magnetic resonance imaging; population; aorta arch; memory; executive function; gender; linear regression analysis; cardiovascular risk; brain tissue; etiology.

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274.

Carotid arterial plaque and clinical factors in stroke patients with dementia.
Lee J.H.
Background: Carotid arterial stenosis becomes more common and important risk factor for stroke patients with dementia in Asian area. We reviewed stroke database to investigate clinical factors related to carotid arterial stenosis, including intracranial arterial stenosis and peripheral arterial disease which reflects advanced atherosclerosis in patients with dementia.

Method(s): Acute stroke patients with dementia whose stroke onset were within 1 week when admitted at the National Health Insurance Corporation Ilsan Hospital from January 2008 to December 2010 with available carotid ultrasound study, transcranial Doppler (TCD) examination and ankle-brachial indexes (ABI) formed the analysis cohorts. Retrospective review was performed.

Result(s): A total of 304 patients were included during that period. By duplex ultrasound, common/internal carotid arteries are examined and the greatest diameter of plaques are recorded. 3 groups of carotid arterial plaques are defined: diameter is less than 2mm (112 patients, 37%), 2-4mm (174 patients, 57%) and greater than 4mm (18 patients, 6%). As the size of carotid arterial plaques increased, ABI is decreased (P = 0.000) and the number of intracranial arterial stenosis is increased (P = 0.008). Among the risk factors, Age, diabetes, male patients are increased (P = 0.000, P = 0.047, P = 0.004) and smoking history showed tendency of increase (P = 0.057) as diameter of carotid arterial plaque increase. However hypertension, total cholesterol, LDL cholesterol, HDL cholesterol, triglyceride and past stroke history are not correlated with carotid arterial stenosis.

Conclusion(s): Among the acute stroke patients with dementia, more than a half of them have carotid arterial plaque which diameters are greater than 2mm and these patients tend to have higher burden of advanced atherosclerosis as evidenced by a higher prevalence of diabetes, intracranial arterial stenosis and peripheral arterial occlusive disease.
Drug Index Terms
low density lipoprotein cholesterol; high density lipoprotein cholesterol; high density lipoprotein; triacylglycerol; low density lipoprotein.

Other Index Terms
*carotid artery; *dementia; *stroke patient; human; patient; artery occlusion; stroke; risk factor; atherosclerosis; ultrasound; diabetes mellitus; peripheral occlusive artery disease; national health insurance; hospital; data base; Doppler echography; examination; ankle brachial index; cohort analysis; Asian; male; smoking; hypertension; cholesterol blood level; prevalence.

Arterial calcifications in relation to cognitive function and structural brain changes.
Bos D., Van der Lugt A., Witteman J., Krestin G., Hofman A., Vernooij M., Ikram M.
AN: 70500894

Background: Atherosclerosis may play an important role in the etiology of cognitive decline and dementia. This study investigates associations between atherosclerosis in four vessel beds outside the brain, with cognition and preclinical MRI-markers of dementia.

Method(s): From the general population, 863 participants (mean age 66.6 years) underwent nonenhanced CT of the coronaries, aortic arch, extracranial and intracranial carotid arteries to quantify calcification volume as a measure of atherosclerosis. Cognitive function was assessed with a neuropsychological test battery comprising the following domains: memory, executive function, information processing speed, global cognition and motor speed. On brain MRI, total brain volume (TBV), grey matter volume (GM), white matter volume (WM) and hippocampal volume...
were assessed. Associations between arterial calcifications (stratified by gender), cognition and brain tissue volumes were assessed with linear regression, adjusted for relevant confounders.

Result(s): Higher CT-assessed calcification load in all vessel beds was associated with worse cognitive scores in all domains. Adjustment for total brain volume attenuated these associations, except for the associations between extracranial and intracranial carotid artery calcifications and motor speed in men. A higher load of extracranial carotid artery calcifications in men and intracranial carotid artery calcifications in women was significantly associated with smaller total brain volume and smaller white matter volume. In women, aortic calcifications were strongly associated with smaller grey matter volume. Calcifications in any vessel bed were not associated with hippocampal volume. Adjustment for cardiovascular risk factors or carotid plaque did not change these associations.

Conclusion(s): A higher arterial calcification load is associated with worse cognitive function. Furthermore, calcification load in specific vessel beds is associated with smaller total brain volume, white matter volume and grey matter volume. The association between arterial calcification load and cognitive function is partly mediated by its effect on brain tissue volumes.

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Publisher
Elsevier Inc.

Emtree Heading
*artery calcification; *cognition; *brain; human; calcification; carotid artery; brain size; atherosclerosis; white matter; gray matter; velocity; female; brain tissue; male; dementia; nuclear magnetic resonance imaging; population; aorta arch; memory; executive function; information processing; gender; linear regression analysis; cardiovascular risk; etiology; marker.

Drug Index Terms
marker.

Other Index Terms
*artery calcification; *cognition; *brain; human; calcification; carotid artery; brain size; atherosclerosis; white matter; gray matter; velocity; female; brain tissue; male; dementia; nuclear magnetic resonance imaging; population; aorta arch; memory; executive function; information processing; gender; linear regression analysis; cardiovascular risk; etiology.

Link to the Ovid Full Text or citation:
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Enhanced carotid plaque echolucency is associated with worse cognitive performance in elderly patients with atherosclerotic disease.


AN: 70497061

Introduction: Numerous studies have demonstrated the existence of a relationship between echogenicity of carotid plaque and cerebral ischaemic events, both silent and clinically manifest. These, in turn, expose the patient to increased risk of developing cognitive impairment and dementia in geriatric age.

Aim(s): Based on this scientific evidence we decided to investigate the relationship between echogenicity of carotid plaques and cognitive performance in patients with carotid atheromatous plaques but with no history of cerebrovascular events and/or clinical evidence for dementia.

Method(s): We studied 93 individuals aged 65 years or more (72.6+/-; 5.2 years) referred to our angiology unit for atheroma of neck vessels. At enrolment, patients underwent ultrasonography of the neck vessels using a 7-8 MHz linear probe; images were stored on magneto-optical disk and subsequently used to calculate the grey scale median (GSM) using Adobe Photoshop 5.0. The calculation of the GSM was performed by researchers blinded to the clinical characteristics of patients. All participants were also subjected to the study of cognitive function by Mini Mental State Examination (MMSE), Trail Making Test (TMT) A and B and verbal fluency test (VFT). The results of psychometric tests were logarithmically transformed and used to calculate a composite cognitive score.

Result(s): Patients were divided into two groups according to echolucency of carotid plaques used as the discriminating median GSM obtained in the study population (33.5+/-;6.6 vs 60.4+/-; 13.1, respectively, p<0.0001). Cognitive performance was on average worse in patients with more plaque echolucency (MMSE: 28.5+/-;1.4 vs 28.6+/-;1.4, p = ns; TMTA 92.5+/-;27.2 vs 64.3+/-;31.1, p<0.001; TMTB 214.2+/-;76.6 vs 147.1 +/-;55.9, p<0.005; VFT 33.5+/-;8.3 vs 41.3+/-;9.5, p<0.004; z score: -
0276 +/-;0540 vs 0398 +/-;0598, p< 0.0001). Considering the study population as a whole, we observed a direct correlation between GSM and cognitive performance (r: 0.526, p<0.001).

Conclusion(s): The results of our study demonstrate the existence of an inverse relationship between echolucency of carotid plaques and cognitive function in the elderly and suggest the possible use of this method to identify subjects at increased risk of developing dementia.

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(Pinelli, Turco, De Blasis) Ospedale Civile di Avezzano, Avezzano, Italy
(Lechiara) Ospedale S. Rinaldi, Pescina, Italy
(Ghiadoni) Universita degli Studi di Pisa, Dipartimento di Medicina Interna, Pisa, Italy

Publisher
Adis International Ltd

Emtree Heading
*carotid artery; *prevention; *society; *aged; human; patient; dementia; population; cognition; neck; risk; cognitive defect; atherosclerotic plaque; angiology; atheroma; echography; optical disk; Mini Mental State Examination; psychologic test; psychometry.

Other Index Terms
*carotid artery; *prevention; *society; *aged; human; patient; dementia; population; cognition; neck; risk; cognitive defect; atherosclerotic plaque; angiology; atheroma; echography; optical disk; mini mental state examination; psychologic test; psychometry.

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278.

Carotid atherosclerosis is associated with lower cognitive test results in a stroke-free middle-aged population. the tromso study.
Arntzen K.A., Schirmer H., Johnsen S.H., Wilsgaard T., Mathiesen E.B.
Background: Carotid artery atherosclerosis is a major risk factor for stroke and subsequent cognitive impairment. Prospective studies indicate that also subclinical carotid atherosclerosis is associated with a higher risk of cognitive decline and dementia in elderly persons. The relationship between degrees of carotid atherosclerosis and cognitive function in a middle-aged general population is less known.

Method(s): In a prospective study we followed a stroke-free middle-aged population of 4371 participants (mean age 59 yrs) who at baseline underwent carotid ultrasound examination and assessment of cardiovascular risk factors and 7 years later tests of cognitive function. Associations between intima-media thickness (IMT), number of plaques and total plaque area and cognitive test scores on verbal memory, digit-symbol coding and tapping tests were assessed in linear regression models.

Result(s): Presence of plaque and number of plaques were associated with lower test scores on the verbal memory test and on the digit-symbol coding test in the multivariable regression model adjusted for sex, age, education, depression and cardiovascular risk factors. Total plaque area was associated with lower cognitive scores on the verbal memory test, whereas IMT was associated with lower scores on the digit-symbol coding test. No significant association was seen between carotid atherosclerosis and the tapping test scores.

Conclusion(s): In this middle-aged general population we found that subclinical carotid atherosclerosis measured as IMT, number of plaques and total plaque area were independent risk factors for lower cognitive test scores after 7 years of follow-up.

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(Wilsgaard) Department of Community Medicine, University of Tromso, Tromso, Norway  
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Publisher
S. Karger AG

Emtree Heading
*middle aged; *stroke; *carotid atherosclerosis; *population; verbal memory; prospective study; model; risk factor; cognition; cardiovascular risk; follow up; cognitive defect; risk; dementia; aged; carotid artery; ultrasound; examination; arterial wall thickness; linear regression analysis; education.
Infectious burden and cognition: The northern manhattan study.
Katan M., Moon Y.P., Paik M.C., Gervasi-Franklin P., Sacco R.L., Wright C.B., Elkind M.S.
Conference Publication: (var.pagings). 42 (3) (pp e163), 2011. Date of Publication: 01 Mar 2011.
AN: 70362597

Background: A composite measure of several chronic infections (infectious burden, or IB) is associated with risk of stroke and carotid atherosclerosis in our cohort. The association of IB with cognitive impairment and dementia remains mostly unexplored, however. We hypothesized that a measure of IB associated with vascular risk would also be associated with cognition and cognitive decline in a prospective cohort study.

Method(s): Cross-sectional and prospective analyses among stroke-free community participants in the multi-ethnic Northern Manhattan Study were performed. Cognition was assessed using both the Mini Mental State Exam (MMSE) at enrolment and the modified Telephone Interview for Cognitive Status (TICS-m) during annual telephone follow up. IB was calculated based on a composite measure of serologies against microbial agents previously shown to be associated with risk of stroke and carotid plaque (i.e. Chlamydia pneumoniae, Helicobacter pylori, CMV, HSV1 and 2). Linear and logistic regression were used to measure the magnitude of association between IB and cognition after adjusting for other risk factors, and generalized estimating equation models were used to evaluate associations with TICS-m and its change over time.
Result(s): Both serologies and cognitive assessments were available in 1623 participants (mean age 68.5 +/- 10.1 yrs, 64.9% women). Median MMSE was 27 (interquartile range (IQR) 24-29) and median TICS-m 32 (IQR 27-36). In the unadjusted model IB index was associated with MMSE and TICS-m (both P<0.0001; see table). These effects were attenuated after adjusting for demographics, and there was little change after further adjusting for vascular risk factors. The effect of IB remained significant for TICS-m (p<0.0001; see table). IB was associated with MMSE =<24 (adjusted OR 1.22, 95% confidence interval 1.03-1.45). However, IB was not associated with cognitive decline over time (p=0.07).

Conclusion(s): A measure of infectious burden that is associated with vascular disease risk was independently and inversely associated with cognitive performance in this multi-ethnic cohort, though it was not associated with further cognitive decline. Past infection and associated inflammation-related vascular damage may contribute to cognitive impairment in the elderly. (Table presented).

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Publisher
Lippincott Williams and Wilkins

Emtree Heading
*cognition; *stroke; risk; Mini Mental State Examination; telephone; infection; serology; model; cognitive defect; risk factor; Chlamydia pneumoniae; blood vessel injury; aged; carotid atherosclerosis; dementia; cohort analysis; interview; tic; follow up; carotid artery; mental health; Helicobacter pylori; Herpes simplex virus 1; logistic regression analysis; female; confidence interval; vascular disease; community.

Other Index Terms
*cognition; *stroke; risk; mini mental state examination; telephone; infection; serology; model; cognitive defect; risk factor; Chlamydia pneumoniae; blood vessel injury; aged; carotid atherosclerosis; dementia; cohort analysis; interview; tic; follow up; carotid artery; mental health; Helicobacter pylori; Herpes simplex virus 1; logistic regression analysis; female; confidence interval; vascular disease; community.

Link to the Ovid Full Text or citation:
Carotid artery atherosclerosis, MRI indices of brain ischemia, aging, and cognitive impairment: The Framingham study.
AN: 354869796

Background and Purpose: Carotid atherosclerosis has been associated with increased risk of stroke and poorer cognitive performance in older adults. The relation of carotid atherosclerosis to cognitive impairment and MRI indices of ischemia and aging in midlife is less clear. Methods: We studied 1975 Framingham Offspring Study participants free of stroke and dementia with available carotid ultrasound, brain MRI, and neuropsychological testing. We related common and internal carotid artery intima-media thickness and internal carotid stenosis to large white matter hyperintensity (>1 SD above age-specific mean), total brain volume, hippocampal volume, silent cerebral infarcts, and neuropsychological measures of verbal memory, executive function, and nonverbal memory measures. Results: We observed that internal carotid artery intima-media thickness, but not common carotid artery intima-media thickness, was associated with higher prevalence of silent cerebral infarcts (OR, 1.21; 95% CI, 1.03-1.43; P<0.05), large white matter hyperintensity (OR, 1.19; 95% CI, 1.03-1.38; P<0.05), lower total brain volume (-0.05 per SD; P<0.05), and poorer performance in verbal memory (-0.06 per SD; P<0.05) and nonverbal memory measures (-0.08 per SD; P<0.01), but not with hippocampal volume. Internal carotid stenosis =25% was associated with a higher prevalence of large white matter hyperintensity (adjusted OR, 1.77; 95% CI, 1.25-2.53) and lower total brain volume (-0.11 per SD; P=0.042) but not with silent cerebral infarcts or hippocampal volume. Internal carotid stenosis =50% was associated with higher prevalence of silent cerebral infarcts (OR, 2.53; 95% CI, 1.17-5.44), large white matter hyperintensity (OR, 2.35; 95% CI, 1.08-5.13), and poorer performance on executive function (-0.39 per SD; P<0.05), but not with total brain volume or hippocampal volume. Conclusions: Carotid atherosclerosis markers were associated with MRI indices of brain ischemia and aging and with cognitive impairment in a community-based sample of middle-aged adults. Our data suggest that...
internal carotid artery intima-media thickness may be a better marker for cognitive impairment than common carotid artery intima-media thickness. © 2009 American Heart Association, Inc.


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Publisher:
Lippincott Williams and Wilkins (530 Walnut Street, P O Box 327, Philadelphia PA 19106-3621, United States)

Emtree Heading:
adult; aging; artery intima proliferation; article; *atherosclerosis; brain infarction; *brain ischemia; brain size; carotid artery obstruction; *cognitive defect; controlled study; dementia; disease marker; female; hippocampus; human; internal carotid artery; major clinical study; male; neuropsychology; nuclear magnetic resonance imaging; prevalence; priority journal; ultrasound; verbal memory; white matter.

Other Index Terms:
adult; aging; artery intima proliferation; article; *atherosclerosis; brain infarction; *brain ischemia; brain size; carotid artery obstruction; *cognitive defect; controlled study; dementia; disease marker; female; hippocampus; human; internal carotid artery; major clinical study; male; neuropsychology; nuclear magnetic resonance imaging; prevalence; priority journal; ultrasound; verbal memory; white matter.

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Experimental models of vascular dementia and vascular cognitive impairment: A systematic review.
Jiwa N.S., Garrard P., Hainsworth A.H.
AN: 359840579

Vascular cognitive impairment (VCI) encompasses vascular dementia and is the second most common cause of dementing illness after Alzheimer’s disease. The main causes of VCI are: cerebral small vessel disease; multi-infarct dementia; strategic infarct (i.e. located in a functionally-critical brain area); haemorrhage/microbleed; angiopathy (including cerebral amyloid angiopathy); severe hypoperfusion (e.g. cardiac arrhythmia); and hereditary vasculopathy (e.g. cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy, CADASIL). In this systematic analysis, we aimed to relate cognitive and neuropathological features of experimental models to clinical VCI. We extracted data from 107 studies covering 16 models. These included: brief global ischaemic insults (in rats, mice or gerbils); chronic global hypoperfusion (rats, mice, gerbils); chronic hypertension (in primates or stroke-prone, spontaneously-hypertensive rats); multiple ischaemic lesions because of intra-vascular emboli (in rodents, rabbits or primates); strategic ischaemic lesions (in rats or mini-pigs); generalised vasculopathies, because of mutant Notch3, hyperhomocysteinaemia, experimental diabetes mellitus or lack of cerebral vasodilator M5 receptors (rats or mice). Most cognitive testing showed deficits in working and reference memory.

The lesions observed were microinfarcts, diffuse white matter lesions, hippocampal neuronal death, focal ischaemic lesions and micro-haemorrhages. The most-used model was bilateral carotid artery occlusion in rats, leading to chronic hypoperfusion and white matter injury. © 2010 The Authors. Journal of Neurochemistry © 2010 International Society for Neurochemistry.


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Publisher
Blackwell Publishing Ltd (9600 Garsington Road, Oxford OX4 2XG, United Kingdom)

Emtree Heading
atherosclerosis; brain embolism; CADASIL; carotid artery obstruction; cognitive defect/dt [Drug Therapy]; *dementia; gerbil; hippocampus; hyperhomocysteinemia; hypertension; memory
Carotid- intima media thickness is independently associated with cognitive decline. The INVADE study.
Sander K., Bickel H., Forstl H., Etgen T., Briesenick C., Poppert H., Sander D.
AN: 358470612
Objectives: Increased carotid intima-media thickness (C-IMT) is a non-invasive marker of atherosclerosis and predicts vascular events. Moreover, increasing evidence suggests an
association between carotid atherosclerosis and cognitive decline. The purpose of this study is to investigate the relationship between C-IMT and the development of cognitive impairment in a large population-based sample.

Method(s): This study was based on the data of the participants of the INVADE (Intervention project on cerebrovascular diseases and dementia in the district of Ebersberg, Bavaria) project. Vascular risk factors, Geriatric depression scale (GDS) and "6 Item Cognitive Impairment Test" (6CIT) were evaluated at baseline and after 2 years. The relationship between C-IMT and cognitive impairment was analysed using multivariate logistic regression.

Result(s): Complete baseline data were available in 3386 subjects (mean age 67.7 [95% confidence interval (CI): 67.5, 68.0] years, 41% male). During follow-up, 174 subjects developed a new cognitive impairment. In the subgroup without cognitive impairment at baseline a significant association between cognitive decline after 2 years and elevated C-IMT at baseline could be detected with a significantly higher baseline C-IMT in those with cognitive decline (0.87mm vs. 0.78 mm; p < 0.0001). After adjustment for various risk factors only age, GDS baseline 6CIT and C-IMT were independently associated with the development of a new cognitive impairment.

Conclusion(s): Our data indicate that an increased carotid intima-media thickness predicts a cognitive decline in an elderly population without prevalent cognitive impairment. Copyright © 2009 John Wiley & Sons, Ltd.


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Publisher
John Wiley and Sons Ltd (Southern Gate, Chichester, West Sussex PO19 8SQ, United Kingdom)

Emtree Heading
aged; *arterial wall thickness; *artery media; article; cardiovascular risk; *carotid artery; *cognitive defect; dementia; depression; diabetes mellitus; disease association; disease course; female; Geriatric Depression Scale; human; *intima; ischemic heart disease; major clinical study; male; prediction; prospective study; rating scale.

Other Index Terms
aged; *arterial wall thickness; *artery media; article; cardiovascular risk; *carotid artery; *cognitive defect; dementia; depression; diabetes mellitus; disease association; disease course; female;
Geriatric Depression Scale; human; intima; ischemic heart disease; major clinical study; male; prediction; prospective study; rating scale.

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297.

Subclinical vascular atherosclerosis related to cognitive impairment and its biomarkers in community elderly subjects.
Yang C.-Y., Lee I., Park H.-I., Park H.-Y., Song J.-E.
AN: 70477779
Objective: To evaluate the effect of common carotid artery atherosclerosis to the cognitive decline and cognition related biomarkers in older adult.
Design(s): Cross-sectional survey, controlled study.
Setting(s): Community health care course.
Participant(s): Seventy adult lived in community, aged 64-82 years, were included. They did not have diagnosed previously as cognitive impairment or dementia.
Intervention(s): We performed survey, cognitive function test, blood sample test, and carotid sonography. All subjects were divided into IMT-normal (CCA-IMT <1 mm, n=46), IMT-abnormal group (CCA-IMT >1mm, n=24).
Main Outcome Measure(s): We conducted life style survey (BMI, the history of smoking, alcohol, diabetes, hypertension, previous stroke, hyperlipidemia, vascular and cardiovascular disease, and regular exercise), the cognitive function by mini-mental state examination (K-MMSE), clinical dementia rating (CDR-K), Montreal cognitive assessment (MOCA-K), the cognition biomarkers by insulin-like growth factor-1, HDL, LDL, total cholesterol, triglyceride, high sensitivity C-reactive protein (hs-CRP), total homocysteine (t-HCY), glucose, insulin, HOMA insulin resistance index,
vitamin B12 and folate level, and the common carotid artery intima thickness (CCA-IMT) and plaques by carotid ultrasonography.

Result(s): There were significant difference between 2 groups in LDL, triglyceride, hs-CRP, abnormal t-HCY, age, sex, body weight and height, average IMT of both CCA, abnormal in IMT or plaque, IMT quartile, MOCA-K, K-MMSE, MMSE quartile (P<.05). The risk factors for abnormal IMT were LDL, average IMT of both CCA, IMT quartile, K-MMSE, MMSE quartile, age, and height as odds ratio more than 1 (P<.05). After the adjustment of age, the risk factors for abnormal IMT were LDL, average IMT of both CCA, IMT quartile, MOCA-K, K-MMSE, MMSE quartile, height, and weight as odds ratio more than 1 (P<.05).

Conclusion(s): The subclinical vascular atherosclerosis (IMT) and cognitive biomarkers maybe one of the important factor of cognitive decline.

Institution
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*aged; *human; *atherosclerosis; *cognitive defect; *community; *rehabilitation; *physical medicine; Mini Mental State Examination; cognition; height; carotid artery; echography; adult; risk factor; risk; dementia; carotid atherosclerosis; controlled study; community care; blood sampling; lifestyle; smoking; diabetes mellitus; function test; stroke; hyperlipidemia; cardiovascular disease; exercise; cholesterol blood level; hypertension; insulin resistance; thickness; body weight; weight; common carotid artery; low density lipoprotein; triacylglycerol; alcohol; C reactive protein; somatomedin C; homocysteine; glucose; insulin; vitamin; cyanocobalamin; folic acid; high density lipoprotein.

Drug Index Terms
low density lipoprotein; triacylglycerol; alcohol; C reactive protein; somatomedin C; homocysteine; glucose; insulin; vitamin; cyanocobalamin; folic acid; high density lipoprotein.

Other Index Terms
*aged; *human; *atherosclerosis; *cognitive defect; *community; *rehabilitation; *physical medicine; mini mental state examination; cognition; height; carotid artery; echography; adult; risk factor; risk; dementia; carotid atherosclerosis; controlled study; community care; blood sampling; lifestyle; smoking; diabetes mellitus; function test; stroke; hyperlipidemia; cardiovascular disease; exercise; cholesterol blood level; hypertension; insulin resistance; thickness; body weight; weight; common carotid artery.

Link to the Ovid Full Text or citation:
Intima media thickness abnormality related to cognitive impairment and vascular biomarkers in the
community-based elderly.
Yang C.-Y., Park H.-Y., Park H.-I., Song J.-E., Park S.-A.
AN: 70335957
Objective: This study aimed to evaluate the effect of common carotid artery atherosclerosis to the
cognitive impairment and vascularrelated biomarkers in elder people.
Method(s): Seventy physically healthy adult lived in community, aged 64-82 years, were included.
All subjects were divided into IMT-normal (CCA-IMT< 1 mm, n = 46), IMT-abnormal group
(CCAIMT>= 1 mm, n = 24). We conducted life style survey (body weight and height, the history of
smoking, alcohol, diabetes, hypertension, previous stroke, hyperlipidemia, vascular and
vascular disease, and regular exercise), the cognitive function by mini-mental state
examination (K-MMSE), clinical dementia rating (CDR-K), Montreal cognitive assessment (MOCA-
K), biomarkers by insulin-like growth factor-1, HDL, LDL, total cholesterol, triglyceride, high
sensitivity C-reactive protein (hs-CRP), total homocystein (t-HCY), glucose, insulin, HOMA insulin
resistance index, vitamin B12 and folate level, and the common carotid artery-intima media
thickness (CCA-IMT) and plaques by carotid ultrasonography.
Result(s): There were significant difference between two groups in LDL, triglyceride, hs-CRP,
abnormal t-HCY, age, sex, body weight and height, average IMT of both CCA, abnormal in IMT or
plaque, IMT quartile, MOCA-K, K-MMSE, MMSE quartile (P < 0.05). The risk factors for abnormal
IMT were LDL, average IMT of both CCA, IMT quartile, K-MMSE, MMSE quartile, age, and height as
odds ratio more than 1 (P < 0.05). After the adjustment of age, the risk factors for abnormal IMT
were significant in LDL, average IMT of both CCA, IMT quartile, MOCA-K, K-MMSE, MMSE quartile,
height and weight (P < 0.05).
Conclusion(s): The subclinical vascular atherosclerosis of IMT and vascular biomarkers maybe one of the important factors of cognitive impairment.

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Publisher
Blackwell Publishing Ltd

Emtree Heading
*cognitive defect; *arterial wall thickness; *community; *stroke; *aged; Mini Mental State Examination; height; risk factor; common carotid artery; body weight; carotid artery; echography; risk; weight; carotid atherosclerosis; normal human; lifestyle; smoking; diabetes mellitus; hypertension; hyperlipidemia; cardiovascular disease; exercise; cognition; dementia; cholesterol blood level; insulin resistance; artery intima; atherosclerosis; low density lipoprotein; triacylglycerol; alcohol; high density lipoprotein; C reactive protein; somatomedin C; glucose; insulin; vitamin; cyanocobalamin; folic acid.

Drug Index Terms
low density lipoprotein; triacylglycerol; alcohol; high density lipoprotein; C reactive protein; somatomedin C; glucose; insulin; vitamin; cyanocobalamin; folic acid.

Other Index Terms
*cognitive defect; *arterial wall thickness; *community; *stroke; *aged; mini mental state examination; height; risk factor; common carotid artery; body weight; carotid artery; echography; risk; weight; carotid atherosclerosis; normal human; lifestyle; smoking; diabetes mellitus; hypertension; hyperlipidemia; cardiovascular disease; exercise; cognition; dementia; cholesterol blood level; insulin resistance; artery intima; atherosclerosis.

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Correlation of cognitive functions and CIMT in young diabetics.
Srivastava P., Kumar M., Bhatia R., Singh M.B., Tripathi M., Prasad K., Tandon N.
AN: 70335953

Introduction: Cognitive dysfunction in diabetes mellitus (DM), is correlated both with hyper and hypoglycemia, insulin resistance and concomitant vascular risk factors. The relation of atherogenesis with subclinical cognitive impairment has been evaluated in older adults but not in young asymptomatic patients.

Objective(s): Aim is to identify subclinical impairment in individual cognitive domains in young diabetics and correlate with carotid intimal media thickness (CIMT) identified as a surrogate marker for atherosclerosis.

Method(s): Young literate diabetics (18-45 years), from the diabetes clinic were administered Addenbrooke's cognitive examination (ACE) in English and Hindi followed by Carotid Doppler study on the same day. Past history of stroke or transient ischemic attacks (TIAs) were exclusion factors.

Result(s): Of 53 patients included, mean age was 35.7 years (M: 38; F: 15). Abnormal CIMT was taken as > 0.06 cm on either side. Abnormal ACE, Mini Mental Scale Examination (MMSE) scores were taken as < 82 and < 24 respectively. Two points less than normal in each cognitive domain was defined as abnormal. Increased right CIMT was found associated with visuo spatial, memory, MMSE and total ACE scores. Increased left CIMT correlated with attention, orientation, language, visuo spatial, memory, MMSE scores and total AC score in Hindi (P < 0.01).

Conclusion(s): The study demonstrated derangements in individual domains of cognition and high CIMT in young diabetics, suggesting accelerated atherosclerosis and chronic subclinical cerebral ischemia which may account for subclinical cognitive dysfunction.

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(Tandon) Endocrinology, All India Institute of Medical Sciences, New Delhi, India
Publisher
Blackwell Publishing Ltd
Emtree Heading
Relationship between plaque echolucency and cognitive function in patients with carotid atherosclerosis.


AN: 70271179

Dipartimento di Medicina Interna, Pisa, Italy Introduction: Numerous studies have demonstrated the existence of a relationship between echogenicity of carotid plaques and cerebral ischaemic events, both silent and clinically manifest. These, in turn, expose the patient to increased risk of developing cognitive impairment and dementia in geriatric age.

Aim(s): Based on this scientific evidence we decided to investigate the relationship between echogenicity of carotid plaques and cognitive performance in patients with carotid atheromatous plaques but no history of cerebrovascular events and/or clinical evidence for dementia.
Method(s): We studied 55 individuals aged 65 years or more (73.3 +/- 5.1 years) relating to our angiology unit for atheroma of neck vessels. At enrolment, patients underwent ultrasonography of the neck vessels using a 7-8MHz linear probe; images were stored on magneto-optical disk and subsequently used to calculate the grey scale median (GSM) using Adobe Photoshop 5.0. The calculation of the GSM was performed by researchers blinded to the clinical characteristics of patients. All participants were also subjected to the study of cognitive functions by Mini-Mental State Examination (MMSE), Trail Making Test (TMT) A and B and verbal fluency test (VFT). The results of psychometric tests were logarithmically transformed and used to calculate a composite cognitive score.

Result(s): Patients were divided into two groups according echolucency of carotid plaques using as discriminating median GSM obtained in the study population (36.5 +/- 14.1 vs 52.3 +/- 16.2 respectively, p < 0.01). Cognitive performance was on average worse in patients with more plaque echolucency (MMSE: 28.1 +/- 1.4 vs 28.3 +/- 1.3, p = ns; TMTA: 86.1 +/- 24.9 vs 69.7 +/- 36.6, p < 0.04; TMTB: 220.1 +/- 81.9 vs 160.4 +/- 74.0, p < 0.004; VFT: 33.5 +/- 9.1 vs 40.0 +/- 7.2, p < 0.01; z score: -0309 +/- 0496 vs 0236 +/- 0712, p < 0.001). Considering the study population as a whole, we observed an inverse correlation between GSM and cognitive performance (r: -0.345, p < 0.002).

Conclusion(s): The results of our study demonstrate the existence of an inverse relationship between echolucency of carotid plaques and cognitive function in the elderly and suggest the possible use of this method to identify subjects at increased risk of developing dementia.
Peripheral arterial disease and cognition.
Egyptian Journal of Neurology, Psychiatry and Neurosurgery. 46 (2) (pp 311-322), 2009. Date of Publication: July 2009.
AN: 355219079
Background: Some investigators studied the relation between PVD and cognition and they found that, PVD patients performed more poorly than healthy subjects in some cognitive tests.
Objective(s): The aim of this study is to assess the relationship between PAD and cognitive dysfunction in patients without a known history of previous ischemic insult to the brain and to stress on the role of (ABI) as an accurate, simple, and non invasive measure of PAD and generalized atherosclerosis.
Method(s): Twenty patients with PAD and10 healthy normal control were included in the present study. All patients and control were subjected to: complete neurovascular examination, laboratory investigations, duplex arterial scan of the arteries of the lower extremities and of the carotid arteries, measurement of the ankle/brachial index (ABI), neuroimaging: M.R.I brain and cognitive assessment using tests for global and specific cognitive functions.
Result(s): In comparison to normal healthy subjects, patients with PAD and low ABI performed significantly worse in MMSE, and tests for attention, perceptuomotor speed, executive functions, short term memory, visual memory and visuoconstructive abilities. Moreover, subjects with PAD and low ABI had significant abnormal changes in neuroimaging and had significant increase in IMT and stenosis of the carotid artery.
Conclusion(s): (ABI) could be considered as an accurate, simple, and non invasive measure for diagnosis of PAD that associated with some cognitive impairment and generalized atherosclerosis.
Institution
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Subclinical atherosclerosis is weakly associated with lower cognitive function in healthy hyperhomocysteinemic adults without clinical cardiovascular disease.

Objective: Atherosclerosis is the most common pathologic process underlying cardiovascular disease (CVD). It is not well known whether subclinical atherosclerosis is an independent risk factor for lower cognitive function among individuals without clinically evident CVD.

Method(s): We examined cross-sectional associations between subclinical atherosclerosis and cognitive function in a community-based sample of otherwise healthy adults with plasma homocysteine >=8.5 mumol/L enrolled in the BVAIT study (n=504, mean age 61 years). Carotid artery intima-media thickness (CIMT), coronary artery calcium (CAC) and abdominal aortic calcium (AAC) were used to measure subclinical atherosclerosis. Cognitive function was assessed with a battery of neuropsychological tests. A principal components analysis was used to extract five uncorrelated cognitive factors from scores on individual tests, and a measure of global cognition was derived. Multivariable linear regression was used to examine the association between subclinical atherosclerosis and cognitive function, adjusting for other correlates of cognition.

Result(s): Increasing thickness of CIMT was associated with significantly lower scores on the verbal learning factor (beta=-0.07 per 0.1mm increase CIMT [SE(beta)=0.03], p=0.01). CAC and AAC were not individually associated with any of the cognitive factors.

Conclusion(s): This study provides evidence that increasing CIMT is weakly associated with lower verbal learning abilities but not global cognition in a population of otherwise healthy middle-to-older aged adults with elevated plasma homocysteine levels but without clinically evident CVD. The association between CIMT and poor verbal learning may pertain particularly to men. Copyright © 2008 John Wiley & Sons, Ltd.

Carotid atherosclerosis and cognitive decline in patients with Alzheimer’s disease.
Silvestrini M., Gobbi B., Pasqualetti P., Bartolini M., Baruffaldi R., Lanciotti C., Cerqua R., Altamura C., Provinciali L., Vernieri F.
Neurobiology of Aging. 30 (8) (pp 1177-1183), 2009. Date of Publication: August 2009.
AN: 50013216
Aim of the study was to explore the correlation between the progression of carotid atherosclerosis and the evolution of cognitive impairment in 66 patients with Alzheimer’s disease (AD). They underwent cognitive status evaluation and ultrasonography (US) to investigate carotid arteries intima-media thickness (IMT) and plaque index (PI). After a 12-month follow-up period,
neuropsychological and US examinations were repeated to assess the progression of carotid atherosclerosis and of cognitive decline [in terms of changes in Mini Mental State Examination (MMSE) scores]. MMSE score changes were related to baseline IMT (p = 0.018), changes in IMT (p < 0.001) and PI (p = 0.006), and “antihypertensive drug intake” (p < 0.001). While the first three variables correlated with increased cognitive impairment, the last one was associated with a reduced extent of MMSE score decline. Results show a link between progression of carotid wall changes and of cognitive decline, and suggest a possible protective role of antihypertensive therapy. Given the potential clinical implications, our preliminary findings could stimulate further investigations into the role of vascular impairment in patients with AD. © 2007 Elsevier Inc. All rights reserved.

PMID

Institution
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Publisher
Elsevier Inc. (360 Park Avenue South, New York NY 10010, United States)

Emtree Heading
aged; Alzheimer disease/dt [Drug Therapy]; *Alzheimer disease/dt [Drug Therapy]; arterial wall thickness; article; atherosclerotic plaque; *cerebrovascular disease/di [Diagnosis]; *cognitive defect/di [Diagnosis]; disease association; disease course; echography; female; follow up; human; hypertension/dt [Drug Therapy]; major clinical study; male; Mini Mental State Examination; neuroprotection; neuropsychological test; priority journal; antihypertensive agent/dt [Drug Therapy]; donepezil/dt [Drug Therapy]; *carotid atherosclerosis/di [Diagnosis].

Candidate Terms
*carotid atherosclerosis / *diagnosis [other term].

Drug Index Terms
antihypertensive agent / drug therapy; donepezil / drug therapy.

Other Index Terms
aged; Alzheimer disease / drug therapy; *Alzheimer disease / *drug therapy; arterial wall thickness; article; atherosclerotic plaque; *cerebrovascular disease / *diagnosis; *cognitive defect / *diagnosis; disease association; disease course; echography; female; follow up; human; hypertension / drug
Intracranial atherosclerosis as a contributing factor to Alzheimer's disease dementia.
Kokjohn T.A., Maarouf C.L., Sabbagh M.N., Belohlavek M., Garami Z., Beach T.G., Roher A.E.
AN: 70109345

Background: Cardiovascular diseases are significant Alzheimer's disease (AD) risk factors. Atherosclerosis of carotid and intracranial arteries results in decreased perfusion pressure and consequent hypoxia/ischemia, metabolic distress, neuronal dysfunction and dementia. Phase contrast magnetic resonance angiography and Duplex ultrasound of cervical arteries have demonstrated significant differences in cerebral blood flow between AD and non-demented (ND) individuals.

Method(s): We quantified the degree of occlusion in the circle of Willis arteries collected from 102 subjects: 59 AD, 36 ND and 7 non-AD dementia (NADD) individuals. The external and internal (lumenal) surfaces were electronically measured on arterial cross-sections (~ 0.5 cm) to obtain an index of stenosis and evaluate the extent of atherosclerotic occlusion.

Result(s): Arteries of the circle of Willis were more severely occluded by atherosclerotic lesions in AD than in the ND and NADD groups. In the AD cohort, 21% of arterial sections were 60-69% occluded, 15% were 70-79%, 9.3% were 80-89% 3.9% were 90-99% with 1.3% of arteries exhibiting complete (100%) occlusion. By contrast, for the identical decile degree of stenosis, the corresponding percentages were: 15%, 7.9%, 2.2, 1.2% and 0.5% in the ND group. The NADD arterial stenoses were uniformly lower than those of the ND cohort. A comparison between
individual major intracranial arteries demonstrated significant differences between the AD and ND cohorts being the former group more affected than the latter: vertebral arteries, \( p=0.028 \); basilar artery, \( p=0.004 \); posterior cerebral artery, \( p=0.002 \); middle cerebral artery, \( p=0.0005 \); anterior cerebral artery, \( p=0.037 \) and internal carotid artery, \( p=0.003 \).

Conclusion(s): Atherosclerosis of intracranial arteries is more severe and involves a larger number of arterial sites in AD patients than in ND and NADD. The data is consistent with the hypothesis that combined functional and anatomical alterations of the cardiovascular system attenuate cerebral blood flow and contribute to neuronal damage and dementia.

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*Alzheimer disease; *atherosclerosis; *dementia; artery; occlusion; brain circulus arteriosus; stenosis; brain blood flow; cardiovascular disease; risk factor; carotid artery; perfusion pressure; magnetic resonance angiography; ultrasound; basilar artery; posterior cerebral artery; middle cerebral artery; anterior cerebral artery; vertebral artery; internal carotid artery; patient; hypothesis; cardiovascular system; peripheral occlusive artery disease.

Other Index Terms
*Alzheimer disease; *atherosclerosis; *dementia; artery; occlusion; brain circulus arteriosus; stenosis; brain blood flow; cardiovascular disease; risk factor; carotid artery; perfusion pressure; magnetic resonance angiography; ultrasound; basilar artery; posterior cerebral artery; middle cerebral artery; anterior cerebral artery; vertebral artery; internal carotid artery; patient; hypothesis; cardiovascular system; peripheral occlusive artery disease.

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Vascular ultrasound parameters and cognitive performance in patients with dementia.
Martinic Popovic I., Jurasic M.J., Seric V., Trkanjec Z., Morovic S., Demarin V.
Journal of the Neurological Sciences. Conference: 5th International Congress on Vascular
AN: 70102355
Background and aim: Non-invasive neurosonology methods are known to be a convenient tool in
the assessment of vascular changes of both extracranial and basal cerebral arteries. Vascular
pathology is common characteristics of both vascular dementia (VAD) and Alzheimer's disease
(AD), so these methods are increasing in importance in order to early recognize the patients at
possible risk of clinically evident dementia. The aim of this study was to compare vascular
ultrasound parameters and cognitive decline in patients with VAD and AD.
Patients and Methods: The study included 16 patients diagnosed with AD (8 men and 8 women,
mean age 72.19 +/- 6.86 years) and 22 patients with VAD (14 women and 8 men, mean age 70.20+/-
15.50 years) with similar scores on MMSE (mean 19.95 +/- 5.01 points). Ultrasound measurements on
common carotid artery (CCA) were performed using Aloka ProSoundALPHA 10 with 13MHz linear
probe.
Result(s): Both groups did not differ significantly in mean MMSE scores (20.38 +/- 4.73 points for
patients with AD; 19.80 +/- 5.19 points for patients with VAD). We found no statistically significant
differences among both groups regarding body mass index, blood and pulse pressure, intima
media thickness, CCA diameter and beta stiffness index. However, regression analysis for both
groups proved that MMSE corresponds to vascular diameter change and beta stiffness index
increase (p < 0.01).
Conclusion(s): Positive correlation between MMSE results and vascular parameters, such as
vascular diameter increase and beta stiffness increase indicate that non-invasive monitoring
vascular changes with ultrasound may be useful in follow up of demented patients. The same
method would probably be useful in early identification of subjects at the symptomatic stage of
cognitive decline.
Institution
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Publisher
Elsevier
Signs of subclinical vascular disease and amnestic form of mild cognitive impairment.

Adam I., Csanyi A.F.


Background and aims: Mild cognitive impairment (MCI) is regarded as a precursor to dementia, but not all patients with MCI develop dementia. Current diagnostic criteria for MCI define heterogeneous populations, but signs of subclinical vascular disease may be of help in predicting a conversion to dementia. In a preliminary study we investigated the association of early signs of atherosclerosis with amnestic MCI by various noninvasive measures.

Method(s): Performances on ADAS-Cog test and Mini-Mental State Examination (MMSE) were compared in 26 subjects (70.6 +/- 6.5 years) with ultrasound assessed common carotid intima-media thickness (IMT), index of augmentation (AIX) and aortic pulse wave velocity (PWV). Mayo Clinic criteria were used for evaluation of amnestic form of MCI. Subjects with a previous history of stroke were excluded. The values of Hamilton Rating Scale for depression were less than 12.
Result(s): No associations were found for cognitive values (ADAS-cog and MMSE) and IMT, AIX, PWV.

Conclusion(s): The amnestic subtype of MCI has putatively a degenerative etiology. Studies have shown that these people overwhelmingly progressed to AD. Further studies are needed to assess the association between the amnestic and other types (multiple domain and single non-memory domain) of MCI and early vascular risk factors.

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Publisher
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Emtree Heading
*vascular disease; *mild cognitive impairment; *multiinfarct dementia; dementia; arterial wall thickness; pulse wave; hospital; Hamilton scale; etiology; memory; risk factor; precursor; patient; diagnosis; Mini Mental State Examination; atherosclerosis; mental health; examination; carotid artery; population.

Other Index Terms
*vascular disease; *mild cognitive impairment; *multiinfarct dementia; dementia; arterial wall thickness; pulse wave; hospital; Hamilton scale; etiology; memory; risk factor; precursor; patient; diagnosis; mini mental state examination; atherosclerosis; mental health; examination; carotid artery; population.

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
SFX

329.

Carotid stenosis and cognitive function.
Sztriha LK.
While stroke is a known cause of cognitive impairment, the relationship between carotid artery stenosis and cognitive function in people without a history of stroke is less clear. A number of risk factors for vascular disease are related to cognitive impairment. Hypertension, diabetes mellitus, cigarette smoking, and dyslipidemia are associated with an increased risk of carotid artery disease too. Some studies have suggested that stenosis of the internal carotid artery may be an independent risk factor for cognitive impairment. Cognitive impairment and decline tend to be more frequent with left-sided stenosis, if tests for dominant hemispheric function in right-handed individuals are utilized during the assessment. The possible pathomechanisms of cognitive impairment include silent embolization and hypoperfusion. High-grade stenosis of the internal carotid artery may be associated with cognitive impairment even without evidence of infarction on magnetic resonance imaging. On the other hand, it is fairly common that patients have normal cognition despite severe carotid artery disease, highlighting the important role of an efficient collateral blood supply. The carotid intimamedia thickness appears to be a marker of underlying risk factors and generalized atherosclerosis, rather than a direct cause of cognitive impairment. Carotid endarterectomy or stenting may lead to a decline in cognitive function due to microembolic ischemia or intraprocedural hypoperfusion. Conversely, restoring perfusion could improve cognitive dysfunction that might have occurred from a state of chronic hypoperfusion. It is unclear whether these complex interactions ultimately result in a net improvement or a deterioration of cognitive function. Evidence at present does not seem strong enough to include loss of cognition as a factor in determining the balance of risk and benefit from therapy for asymptomatic carotid stenosis.

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Emtree Heading
*cognition; *carotid artery obstruction; *multiinfarct dementia; cognitive defect; perfusion; risk factor; stenosis; risk; stroke; carotid artery disease; internal carotid artery; carotid endarterectomy; stent; ischemia; deterioration; therapy; diabetes mellitus; dyslipidemia; hypertension; artificial embolism; vascular disease; infarction; nuclear magnetic resonance imaging; patient; collateral circulation; carotid artery; arterial wall thickness; atherosclerosis; cigarette smoking; marker.
Drug Index Terms
marker.
Socioeconomic status moderates the association between carotid intima–media thickness and cognition in midlife: Evidence from the Whitehall II study.
AN: 351444793

Background: Common carotid artery intima–media thickness (IMT) is a measure of generalized atherosclerosis and has been shown to be associated with cognitive function. We examine two questions: does socioeconomic status (SES) moderate this association and is IMT more strongly associated with specific aspects of cognitive function? Methods: Data are drawn from the Phase 7 (2003-2004) of the Whitehall II study (N = 3896). In cross-sectional analyses the association between IMT and six measures of cognition (short-term verbal memory, inductive reasoning, vocabulary, semantic and phonemic fluency and a measure of global cognitive status) was examined in analyses adjusted for previous history of coronary heart disease, health behaviours and other vascular risk measures such as blood pressure, cholesterol and body mass index. Result(s): The overall association between IMT and the six measures of cognition was restricted to the low SES group (p = 0.02). Within this group, IMT was significantly associated with inductive reasoning (p = 0.001), vocabulary (p = 0.002), phonemic (p = 0.006) and semantic fluency (p = 0.02). The covariates examined explained about a quarter of the association between IMT and
cognition in the low SES group. The associations with the measure of inductive reasoning (p = 0.02), vocabulary (p = 0.02) and phonemic fluency (p = 0.04) remained after adjustment for all covariates.

Conclusion(s): SES is an important modifier of the association between IMT and cognition, an inverse association between the two was observed only in the low SES group. It is possible that high cognitive reserve among the high SES individuals prevents the functional manifestations of atherosclerosis. Verbal memory was not one of the cognitive domains associated with IMT. © 2007 Elsevier Ireland Ltd. All rights reserved.

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Emtree Heading
adult; anamnesis; artery intima; artery media; article; *atherosclerosis; blood pressure; body mass; cardiovascular risk; *carotid artery; cholesterol blood level; *cognition; disease association; female; health behavior; human; ischemic heart disease; major clinical study; male; priority journal; semantics; socioeconomics; verbal memory; cholesterol/ec [Endogenous Compound].

Drug Index Terms
cholesterol / endogenous compound.

Other Index Terms
adult; anamnesis; artery intima; artery media; article; *atherosclerosis; blood pressure; body mass; cardiovascular risk; *carotid artery; cholesterol blood level; *cognition; disease association; female; health behavior; human; ischemic heart disease; major clinical study; male; priority journal; semantics; socioeconomics; verbal memory.

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Background: Decline of cognitive function with age may be due, in part, to atherosclerotic changes. The aim of the present study was to determine the relative contribution of cardiovascular disease (CVD) to cognitive functioning in middle-aged and elderly men.

Method(s): In a cross-sectional study, cognitive tests were administered to 400 independently living men aged 40-80 years. Compound scores were calculated for memory function, processing capacity/speed, and executive function. The MMSE was used as a measure of global cognitive function. Carotid intima-media thickness, pulse wave velocity and ankle brachial blood pressure index were assessed as measures of sub-clinical CVD. The adjusted association of sub-clinical and prevalent CVD with neuropsychological test scores in the total group and in subgroups was assessed by linear regression analysis.

Result(s): Increased IMT was associated with lower scores on memory performance, and increased PWV was associated with lower scores on processing capacity and executive functioning. Compared with subjects with no CVD, both sub-clinical and prevalent cardiovascular diseases were related to a lower memory performance, beta's (95% CI) were -0.45 (-0.83, -0.07) and -0.45 (-0.84, 0.01), respectively. These associations were present in both middle-aged and elderly men. Furthermore, we observed that for subjects who had sub-clinical or prevalent cardiovascular disease the distribution of MMSE-scores was shifted toward lower values; the distributions were statistically different (p = 0.003).

Conclusion(s): The results of this study support a relation of sub-clinical CVD with cognitive functioning in middle-aged and elderly men. These results suggest that actions to prevent cognitive decline by preventing atherosclerosis should be taken before middle age. © 2006 Elsevier Ireland Ltd. All rights reserved.

Carotid intima-media thickness and cognitive function in elderly women: A population-based study.
AN: 47573715
Objective: Several vascular risk factors have been linked to cognitive decline. However, little is known about the association between the atherosclerotic process and cognitive impairment. We investigated whether carotid intima-media thickness (IMT) predicts the risk of cognitive impairment and whether the putative impairment is specific for some cognitive domains.
Method(s): A 12-year population-based follow-up study was performed for a total of 91 women, aged 60-70 years at baseline. Ultrasonographically assessed carotid artery IMT and the Mini-Mental State Examination test were performed at baseline and 12-year follow-up. A detailed cognitive evaluation for memory and cognitive speed was performed in 2003. The mean of left and right carotid bifurcation IMT was used in the analyses for association with the risk for poor cognitive speed and memory.

Result(s): Increased IMT at baseline was an independent predictor for poor memory (beta = -5.004, 95% confidence interval = -7.74 to -2.27; p = 0.001) and cognitive speed (beta = 2.562, 95% confidence interval = 1.19-4.94; p = 0.035) at 12-year follow-up after adjustment for age, education, depression, plasma LDL cholesterol, systolic blood pressure, cardiovascular disease, hormone replacement therapy, smoking, alcohol consumption and physical activity. The risk for poor memory (p = 0.023 for linear trend) and cognitive speed (p = 0.070 for linear trend) increased with increasing IMT tertiles.

Conclusion(s): Carotid IMT predicts an increased risk for cognitive impairment, particularly poor memory and cognitive speed, in elderly women. Copyright © 2007 S. Karger AG.

Carotid artery intima-media thickness and cognition in cardiovascular disease.
AN: 47385831
Background: Increased carotid artery intima-media thickness (IMT) is a non-invasive marker of systemic arterial disease. Increased IMT has been associated with atherosclerosis, abnormal arterial mechanics, myocardial infarction, and stroke. Given evidence of a relationship between cardiovascular health and attention-executive-psychomotor functioning, the purpose of this study was to examine IMT in relation to neuropsychological test performance in patients with a variety of cardiovascular diagnoses.
Method(s): One hundred and nine participants, ages 55 to 85, underwent neuropsychological assessment and B-mode ultrasound of the left common carotid artery. IMT was calculated using an automated algorithm based on a validated edge-detection technique. The relationship between IMT and measures of language, memory, visual-spatial abilities and attention-executive-psychomotor functioning was modeled using hierarchical linear regression analyses adjusted for...
age, education, sex, cardiovascular risk, current systolic blood pressure, and history of coronary artery disease (CAD).

Result(s): Increased IMT was associated with significantly lower performance in the attention-executive-psychomotor domain (IMT beta = -0.26, p < .01), independent of age, education, sex, cardiovascular risk, current systolic blood pressure, and CAD (F(10,100) = 3.61, p < .001). IMT was not significantly related to language, memory, or visual-spatial abilities.

Conclusion(s): Our findings suggest that, in patients with cardiovascular disease, IMT may be associated with the integrity of frontal subcortical networks responsible for attention-executive-psychomotor performance. Future studies are needed to clarify the mechanisms by which IMT affects cognition and examine potential interactions between increased IMT and other measures of cardiovascular health such as blood pressure variability, cardiac systolic performance, and systemic perfusion. © 2006 Elsevier Ireland Ltd. All rights reserved.


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Emtree Heading
adult; aged; algorithm; article; attention; B scan; blood pressure variability; *blood vessel parameters; *cardiovascular disease; cardiovascular risk; *carotid artery; *cognition; common carotid artery; coronary artery disease; education; female; frontal cortex; human; language; linear regression analysis; major clinical study; male; memory; neuropsychological test; priority journal; psychomotor activity; sex difference; systolic blood pressure; task performance; *intima media thickness.

Candidate Terms
*intima media thickness [other term].

Other Index Terms

Page 219
Atherosclerosis and risk for dementia.

Objective: Atherosclerosis has been implicated in the development of dementia and its major subtypes, Alzheimer's disease and vascular dementia. However, support for this association mainly comes from cross-sectional studies. We investigated the association of atherosclerosis with dementia and subtypes of dementia during long follow-up, with various noninvasive measures of atherosclerosis.

Method(s): This study was based on 6,647 participants in the Rotterdam Study, a population-based prospective cohort study among 7,983 elderly subjects. At baseline (1990-1993) and at the third survey (1997-1999), common carotid intima media thickness, carotid plaques, and peripheral arterial disease (measured as ankle-brachial index) were measured. During follow-up (mean, 9.0 years), 678 subjects developed dementia. We estimated the associations of different measures of atherosclerosis with risk for dementia and subtypes of dementia by means of Cox proportional hazard models. Analyses were repeated and stratified on duration of follow-up. To evaluate competing risk for mortality, we examined the association between measures of atherosclerosis and risk for dementia or mortality by combining the two in a single outcome measure.
Result(s): We found that atherosclerosis, predominantly carotid atherosclerosis, was associated with an increased risk for dementia during short follow-up. This association attenuated with longer follow-up, likely because of the strong association between atherosclerosis and mortality. The associations did not differ across apolipoprotein E genotypes.

Interpretation(s): Our findings suggest that atherosclerosis is associated with an increased risk for dementia. Stronger associations between atherosclerosis and mortality may attenuate the association between atherosclerosis and dementia in prospective cohort studies with long follow-up periods.


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Publisher
John Wiley and Sons Inc. (P.O.Box 18667, Newark NJ 07191-8667, United States)

Emtree Heading
adult; aged; Alzheimer disease; ankle brachial index; artery disease; artery intima proliferation; article; *atherosclerosis; atherosclerotic plaque; carotid artery; cerebrovascular disease; *dementia; disease association; female; follow up; genotype; human; major clinical study; male; mortality; multiinfarct dementia; non invasive measurement; priority journal; apolipoprotein E/ec

[Endogenous Compound].

Drug Index Terms
apolipoprotein E / endogenous compound.

Other Index Terms
adult; aged; Alzheimer disease; ankle brachial index; artery disease; artery intima proliferation; article; *atherosclerosis; atherosclerotic plaque; carotid artery; cerebrovascular disease; *dementia; disease association; female; follow up; genotype; human; major clinical study; male; mortality; multiinfarct dementia; non invasive measurement; priority journal.

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The authors describe the design and the general, ultrasonographic, neuropsychological methodology of an observational epidemiological population survey, named REMEMBER (Registry Evaluation Memory in Buttrio e Remanzacco) conducted in the northeast of Italy in a randomized stratified sample of 1,026 subjects (554 F and 472 M) aged 55-98 years. The study was planned as cross-sectional and longitudinal survey of cognitive impairment, cardiovascular risk factors, carotid atherosclerosis in a midlife and older Italian population sample. The objectives of the first phase are to assess the prevalence of the different types of dementia, the cognitive impairment non-dementia, the cardiovascular risk factors, the carotid intima-media thickness and arterial distensibility, and of depression. The conclusions of this study will make it possible to organize preventive and interventional strategies for these epidemic conditions. Copyright © 2006 S. Karger AG.


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Cognitive functions in carotid artery disease before endarterectomy.
Journal of Clinical and Experimental Neuropsychology. 28 (3) (pp 357-369), 2006. Date of Publication: April 2006.
AN: 43477936

Restorative effects of carotid endarterectomy (CEA) on cognitive functioning in patients with severe atherosclerotic disease presuppose the existence of cognitive deficits prior to the intervention. Thorough examination of this premise received only minor attention. The present study assessed symptomatic and asymptomatic patients with severe unilateral or bilateral stenosis.
of the carotid arteries one day before CEA. Healthy volunteers with similar demographic characteristics served as control subjects. Patients overall showed decreased functioning on tests of attention, verbal and visual memory, verbal fluency, and psychomotor speed and executive functioning, even after correction for the effects of mood. Simple motor skills and visuospatial functioning were not affected. Patients grouped according to presence and type of previous clinical symptoms and severity of contralateral stenosis only slightly differed from each other. The findings leave open the potential of improving cognitive function after CEA. Copyright © Taylor & Francis Group, LLC.


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Publisher
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Emtree Heading
aged; article; atherosclerosis; *carotid artery disease; *carotid endarterectomy; *cognition; controlled study; demography; depth perception; female; human; major clinical study; male; motor performance; priority journal; psychomotor activity; stenosis; verbal memory; visual memory.

Other Index Terms
aged; article; atherosclerosis; *carotid artery disease; *carotid endarterectomy; *cognition; controlled study; demography; depth perception; female; human; major clinical study; male; motor performance; priority journal; psychomotor activity; stenosis; verbal memory; visual memory.

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Effect of carotid endarterectomy on patient evaluations of cognitive functioning and mental and physical health.
AN: 41218947
The prophylactic effect of carotid endarterectomy (CEA) against stroke has been well established. As a consequence of the restoration of cerebral blood supply and reduced risk of stroke, cognitive functioning and perceived health may improve. Fifty-one patients with severe atherosclerotic disease of the carotid artery but without history of major stroke completed the Cognitive Failures Questionnaire and the Short Form 36 Health Survey before CEA and 3 and 12 months thereafter. Before CEA, patients reported significant but small deviations from the norm in physical function, general health, and vitality. Small improvements after CEA were observed in the perception of physical role function, general health, vitality, and mental health. Patients also retrospectively noted a slight worsening of health in the year before surgery and some improvement after surgery. Evaluation of cognitive failures in daily life did not change. Demographic or medical characteristics, such as a history of temporary ischemic symptoms, occlusion of the contralateral artery, and shunt use during surgery, did not affect outcome. In conclusion, no negative outcomes and even some limited positive effects in the perception of mental and physical health are to be expected after CEA. © Annals of Vascular Surgery Inc.
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Publisher
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Background: Loss of cognitive function is a common condition in the elderly population. Cognitive impairment is defined as the transitional stage of cognitive decline, between normal aging and early dementia. We tested whether arterial stiffness, evaluated as pulse wave velocity (PWV), is associated with cognitive impairment in older subjects, and whether PWV is increased at a comparable extent in older subjects with cortical or subcortical cerebral lesions when compared with age-matched controls referred for memory deficits. Subjects and methods: Eighty-four subjects (78 +/- 5 years, 30 men and 54 women) referred for memory deficit with no history of stroke or atrial fibrillation were studied. Carotid-femoral PWV was determined non-invasively with Complior. The Mini Mental State Examination was assessed as a measure of global cognitive function. The sum of the score on the Activities of Daily Living and Instrumental Activities of Daily Living scales was used as a measure of personal independency. Based upon brain imaging,
subjects were classified as referred for memory deficits with normal brain imaging, or control, with subcortical microvascular lesions or with cortical atrophy.

Result(s): PWV, normalized for mean blood pressure, was inversely correlated with the Mini Mental State Examination (r = -0.26, P < 0.05), even after controlling for education, prevalent cardiovascular (CV) disease, CV risk factors, and medication use (beta coefficient = -0.28, P < 0.01).

PWV was also inversely correlated with personal independency (r = -0.36, P < 0.01; beta coefficient = -0.38, P < 0.01, after multiple adjustment). In the presence of no significant differences in age, education, traditional CV risk factor levels, carotid plaques, or prevalence of CV disease, higher PWV values were more frequent in subjects with cortical atrophy than in patients with subcortical microvascular lesions or controls (P < 0.05).

Conclusion(s): PWV was associated with cognitive impairment and with a greater personal dependency, independently of major modifiable CV risk factors. © 2005 Lippincott Williams & Wilkins.


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Emtree Heading
aged; aging; *artery compliance; atherosclerotic plaque; brain atrophy; cardiovascular disease; cardiovascular risk; carotid artery; cognition; *cognitive defect; conference paper; daily life activity; dementia; drug use; female; femoral artery; heart atrium fibrillation; human; major clinical study; male; memory disorder; Mini Mental State Examination; neuroimaging; priority journal; pulse wave; stroke.

Other Index Terms
aged; aging; *artery compliance; atherosclerotic plaque; brain atrophy; cardiovascular disease; cardiovascular risk; carotid artery; cognition; *cognitive defect; conference paper; daily life activity; dementia; drug use; female; femoral artery; heart atrium fibrillation; human; major clinical study; male; memory disorder; mini mental state examination; neuroimaging; priority journal; pulse wave; stroke.

Link to the Ovid Full Text or citation:
Left or right carotid endarterectomy in patients with atherosclerotic disease: Ipsilateral effects on cognition?
AN: 38229765
We evaluated hemispheric functions ipsilateral to the side of carotid endarterectomy (CEA) in patients with a severe stenosis in the left or right carotid artery. Assessments took place 1 day before and 3 months after CEA. Only right-handed males were included. Nineteen patients underwent surgery of the left carotid artery and 17 of the right. Valid instruments for hemispheric function were included, such as verbal dichotic listening, finger tapping, and a lateralised test for motor planning. Results showed that, preoperatively, patients had lower scores compared to norms on the laterality tests, and on a visuoconstructive test. There was no evidence of ipsilateral improvement related to side of surgery. Left ear dichotic listening improved, which was seen in both left and right surgery groups. Also in both groups, left- and right-hand movement speed in the motor planning test decreased. Conclusion is that beneficial ipsilateral cognitive change after CEA in patients with severe stenosis in one of the carotid arteries may not be demonstrated, even if valid instruments for hemispheric function are included. © 2004 Elsevier Inc. All rights reserved.
Carotid intima-media thickness and cognitive decline: What does it mean for prevention of dementia?.
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Emtree Heading atherosclerosis; *carotid artery; carotid artery obstruction; *cognitive defect/dt [Drug Therapy]; *cognitive defect/pc [Prevention]; *dementia/dt [Drug Therapy]; *dementia/pc [Prevention]; diabetes mellitus; disease predisposition; editorial; heart infarction; human; hypertension; *intima;
mixed depression and dementia; multiinfarct dementia; priority journal; prophylaxis; risk assessment; stroke; *thickness; treatment indication; *tunica media; atenolol/dt [Drug Therapy]; atenolol/pd [Pharmacology]; candesartan/dt [Drug Therapy]; candesartan/pd [Pharmacology]; dipeptidyl carboxypeptidase inhibitor/dt [Drug Therapy]; dipeptidyl carboxypeptidase inhibitor/pd [Pharmacology]; enalapril/dt [Drug Therapy]; enalapril/pd [Pharmacology]; losartan/dt [Drug Therapy]; losartan/pd [Pharmacology]; valsartan/dt [Drug Therapy]; valsartan/pd [Pharmacology].

Drug Index Terms
atenolol / drug therapy / pharmacology; candesartan / drug therapy / pharmacology; dipeptidyl carboxypeptidase inhibitor / drug therapy / pharmacology; enalapril / drug therapy / pharmacology; losartan / drug therapy / pharmacology; valsartan / drug therapy / pharmacology.

Other Index Terms
atherosclerosis; *carotid artery; carotid artery obstruction; *cognitive defect / *drug therapy / *prevention; *dementia / *drug therapy / *prevention; diabetes mellitus; disease predisposition; editorial; heart infarction; human; hypertension; *intima; mixed depression and dementia; multiinfarct dementia; priority journal; prophylaxis; risk assessment; stroke; *thickness; treatment indication; *tunica media.

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384.

Small Dense Low-Density Lipoprotein and Carotid Atherosclerosis in Relation to Vascular Dementia.

Vascular dementia (VaD) and Alzheimer’s disease (AD) are the most common causes of dementia in the elderly. The aim of this study was to investigate carotid atherosclerosis, serum lipid profiles, and atherogenic hormone levels in nondiabetic Japanese men with VaD or AD. Carotid artery
intima-media thickness (IMT) and plaque, serum lipid and lipoprotein profiles, including low-density lipoprotein (LDL) particle size, as well as insulin-like growth factor-I (IGF-I, somatomedin C) and testosterone levels, were determined in 34 patients with AD, 37 patients with VaD, and 63 healthy male controls. Age, body mass index, systolic and diastolic blood pressure, and fasting plasma glucose, hemoglobin A1c (HbA1c), triglyceride, high-density lipoprotein (HDL)-cholesterol, and apolipoproteins (apo) A-I, B, and E levels did not differ significantly among the 3 groups. However, the mean value of carotid IMT, the frequency of atherosclerotic plaque deposition, the serum levels of LDL-cholesterol, lipoprotein(a), and lipid peroxides, and the incidence of small dense LDL (particle diameter $\leq 25.5$ nm) were increased significantly in VaD patients compared with AD patients or controls. VaD patients had a close reverse correlation between carotid IMT and LDL particle diameter, which were statistically proven independent risk factors for VaD. In contrast, AD patients had significantly lower serum levels of IGF-I and testosterone than either VaD patients or controls. Our results indicate that VaD is associated with atherogenic dyslipidemia, in particular, small dense LDL and carotid atherosclerosis, whereas AD is associated with hyposomatomedinemia and hypogonadism rather than atherosclerosis. © 2004 Elsevier Inc. All rights reserved.


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Emtree Heading
adult; aged; alcohol consumption; Alzheimer disease; artery intima proliferation; article; atherogenesis; *atherosclerosis; atherosclerotic plaque; controlled study; dementia/ep [Epidemiology]; disease association; dyslipidemia/co [Complication]; dyslipidemia/di [Diagnosis]; female; human; hypogonadism; intravascular ultrasound; lipid blood level; lipoprotein blood level; major clinical study; male; *multinfarct dementia; particle size; priority journal; risk factor; smoking; testosterone blood level; alcohol; lipid/ec [Endogenous Compound]; lipid peroxide/ec [Endogenous Compound]; lipoprotein/ec [Endogenous Compound]; lipoprotein A/ec [Endogenous Compound]; *low density lipoprotein/ec [Endogenous Compound]; low density lipoprotein cholesterol/ec [Endogenous Compound]; somatomedin C/ec [Endogenous Compound]; testosterone/ec [Endogenous Compound]; unclassified drug; *carotid atherosclerosis; *small dense low density lipoprotein/ec [Endogenous Compound].

Candidate Terms
Peripheral arterial disease and cognitive function.
Psychosomatic Medicine. 65 (5) (pp 757-763), 2003. Date of Publication: September/October 2003. AN: 37163380
Objective: Peripheral arterial disease (PAD) is associated with comorbid atherosclerosis of the coronary and carotid arteries and is a significant risk factor for stroke. However, cognitive function in PAD patients before clinically evident stroke remains poorly characterized. Here we hypothesized that, on neuropsychological testing, PAD patients would perform more poorly than healthy control subjects, and persons with mild cardiovascular disease (essential hypertension), but
better than stroke patients, thus reflecting a continuum of cognitive impairment associated with increased severity of vascular disease.

Method(s): The cognitive performance of 38 PAD patients (mean ankle-brachial index=0.67, Fontaine Class II) was contrasted with that of 23 healthy normotensive controls, 20 essential hypertensives, and 26 anterior ischemic stroke patients on twelve neuropsychological tests.

Result(s): PAD patients performed significantly more poorly than hypertensives and normotensives, but better than stroke patients, on seven tests of nonverbal memory, concentration, executive function, perceptuo-motor speed, and manual dexterity. Hypertensives displayed poorer performance than normotensives on tests of nonverbal memory and manual dexterity. These findings were independent of age, education, and depression scores. Higher diastolic blood pressure and plasma glucose levels predicted poorer performance of select cognitive tests by PAD patients. Eight to 67% of PAD patients displayed impaired performance (< 5th percentile of normotensive controls) on the seven aforementioned cognitive tests.

Conclusion(s): PAD patients exhibit diminished performance across a variety of domains of cognitive function. Findings also suggest a continuum of cognitive impairment associated with increasingly severe manifestations of cardiovascular disease, thus emphasizing the need for enhanced preventative measures to avert functional declines.


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Publisher
Lippincott Williams and Wilkins (351 West Camden Street, Baltimore MD 21201-2436, United States)

Emtree Heading
adult; *artery disease; article; atherosclerosis; cerebrovascular accident; clinical article; *cognition; cognitive defect; comorbidity; controlled study; diastolic blood pressure; disease severity; female; glucose blood level; human; hypertension; male; memory; neuropsychological test; neuropsychology; priority journal; risk factor; stroke/et [Etiology]; glucose/ec [Endogenous Compound].

Drug Index Terms
glucose / endogenous compound.

Other Index Terms
Ultrasonographic assessment of carotid wall characteristics and cognitive functions in a community sample of 59- to 71-year-olds.


AN: 26286154

Background and Purpose: This study was aimed at analyzing cross-section relationships between cognitive performance and ultrasonographic assessment of carotid wall characteristics.

Method(s): A cohort of 1279 subjects (men, 41%) aged 59 to 71 years was recruited from the electoral rolls of the city of Nantes (western France). Cognitive performances were evaluated with the Mini-Mental State Examination MMSE) and seven neuropsychological tests assessing attention, psychomotor rapidity, verbal abilities, memory, and visuospatial perception. For each tests, subject were classified into three performance levels with a quartile distribution: 25% lowest, and 50% middle. The intima-media thickness of common arteries and the presence of plaques in the carotid arteries were assessed with B-mode ultrasound examination.

Result(s): Only 28% of men and 17% of women had carotid plaques inducing moderate stenosis of the lumen (<40%). After adjustment for possible confounders, odds ratios for poor cognitive performance associated with plaques were above 1 for all cognitive tests in men. This association was statistically significant for the MMSE and another test assessing attention skills. There was a slight association between increase of the common carotid intima-media thickness and poor
cognitive scores in men with plaques. In women, no association was found between cognitive functions and presence of plaques or intima-media thickness.

Conclusion(s): This study indicated a moderate association between atherosclerosis of the carotid arteries and poor cognitive functioning in men aged 59 to 79 years. In view of these moderate cross-sectional results, further studies are required to better assess the relationship between carotid atherosclerosis and cognitive impairment.

Cardiovascular disease and distribution of cognitive function in elderly people: The Rotterdam study.

Breteler M.M.B., Claus J.J., Grobbee D.E., Hofman A.


AN: 24181869

Objective - To investigate the distribution of cognitive function in elderly people and to assess the impact of clinical manifestations of atherosclerotic disease on this distribution.

Design - Single centre population based cross sectional door to door study.

Setting - Ommoord, a suburb of Rotterdam, the Netherlands.

Subjects - 4971 subjects aged 55 to 94 years.

Main outcome measure - Cognitive function as measured by the mini mental state examination.

Results - The overall participation rate in the study was 80%. Cognitive test data were available for 90% of the participants. Increasing age and lower educational level were associated with poorer cognitive function. Previous vascular events, presence of plaques in the carotid arteries, and presence of peripheral arterial atherosclerotic disease were associated with worse cognitive performance independent of the effects of age and education. On average the differences were moderate; however, they reflected the net result of a shift of the total population distribution of cognitive function towards lower values. Thereby, they resulted in a considerable increase in the proportion of subjects with scores indicative of dementia.

Conclusions - These findings are compatible with the view that atherosclerotic disease accounts for considerable cognitive impairment in the general population.


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Publisher BMJ Publishing Group (Tavistock Square, London WC1H 9JR, United Kingdom)

Emtree Heading adult; aged; *aging; article; *atherosclerosis / *epidemiology; cardiovascular disease / ep [Epidemiology]; clinical trial; *cognitive defect / ep [Epidemiology]; *cognitive defect / et [Etiology]; controlled clinical trial; controlled study; *dementia / ep [Epidemiology]; *dementia / et [Etiology]; female; human; major clinical study; male; Netherlands; priority journal.

Other Index Terms adult; aged; *aging; article; *atherosclerosis / epidemiology; cardiovascular disease / epidemiology; clinical trial; *cognitive defect / epidemiology / etiology; controlled clinical trial;
Carotid stenosis and atherosclerotic heart disease: Interactive effects on cognitive status.
Seidenberg M., Parker J.C., Nichols W.K.
AN: 15094490
It is quite common for patients with carotid artery disease to also suffer from other chronic medical disease. To date, there have been few systematic investigations of the influence and interaction of such associated medical problems. In this paper, we present the results of a pilot study using a retrospective approach to investigate the interaction of carotid artery disease and atherosclerotic heart disease for neuropsychological performance. Forty-six patients with carotid artery disease were divided into four groups: 1) discrete carotid lesions and heart disease, b) discrete carotid lesions alone, c) generalized cerebrovascular disease and heart disease, and d) generalized cerebrovascular disease alone. Results indicated a consistent pattern of greater cognitive impairment in those carotid artery patients who have both generalized cerebrovascular disease and atherosclerotic heart disease which was most evident on tests of nonverbal memory abilities. The potential significance of these findings for both clinical assessment and methodological considerations in studying carotid artery disease is discussed.

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Emtree Heading
*atherosclerosis; cardiovascular system; *carotid artery obstruction; central nervous system; clinical article; *cognition; heart; *heart disease; human; peripheral vascular system; psychological aspect.
Other Index Terms
atherosclerosis; cardiovascular system; carotid artery obstruction; central nervous system; clinical article; cognition; heart; heart disease; human; peripheral vascular system; psychological aspect.

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Search Strategy:

1. cognition/ (94748)
2. cognitive function*.tw. (58742)
3. dementia/ (49736)
4. Alzheimer disease/ (91342)
5. 1 or 2 or 3 or 4 (257625)
6. (atherosclerotic or intima media thickness or plaque).mp. (119020)
7. atherosclerosis/ (35080)
8. 6 or 7 (145302)
9. 5 and 8 (6774)
10. Carotid Arteries/ (32174)
11. carotid arter*.mp. (102137)
12. 10 or 11 (102137)
13. 9 and 12 (124)

2.


OBJECTIVE: We examine the relationship between variability in the plaque strain distribution estimated using ultrasound with multiple cognitive domains including executive, language, visuospatial reasoning, and memory function.

METHOD: Asymptomatic (n = 42) and symptomatic (n = 34) patients with significant (>60%) carotid artery stenosis were studied for plaque instability using ultrasound strain imaging and
multiple cognitive domains including executive, language, visuospatial reasoning, and memory function. Correlation and ROC analyses were performed between ultrasound strain indices and cognitive function. Strain indices and cognition scores were also compared between symptomatic and asymptomatic patients to determine whether there are significant group differences.

RESULTS: Association of high-strain distributions with dysexecutive function was observed in both asymptomatic and symptomatic patients. For memory, visuospatial, and language functions, the correlations between strain and cognition were weaker for the asymptomatic compared to symptomatic group.

CONCLUSIONS: Both asymptomatic and symptomatic patients demonstrate a relationship between vessel strain indices and executive function indicating that silent strokes and micro-emboli could initially contribute to a decline in executive function, whereas strokes and transient ischemic attacks may cause the further decline in other cognitive functions.

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4.

Carotid Intima-media Thickness, Cognitive Performance and Cognitive Decline in Stroke-free Middle-aged and Older Adults. The Atahualpa Project.
Del Brutto OH; Mera RM; Recalde BY; Del Brutto VJ.
[Journal Article]
UI: 31839546

BACKGROUND: Little is known on factors influencing cognitive function in rural communities. Using the Atahualpa Project cohort, we aimed to assess whether the carotid intima-media thickness (cIMT) - used as a surrogate of extracranial carotid atherosclerosis - is associated with cognitive performance and further decline in community-dwelling adults living in a rural setting.

METHODS: The study included Atahualpa residents aged greater than or equal to 40 years who had ultrasound examination of the extracranial carotid arteries and a baseline Montreal Cognitive...
Assessment (MoCA), as well as the subset of individuals who also had a follow-up MoCA at least 1 year after baseline. Relationship between cIMT and cognitive function was assessed by means of generalized linear and longitudinal models, adjusted for relevant covariates. Mediation analysis was utilized to establish the proportion of the effect between increased cIMT and cognitive performance, which is mediated by age.

RESULTS: A total of 561 individuals were included for the cross-sectional study, and 510 of them were assessed for the prospective cohort. Univariate analysis showed a significant association between increased cIMT and worse cognitive performance (P < .001), which vanishes after considering the effect of age and low scholarity. Causal mediation analysis confirms that age captures 82.6% (95% C.I.: 63.9% to 100%) of the effect of this association. There was no relationship between increased cIMT and cognitive decline in the follow-up.

CONCLUSIONS: In this rural population, the association between increased cIMT and cognitive dysfunction is mostly mediated by increasing age.
Carotid intima-media thickness   aging
cognitive decline
cognitive performance
extracranial carotid atherosclerosis
population study.
Year of Publication
2020

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5.

Association Between Carotid Artery Intima-Media Thickness and Combinations of Mild Cognitive Impairment and Pre-Frailty in Older Adults.
Park J; Park JH; Park H.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 31430926
Carotid intima-media thickness (CIMT) has been proposed as a surrogate marker of cardiovascular disease. Mild cognitive impairment (MCI) and pre-frailty are reportedly associated with increased CIMT. As the evidence on the association of CIMT with combinations of MCI and pre-frailty is limited, this association is examined. A total of 231 older adults participated. MCI was defined according to clinical consensus or psychometric criteria by a dementia specialist, and considering detailed neuropsychological assessments. Also, pre-frailty was defined as subjects with frail component of 1 or 2. Carotid variables were measured using a B-mode ultrasound. The analysis of covariance (ANCOVA) was performed to assess independent differences in CIMT among the four groups, according to the cognitive function and frailty status after a multivariate adjustment. Increased CIMT is associated with combinations of MCI and pre-frailty. ANCOVA showed that
CIMTs were significantly different among the four groups according to the cognitive function and frailty status. CIMTmax combined with MCI and pre-frailty was the thickest (1.04 +/- 0.3 mm), whereas the CIMT of no MCI and no pre-frailty was the thinnest (0.82 +/- 0.2 mm). The results suggest that combinations of MCI and pre-frailty are associated with increased CIMT in older adults.
Subclinical carotid atherosclerosis and neurocognitive function in an urban population.
Wendell CR; Waldstein SR; Evans MK; Zonderman AB.
Atherosclerosis. 249:125-31, 2016 06.
UI: 27092741
BACKGROUND AND AIMS: Examine age, sex, race, and socioeconomic status as modifiers of the association between carotid intimal medial thickness (IMT) and neurocognitive performance in a socioeconomically diverse, biracial, urban, adult population.
METHODS: Participants were 1712 community-dwelling adults (45% men, 56% African-American, 38% below poverty threshold, aged 30-64 years) enrolled in the Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study. Participants underwent initial carotid ultrasonography followed by cognitive testing on up to two occasions over 4 years. Mixed-effects regression analyses were adjusted for demographic, behavioral, and biomedical covariates.
RESULTS: Significant cross-sectional IMT x race x poverty interactions were identified for measures of delayed recall memory, auditory-verbal attention, and working memory. An IMT x race interaction also appeared for auditory-verbal learning. Higher IMT was generally associated with worse cognitive performance, but the disadvantage was most pronounced among those with higher socioeconomic status and white participants. No longitudinal associations were identified.
CONCLUSIONS: Carotid IMT-cognition associations differed as a function of race and socioeconomic status and were most compelling for measures of attention, executive function, and memory. These findings highlight the possibility that subclinical atherosclerosis may be differentially informative as a predictor of cognitive performance among varied demographic subgroups.
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Version ID
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
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MeSH Heading
Keyword Heading
*Carotid intimal medial thickness. *Cognitive function
*Subclinical cardiovascular disease.
Year of Publication
2016

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
Carotid artery plaque detected on ultrasound is associated with impaired cognitive state in the elderly: A population-based study in Wakiso district, Uganda.
Mworozi K; Ameda F; Byanyima RK; Nakasujja N.
[Journal Article]
UI: 31301929
Carotid artery disease which includes carotid artery stenosis, plaques, clots and increased intima media thickness, have been reported by many studies to be associated with dementia. Dementia is an end stage of usually asymptomatic cognitive impairment. Risk factors of carotid artery disease include; age, atherosclerosis, arteriosclerosis, shorter years in school, history of hypertension, diabetes mellitus, stroke and depression. This study set out to determine the prevalence of abnormal carotid ultrasound findings and their association with cognitive function among the adults >=60 years in Wakiso district, Uganda in 2018. A total of 210 participants were included. Carotid artery stenosis, presence of plaque, stenosis and intima-media thickness were assessed by ultrasound. Cognitive status was assessed using a Mini Mental State Exam (MMSE) test. The prevalence of plaque was 21.4%. Variables which included; presence of plaque, age, education, gender, marital status, whether participant stayed alone or with someone else, care for self, occupation status, division of staying and history of smoking. The presence of plaque was associated with an abnormal cognitive function at both univariate and multivariate analysis with respective OR=3.8 (95% CI=1.90-7.54, p-value=0.0001) and OR=3.4 (95% CI=1.38-8.15, p-value=0.007). The cognitive function distribution was 43.8%, 19%, 34.3% and 2.9% within the normal, mild, moderate, and severe cognitive function status respectively. This study showed that prevalence of carotid artery plaque was high in this elderly population in Wakiso district Uganda. Also, carotid artery plaque was associated with abnormal cognitive function.
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Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
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Mworozi, Kenneth; Ameda, Faith; Byanyima, Rosemary K; Nakasujja, Noeline.

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MeSH Heading

Keyword Heading
Abnormal cognitive function Carotid artery disease Carotid artery plaque Carotid ultrasound Elderly Intima-media thickness Mini-mental state examination.

Year of Publication
2019

Link to the Ovid Full Text or citation:
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Common Carotid Artery Calcification Impacts on Cognitive Function in Older Patients.
Di Daniele N; Celotto R; Alunni Fegatelli D; Gabriele M; Rovella V; Scuteri A.
[Journal Article]
UI: 30779026
INTRODUCTION: Cognitive impairment and dementia represent an emerging health problem.
Cardiovascular (CV) risk factors contribute to cognitive impairment.
AIM: To investigate the effect of vascular calcification on cognitive impairment and dementia,
independently of plaque and traditional CV risk factors.
METHODS: Four hundred and sixty-nine patients (age of 78.6 +/- 6.1 years, 74.4% women) were
studied. Traditional CV risk factors levels, cognitive function (MMSE), brain CT scan, and other
vascular parameters were measured. Common Carotid Artery (CCA) plaque and calcification were
evaluated by ultrasound.
RESULTS: CCA calcification was associated with a lower MMSE score than in subjects with no CCA
calcification (23.7 +/- 0.3 versus 25.5 +/- 0.8; p = 0.015), after controlling for age, sex, education,
blood pressure levels, diabetes, creatinine, lipid lowering therapy, neuroimaging alteration, and
CCA plaque. Similarly, CCA calcification was associated with higher odds of dementia regardless of
the presence of CCA plaque (OR 1.70, 95% CI 1.01-2.94, p < 0.05). This trend was not observed
when stratifying patients according to the presence of CCA plaque.
CONCLUSION: CCA calcification is associated with cognitive impairment and dementia,
independently of established CV risk factors and CCA plaque. The impact of arterial calcification on
cognition seems largely independent of arterial stiffness.
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Scuteri, Angelo. Department of Medical, Surgical, and Experimental Sciences, University of Sassari, Sassari, Italy. d341elefante@virgilio.it.

MeSH Heading

Keyword Heading
Arterial stiffness   Cognitive impairment
Dementia
Vascular aging
Vascular calcification.
Year of Publication
2019

Link to the Ovid Full Text or citation:
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11.

Cortical Cerebral Microinfarcts on 3T Magnetic Resonance Imaging in Patients With Carotid Artery Stenosis.
Takasugi J; Miwa K; Watanabe Y; Okazaki S; Todo K; Sasaki T; Sakaguchi M; Mochizuki H. Stroke. 50(3):639-644, 2019 03.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 30744544

Background and Purpose - Carotid artery stenosis is common in the elderly and contributes to cognitive impairment and dementia. Cortical cerebral microinfarcts (CMIs) play an important role in vascular cognitive impairment and dementia. We aimed to investigate the association between CMIs on 3T magnetic resonance imaging and clinical and radiological features, including plaque morphology, and cognitive function in patients with carotid stenosis. Methods- Eighty-nine patients with >30% carotid stenosis on ultrasound were prospectively enrolled, and underwent brain and carotid artery magnetic resonance imaging. CMIs were rated according to predetermined criteria based on 3D-double inversion recovery and fluid-attenuated inversion recovery images. Results - CMIs were identified in 26 patients (29%; median number 0, range 0-9). Poisson regression models adjusted for age and sex revealed that CMIs were associated with intraplaque hemorrhage (rate ratio, 1.95; 95% CI, 1.26-3.18), lacunar infarcts (rate ratio, 1.54; 95% CI, 1.00-2.44), and cortical infarcts (rate ratio, 3.22; 95% CI, 2.20-5.00). These associations were also observed in asymptomatic patients (n=64). Of 81 patients with unilateral carotid stenosis, the prevalence and number of CMIs were significantly higher in the hemisphere ipsilateral to the carotid stenosis than in the contralateral hemisphere (P=0.005 and P<0.001, respectively). The presence of CMIs was associated with poor cognitive function. Conclusions - Our results indicate that vulnerable carotid plaque increases the risk of CMIs and subsequent cognitive impairment. Carotid atherosclerosis could be a potential therapeutic target for cognitive impairment.

Version ID
1
Record Owner
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Status
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Authors Full Name
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Institution

Page 13
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MeSH Heading

Keyword Heading
*carotid stenosis *cognition
*dementia
*embolism
*magnetic resonance imaging.

Year of Publication
2019

Link to the Ovid Full Text or citation:
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12.

Healthy Lifestyle During the Midlife Is Prospectively Associated With Less Subclinical Carotid Atherosclerosis: The Study of Women's Health Across the Nation.
Wang D; Jackson EA; Karvonen-Gutierrez CA; Elliott MR; Harlow SD; Hood MM; Derby CA; Sternfeld B; Janssen I; Crawford SL; Huang MH; EI Khoudary SR; Chae CU; Baylin A.
[Journal Article. Research Support, N.I.H., Extramural]
UI: 30482079

Background Measures of subclinical atherosclerosis are predictors of future cardiovascular outcomes as well as of physical and cognitive functioning. The menopausal transition is associated with accelerated progression of atherosclerosis in women. The prospective association between a healthy lifestyle during the midlife and subclinical atherosclerosis is unclear. Methods and Results Self-reported data on smoking, diet, and physical activity from 1143 women in the Study of Women's Health Across the Nation were used to construct a 10-year average Healthy Lifestyle Score (HLS) during the midlife. Markers of subclinical atherosclerosis were measured 14 years after baseline and included common carotid artery intima-media thickness (CCA - IMT), adventitial diameter (CCA - AD), and carotid plaque. The associations of average HLS with CCA-IMT and CCA-AD were estimated using linear models; the association of average HLS with carotid plaque was estimated using cumulative logit models. Average HLS was associated with smaller CCA-IMT and CCA-AD in the fully adjusted models (P=0.0031 and <0.001, respectively). Compared with participants in the lowest HLS level, those in the highest level had 0.024 mm smaller CCA-IMT (95% confidence interval: -0.048, 0.000), which equals 17% of the SD of CCA-IMT, and 0.16 mm smaller CCA-AD (95% confidence interval: -0.27, -0.04), which equals 24% of the SD of CCA-AD. Among the 3 components of the HLS, abstinence from smoking had the strongest association with subclinical atherosclerosis. Conclusions Healthy lifestyle during the menopausal transition is associated with less subclinical atherosclerosis, highlighting the growing recognition that the midlife is a critical window for cardiovascular prevention in women.

Version ID
1

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Authors Full Name
Wang, Dongqing; Jackson, Elizabeth A; Karvonen-Gutierrez, Carrie A; Elliott, Michael R; Harlow, Sioban D; Hood, Michelle M; Derby, Carol A; Sternfeld, Barbara; Janssen, Imke; Crawford, Sybil L; Huang, Mei-Hua; El Khoudary, Samar R; Chae, Claudia U; Baylin, Ana.

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Comments
Erratum in (EIN)

MeSH Heading

Keyword Heading
*atherosclerosis  *cardiovascular disease
*lifestyle
*risk factors
To investigate the association between pulse wave velocity, intima-media thickness, carotid artery diameter, carotid plaques, and conversion from mild cognitive impairment to dementia. Three hundred and seventy-five elderly ambulatory subjects with mild cognitive impairment were followed yearly to examine potential conversion to dementia. Vascular function was assessed by carotid-femoral pulse wave velocity. Vascular structure was evaluated by intima-media thickness, carotid artery diameter, and carotid plaques using an ultrasonographic assessment of carotid arteries. One hundred and five patients (28%) converted to dementia during a mean follow-up period of 4.5 years. Higher pulse wave velocity was associated with greater risk of conversion to dementia (1-SD increase of pulse wave velocity: hazard ratio, 1.33; 95% CI, 1.04-1.71; P=0.02) independently of age, sex, educational level, systolic blood pressure, cardiovascular diseases, body mass index, calcium channel blockers intake, Mini-Mental State Examination at baseline, and apoE epsilon4 status. Intima-media thickness, carotid plaques, and carotid artery diameter did not predict conversion to dementia (1-SD increase of intima-media thickness: hazard ratio, 0.93; 95% CI, 0.73-1.18; P=0.55; presence of carotid plaques: hazard ratio, 1.08; 95% CI, 0.62-1.87; P=0.79; 1-
SD increase of carotid artery diameter: hazard ratio, 1.08; 95% CI, 0.89-1.31; P=0.44). Pulse wave velocity was associated with conversion to dementia, whereas intima-media thickness, carotid plaques, or carotid artery diameter were not after controlling for age and other confounding factors. Arterial stiffness could identify mild cognitive impairment patients at higher risk of dementia and may be a therapeutic target to delay or prevent the onset of dementia.


Comments

Comment in (CIN)

MeSH Heading


Keyword Heading

*blood pressure  *dementia

*patients

*pulse wave analysis

*risk

*vascular stiffness.
Association between carotid atheroma and cerebral cortex structure at age 73 years.
Alhusaini S; Karama S; Nguyen TV; Thiel A; Bernhardt BC; Cox SR; Corley J; Taylor A; Evans AC; Star JM; Bastin ME; Wardlaw JM; Deary IJ; Ducharme S.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 30179274

OBJECTIVE: To examine the relationship between carotid atherosclerosis and cerebral cortical thickness and investigate whether cortical thickness mediates the association between carotid atheroma and relative cognitive decline.

METHODS: We assessed 554 community-dwelling subjects (male/female: 296/258) from the Lothian Birth Cohort 1936 who underwent brain magnetic resonance imaging and carotid Doppler ultrasound studies at age 73 years. The relationship between carotid atherosclerosis markers (internal carotid artery stenosis, intima-media thickness, velocity, pulsatility, and resistivity indexes) and vertex-wide cerebral cortical thickness was examined cross-sectionally, controlling for gender, extensive vascular risk factors (VRFs), and intelligence quotient at age 11 (IQ-11). We also determined the association between carotid stenosis and a composite measure of fluid intelligence at age 73 years. A mediation model was applied to examine whether cortical thickness mediated the relationship between carotid stenosis and cognitive function.

RESULTS: A widespread negative association was identified between carotid stenosis (median = 15%) and cerebral cortical thickness at age 73 years, independent of the side of carotid stenosis, other carotid measures, VRFs, and IQ-11. This association increased in an almost dose-response relationship from mild to severe degrees of carotid stenosis, across the anterior and posterior
circulation territories. A negative association was also noted between carotid stenosis and fluid intelligence (standardized beta coefficient = -0.151, p = 0.001), which appeared partly (approximately 22%) mediated by carotid stenosis-related thinning of the cerebral cortex.

**INTERPRETATION:** The findings suggest that carotid stenosis represents a marker of processes that accelerate aging of the cerebral cortex and cognition that is in part independent of measurable VRFs. Cortical thinning within the anterior and posterior circulation territories partially mediated the relationship between carotid atheroma and fluid intelligence. 


Version ID
1

Record Owner
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Status
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Carotid circumferential wall stress is not associated with cognitive performance among individuals in late middle age: The Maastricht Study.
Geijselaers SL; Sep SJ; Schram MT; van Boxtel MP; van Sloten TT; Op Het Roodt J; Henry RM; Reesink KD; Schaper NC; Dagnelie PC; van der Kallen CJ; Biessels GJ; Stehouwer CD.
Atherosclerosis. 276:15-22, 2018 09.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 30006323

BACKGROUND AND AIMS: Arterial remodelling aims at normalising circumferential wall stress (CWS). Greater CWS in the carotid artery has previously been associated with the prevalence and severity of cerebral small vessel disease, a major cause of ageing-related cognitive decline. Here we test the hypothesis that greater carotid CWS is associated with poorer cognitive performance.

METHODS: We studied 722 individuals (60+/−8 years, 55% men, 42.5% highly educated, blood pressure 137+/−19/77+/−11mmHg, n=197 with type 2 diabetes) who completed a neuropsychological assessment and underwent vascular ultrasound to measure the intima-media thickness (IMT) and interadventitial diameter (IAD) of the left common carotid artery at a plaque-free site. From IMT and IAD, lumen diameter (LD) was calculated. These structural measures were then combined with local carotid pulse pressure and brachial mean arterial pressure to obtain a measure of pulsatile (CWSpulsatile) and average (CWSmean) mechanical load on the vessel wall. Cognitive domains assessed were memory, executive function and attention, and processing speed.
RESULTS: After adjustment for age, sex, and education, regression analyses showed that neither CWSpulsatile nor CWSmean were associated with measures of cognitive performance (p-values >=0.31). This null association did not differ by age or educational level, and was observed in both individuals with and without carotid plaque, diabetes and/or hypertension. In addition, none of the individual measures of carotid structure (i.e. IMT, IAD, and LD) was related to cognitive performance.

CONCLUSIONS: The present cross-sectional study shows that carotid CWS is not associated with cognitive performance, at least not among relatively highly educated individuals in late middle age with adequately controlled cardiovascular risk factors.
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MeSH Heading


Year of Publication
2018

Link to the Ovid Full Text or citation:

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Cognitive function of patients with rheumatoid arthritis is associated with disease activity but not carotid atherosclerotic changes.

Lee JH; Kim GT; Kim YK; Lee SG.
[Journal Article]
UI: 29652660

OBJECTIVES: Although the relationship between atherosclerosis and cognitive impairment has been studied and replicated, whether cognitive deficits in RA can be attributed to atherosclerotic changes is not well understood. This study investigated cognitive function in patients with RA and evaluated whether cognitive function was affected by carotid arterial atherosclerosis.

METHODS: We examined 70 RA patients and 40 healthy controls. RA activity was assessed by disease activity score with 28 joint-erythrocyte sedimentation rate (DAS28-ESR). Cognitive function was assessed by the Korean version of the Consortium to Establish a Registry for Alzheimer’s disease (CERAD-K) neuropsychological battery. Carotid arteries were scanned for the presence of plaques and to assess intima-media thickness (IMT). We assessed potential risk factors of cognitive impairment in RA patients using regression analyses.

RESULTS: There was a significant difference between RA patients and healthy controls in the verbal fluency (p=0.004) and Boston naming test (p=0.035). Carotid ultrasound revealed significantly more plaque in RA patients than in healthy controls (p=0.017). RA patients with memory impairment had significantly higher DAS28-ESR scores (p<0.001), age (p=0.009), and mean cIMT (p=0.027) than RA patients without memory impairment. In multivariable regression analysis, CERAD-K total score showed a significant negative correlation with age (beta=-0.415, p<0.001) or DAS28-ESR (beta=-4.685, p<0.001), but no correlation was found between CERAD-K total score and presence of plaque or cIMT.

CONCLUSIONS: Our results indicate that disease activity of RA and aging contribute to cognitive dysfunction, but there was no association between cognitive function and carotid atherosclerotic changes in RA patients.

Version ID
Association of subclinical carotid atherosclerosis with immediate memory and other cognitive functions.
Matsumoto L; Suzuki K; Mizuno Y; Ohike Y; Ozeki A; Ono S; Takanashi M; Sawaki D; Suzuki T; Yamazaki T; Tsuji S; Iwata A.
[Journal Article]
UI: 28776906
AIM: To clarify whether carotid atherosclerosis and its risk factors are associated with cognitive decline.
METHODS: We evaluated 206 individuals who visited our center for health screening. We carried out physical examinations, blood tests, intima-media thickness (IMT) measurement by carotid ultrasonography, brain magnetic resonance imaging scanning and cognitive function assessments. A total of 30 individuals, who had significant cerebrovascular lesions detected in magnetic resonance imaging scans, were excluded. To detect early cognitive decline, we defined "cognitive impairment (CI)" when a patient satisfied at least one of three criteria. These were Mini-Mental State Examination score <24, clock-drawing test score <4 coexisting with forgetfulness and Wechsler Memory Scale-revised delayed recall score below the normal range for the duration of education (>16 years of education: >=9, 10-15 years: >=5, 0-9 years: >=3).
RESULTS: Among 176 individuals, 27 were placed in the CI group. IMT was significantly higher in the CI group as compared with the non-CI group (mean +/- SD: 2.0 +/- 1.0 vs 1.7 +/- 0.7, P = 0018 by Student’s t-test). Other atherosclerotic risk factors, such as blood pressure, low-density lipoprotein cholesterol, and hemoglobin A1c, were not significantly different between the two groups. In multivariate analysis, maximum IMT was associated with impaired immediate recall score on Wechsler Memory Scale-revised, independent of the presence of deep white matter hyperintensities on the magnetic resonance imaging scan.
CONCLUSIONS: Subclinical carotid atherosclerosis, defined as thickened IMT, could be a marker for early stages of CI, especially for immediate memory recall. The impairment is presumably caused by inducing cerebral microvascular dysfunction in the frontal lobe. Geriatr Gerontol Int 2018; 18: 65-71.
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Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
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MeSH Heading

Keyword Heading

Carotid atherosclerotic plaque instability and cognition determined by ultrasound-measured plaque strain in asymptomatic patients with significant stenosis.

Dempsey RJ; Varghese T; Jackson DC; Wang X; Meshram NH; Mitchell CC; Hermann BP; Johnson SC; Berman SE; Wilbrand SM.


[Clinical Trial. Journal Article. Research Support, N.I.H., Extramural]

UI: 28298048

OBJECTIVE This article describes the use of ultrasound measurements of physical strain within carotid atherosclerotic plaques as a measure of instability and the potential for vascular cognitive decline, microemboli, and white matter changes. METHODS Asymptomatic patients with significant (> 60%) carotid artery stenosis were studied for dynamic measures of plaque instability, presence of microemboli, white matter changes, and vascular cognitive decline in comparison with normative controls and premorbid state. RESULTS Although classically asymptomatic, these patients showed vascular cognitive decline. The degree of strain instability measured within the atherosclerotic plaque directly predicted vascular cognitive decline in these patients thought previously to be asymptomatic according to classic criteria. Furthermore, 26% of patients showed microemboli, and patients had twice as much white matter hyperintensity as controls. CONCLUSIONS These data show that physical measures of plaque instability are possible through interpretation of ultrasound strain data during pulsation, which may be more clinically relevant.
than solely measuring degree of stenosis. The data also highlight the importance of understanding that the definition of symptoms should not be limited to motor, speech, and vision function but underscore the role of vascular cognitive decline in the pathophysiology of carotid atherosclerotic disease. Clinical trial registration no.: NCT02476396 (clinicaltrials.gov).

Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
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Authors Full Name
Dempsey, Robert J; Varghese, Tomy; Jackson, Daren C; Wang, Xiao; Meshram, Nirvedh H; Mitchell, Carol C; Hermann, Bruce P; Johnson, Sterling C; Berman, Sara E; Wilbrand, Stephanie M.
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Comments
Comment in (CIN)

MeSH Heading
Cognitive Dysfunction/px [Psychology]. Constriction, Pathologic/dg [Diagnostic Imaging].
Constriction, Pathologic/px [Psychology]. Dementia, Vascular/dg [Diagnostic Imaging]. Dementia,
[Diagnostic Imaging]. *Plaque, Atherosclerotic/px [Psychology]. Prodromal Symptoms. Severity of
Illness Index. *Ultrasonography. White Matter/dg [Diagnostic Imaging].

Keyword Heading
*CA = carotid artery  *CAS = CA stenosis  
*HITS = high-intensity transient signal  
*MCA = middle cerebral artery  
*TCD = transcranial Doppler  
*TIA = transient ischemic attack  
*WMH = white matter hyperintensity  
*carotid atherosclerosis  
*plaque instability  
*stroke  
*ultrasound  
*ultrasound strain  
*vascular cognitive decline  
*vascular disorders.  

Year of Publication  
2018

Link to the Ovid Full Text or citation:  
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SFX
Carotid Atherosclerosis and Cognitive Impairment in Nonstroke Patients. [Review]
Chen WH; Jin W; Lyu PY; Liu Y; Li R; Hu M; Xiao XJ.
[Journal Article. Review]
UI: 28937045
OBJECTIVE: As a vascular risk factor, carotid atherosclerosis is crucial to cognitive impairment. While carotid intima-media thickness, carotid artery plaque, and carotid stenosis can reflect carotid atherosclerosis in different stages, this review aimed to explore researches on the role of carotid intima-media thickness, carotid artery plaque, and carotid stenosis in the progress of cognitive impairment in nonstroke patients and tried to illustrate the possible mechanisms.
DATA SOURCES: We searched the PubMed database for recently published research articles up to July 2017, with the key words of "carotid atherosclerosis," "carotid intima-media thickness," "carotid plaque," "carotid stenosis," "nonstroke," and "cognitive impairment."
STUDY SELECTION: Articles were obtained and reviewed to analyze the role of carotid atherosclerosis such as carotid intima-thickness, carotid plaque, and carotid stenosis in the progress of cognitive impairment in nonstroke patients and the possible mechanisms.
RESULTS: In recent years, most studies proved that by evaluating carotid atherosclerosis with ultrasonography, carotid atherosclerosis accounts for the development of cognitive decline in nonstroke patients. Carotid atherosclerosis not only impairs the subtle general cognitive function but also decreases the specific domains of cognitive function, such as memory, motor function, visual perception, attention, and executive function. But, it is still controversial. The possible mechanisms of cognitive impairment in nonstroke patients with carotid atherosclerosis can be classified as systemic global cerebrovascular function, small-vessel diseases, and the mixed lesions. CONCLUSIONS: Carotid atherosclerosis can be used to predict the risk of cognitive impairment. Furthermore, diagnosing and treating carotid atherosclerosis at early stage might help clinicians prevent and treat vascular cognitive impairment in nonstroke patients.
Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
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Authors Full Name
Chen, Wei-Hong; Jin, Wei; Lyu, Pei-Yuan; Liu, Yang; Li, Rui; Hu, Ming; Xiao, Xiang-Jian.
Institution

Asymptomatic carotid stenosis is associated with cognitive impairment.
Lal BK; Dux MC; Sikdar S; Goldstein C; Khan AA; Yokemick J; Zhao L.
UI: 28712815
BACKGROUND: Cerebrovascular risk factors (e.g., hypertension, coronary artery disease) and stroke can lead to vascular cognitive impairment. The Asymptomatic Carotid Stenosis and Cognitive Function study evaluated the isolated impact of asymptomatic carotid stenosis (no prior ipsilateral or contralateral stroke or transient ischemic attack) on cognitive function. Cerebrovascular hemodynamic and carotid plaque characteristics were analyzed to elucidate potential mechanisms affecting cognition.

METHODS: There were 82 patients with >=50% asymptomatic carotid stenosis and 62 controls without stenosis but matched for vascular comorbidities who underwent neurologic, National Institutes of Health Stroke Scale, and comprehensive neuropsychological examination. Overall cognitive function and five domain-specific scores were computed. Duplex ultrasound with Doppler waveform and B-mode imaging defined the degree of stenosis, least luminal diameter, plaque area, and plaque gray-scale median. Breath-holding index (BHI) and microembolization were measured using transcranial Doppler. We assessed cognitive differences between stenosis patients and control patients and of stenosis patients with low vs high BHI and correlated cognitive function with microembolic counts and plaque characteristics.

RESULTS: Stenosis and control patients did not differ in vascular risk factors, education, estimated intelligence, or depressive symptoms. Stenosis patients had worse composite cognitive scores (P = .02; Cohen’s d = 0.43) and domain-specific scores for learning/memory (P = .02; d = 0.42) and motor/processing speed (P = .01; d = 0.65), whereas scores for executive function were numerically lower (P = .08). Approximately 49.4% of all stenosis patients were impaired in at least two cognitive domains. Precisely 50% of stenosis patients demonstrated a reduced BHI. Stenosis patients with reduced BHI performed worse on the overall composite cognitive score (t = -2.1; P = .02; d = 0.53) and tests for learning/memory (t = -2.7; P = .01; d = 0.66). Cognitive function did not correlate with measures of plaque burden (degree of stenosis, least luminal diameter, and plaque area) or with plaque gray-scale median.

CONCLUSIONS: Asymptomatic carotid stenosis is associated with cognitive impairment independent of known vascular risk factors for vascular cognitive impairment. Approximately 49.4% of these patients demonstrate impairment in at least two neuropsychological domains. The deficit is driven primarily by reduced motor/processing speed and learning/memory and is mild to moderate in severity. The mechanism for impairment is likely to be hemodynamic as evidenced by reduced cerebrovascular reserve and the likely result of hypoperfusion from a pressure drop across the stenosis in the presence of inadequate collateralization.

Copyright © 2017 Society for Vascular Surgery. Published by Elsevier Inc. All rights reserved.
Carotid disease at age 73 and cognitive change from age 70 to 76 years: A longitudinal cohort study.
Wardlaw JM; Allerhand M; Eadie E; Thomas A; Corley J; Pattie A; Taylor A; Shenkin SD; Cox S; Gow A; Starr JM; Deary IJ.
[Journal Article]
UI: 28155579
Cognitive decline and carotid artery atheroma are common at older ages. In community-dwelling subjects, we assessed cognition at ages 70, 73 and 76 and carotid Doppler ultrasound at age 73, to determine whether carotid stenosis was related to cognitive decline. We used latent growth curve models to examine associations between four carotid measures (internal carotid artery stenosis, velocity, pulsatility and resistivity indices) and four cognitive ability domains (memory, visuospatial function, crystallised intelligence, processing speed) adjusted for cognitive ability at age 11, current age, gender and vascular risk factors. Amongst 866 participants, carotid stenosis (median 12.96%) was not associated with cognitive abilities at age 70 or cognitive decline from age 70 to 76.
Increased ICA pulsatility and resistivity indices were associated with slower processing speed (both \( P < 0.001 \)) and worse visuospatial function (\( P = 0.036, 0.031 \), respectively) at age 70, and declining crystallised intelligence from ages 70 to 76 (\( P = 0.008, 0.006 \), respectively). The findings suggest that vascular stiffening, rather than carotid luminal narrowing, adversely influences cognitive ageing and provides a potential target for ameliorating age-related cognitive decline.

Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
Authors Full Name
Wardlaw, Joanna M; Allerhand, Michael; Eadie, Elizabeth; Thomas, Avril; Corley, Janey; Pattie, Alison; Taylor, Adele; Shenkin, Susan D; Cox, Simon; Gow, Alan; Starr, John M; Deary, Ian J.

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MeSH Heading

Keyword Heading
Carotid stenosis  ageing
cognition
vascular risk factors
white matter hyperintensities.
Year of Publication
2017

Link to the Ovid Full Text or citation:
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35.

Atherosclerotic carotid stenosis and cognitive function. [Review]
Wang T; Mei B; Zhang J.
[Journal Article. Review]
UI: 27152468
Atherosclerosis carotid stenosis is associated with stroke and cognitive impairment. Progressive cognitive decline may be an even greater problem than stroke, but it has not been widely recognized and therefore must be adequately addressed. Although both Carotid Endarterectomy (CEA) and Carotid Artery Stenting (CAS) have been proven can prevent future stroke in patients with atherosclerotic carotid stenosis, the influence of CEA and CAS on cognitive function is not clear. In the first part of this review, we evaluated the literature concerning carotid stenosis and the risk of cognitive impairment. Studies have suggested that both symptomatic and asymptomatic carotid stenosis are associated with cognitive impairment. In the second part, we reviewed the impact of CEA and CAS on cognitive function, some studies have shown benefits, but others have not.
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Version ID
1

Record Owner
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MeSH Heading

Keyword Heading
Carotid artery stenting  Carotid endarterectomy  Carotid stenosis  Cognitive function  Revascularization.

Year of Publication
2016

Link to the Ovid Full Text or citation:
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37.
Carotid atherosclerosis, cytomegalovirus infection, and cognitive decline in the very old: a community-based prospective cohort study.
Kawasaki M; Arai Y; Takayama M; Hirata T; Takayama M; Abe Y; Niimura H; Mimura M; Takebayashi T; Hirose N.
[Journal Article. Multicenter Study. Observational Study. Research Support, Non-U.S. Gov't]
UI: 26886582

To investigate various risk factors of cognitive decline in the very old, we studied 494 subjects over 85 years old without diagnosis of dementia at baseline from the Tokyo Oldest Old Survey on Total Health, an ongoing, community-based cohort in Japan. Cognitive function was assessed at baseline and at 3-year follow-up using Mini-Mental State Examination (MMSE). Plasma samples were assayed for levels of cytomegalovirus (CMV) immunoglobulin G (IgG) antibodies, tumor necrosis factor-alpha, interleukin-6, and blood chemistry. Carotid artery plaques were measured using an ultrasonography. In the cross-sectional analyses using Tobit regression, individuals with high carotid artery plaque score (≥5.0) had MMSE scores that were 1.08 points lower compared to those with no plaque (95 % confidence interval (CI) -1.95 to -0.20; p = 0.016), adjusted for age, sex, and education. Individuals with CMV IgG titers in the highest quartile had MMSE scores that were 1.47 points lower compared to individuals in the lowest quartile (95 % CI -2.44 to -0.50; p = 0.003). CMV and carotid atherosclerosis showed evidence of an interaction, where the association between CMV and MMSE was present only in subjects with carotid artery plaque. In the longitudinal analyses using linear regression, carotid atherosclerosis, smoking, low grip strength, and poor activities of daily living (ADL) status were associated with faster cognitive decline, adjusted for age, sex, education, and baseline cognitive function. Our findings suggest that carotid atherosclerosis is consistently associated with low cognitive function in the very old and modifies the association between latent CMV infection and cognition.
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MeSH Heading

Keyword Heading
Atherosclerosis Cognitive decline Cytomegalovirus Inflammation Very old.

Year of Publication
2016

Link to the Ovid Full Text or citation:
Low carotid artery wall shear stress is independently associated with brain white-matter hyperintensities and cognitive impairment in older patients.
Liu Z; Zhao Y; Wang X; Zhang H; Cui Y; Diao Y; Xiu J; Sun X; Jiang G.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 26868512

BACKGROUND & AIMS: Brain white-matter lesions and cognitive impairment are increasing because of the increasing number of patients aged >=80 y. Wall shear stress (WSS) plays a pivotal role as a fluid mechanical mediator in vascular reactivity and atherosclerosis. In this study, we investigated the associations among common carotid artery (CCA) WSS, white-matter lesions, and cognitive impairment in patients aged >=80 y.

METHODS: We enrolled 384 patients aged >=80 y. All subjects had CCA-WSS, brain white-matter hyperintensities (WMH), and Mini-Mental State Examination (MMSE) assessments and were divided into three groups using tertiles of mean and peak CCA-WSS.

RESULTS: For groups classified by the tertile of mean CCA-WSS, WMH, and WMH fraction were decreased; the MMSE score increased from low to high in the respective groups. Differences in WMH, WMH fraction, and the MMSE score were significant between any two groups (all adjusted p < 0.001). Groups classified by the tertile of peak CCA-WSS had the same pattern. Mean and peak CCA-WSS were significantly and inversely correlated with WMH (r = -0.575 and -0.570, respectively; p < 0.001) and WMH fraction (r = -0.574 and -0.569, respectively; p < 0.001) but positively correlated with the MMSE score (r = 0.390 and 0.278, respectively; p < 0.001). Multiple linear backward stepwise regression indicated the mean and peak CCA-WSS were significantly and independently associated with WMH, WMH fraction, and the MMSE score (all adjusted p < 0.001).

CONCLUSION: Carotid artery WSS was independently associated with brain white-matter lesions and cognitive impairment in patients aged >=80 y.

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Version ID
39.

Classification of Symptomatic and Asymptomatic Patients with and without Cognitive Decline Using Non-invasive Carotid Plaque Strain Indices as Biomarkers.
Wang X; Jackson DC; Mitchell CC; Varghese T; Wilbrand SM; Rocque BG; Hermann BP; Dempsey RJ.
[Journal Article. Research Support, N.I.H., Extramural. Research Support, Non-U.S. Gov't]
UI: 26778288
Vascular cognitive decline may be caused by micro-emboli generated by carotid plaque instability. We previously found that maximum strain indices in carotid plaque were significantly correlated with cognitive function. In the work described here, we examined these associations with a larger sample size, as well as evaluated the performance of these maximum strain indices in predicting cognitive impairment. Ultrasound-based strain imaging and cognition assessment were conducted on 75 human patients. Patients underwent one of two standardized cognitive test batteries, either the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) or the National Institute of Neurologic Disorder and Stroke-Canadian Stroke Network (NiINDS-CSN) Vascular
Cognitive Impairment Harmonization Standards (60 min). Scores were standardized within each battery to allow these data to be combined across all participants. Radiofrequency signals for ultrasound strain imaging were acquired on the carotid arteries using either a Siemens Antares with a VFX 13-5 linear array transducer or a Siemens S2000 with an 18 L6 linear array transducer. The same hierarchical block-matching motion tracking algorithm developed in our laboratory was used to estimate accumulated axial, lateral, and shear strain indices in carotid plaque, with inclusion of adventitia regardless of the ultrasound system and transducer used. Associations between cognitive z-scores and maximum strain indices were examined using Pearson’s correlation coefficients. Maximum strain indices were also employed to predict cognitive impairment using receiver operating characteristic analysis. All correlations between maximum strain indices and total cognition were statistically significant (p < 0.05), indicating that these indices have good utility in predicting cognitive impairment. Maximum lateral strain indices provided an area under the curve of 0.85 for symptomatic patients and 0.68 for asymptomatic patients. Our results indicate the important relationship of maximum strain indices to cognitive function and the feasibility of using maximum strain indices to predict cognitive decline with inclusion of the adventitia layer into the segmentation of plaque.
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MeSH Heading

Keyword Heading
Adventitia Carotid Plaque Elasticity imaging Elastography Motion tracking Multi-level Strain imaging Vascular cognitive impairment.

Year of Publication
2016

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
SFX

41.
Improved Correlation of Strain Indices with Cognitive Dysfunction with Inclusion of Adventitial Layer with Carotid Plaque.
Wang X; Mitchell CC; Varghese T; Jackson DC; Rocque BG; Hermann BP; Dempsey RJ.

Plaque instability may lead to chronic embolization, which in turn may contribute to progressive cognitive decline. Accumulated strain tensor indices over a cardiac cycle within a pulsating carotid plaque may be viable biomarkers for the diagnosis of plaque instability. Using plaque-only carotid artery segmentations, we recently demonstrated that impaired cognitive function correlated significantly with maximum axial and lateral strain indices within a localized region of interest in plaque. Inclusion of the adventitial layer focuses our strain or instability measures on the vessel wall-plaque interface hypothesized to be a region with increased shearing forces and measurable instability. A hierarchical block-matching motion tracking algorithm developed in our laboratory was used to estimate accumulated axial, lateral, and shear strain distribution in plaques identified with the plaque-with-adventitia segmentation. Correlations of strain indices to the Repeatable Battery for the Assessment of Neuropsychological Status Total score were performed and compared with previous results. Overall, correlation coefficients (r) and significance (p) values improved for axial, lateral, and shear strain indices. Shear strain indices, however, demonstrated the largest improvement. The Pearson correlation coefficients for maximum shear strain and cognition improved from the previous plaque-only analyses of -0.432 and -0.345 to -0.795 and -0.717 with the plaque-with-adventitia segmentation for the symptomatic group and for all patients combined, respectively. Our results demonstrate the advantage of including adventitia for ultrasound carotid strain imaging providing improved association to parameters assessing cognitive impairment in patients. This supports theories of the importance of the vessel wall plaque interface in the pathophysiology of embolic disease.

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MeSH Heading
Adult. *Adventitia/dg [Diagnostic Imaging]. Aged. *Carotid Stenosis/dg [Diagnostic Imaging].

Keyword Heading
carotid plaque  elasticity imaging
motion tracking
strain
vascular cognitive dementia.

Year of Publication
2016

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
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Subclinical carotid artery atherosclerosis and performance on cognitive tests in middle-aged adults: Baseline results from the ELSA-Brasil.
Suemoto CK; Santos IS; Bittencourt MS; Pereira AC; Goulart AC; Rundek T; Passos VM; Lotufo P; Bensenor IM.
[Journal Article. Multicenter Study. Research Support, Non-U.S. Gov't]
Ui: 26520907

BACKGROUND AND AIMS: Carotid artery intima-media thickness (CIMT) may be used as a biomarker for early cognitive impairment. However, the results of the association between CIMT and cognitive function in middle-aged subjects are mixed. We aimed to investigate this association in a large Brazilian sample with no history of stroke at baseline. Additionally, we tested the effect of interactions between CIMT and cardiovascular risk factors on cognitive performance.

METHODS: In this cross-sectional study, cognition was evaluated using the delayed word recall (DWRT), the category fluency, and the trail making tests (TMT). CIMT was measured at the common carotid artery. The association between CIMT and cognitive tests was investigated using linear regression models, adjusted for an extensive set of possible confounding variables. We also included interaction terms with selected risk factors.

RESULTS: The mean age of the 8208 participants was 49.6 +/- 7.3 years, 44% were male, and 56% White. Increase in CIMT was associated with worse performance on the DWRT (beta = -0.433, 95%CI = -0.724; -0.142, p = 0.004). We found effect modification of the association between cognitive function and CIMT by self-reported heart failure and alcohol intake. Participants had worse performance in the TMT if they had greater CIMT and current alcohol use (p < 0.0001). The interaction between CIMT and heart failure on TMT performance was not significant after adjustment for multiple comparisons (p = 0.07).

CONCLUSIONS: In this sample of middle-aged adults, CIMT was inversely associated with memory function. Additionally, the presence of alcohol use resulted in a stronger association of CIMT with worse performance on an executive function test.

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MeSH Heading

Keyword Heading
Atherosclerosis Carotid intima media thickness Cognition disorders.

Year of Publication
2015
Subclinical Atherosclerosis Is Inversely Associated With Gray Matter Volume in African Americans With Type 2 Diabetes.

Freedman BI; Divers J; Whitlow CT; Bowden DW; Palmer ND; Smith SC; Xu J; Register TC; Carr JJ; Wagner BC; Williamson JD; Sink KM; Maldjian JA.


[Journal Article. Research Support, N.I.H., Extramural]

UI: 26370382

OBJECTIVE: Relative to European Americans, African Americans manifest lower levels of computed tomography-based calcified atherosclerotic plaque (CP), a measure of subclinical cardiovascular disease (CVD). Potential relationships between CP and cerebral structure are poorly defined in the African American population. We assessed associations among glycemic control, inflammation, and CP with cerebral structure on MRI and with cognitive performance in 268 high-risk African Americans with type 2 diabetes.

RESEARCH DESIGN AND METHODS: Associations among hemoglobin A1c (HbA1c), C-reactive protein (CRP), and CP in coronary arteries, carotid arteries, and the aorta with MRI volumetric analysis (white matter volume, gray matter volume [GMV], cerebrospinal fluid volume, and white matter lesion volume) were assessed using generalized linear models adjusted for age, sex, African ancestry proportion, smoking, BMI, use of statins, HbA1c, hypertension, and prior CVD.

RESULTS: Participants were 63.4% female with mean (SD) age of 59.8 years (9.2), diabetes duration of 14.5 years (7.6), HbA1c of 7.95% (1.9), estimated glomerular filtration rate of 86.6 mL/min/1.73 m(2) (24.6), and coronary artery CP mass score of 215 mg (502). In fully adjusted models, GMV was inversely associated with coronary artery CP (parameter estimate [beta] -0.47 [SE 0.15], P = 0.002; carotid artery CP (beta -1.92 [SE 0.62], P = 0.002; and aorta CP [beta -0.10 [SE 0.03] P = 0.002),
whereas HbA1c and CRP did not associate with cerebral volumes. Coronary artery CP also associated with poorer global cognitive function on the Montreal Cognitive Assessment.

CONCLUSIONS: Subclinical atherosclerosis was associated with smaller GMV and poorer cognitive performance in African Americans with diabetes. Cardioprotective strategies could preserve GMV and cognitive function in high-risk African Americans with diabetes.

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Version ID
1

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MeSH Heading

Registry Number/Name of Substance
0 (Blood Glucose).

Year of Publication
2015

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47.

Intima-Media Thickness and Cognitive Function in Stroke-Free Middle-Aged Adults: Findings From the Coronary Artery Risk Development in Young Adults Study.
Zeki Al Hazzouri A; Vittinghoff E; Sidney S; Reis JP; Jacobs DR Jr; Yaffe K.
[Journal Article. Research Support, N.I.H., Extramural. Research Support, Non-U.S. Gov't]
BACKGROUND AND PURPOSE: The relationship between carotid artery intima-media thickness (IMT) and cognitive function in midlife remains relatively unexplored. We examined the association between IMT and cognitive function in a middle-aged epidemiological cohort of 2618 stroke-free participants.

METHODS: At the year 20 visit (our study baseline), participants from the Coronary Artery Risk Development in Young Adults study had IMT measured by ultrasound at the common carotid artery. Five years later, participants completed a cognitive battery consisting of the Rey Auditory-Verbal Learning Test of verbal memory, the Digit Symbol Substitution Test of processing speed, and the Stroop test of executive function. We transformed cognitive scores into standardized z scores, with negative values indicating worse performance.

RESULTS: Mean age at baseline was 45.3 years (SD, 3.6). Greater IMT (per 1 SD difference of 0.12 mm) was significantly associated with worse performance on all cognitive tests (z scores) in unadjusted linear regression models (verbal memory, -0.16; 95% confidence interval [CI], -0.20 to -0.13; processing speed, -0.23; 95% CI, -0.27 to -0.19; and executive function, -0.17; 95% CI, -0.20 to -0.13). In models adjusted for sociodemographics and vascular risk factors that lie earlier in the causal pathway, greater IMT remained negatively associated with processing speed (-0.06; 95% CI, -0.09 to -0.02; P, 0.003) and borderline associated with executive function (-0.03; 95% CI, -0.07 to 0.00; P, 0.07) but not with verbal memory.

CONCLUSIONS: We observed an association between greater IMT and worse processing speed—a key component of cognitive functioning—at middle age above and beyond traditional vascular risk factors. Efforts targeted at preventing early stages of atherosclerosis may modify the course of cognitive aging.
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MeSH Heading

Keyword Heading
carotid intima-media thickness cognition epidemiology risk factors stroke.

Year of Publication
2015

Link to the Ovid Full Text or citation:
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48.

Carotid and vertebral arterial variations in Alzheimer's disease.
Zhou R; Liu D; Yu K; Chen Y; Li L; Xu J; Zhou H.
[Journal Article]
UI: 25817257
The effects of carotid and vertebral arterial morphological variations on cognitive function impairment remain unclear. We investigated the association between extracranial carotid and vertebral arterial variations and the risk of Alzheimer's disease (AD). A prospective study with a 5-year followup was conducted from July 2008 to June 2013. A total of 1741 subjects (50 years of age and older) were examined for carotid and vertebral arterial variations using computed tomography angiography (CTA) and completed the study follow-up. Variations of the carotid and vertebral arteries were classified as tortuosity, kinking and coiling, according to the Weibel and Fields criteria. Cognitive function was assessed using the Mini-Mental State Examination and the Activities of Daily Living scale. We analyzed the association between arterial variations and the risk of AD by using multivariate Cox proportional-hazards models. The prevalence of carotid arterial variations was 38.4%, and the prevalence of vertebral arterial variations was 86.6%. Among the 1741 subjects who completed the study follow-up, 134 AD cases were detected. The subjects diagnosed with AD displayed greater kinking and coiling in the carotid artery (P<0.01) and vertebral artery (P<0.05) than the subjects without AD. After adjusting for potential confounders, kinking and coiling (hazard ratio [HR]=1.93, 95% confidence interval [CI], 1.37 to 2.86, P<0.01) in the carotid artery were significantly associated with AD. Additionally, after adjusting for potential confounders, kinking and coiling (HR=1.73, 95% CI, 1.25 to 2.31, P<0.01) in the vertebral artery were significantly associated with the risk of AD. We determined that age, hypertension and smoking status were significant predictors of AD in the multivariable models with carotid and vertebral arterial variation. The results of the current study indicate that severe carotid and vertebral arterial variations are associated with a significantly increased risk of AD. Further investigation into the association between these variations and AD would be useful for preventing AD.

Version ID
1

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MeSH Heading
Markers for the risk of progression from mild cognitive impairment to Alzheimer's disease.
Buratti L; Balestrini S; Altamura C; Viticchi G; Falsetti L; Luzzi S; Provinciali L; Vernieri F; Silvestrini M. Journal of Alzheimer's Disease. 45(3):883-90, 2015.

BACKGROUND: Defining reliable markers of conversion to dementia could be the first step in order to identify appropriate treatment strategies for mild cognitive impairment (MCI) patients.

OBJECTIVE: To develop a tool able to predict the risk of progression from MCI to Alzheimer's disease (AD).

METHODS: 406 MCI patients were included and followed for a one-year period. Demographic characteristics, vascular risk factors, extent of cerebrovascular lesions, markers of carotid atherosclerosis investigated with an ultrasonographic assessment (plaque index and intima-media thickness) and cerebrovascular reactivity to apnea (breath-holding index) were considered as potential predictors of conversion.

RESULTS: 106 (26%) MCI patients showed a conversion to AD. Plaque index, intima-media thickness, and breath-holding index were relevant predictors of conversion (p = 0.042; p = 0.003; p < 0.001, multivariate logistic regression analysis). A simplified scoring system was devised based on the magnitude of the estimated multinominal logistic regression beta coefficient results. A total score was calculated as the sum of each predictive factor which resulted in a 0-5 range. The optimal cut-off score was >=3 (sensitivity, 23.6%, 95% CI 15.9%-32.8%; specificity, 97.7%, 95% CI...
95.3%-99.1%; positive likelihood ratio, 10.1, 95% CI 4.5%-22.7%; negative likelihood ratio, 0.78, 95% CI 0.70%-0.87%). The AUC was 0.71 (95% CI, 0.65-0.77).

CONCLUSIONS: Our findings show the possibility to obtain a predictive indicator of the risk of conversion from MCI to dementia by considering the presence of both atherosclerotic changes in the carotid district and impairment of cerebral hemodynamics. Such an approach may allow us to formulate a correct prognosis in more than 70% of patients with amnesic MCI.

Keywords: Alzheimer's disease, atherosclerosis, carotid arteries, cerebral hemodynamics, mild cognitive impairment, ultrasonography.
Association of postural instability with asymptomatic cerebrovascular damage and cognitive decline: the Japan Shimanami health promoting program study.
Tabara Y; Okada Y; Ohara M; Uetani E; Kido T; Ochi N; Nagai T; Igase M; Miki T; Matsuda F; Kohara K.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 25523051

BACKGROUND AND PURPOSE: Asymptomatic cerebral small-vessel disease (cSVD) in elderly individuals are potent risk factors for stroke. In addition to common clinical risk factors, postural instability has been postulated to be associated with cSVD in older frail patients. Here, we conducted a cross-sectional study to understand the possible link between postural instability and asymptomatic cSVD further, namely periventricular hyperintensity, lacunar infarction, and microbleeds, as well as cognitive function, in a middle-aged to elderly general population (n=1387).

METHODS: Postural instability was assessed based on one-leg standing time (OLST) and posturography findings. cSVD was evaluated by brain MRI. Mild cognitive impairment was assessed using a computer-based questionnaire, and carotid intima-media thickness as an index of atherosclerosis was measured via ultrasonography.

RESULTS: Frequency of short OLST, in particular <20 s, increased linearly with severity of cSVD (lacunar infarction lesion: none, 9.7%; 1, 16.0%; >2, 34.5%; microbleeds lesion: none, 10.1%; 1, 15.3%;...
>2, 30.0%; periventricular hyperintensity grade: 0, 5.7%; 1, 11.5%; >2, 23.7%). The association of short OLST with lacunar infarction and microbleeds but not periventricular hyperintensity remained significant even after adjustment for possible covariates (lacunar infarction, \(P=0.009\); microbleeds, \(P=0.003\); periventricular hyperintensity, \(P=0.601\)). In contrast, no significant association was found between posturographic parameters and cSVD, whereas these parameters were linearly associated with OLST. Short OLST was also significantly associated with reduced cognitive function independent of covariates, including cSVD (\(P=0.002\)).

CONCLUSIONS: Postural instability was found to be associated with early pathological changes in the brain and functional decline, even in apparently healthy subjects.

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Comments
Comment in (CIN) Erratum in (EIN)

MeSH Heading
Carotid plaque as a predictor of dementia in older adults: the Three-City Study.
Carcaillon L; Pluchart M; Zureik M; Rouaud O; Majed B; Ritchie K; Tzourio C; Dartigues JF; Empana JP.
[Journal Article. Multicenter Study. Research Support, Non-U.S. Gov't]
UI: 25510384
BACKGROUND: The contribution of carotid atherosclerosis to incident dementia remains unclear. We examined the association between carotid plaques (CP) and common carotid intima media thickness (CCA-IMT) with incident dementia and its subtypes, and their added value for dementia risk prediction.
METHODS: At baseline, 6025 dementia-free subjects aged 65-86 years underwent bilateral carotid ultrasonography measures of CP and plaque-free CCA-IMT. Subjects were followed-up over 7 years for the detection of dementia.
RESULTS: After a mean 5.4 years of follow-up, 421 subjects developed dementia including 272 Alzheimer's disease and 83 vascular/mixed dementia (VaD). Only CP were independently related to VaD (HR(>=2 sites with plaques) = 1.92; 95% confidence interval or CI = 1.13-3.22) and improved VaD risk prediction (continuous Net Reclassification Index = 30.1%; 95% CI = 8.4-51.7) beyond
known dementia risk factors. Accounting for stroke or competing risk by death marginally modified the results.

CONCLUSION: In older adults, CP are independent predictors of incident VaD and may improve VaD risk prediction.

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Supplemental material

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doi: 10.1136/bmjopen-2021-055131
Atherosclerotic calcification is related to a higher risk of dementia and cognitive decline.

Bos D; Vernooij MW; de Bruijn RF; Koudstaal PJ; Hofman A; Franco OH; van der Lugt A; Ikram MA. Alzheimer's & Dementia. 11(6):639-47.e1, 2015 Jun.

BACKGROUND: Longitudinal data on the role of atherosclerosis in different vessel beds in the etiology of cognitive impairment and dementia are scarce and inconsistent.

METHODS: Between 2003-2006, 2364 nondemented persons underwent computed tomography of the coronaries, aortic arch, extracranial, and intracranial carotid arteries to quantify atherosclerotic calcification. Participants were followed for incident dementia (n = 90) until April 2012. At baseline and follow-up participants also underwent a cognitive test battery.

RESULTS: Larger calcification volume in all vessels, except in the coronaries, was associated with a higher risk of dementia. After adjustment for relevant confounders, extracranial carotid artery
calcification remained significantly associated with a higher risk of dementia [hazard ratio per standard deviation increase in calcification volume: 1.37 (1.05, 1.79)]. Additional analyses for Alzheimer’s disease only or censoring for stroke showed similar results. Larger calcification volumes were also associated with cognitive decline.

CONCLUSIONS: Atherosclerosis, in particular in the extracranial carotid arteries, is related to a higher risk of dementia and cognitive decline.
The role of carotid intima-media thickness in predicting longitudinal cognitive function in an older adult cohort.

Frazier DT; Seider T; Bettcher BM; Mack WJ; Jastrzab L; Chao L; Weiner MW; DeCarli C; Reed BR; Mungas D; Chui HC; Kramer JH.


[Journal Article. Research Support, N.I.H., Extramural]

UI: 25502351
BACKGROUND AND PURPOSE: Carotid atherosclerosis is a risk factor for cerebrovascular disease in older adults. Although age-related cognitive decline has been associated with cerebrovascular disease, not much is known about the consequences of carotid atherosclerosis on longitudinal cognitive function. This study examines the longitudinal relationship between atherosclerosis and cognition in a sample of non-demented older subjects using baseline measurements of carotid intima media thickness (CIMT) and annual cognitive measures of executive function (EXEC) and verbal memory (MEM).

METHODS: Baseline measurements included CIMT derived from B-mode carotid artery ultrasound, structural T1-weighted images of white matter hypointensities (WMH), white matter lesions (WML), and cerebral infarct. Hypertension, low-density lipoprotein (LDL), diabetes, and waist to hip ratios (WHR) were included as covariates in our models to control for cerebrovascular risks and central adiposity. Annual composite scores of EXEC and MEM functions were derived from item response theory. Linear mixed models were used to model longitudinal cognitive change.

RESULTS: A significant inverse relationship was found between baseline CIMT and annual EXEC score, but not annual MEM score. Subjects included in the highest 4th quartile of CIMT showed a rate of annual decline in EXEC score that was significant relative to subjects in lower quartile groups (p<0.01). The relationship between the 4th quartile of CIMT and annual EXEC score remained significant after independently adjusting for imaging measures of white matter injury and cerebral infarct.

CONCLUSIONS: Older adult subjects with the highest index of CIMT showed an annual decline in EXEC scores that was significant relative to subjects with lower quartile measurements of CIMT, independent of our measures of white matter injury and cerebral infarct. Our findings suggest that elevated measures of CIMT may mark an atherosclerotic state, resulting in a decline in executive function and not memory in non-demented older adults.
Differential impact of subclinical carotid artery disease on cerebral structure and functioning in type 1 diabetes patients with versus those without proliferative retinopathy.

van Duinkerken E; Ijzerman RG; van der Zijl NJ; Barkhof F; Pouwels PJ; Schoonheim MM; Moll AC; Boerop J; Wessels AM; Klein M; Snoek FJ; Diamant M.


[Comparative Study. Journal Article. Research Support, Non-U.S. Gov't]

UI: 24620788

BACKGROUND: Type 1 diabetes mellitus (T1DM) is associated with cerebral compromise, typically found in patients with microangiopathy. Associations between subclinical macroangiopathy and the brain, whether or not in the presence of microangiopathy, have not been fully explored in T1DM. We hypothesized that subclinical macroangiopathy in adult T1DM may affect the brain and interacts with microangiopathy.

METHODS: In 51 asymptomatic T1DM patients with, 53 without proliferative retinopathy and 51 controls, right common carotid artery ultrasound was used to assess intima media thickness (cIMT) and distensibility (cD). Neuropsychological tests for cognitive functions, and magnetic resonance imaging for white matter integrity and functional connectivity, i.e. neuronal communication, were used.
RESULTS: After correction for confounders, cIMT was borderline significantly increased in all T1DM patients (P = 0.071), whereas cD was not statistically significantly altered (P = 0.45). Patients with proliferative retinopathy showed the largest increase in cIMT and decrease in cD. In all participants, after adjustment for confounders, increased cIMT was related to decreased white matter integrity (beta = -0.198 P = 0.041) and decreased functional connectivity in visual areas (beta = -0.195 P = 0.046). For cognition, there was a significant interaction between cIMT and the presence of proliferative retinopathy after adjustment for confounding factors (all P < 0.05). Increased cIMT was associated with lower general cognitive ability (beta = -0.334; P = 0.018), information processing speed (beta = -0.361; P = 0.010) and attention (beta = -0.394; P = 0.005) scores in patients without, but not in patients with proliferative retinopathy.

CONCLUSIONS: These findings suggest that subclinical macroangiopathy may be a factor in the development of diabetes-related cognitive changes in uncomplicated T1DM, whereas in patients with advanced T1DM, proliferative retinopathy may rather be the driving force of cerebral compromise.
Visit-to-visit blood pressure variability in the elderly: associations with cognitive impairment and carotid artery remodeling.

Nagai M; Hoshide S; Nishikawa M; Masahisa S; Kario K.


[Journal Article]

UI: 24529116

OBJECTIVE: Recently, visit-to-visit blood pressure (BP) variability has been shown to be associated with vascular remodeling and cognitive dysfunction. However, there have been no studies that focused on the relationship between visit-to-visit BP variability and cognitive dysfunction in relation to vascular remodeling. In this study, we investigated the relationships among visit-to-visit BP measures, carotid artery remodeling and cognitive function in the elderly at high risk of cardiovascular disease.

METHODS: The cognitive function was evaluated using a Mini-Mental State Examination (MMSE) and global deterioration scale (GDS) in 201 elderly subjects at high risk of cardiovascular disease (79.9 +/- 6.4 years old; female 75%). Based on 12 visits (once a month), visit-to-visit BP variability (expressed as the coefficient of variation [CV] and as delta [maximum--minimum] BP) were measured. Carotid ultrasound was performed to measure intima-media thickness (IMT) and the stiffness parameter beta.

RESULTS: The patients having both high delta systolic BP (SBP) and high IMT had significantly higher prevalence of low MMSE score than those with both low delta SBP and low IMT (p < 0.05), and the patients having both high delta SBP and high stiffness parameter beta also had significantly higher prevalence of low MMSE score than those with both low delta SBP and low stiffness parameter beta (p < 0.01). In the logistic regression analysis adjusted for age, calcium
channel blocker use, low density lipoprotein, average heart rate, and average SBP level, a 
significant interaction was found between delta SBP and stiffness parameter beta for the low 
MMSE score (p < 0.05).

CONCLUSIONS: In the high risk elderly, exaggerated visit-to-visit BP variability and advanced 
carotid artery remodeling have a synergetic association with cognitive dysfunction.

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MeSH Heading
[Diagnostic Imaging]. *Carotid Intima-Media Thickness. Cognition Disorders/ep [Epidemiology]. 
Resistance/ph [Physiology].

Keyword Heading
Carotid artery remodeling Cognitive impairment
The elderly
Visit-to-visit blood pressure variability.

Year of Publication
2014
Association of cognitive dysfunction with cardiovascular disease events in elderly hypertensive patients.
Yano Y; Bakris GL; Inokuchi T; Ohba Y; Tamaki N; Nagata M; Kuwabara M; Yokota N; Eto T; Kuroki M; Shimada K; Kario K.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 24351802

OBJECTIVES: This study assesses whether presence of cognitive dysfunction can be a marker associated with the development of cardiovascular disease (CVD) events independent of ambulatory blood pressure (BP) or other indices of target organ damage (TOD) in elderly hypertensive patients.

METHODS: We recruited 585 hypertensive patients (mean age, 73 years; 41% men) who were ambulatory, lived independently, and were without clinically overt dementia. Cognitive function was assessed by Mini-Mental State Examination (MMSE) at baseline, and CVD events (coronary artery disease, stroke, congestive heart failure, and sudden death) were prospectively ascertained. Cognitive dysfunction was defined as the lowest quartile of MMSE scores (n = 183, median 24 points).

RESULTS: CVD events occurred in 42 people over an average of 2.8 years (1644 person-years). The prevalence of cognitive dysfunction was higher in patients with CVD events than those without (57 vs. 29%; both P <0.001) at baseline. Cognitive dysfunction was associated with CVD events, after adjustment for nocturnal SBP and evidence of TOD [i.e. albuminuria, cardiac hypertrophy, and carotid-artery intima-media thickness (IMT)], hazard ratio 2.5-2.9 (all P <0.01). Incorporation of MMSE in the risk model (including age, estimated glomerular filtration rate, and preexisting CVD) improved the C-statistics (from 0.691 to 0.741) and resulted in a net reclassification improvement of
17.6% (P = 0.02). In contrast, incorporation of albuminuria, cardiac hypertrophy, and high carotid-artery IMT added little further improvement in the risk prediction.

CONCLUSION: Cognitive dysfunction is an independent marker associated with increased risk of CVD events in elderly hypertensive patients.

Version ID
1

Record Owner
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Status
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MeSH Heading

Year of Publication
2014

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SFX
Correlation of cognitive function with ultrasound strain indices in carotid plaque.
Wang X; Jackson DC; Varghese T; Mitchell CC; Hermann BP; Kliewer MA; Dempsey RJ.
[Journal Article. Research Support, N.I.H., Extramural]
U1: 24120415
Instability in carotid vulnerable plaque can generate cerebral micro-emboli, which may be related
to both stroke and eventual cognitive abnormality. Strain imaging to detect plaque vulnerability
based on regions with large strain fluctuations, with arterial pulsation, may be able to determine
the risk of cognitive impairment. Plaque instability may be characterized by increased strain
variations over a cardiac cycle. Radiofrequency signals for ultrasound strain imaging were acquired
from the carotid arteries of 24 human patients using a Siemens Antares with a VFX 13-5 linear
array transducer. These patients underwent standardized cognitive assessment (Repeatable Battery
for the Assessment of Neuropsychological Status [RBANS]). Plaque regions were segmented by a
radiologist at end-diastole using the Medical Imaging Interaction Toolkit. A hierarchical block-
matching motion tracking algorithm was used to estimate the cumulated axial, lateral and shear
strains within the imaging plane. The maximum, minimum and peak-to-peak strain indices in the
plaque computed from the mean cumulated strain over a small region of interest in the plaque
with large deformations were obtained. The maximum and peak-to-peak mean cumulated strain
indices over the entire plaque region were also computed. All strain indices were then correlated
with RBANS Total performance. Overall cognitive performance (RBANS Total) was negatively
associated with values of the maximum strain and the peak-to-peak for axial and lateral strains,
respectively. There was no significant correlation between the RBANS Total score and shear strain
and strain indices averaged over the entire identified plaque for this group of patients. However,
correlation of maximum lateral strain was higher for symptomatic patients (r = -0.650, p = 0.006)
and for asymptomatic patients (r = -0.115, p = 0.803). On the other hand, correlation of maximum
axial strain averaged over the entire plaque region was significantly higher for asymptomatic
patients (r = -0.817, p = 0.016) than for symptomatic patients (r = -0.224, p = 0.402). The results
reveal a direct relationship between the maximum axial and lateral strain indices in carotid plaque
and cognitive impairment.
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Albuminuria and carotid atherosclerosis as predictors of cognitive function in a general population.
Rogne SO; Solbu MD; Arntzen KA; Herder M; Mathiesen EB; Schirmer H.
[Journal Article]
UI: 24158160
BACKGROUND/AIMS: Albuminuria and carotid atherosclerosis are predictors of cardiovascular disease and potential predictors of cognitive decline. Our aim was to study whether albuminuria was an early predictor of cognitive function independent of carotid atherosclerosis in a general population.
METHODS: The study population comprised 1,577 adults without self-reported stroke. In 1994 and 2007 all were screened for cardiovascular risk factors, urinary albumin-creatinine ratio (ACR), carotid intima-media thickness and carotid total plaque area (TPA). Endpoints were neuropsychological test results in 2007 from the digit symbol test, the finger-tapping test, the Mini Mental Status Examination and the 12-word test parts 1 and 2. Multivariate linear regression was used to assess associations.
RESULTS: Higher ACR, DELTAACR, intima-media thickness, TPA and DELTATPA independently predicted a lower score on the digit symbol test. Higher DELTAACR and DELTATPA predicted a lower score on the finger-tapping test. Higher TPA predicted a lower score on the 12-word test part 1 (immediate recall). Smoking predicted lower scores on the digit symbol and finger-tapping tests independent of albuminuria and carotid atherosclerosis.
CONCLUSIONS: Our results suggest that albuminuria, carotid atherosclerosis and smoking are independent predictors of executive function and motor tempo.
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Version ID
1
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From MEDLINE, a database of the U.S. National Library of Medicine.
Status
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Authors Full Name
Asymptomatic cervicocerebral atherosclerosis, intracranial vascular resistance and cognition: the AsIA-neuropsychology study.
Lopez-Oloriz J; Lopez-Cancio E; Arenillas JF; Hernandez M; Jimenez M; Dorado L; Barrios M; Soriano-Raya JJ; Miralbell J; Caceres C; Fores R; Pera G; Davalos A; Mataro M.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 24075765
BACKGROUND AND PURPOSE: Carotid atherosclerosis has emerged as a relevant contributor to cognitive impairment and dementia whereas the role of intracranial stenosis and vascular resistance in cognition remains unknown. This study aims to assess the association of
asymptomatic cervicocerebral atherosclerosis and intracranial vascular resistance with cognitive performance in a large dementia-free population.

METHODS: The Barcelona-AsIA (Asymptomatic Intracranial Atherosclerosis) Neuropsychology Study included 747 Caucasian subjects older than 50 with a moderate-high vascular risk (assessed by REGICOR score) and without history of neither symptomatic vascular disease nor dementia. Extracranial and transcranial color-coded duplex ultrasound examination was performed to assess carotid intima-media thickness (IMT), presence of carotid plaques (ECAD group), intracranial stenosis (ICAD group), and middle cerebral artery pulsatility index (MCA-PI) as a measure of intracranial vascular resistance. Neuropsychological assessment included tests in three cognitive domains: visuospatial skills and speed, verbal memory and verbal fluency.

RESULTS: In univariate analyses, carotid IMT, ECAD and MCA-PI were associated with lower performance in almost all cognitive domains, and ICAD was associated with poor performance in some visuospatial and verbal cognitive tests. After adjustment for age, sex, vascular risk score, years of education and depressive symptoms, ECAD remained associated with poor performance in the three cognitive domains and elevated MCA-PI with worse performance in visuospatial skills and speed.

CONCLUSIONS: Carotid plaques and increased intracranial vascular resistance are independently associated with low cognitive functioning in Caucasian stroke and dementia-free subjects. We failed to find an independent association of intracranial large vessel stenosis with cognitive performance.

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Carotid artery atherosclerosis is correlated with cognitive impairment in an elderly urban Chinese non-stroke population.

Xiang J; Zhang T; Yang QW; Liu J; Chen Y; Cui M; Yin ZG; Li L; Wang YJ; Li J; Zhou HD.
[Journal Article]
UI: 23978769

Carotid artery atherosclerosis may cause increased intima-media thickness (IMT), plaque formation, and vessel stenosis or occlusion. However, the association between carotid artery atherosclerosis and cognitive impairment remains uncertain. This study explored the effects of IMT...
and carotid artery stenosis on cognitive function in an elderly Chinese non-stroke population. A total of 2015 patients were recruited. The IMT of carotid arteries and the presence of plaques and stenosis in carotid arteries were assessed with B-mode ultrasound examination. Cognitive performance was evaluated with neuropsychological tests. The cross-sectional relationships between cognitive performance and carotid wall characteristics were analyzed. Carotid artery atherosclerosis (IMT>1.0) and stenosis were found in 86% and 51% of patients, respectively. Cognitive impairment was found in 356 (17.7%) patients. After adjustment for possible confounders, IMT (odds ratio [OR]=1.96; 95% confidence interval [CI] 1.23-3.16) and hyperdense plaque (OR=4.72; 95% CI 2.56-11.2) were associated with poor cognitive performance. Patients with severe (>=70%) carotid artery stenosis had a lower Mini-Mental State Examination score compared with the mild to modest (40-70%) carotid artery stenosis group. Cognitive performance differed between patients with left and right carotid artery stenosis, but no differences were observed between patients with severe left and right carotid artery stenosis. This study indicates that carotid artery atherosclerosis is correlated with cognitive impairment in the elderly Chinese population. A larger sample size across multiple centers and a longitudinal study are required to further explore the impact of carotid artery atherosclerosis on cognition in the elderly population.
Atherosclerosis and physical functioning in older men, a longitudinal study.
den Ouden ME; Schuurmans MJ; Arts IE; Grobbee DE; Bots ML; van den Beld AW; Lamberts SW;
van der Schouw YT.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 23299387

OBJECTIVE: Functional decline is a major threat to independency, progressing into functional
limitations and eventually leading to disability. Chronic diseases, especially cardiovascular diseases,
are important determinants of functional limitations and disability. Vascular damage exits long
before it is clinically manifest and can have adverse effects on health, physical and cognitive
functioning. The objective was to investigate the association between non-invasive atherosclerosis
measures and physical functioning in older men.

DESIGN: Prospective cohort study.

SETTING: The study was conducted in the general community.

PARTICIPANTS: 195 independently living older men.

MEASUREMENTS: Atherosclerosis was measured by intima media thickness (CIMT) of the common
carotid artery using ultrasonography and assessment for presence of atherosclerotic plaques.
Physical functioning was measured by isometric handgrip strength and leg extensor strength using
a hand held dynamometer, lower extremity function using the physical performance score and ability to perform activities of daily life using the modified Stanford health assessment questionnaire. Linear regression analysis was performed to estimate the associations between CIMT or plaques and physical functioning.

RESULTS: After adjustment for confounders, higher baseline CIMT was associated with lower isometric handgrip strength at follow up (betaCIMT = -7.21, 95% CI[-13.64;-0.77]). No other associations were found between CIMT and physical functioning. In addition, no associations were found for the presence of plaques and physical functioning either at baseline, or at follow-up.

CONCLUSION: Atherosclerosis, as measured by higher CIMT, is related to a lower isometric handgrip strength at follow-up, but no further associations with physical functioning were found in this longitudinal study among independently living older men.
Carotid atherosclerosis and prospective risk of dementia.
Wendell CR; Waldstein SR; Ferrucci L; O'Brien RJ; Strait JB; Zonderman AB.
[Journal Article. Research Support, N.I.H., Intramural]
UI: 23103489

BACKGROUND AND PURPOSE: Although vascular risk factors have been implicated in the development of all-cause dementia and Alzheimer disease (AD), few studies have examined the association between subclinical atherosclerosis and prospective risk of dementia.

METHODS: Participants from the Baltimore Longitudinal Study of Aging (n=364; age, 60-95 years; median age, 73; 60% male; 82% white) underwent initial carotid atherosclerosis assessment and subsequently were assessed for dementia and AD annually for up to 14 years (median, 7.0). Cox proportional hazards models predicting all-cause dementia and AD were adjusted for age, sex, race, education, blood pressure, cholesterol, cardiovascular disease, diabetes mellitus, and smoking.

RESULTS: Sixty participants developed dementia, with 53 diagnosed as AD. Raw rates of future dementia and AD among individuals initially in the upper quintile of carotid intimal medial thickness or with bilateral carotid plaque were generally double the rates of individuals with intimal medial thickness in the lower quintiles or no plaque at baseline. Adjusted proportional hazards models revealed >2.5-fold increased risk of dementia and AD among individuals in the upper quintile of carotid intimal medial thickness, and approximately 2.0-fold increased risk of dementia among individuals with bilateral plaque.

CONCLUSIONS: Multiple measures of carotid atherosclerosis are associated with prospective risk of dementia. Individuals in the upper quintile of carotid intimal medial thickness or bilateral carotid plaque were at greatest risk. These findings underscore the possibility that early intervention to reduce atherosclerosis may help delay or prevent onset of dementia and AD.

Version ID
1
Record Owner
Carotid intima-media thickness is associated with cognitive deficiency in hypertensive patients with elevated central systolic blood pressure.

Dias Eda M; Giollo LT Jr; Martinelli DD; Mazeti C; Junior HM; Vilela-Martin JF; Yugar-Toledo JC.


[Comparative Study. Journal Article]
UI: 23078629
BACKGROUND: The role of hypertension in the loss of cognitive function is controversial. Relationships between hypertension and increases in cerebral vascular resistance, diffused lesions and multiple lacunar infarcts of the white matter are well known. Thus, the objectives of this study were: to evaluate the relationship between hypertension and cognitive dysfunction (CD), identify risk factors and determine the association between early markers of vascular disease and CD in hypertensive individuals.

METHODS: Two hundred individuals aged between 40 and 80 years old were evaluated in this cross-sectional prospective study. Fifty participants were controls (CT). The remaining 150 hypertensive patients were subdivided into two groups, those with CD (HCD) and those without CD (HNCD). All participants underwent clinical evaluations and biochemical blood tests were performed. CD was investigated using the Mini Mental State Examination (MMSE) following the guidelines for its use in Brazil. The impact of hypertension on the arterial bed was assessed by identifying and measuring changes in the intima-media thickness (IMT) by vascular ultrasonography of the carotid arteries and analyses of the central blood pressure and Augmentation Index by applanation tonometry of the radial artery.

RESULTS: There were no significant differences in the total cholesterol, high-density lipoprotein cholesterol and triglycerides plasma concentrations between the three groups. The serum creatinine and estimated glomerular filtration rate were within normal ranges for all three groups. A significantly lower MMSE score was recorded for the HCD Group compared to the HNCD and CT Groups (p-value < 0.05). The IMT was significantly different between the HNCD and HCD Groups (p-value = 0.0124). A significant difference in the IMT was also observed between hypertensive patients and the CT Group (p-value < 0.0001). Age, low-density cholesterol, high-density cholesterol, triglycerides and IMT increased the Odds Ratio for cognitive dysfunction. The central systolic pressure was significantly higher in the HCD and HNCD Groups compared to CT Group (p-value < 0.0001).

CONCLUSIONS: Hypertensive patients with CD have changes in the vascular morphology characterized by an increased carotid IMT, enhanced atherosclerotic lipid profile and impaired hemodynamic functional manifested by elevated central systolic blood pressure.
BACKGROUND: The vascular risk factors are associated with an increased risk for vascular cognitive decline (VCD), but also with Alzheimer disease (AD).

OBJECTIVE: To investigate vascular risk factors in relation to AD and VCD, with a non-invasive neurosonological methods in a clinical settings.

RESULTS: A total of 296 patients with AD and 237 patients with VCD were included in the study. Hypertension, hyperlipidemia, diabetes mellitus, stroke, and white matter changes (p<0.001) were
significantly more prevalent in VCD, although they were also present in AD patients. No statistically
significant differences were obtained between groups regarding coronary disease, atrial fibrillation,
average degree of carotid artery stenosis and carotid intima-media thickness (cITM). However, the
patients with AD had carotid artery stenosis ">50%" (p=0.007) and present plaques (p<0.001) more
frequently compared to vascular group. The significant associations between robust cognitive
measure and vascular factors, diabetes mellitus, carotid stenosis, cITM, and type of plaques were
identified only in VCD, but not in AD group.

CONCLUSIONS: The vascular risk factors were more prevalent in VCD group, although they were
also present in AD. With few treatment options available in AD, it may be important not to neglect
the vascular risk factors.

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Version ID
1

Record Owner
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Status
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MeSH Heading
Aged. Aged, 80 and over. Alzheimer Disease/di [Diagnosis]. *Alzheimer Disease/ep [Epidemiology].
Carotid Arteries/dg [Diagnostic Imaging]. Carotid Intima-Media Thickness. Cerebrovascular
Disorders/di [Diagnosis]. *Cerebrovascular Disorders/ep [Epidemiology]. Female. Humans.

Year of Publication
2012

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
Carotid atherosclerosis and 10-year changes in cognitive function.
Zhong W; Cruickshanks KJ; Schubert CR; Acher CW; Carlsson CM; Klein BE; Klein R; Chappell RJ.
[Journal Article. Research Support, N.I.H., Extramural]
UI: 22854188

BACKGROUND: Carotid atherosclerosis has been suggested to be involved in cognitive decline.
METHODS: The Epidemiology of Hearing Loss Study is a longitudinal study of aging among Beaver Dam residents, WI. In 1998-2000, carotid intima-media thickness (IMT) and plaque were measured by ultrasound; cognitive function was measured by the Mini-Mental State Examination (MMSE). Follow-up examinations were conducted in 2003-2005 and 2009-2010. Incidence of cognitive impairment was defined as an MMSE score <24 or reported physician-diagnosed dementia during the follow-up. In the last examination, five additional cognitive tests were added. The associations of carotid atherosclerosis with incident cognitive impairment and cognitive test performance ten years later were evaluated.
RESULTS: A total of 1651 participants (mean age 66.8 years, 41% men) without cognitive impairment at baseline were included in the incidence analysis. IMT was associated with incidence of cognitive impairment after multiple adjustments (hazard ratio: 1.09, p = 0.02 for each 0.1 mm increase in IMT). A total of 1311 participants with atherosclerosis data at baseline had the additional cognitive tests 10 years later. Larger IMT was associated with longer time to complete the Trail-Making Test-part B after multiple adjustments (0.1 mm IMT: 2.3 s longer, p = 0.02). Plaque was not associated with incident cognitive impairment or cognitive test performance 10 years later.
CONCLUSIONS: In this population-based longitudinal study, carotid IMT was associated with a higher risk of developing cognitive impairment during the 10-year follow-up, and was associated with poorer performance in a test of executive function 10 years later.

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Impaired cognitive function in patients with atherosclerotic carotid stenosis and correlation with ultrasound strain measurements.


UI: 22658531
INTRODUCTION: It has been postulated that up to 11 million "silent" strokes occur annually. While these patients are without classic neurologic deficits, they may exhibit cognitive decline. In this study, we examine the cognitive function of patients with carotid stenosis. Additionally, we evaluate a noninvasive measure of strain in pulsating carotid artery plaques to determine its ability to predict cognitive decline.

METHODS: We administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to 44 patients with carotid stenosis. All patients had stenosis meeting NASCET or ACAS criteria for endarterectomy, and were classified as symptomatic or asymptomatic as defined by these publications. Age-adjusted scores for each of the 5 RBANS domains (immediate memory, visuospatial ability, language, attention, and delayed memory) were compared between symptomatic and asymptomatic patients. Mean score for each of the 5 domains was then compared to all other domains, regardless of symptom status. From this cohort, 23 patients underwent assessment of carotid plaque strain by tracking displacements in ultrasound radiofrequency data to estimate axial and principal strains over the cardiac cycle.

RESULTS: Thirty symptomatic and 14 asymptomatic patients were studied. Visuospatial scores were significantly lower than any other domain regardless of symptoms (p<0.05 for all pairwise comparisons). No other domain score was significantly different from any other. In the language domain, asymptomatic patients scored significantly higher than symptomatic patients (p<0.05. For all other domains, no difference was found. Asymptomatic patients showed a relationship between plaque strain and immediate memory (r=-.61, p=ns). Left carotid disease was associated with poorer performance across multiple cognitive domains with increasing accumulated strain. This was not seen in right carotid disease.

CONCLUSION: Patients with large carotid plaques (>70% stenosis) exhibit significant difficulties in mental status whether classically symptomatic or asymptomatic. While language deficits may be a non-specific marker for stroke symptoms, visuospatial deficits are seen before classic symptoms, suggesting that carotid disease may become symptomatic earlier and more subtly than previously suspected. Abnormal strain distribution with pulsation may be related to cognition.
Atherosclerotic calcification relates to cognitive function and to brain changes on magnetic resonance imaging.

Bos D; Vernooij MW; Elias-Smale SE; Verhaaren BF; Vrooman HA; Hofman A; Niessen WJ; Witteman JC; van der Lugt A; Ikram MA.

[Journal Article. Research Support, Non-U.S. Gov't]
UI: 22537801

BACKGROUND: Increasing evidence suggests a role of atherosclerosis in the pathogenesis of cognitive impairment and dementia. Calcification volume measured with computed tomography (CT) is a valid marker of atherosclerosis. This study investigates associations of atherosclerosis (measured using CT) at four locations with cognition and brain changes on magnetic resonance imaging (MRI).

METHODS: To quantify calcification volume, 2414 nondemented people from the Rotterdam Study underwent CT of the coronary arteries, aortic arch, extracranial carotid arteries, and intracranial...
carotid arteries. To assess global cognition and performance on memory, executive function, information processing speed, and motor speed, they also underwent neuropsychological tests. In a random subgroup of 844 participants, brain MRI was performed. Automated segmentation and quantification of brain MRI scans yielded brain tissue volumes in milliliters. Diffusion tensor imaging was used to measure the microstructural integrity of the white matter. Relationships of atherosclerotic calcification with cognition, brain tissue volumes, and diffusion tensor imaging measures were assessed with linear regression models and adjusted for relevant confounders.

RESULTS: With larger calcification volumes, lower cognitive scores were observed. When calcification volumes were larger, total brain volumes were also smaller. Specifically, larger coronary artery calcification volumes related to smaller gray matter volumes, and extracranial and intracranial carotid calcification volumes related to smaller white matter volumes. Larger calcification volume in all vessel beds was accompanied by worse microstructural integrity of the white matter.

CONCLUSIONS: Larger calcification volume is associated with worse cognitive performance. It also relates to smaller brain tissue volumes and worse white matter microstructural integrity, revealing possible mechanisms through which atherosclerosis may lead to poorer cognition.
Year of Publication
2012

Link to the Ovid Full Text or citation:
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SFX

77.

Arntzen KA; Schirmer H; Johnsen SH; Wilsgaard T; Mathiesen EB.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 22537454

BACKGROUND: Carotid atherosclerosis is a risk factor for stroke and cognitive decline, but knowledge on how progression of carotid atherosclerosis affects cognitive function in stroke-free individuals is scarce.

METHODS: In the population-based Tromso study, we calculated the change in ultrasound-assessed carotid plaque number and total plaque area from baseline (survey 4) to follow-up 7 years later (survey 5) in 4274 middle-aged stroke-free subjects. Cognitive function was assessed at follow-up by the verbal memory test, the digit-symbol coding test, and the tapping test and repeated after an additional 6 years in a subgroup of 2042 subjects (survey 6). Associations between the average of survey 4 and survey 5 plaque scores and the progression of plaque scores and cognitive test scores were assessed in regression analyses adjusted for baseline age, sex, education, depression, and cardiovascular risk factors.

RESULTS: Progression of total plaque area was associated with lower scores in the digit-symbol coding test (multivariable adjusted standardized beta, -0.03; 95% CI, -0.05 to -0.00; P = 0.04) and the tapping test (beta, -0.03; 95% CI, -0.06 to -0.00; P = 0.03). Similar results were seen for progression of plaque number. The average plaque scores were associated with lower scores in all cognitive tests (P-values <= 0.01). No association was found between plaque scores and cognitive decline.
CONCLUSIONS: The average plaque scores were associated with lower scores in all cognitive tests. Progression of plaque scores was associated with lower scores in the digit-symbol coding test and the tapping test, but not with the verbal memory test or with cognitive decline.

Copyright © 2012 The Author(s) European Journal of Neurology © 2012 EFNS.
BACKGROUND: Carotid artery atherosclerosis is a major risk factor for stroke and subsequent cognitive impairment. Prospective population studies have shown associations between carotid intima-media thickness (IMT) and stenosis and cognitive decline and dementia in elderly stroke-free persons, whereas results in the middle-aged are conflicting.

METHODS: In this prospective population-based study, 4,371 stroke-free middle-aged participants underwent carotid ultrasound examination and assessment of vascular risk factors at baseline and were tested for cognitive function 7 years later. Associations between IMT, number of plaques and total plaque area and cognitive test scores on verbal memory test, digit symbol-coding test and tapping test were assessed in linear regression models.

RESULTS: In the multivariable analyses adjusted for sex, age, education, depression and vascular risk factors, the presence of plaques was significantly associated with lower test scores on the verbal memory test (p = 0.01) and on the digit symbol-coding test (p = 0.03). The number of plaques (p = 0.01) and the total plaque area (p = 0.02) were associated with lower scores on the verbal memory test. No significant association was seen between common carotid artery IMT and cognitive test scores. The tapping test was not associated with the carotid ultrasound variables.

CONCLUSIONS: In this middle-aged general population, subclinical carotid atherosclerosis measured as the presence of plaques, number of plaques and total plaque area were independent long-term predictors of lower cognitive test scores.

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Version ID 1

Record Owner
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Status MEDLINE

Authors Full Name Arntzen, Kjell Arne; Schirmer, Henrik; Johnsen, Stein Harald; Wilsaard, Tom; Mathiesen, Ellisiv B.

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Vascular predictors of cognitive decline in patients with mild cognitive impairment.
Viticchi G; Falsetti L; Vernieri F; Altamura C; Bartolini M; Luzzi S; Provinciali L; Silvestrini M.
[Comparative Study. Journal Article. Research Support, Non-U.S. Gov't]
UI: 22217417

Our aim in this study was to assess the relationship between the state of cerebral vessels and the risk of conversion from mild cognitive impairment (MCI) to Alzheimer’s disease (AD). We included 117 MCI patients. They underwent an ultrasonographic assessment of common carotid arteries intima-media thickness (IMT) and carotid plaque index. Cerebrovascular reactivity to hypercapnia in the middle cerebral arteries was calculated with the Breath-Holding Index (BHI). After a 12-month follow-up period, neuropsychological examinations demonstrated a progression to dementia in 21 patients. Pathological values of BHI and IMT significantly increased the risk of conversion (BHI: odds ratio, 5.80; 95% confidence interval, 1.83-18.37, p < 0.05; IMT: odds ratio, 3.08; 95% confidence interval, 1.02-9.33; p < 0.05, multinomial logistic regression analysis).

Comparison between patients with all normal values and those with the simultaneous alteration of the 2 vascular indexes showed an increase in the risk of conversion from 9% to 33% (ordinal regression analysis). Our findings show that alterations of cerebral vessel functional and anatomic status increase the risk of conversion from MCI to dementia.

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Atherosclerosis and dementia: a cross-sectional study with pathological analysis of the carotid arteries.

Suemoto CK; Nitrini R; Grinberg LT; Ferretti RE; Farfel JM; Leite RE; Menezes PR; Fregni F; Jacob-Filho W; Pasqualucci CA; Brazilian Aging Brain Study Group.


[Journal Article. Research Support, Non-U.S. Gov't]

UI: 21940957

BACKGROUND AND PURPOSE: Previous ultrasound-based studies have shown an association between carotid artery atherosclerosis and dementia. Our aim was to investigate this association using postmortem examination.

METHODS: Postmortem morphometric measurements of carotid stenosis and intima-media thickness were performed in individuals with dementia (n=112) and control subjects (n=577). Multivariate logistic regression models were applied.

RESULTS: High-grade left internal carotid stenosis (>=70%) was associated with increased odds for dementia (OR, 2.30; 95% CI, 1.14-4.74; P=0.02). Intima-media thickness was not associated with dementia.

CONCLUSIONS: The likelihood of dementia is increased with high-grade left internal carotid artery atherosclerosis after adjusting for demographic and cardiovascular risk factors.

Authors Full Name
Suemoto, Claudia K; Nitrini, Ricardo; Grinberg, Lea T; Ferretti, Renata E L; Farfel, Jose M; Leite, Renata E P; Menezes, Paulo R; Fregni, Felipe; Jacob-Filho, Wilson; Pasqualucci, Carlos A; Brazilian Aging Brain Study Group.

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MeSH Heading

Year of Publication
2011

Page 100
Carotid atherosclerosis and cognitive function in midlife: the Beaver Dam Offspring Study.
Zhong W; Cruickshanks KJ; Huang GH; Klein BE; Klein R; Nieto FJ; Pankow JS; Schubert CR.
[Journal Article. Research Support, N.I.H., Extramural]
UI: 21831374

BACKGROUND: Atherosclerosis may be associated with cognitive function; however the studies are few, especially among midlife adults.

METHODS: Participants in the beaver dam offspring study who had cognitive test data and gradable carotid artery ultrasound scans were included (n=2794, mean age: 49 years).
Atherosclerosis was measured by carotid intima-media thickness (IMT) and the presence of plaque. Cognitive function was measured by the trail making test (TMT), grooved pegboard test (GPT) and mini-mental state examination (MMSE). Generalized cognitive function was defined by a summary score calculated from the TMT and GPT. Linear regression was used to evaluate the associations between carotid atherosclerosis and cognitive function tests.

RESULTS: Larger IMT was associated with lower GPT, MMSE and the summary score adjusting for multiple factors, the coefficients were: 13.8s (p<0.0001), -0.6 (p=0.007), and 0.47 (p=0.01), respectively for 1 mm increase in IMT. Plaque scores were significantly associated with TMT-B, GPT, MMSE, and the summary score adjusting for age, sex and education. The associations remained statistically significant after further adjustments except for the association with TMT-B, which was attenuated and no longer significant.

CONCLUSIONS: Our results show the significant associations between markers of carotid atherosclerosis and cognitive function in a cohort of persons aged 21-84 years. Longitudinal studies are needed to further examine these associations.
A review of carotid atherosclerosis and vascular cognitive decline: a new understanding of the keys to symptomology. [Review]

Dempsey RJ; Vemuganti R; Varghese T; Hermann BP.


This review encourages the reader to consider cerebral vascular disease beyond the traditional clinical end points of major motor and speech strokes and to consider the possible impact of embolic cerebral vascular disease on vascular cognitive decline. This article examines the issue of "silent" strokes in the relationship between the structural stability of atherosclerotic carotid plaque and the development of nonmotor symptomatology, including cognitive decline. It addresses the question of the role of carotid emboli in silent stroke and their cognitive sequelae. In a study of endarterectomy patients, we relate plaque elasticity and its development of mechanical strain features and thinning of stabilizing fibrous cap at the point of these mechanical strain features. The possibility that microemboli from such mechanically unstable carotid plaques could contribute to silent strokes led to a study of cognitive function in such patients. A linear relationship between the process of mechanically unstable areas of carotid plaques and cognitive decline suggests a contributory role for such a process in silent strokes.
Vascular characteristics of patients with dementia.
Morovic S; Jurasic MJ; Martinic Popovic I; Seric V; Lisak M; Demarin V.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 19375085
Arterial beta stiffness index is a potential risk factor for increased stroke occurrence. Vascular component appears to be significant in both Alzheimer's disease (AD) and vascular dementia (VAD). We aimed to further explore vascular characteristics of patients with both types of cognitive decline using non-invasive neurosonological methods. There were 38 patients; 16 diagnosed with AD and 22 with VAD. Vascular risk factors were assessed and ultrasound measurements on common carotid artery (CCA) were performed using Aloka ProSound ALPHA 10 with 13 MHz linear probe. Among AD patients there were 5 with arterial hypertension (AH), 3 with atrial fibrillation (AF), 2 with diabetes mellitus (DM), 6 with hyper lipidemia and 1 smoker. Nineteen VAD patients had AH, 6 had AF, 12 had hyper lipidemia and one was diabetic. We found no statistically significant differences between groups regarding average body mass index (BMI), blood pressure, pulse pressure, intima-media thickness (IMT), CCA diameter or arterial beta stiffness indices. However, the trend of BMI increase, slight blood and pulse pressure decrease, CCA diameter increase and beta stiffness index increase was noted in VAD patients. Even though there was no significant difference found among two explored subgroups of patients with dementia, there was a tendency of greater systolic and diastolic diameters noted in VAD as well as greater stiffness, especially when measured in the right CCA. This indicates that VAD patients may have more prominent vascular changes that may help differentiate the type of dementia and further monitor these individuals. Further studies on a larger number of patients are needed to support this evidence.
Carotid intima-media thickness as a predictor of response to cholinesterase inhibitors in Alzheimer's disease: an open-label trial.
Modrego PJ; Rios C; Perez Trullen JM; Garcia-Gomara MJ; Errea JM.
CNS Drugs. 23(3):253-60, 2009.
[Clinical Trial. Journal Article]
UI: 19320533
BACKGROUND: Cholinesterase inhibitors are modestly effective in treating patients with Alzheimer’s disease. However, there may be important inter-individual variations ranging from no improvement at all to significant improvement and long periods of stabilization. Carotid atherosclerosis is associated with cognitive decline in elderly people.

OBJECTIVE: The objective of this study was to investigate whether carotid intima-media thickness (IMT) predicts response to cholinesterase inhibitors in Alzheimer’s disease.

PATIENTS AND METHODS: A series of 54 patients with mild to moderate Alzheimer’s disease were enrolled consecutively in an open-label trial. At baseline, all patients were assessed on the following clinical scales: Mini-Mental State Examination, Clinical Dementia Rating, the Hachinski Ischemic Scale, Blessed Dementia Rating Scale, Alzheimer’s Disease Assessment Scale-cognitive subscale (ADAS-cog), Neuropsychiatric Inventory (NPI) and a daily-living activities scale (Disability Assessment for Dementia [DAD]). Investigations included magnetic resonance imaging of the brain and a colour echo-Doppler scan of the carotid arteries to measure the maximum IMT. Patients were then commenced on galantamine treatment for 6 months, after which scores on the ADAS-cog, NPI and DAD scales were reassessed.

RESULTS: A total of 50 patients completed the study. Their mean age was 77.78 years (SD 6.51 years); 34 patients were female. Galantamine treatment decreased the mean NPI score from 17.68 to 13.86 points, but this difference was not statistically significant (p=0.07). On the ADAS-cog scale, a modest and nonsignificant mean difference of -0.4 points (p=0.7) was observed. A weak (correlation coefficient r=0.4) but significant correlation between IMT and changes in clinical scale score was found, with low carotid IMT being shown to be a predictor of response on both the ADAS-cog (p=0.003) and NPI (p=0.006) scales; these findings were corroborated in multivariate analysis. For men, the correlation was stronger (r=0.7 and 0.8 for the ADAS-cog and NPI scales, respectively).

CONCLUSION: Although the magnitude of effect was moderate, carotid IMT could be a significant predictor of clinical response to cholinesterase inhibitors in patients with Alzheimer’s disease.
Increased atherogenic lipoproteins are associated with cognitive impairment: effects of statins and subclinical atherosclerosis.

Carlsson CM; Nondahl DM; Klein BE; McBride PE; Sager MA; Schubert CR; Klein R; Cruickshanks KJ. Alzheimer Disease & Associated Disorders. 23(1):11-7, 2009 Jan-Mar.
[Journal Article. Research Support, N.I.H., Extramural. Research Support, Non-U.S. Gov't]
UI: 19266697

Hypercholesterolemia increases the risk for dementia. Some studies suggest that statins may protect cognition, but findings are conflicting. Unmeasured confounders, including high-density lipoprotein (HDL) cholesterol or subclinical atherosclerosis, may have influenced prior study.
outcomes. In older adults participating in a population-based cohort study (n=1711, aged 65 to 97 y), we investigated the relationships of total and HDL cholesterol levels, statin use, and carotid intima-media thickness with the prevalence of cognitive impairment. In adjusted models, participants in the highest quartile of non-HDL (total-HDL) cholesterol had an increased odds of cognitive impairment compared with those in the lowest quartile [odds ratio (OR): 2.06, 95% confidence interval (CI): 1.07-3.98]. Statin use was associated with lower odds of cognitive impairment in unadjusted models (OR: 0.57, 95% CI: 0.36-0.89), but this relationship was not significant after adjusting for vascular and lifestyle factors (OR: 0.84, 95% CI: 0.47-1.49). In this analysis of older adults, increased atherogenic lipoproteins were associated with impaired cognition. Statin use was related to many factors that both negatively and positively affect cognition, but was not associated with better cognitive function. These results suggest that confounding by indication may explain the contradictory findings in studies assessing the association of statins with cognition. Randomized-controlled clinical trials and longitudinal studies are necessary to determine if statins protect against cognitive decline.
Vascular structure and function is correlated to cognitive performance and white matter hyperintensities in older hypertensive patients with subjective memory complaints.

Kearney-Schwartz A; Rossignol P; Bracard S; Felblinger J; Fay R; Boivin JM; Lecompte T; Lacolley P; Benetos A; Zannad F.


[Journal Article. Research Support, Non-U.S. Gov't]

UI: 19246701

BACKGROUND AND PURPOSE: Arterial stiffening and thickening and endothelial dysfunction may be associated with cognitive decline or white matter hyperintensities (WMH) independently of blood pressure level. We aimed to investigate, using an integrative approach, the relative contributions of structural and functional vascular factors to the degree of cognitive impairment (primary outcome) and the severity of WMH (secondary outcome) in elderly hypertensive patients with subjective memory complaints, a group prone to dementia.

METHODS: A prospective, dedicated, cross-sectional population of 198 elderly hypertensive patients (mean age 69.3+/−6.2 years) with subjective memory complaints underwent a full set of cognitive function assessments, brain MRI with semiquantification of WMH, carotid ultrasonography, carotid-femoral pulse wave velocity, brachial endothelial function, and plasma von Willebrand Factor measurements.

RESULTS: After adjustment for the usual cardiovascular risk factors, increased arterial stiffness (as assessed by pulse wave velocity) was significantly and independently associated with memory impairment in men. The severity of WMH was independently associated with increased carotid
intima media thickness and stiffness (as assessed by augmentation index) as well as with increased age and plasma levels of von Willebrand Factor, a biomarker of endothelial dysfunction.

CONCLUSIONS: Our data suggest that vascular abnormalities, independently of blood pressure levels, may play a role in the setting of subjective memory complaints as well as of WMH in elderly hypertensive patients. Arterial thickness and stiffness as well as endothelial function should be assessed simultaneously and may represent additional targets for the prevention of subjective memory complaints and WMH.

Version ID
1

Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.

Status
MEDLINE

Authors Full Name
Kearney-Schwartz, Anna; Rossignol, Patrick; Bracard, Serge; Felblinger, Jacques; Fay, Renaud; Boivin, Jean-Marc; Lecompte, Thomas; Lacolley, Patrick; Benetos, Athanase; Zannad, Faiez.

Institution
Kearney-Schwartz, Anna. Nancy University Hospital, Clinical Investigation Centre, J d'Arc Hospital, Dommartin les Toul, France.

Comments
Comment in (CIN)

MeSH Heading

Year of Publication
2009

Link to the Ovid Full Text or citation:
Click here for full text options
Subclinical atherosclerosis is weakly associated with lower cognitive function in healthy hyperhomocysteinemic adults without clinical cardiovascular disease.

Gatto NM; Henderson VW; St John JA; McCleary C; Detrano R; Hodis HN; Mack WJ.


[Journal Article. Randomized Controlled Trial. Research Support, N.I.H., Extramural]

UI: 18836986

OBJECTIVE: Atherosclerosis is the most common pathologic process underlying cardiovascular disease (CVD). It is not well known whether subclinical atherosclerosis is an independent risk factor for lower cognitive function among individuals without clinically evident CVD.

METHODS: We examined cross-sectional associations between subclinical atherosclerosis and cognitive function in a community-based sample of otherwise healthy adults with plasma homocysteine \( \geq 8.5 \) micromol/L enrolled in the BVAIT study \((n = 504, \text{ mean age 61 years})\).

Carotid artery intima-media thickness (CIMT), coronary artery calcium (CAC) and abdominal aortic calcium (AAC) were used to measure subclinical atherosclerosis. Cognitive function was assessed with a battery of neuropsychological tests. A principal components analysis was used to extract five uncorrelated cognitive factors from scores on individual tests, and a measure of global cognition was derived. Multivariable linear regression was used to examine the association between subclinical atherosclerosis and cognitive function, adjusting for other correlates of cognition.

RESULTS: Increasing thickness of CIMT was associated with significantly lower scores on the verbal learning factor \((\beta = -0.07 \text{ per } 0.1 \text{ mm increase CIMT } [SE(\beta) = 0.03], \text{ } p = 0.01)\). CAC and AAC were not individually associated with any of the cognitive factors.

CONCLUSIONS: This study provides evidence that increasing CIMT is weakly associated with lower verbal learning abilities but not global cognition in a population of otherwise healthy middle-to-older aged adults with elevated plasma homocysteine levels but without clinically evident CVD. The association between CIMT and poor verbal learning may pertain particularly to men.

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Version ID

1
Carotid atherosclerosis and cognitive decline in patients with Alzheimer's disease.
Silvestrini M; Gobbi B; Pasqualetti P; Bartolini M; Baruffaldi R; Lanciotti C; Cerqua R; Altamura C; Provinciali L; Vernieri F.
Aim of the study was to explore the correlation between the progression of carotid atherosclerosis and the evolution of cognitive impairment in 66 patients with Alzheimer’s disease (AD). They underwent cognitive status evaluation and ultrasonography (US) to investigate carotid arteries intima-media thickness (IMT) and plaque index (PI). After a 12-month follow-up period, neuropsychological and US examinations were repeated to assess the progression of carotid atherosclerosis and of cognitive decline [in terms of changes in Mini Mental State Examination (MMSE) scores]. MMSE score changes were related to baseline IMT (p=0.018), changes in IMT (p<0.001) and PI (p=0.006), and "antihypertensive drug intake" (p<0.001). While the first three variables correlated with increased cognitive impairment, the last one was associated with a reduced extent of MMSE score decline. Results show a link between progression of carotid wall changes and of cognitive decline, and suggest a possible protective role of antihypertensive therapy. Given the potential clinical implications, our preliminary findings could stimulate further investigations into the role of vascular impairment in patients with AD.
Socioeconomic status moderates the association between carotid intima-media thickness and cognition in midlife: evidence from the Whitehall II study.
Singh-Manoux A; Britton A; Kivimaki M; Gueguen A; Halcox J; Marmot M.
Atherosclerosis. 197(2):541-8, 2008 Apr.

BACKGROUND: Common carotid artery intima-media thickness (IMT) is a measure of generalized atherosclerosis and has been shown to be associated with cognitive function. We examine two questions: does socioeconomic status (SES) moderate this association and is IMT more strongly associated with specific aspects of cognitive function?

METHODS: Data are drawn from the Phase 7 (2003-2004) of the Whitehall II study (N=3896). In cross-sectional analyses the association between IMT and six measures of cognition (short-term verbal memory, inductive reasoning, vocabulary, semantic and phonemic fluency and a measure of global cognitive status) was examined in analyses adjusted for previous history of coronary heart disease, health behaviours and other vascular risk measures such as blood pressure, cholesterol and body mass index.

RESULTS: The overall association between IMT and the six measures of cognition was restricted to the low SES group (p=0.02). Within this group, IMT was significantly associated with inductive reasoning (p=0.001), vocabulary (p=0.002), phonemic (p=0.006) and semantic fluency (p=0.02). The covariates examined explained about a quarter of the association between IMT and cognition in the low SES group. The associations with the measure of inductive reasoning (p=0.02), vocabulary (p=0.02) and phonemic fluency (p=0.04) remained after adjustment for all covariates.
CONCLUSIONS: SES is an important modifier of the association between IMT and cognition, an inverse association between the two was observed only in the low SES group. It is possible that high cognitive reserve among the high SES individuals prevents the functional manifestations of atherosclerosis. Verbal memory was not one of the cognitive domains associated with IMT.

Version ID
1

Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.

Status
MEDLINE

Authors Full Name
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MeSH Heading

Year of Publication
2008

Link to the Ovid Full Text or citation:
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Link to the External Link Resolver:
SFX
Carotid intima-media thickness and cognitive function in elderly women: a population-based study.

Komulainen P; Kivipelto M; Lakka TA; Hassinen M; Helkala EL; Patja K; Nissinen A; Rauramaa R.


[Comparative Study. Journal Article. Research Support, Non-U.S. Gov't]

UI: 17851259

OBJECTIVE: Several vascular risk factors have been linked to cognitive decline. However, little is known about the association between the atherosclerotic process and cognitive impairment. We investigated whether carotid intima-media thickness (IMT) predicts the risk of cognitive impairment and whether the putative impairment is specific for some cognitive domains.

METHODS: A 12-year population-based follow-up study was performed for a total of 91 women, aged 60-70 years at baseline. Ultrasonographically assessed carotid artery IMT and the Mini-Mental State Examination test were performed at baseline and 12-year follow-up. A detailed cognitive evaluation for memory and cognitive speed was performed in 2003. The mean of left and right carotid bifurcation IMT was used in the analyses for association with the risk for poor cognitive speed and memory.

RESULTS: Increased IMT at baseline was an independent predictor for poor memory (beta = -5.004, 95% confidence interval = -7.74 to -2.27; p = 0.001) and cognitive speed (beta = 2.562, 95% confidence interval = 1.19-4.94; p = 0.035) at 12-year follow-up after adjustment for age, education, depression, plasma LDL cholesterol, systolic blood pressure, cardiovascular disease, hormone replacement therapy, smoking, alcohol consumption and physical activity. The risk for poor memory (p = 0.023 for linear trend) and cognitive speed (p = 0.070 for linear trend) increased with increasing IMT tertiles.

CONCLUSIONS: Carotid IMT predicts an increased risk for cognitive impairment, particularly poor memory and cognitive speed, in elderly women.

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Version ID

1

Record Owner

From MEDLINE, a database of the U.S. National Library of Medicine.

Status

MEDLINE

Authors Full Name

Komulainen, Pirjo; Kivipelto, Miia; Lakka, Timo A; Hassinen, Maija; Helkala, Eeva-Liisa; Patja, Kristiina; Nissinen, Aulikki; Rauramaa, Rainer.

Institution
Cerebrovascular risk factors, vascular disease, and neuropsychological outcomes in adults with major depression.

Smith PJ; Blumenthal JA; Babyak MA; Hoffman BM; Doraiswamy PM; Waugh R; Hinderliter A; Sherwood A.


[Journal Article. Research Support, N.I.H., Extramural]

UI: 17634564

OBJECTIVE: To investigate the relationship of cerebrovascular risk factors (CVRFs), endothelial function, carotid artery intima medial thickness (IMT), and neuropsychological performance in a sample of 198 middle-aged and older individuals with major depressive disorder (MDD). Neuropsychological deficits are common among adults with MDD, particularly among those with CVRFs and potentially persons with subclinical vascular disease.

METHODS: CVRFs were indexed by the Framingham Stroke Risk Profile (FSRP) and serum cholesterol levels obtained by medical history and physical examination. Patients completed a neuropsychological test battery including measures of executive functioning, working memory,
and verbal recall. Vascular function was indexed by carotid artery IMT and brachial artery flow mediated dilation (FMD). Hierarchical multiple regression analyses were used to investigate the association between CVRFs, vascular disease, and neurocognitive performance.

RESULTS: Greater FSRP scores were associated with poorer executive functioning (b = -0.86; p = .041) and working memory (b = -0.90; p = .024). Lower high-density lipoprotein levels also were associated with poorer executive functioning (b = 1.03; p = .035). Higher IMT (b = -0.83; p = .028) and lower FMD (b = 1.29; p = .032) were associated with poorer executive functioning after controlling for CVRFs. Lower FMD was also associated with poorer working memory (b = 1.58; p = .015).

CONCLUSIONS: Greater CVRFs were associated with poorer neuropsychological performance. Vascular dysfunction also was associated with neuropsychological decrements independent of traditional CVRFs.
OBJECTIVE: Atherosclerosis has been implicated in the development of dementia and its major subtypes, Alzheimer's disease and vascular dementia. However, support for this association mainly comes from cross-sectional studies. We investigated the association of atherosclerosis with dementia and subtypes of dementia during long follow-up, with various noninvasive measures of atherosclerosis.

METHODS: This study was based on 6,647 participants in the Rotterdam Study, a population-based prospective cohort study among 7,983 elderly subjects. At baseline (1990-1993) and at the third survey (1997-1999), common carotid intima media thickness, carotid plaques, and peripheral arterial disease (measured as ankle-brachial index) were measured. During follow-up (mean, 9.0 years), 678 subjects developed dementia. We estimated the associations of different measures of atherosclerosis with risk for dementia and subtypes of dementia by means of Cox proportional hazard models. Analyses were repeated and stratified on duration of follow-up. To evaluate competing risk for mortality, we examined the association between measures of atherosclerosis and risk for dementia or mortality by combining the two in a single outcome measure.

RESULTS: We found that atherosclerosis, predominantly carotid atherosclerosis, was associated with an increased risk for dementia during short follow-up. This association attenuated with longer follow-up, likely because of the strong association between atherosclerosis and mortality. The associations did not differ across apolipoprotein E genotypes.

INTERPRETATION: Our findings suggest that atherosclerosis is associated with an increased risk for dementia. Stronger associations between atherosclerosis and mortality may attenuate the association between atherosclerosis and dementia in prospective cohort studies with long follow-up periods.

Version ID
Carotid artery intima-media thickness and cognition in cardiovascular disease.
Haley AP; Forman DE; Poppas A; Hoth KF; Gunstad J; Jefferson AL; Paul RH; Ler AS; Sweet LH; Cohen RA.
[Comparative Study. Journal Article. Research Support, N.I.H., Extramural]
UI: 17196687
BACKGROUND: Increased carotid artery intima-media thickness (IMT) is a non-invasive marker of systemic arterial disease. Increased IMT has been associated with atherosclerosis, abnormal arterial mechanics, myocardial infarction, and stroke. Given evidence of a relationship between cardiovascular health and attention-executive-psychomotor functioning, the purpose of this study was to examine IMT in relation to neuropsychological test performance in patients with a variety of cardiovascular diagnoses.
METHODS: One hundred and nine participants, ages 55 to 85, underwent neuropsychological assessment and B-mode ultrasound of the left common carotid artery. IMT was calculated using an automated algorithm based on a validated edge-detection technique. The relationship between IMT and measures of language, memory, visual-spatial abilities and attention-executive-psychomotor functioning was modeled using hierarchical linear regression analyses adjusted for age, education, sex, cardiovascular risk, current systolic blood pressure, and history of coronary artery disease (CAD).
RESULTS: Increased IMT was associated with significantly lower performance in the attention-executive-psychomotor domain (IMT beta=-0.26, p<.01), independent of age, education, sex, cardiovascular risk, current systolic blood pressure, and CAD (F(10,100)=3.61, p<.001). IMT was not significantly related to language, memory, or visual-spatial abilities.
CONCLUSIONS: Our findings suggest that, in patients with cardiovascular disease, IMT may be associated with the integrity of frontal subcortical networks responsible for attention-executive-psychomotor performance. Future studies are needed to clarify the mechanisms by which IMT affects cognition and examine potential interactions between increased IMT and other measures of cardiovascular health such as blood pressure variability, cardiac systolic performance, and systemic perfusion.
Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
Authors Full Name
Cognitive impairment and carotid atherosclerosis in a general Italian midlife and old population.
Prati P; Casaroli M; Bignamini A; Scotti S; Canciani L; Ruscio M; Balestriere M; Bornstein N; Zanetti O; Tosetto A; Castellani S; Pantoni L; Touboul PJ; Inzitari D.
[Journal Article. Research Support, Non-U.S. Gov't]
UI: 16804332
The authors describe the design and the general, ultrasonographic, neuropsychological methodology of an observational epidemiological population survey, named REMEMBER (Registry Evaluation Memory in Buttrio e Remanzacco) conducted in the northeast of Italy in a randomized stratified sample of 1,026 subjects (554 F and 472 M) aged 55-98 years. The study was planned as
cross-sectional and longitudinal survey of cognitive impairment, cardiovascular risk factors, carotid atherosclerosis in a midlife and older Italian population sample. The objectives of the first phase are to assess the prevalence of the different types of dementia, the cognitive impairment non-dementia, the cardiovascular risk factors, the carotid intima-media thickness and arterial distensibility, and of depression. The conclusions of this study will make it possible to organize preventive and interventional strategies for these epidemic conditions.

Version ID
1

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Status
MEDLINE

Authors Full Name
Prati, P; Casaroli, M; Bignamini, A; Scotti, S; Canciani, L; Ruscio, M; Balestrieri, M; Bornstein, N; Zanetti, O; Tosetto, A; Castellani, S; Pantoni, L; Touboul, P J; Inzitari, D.

Institution
Prati, P. Department of Neurology, Gervasutta Hospital, Udine, Italy. patrizio.prati@tin.it

MeSH Heading

Year of Publication
2006

Link to the Ovid Full Text or citation:
Click here for full text options

Link to the External Link Resolver:
SFX

119.
Carotid intima-media thickness and cognitive decline: what does it mean for prevention of dementia?.
Spence JD.
[Comment. Editorial]
UI: 15337609
Version ID
1
Record Owner
From MEDLINE, a database of the U.S. National Library of Medicine.
Status
MEDLINE
Authors Full Name
Spence, J David.
Comments
Comment on (CON)
MeSH Heading
0 (Angiotensin-Converting Enzyme Inhibitors).
Year of Publication
2004

Link to the Ovid Full Text or citation:
Click here for full text options

Link to the External Link Resolver:
SFX
Small dense low-density lipoprotein and carotid atherosclerosis in relation to vascular dementia. Watanabe T; Koba S; Kawamura M; Itokawa M; Idei T; Nakagawa Y; Iguchi T; Katagiri T. Metabolism: Clinical & Experimental. 53(4):476-82, 2004 Apr. [Comparative Study. Journal Article]

Vascular dementia (VaD) and Alzheimer’s disease (AD) are the most common causes of dementia in the elderly. The aim of this study was to investigate carotid atherosclerosis, serum lipid profiles, and atherogenic hormone levels in nondiabetic Japanese men with VaD or AD. Carotid artery intima-media thickness (IMT) and plaque, serum lipid and lipoprotein profiles, including low-density lipoprotein (LDL) particle size, as well as insulin-like growth factor-I (IGF-I, somatomedin C) and testosterone levels, were determined in 34 patients with AD, 37 patients with VaD, and 63 healthy male controls. Age, body mass index, systolic and diastolic blood pressure, and fasting plasma glucose, hemoglobin A1c (HbA1c), triglyceride, high-density lipoprotein (HDL)-cholesterol, and apolipoproteins (apo) A-I, B, and E levels did not differ significantly among the 3 groups. However, the mean value of carotid IMT, the frequency of atherosclerotic plaque deposition, the serum levels of LDL-cholesterol, lipoprotein(a), and lipid peroxides, and the incidence of small dense LDL (particle diameter ≤ 25.5 nm) were increased significantly in VaD patients compared with AD patients or controls. VaD patients had a close reverse correlation between carotid IMT and LDL particle diameter, which were statistically proven independent risk factors for VaD. In contrast, AD patients had significantly lower serum levels of IGF-I and testosterone than either VaD patients or controls. Our results indicate that VaD is associated with atherogenic dyslipidemia, in particular, small dense LDL and carotid atherosclerosis, whereas AD is associated with hyposomatomedinemia and hypogonadism rather than atherosclerosis.
Ultrasonographic assessment of carotid wall characteristics and cognitive functions in a community sample of 59- to 71-year-olds. The EVA Study Group.
Auperin A; Berr C; Bonithon-Kopp C; Touboul PJ; Ruelland I; Ducimetiere P; Alperovitch A.
[Journal Article]
UI: 8711788
BACKGROUND AND PURPOSE: This study was aimed at analyzing cross-sectional relationships between cognitive performance and ultrasonographic assessment of carotid wall characteristics.
METHODS: A cohort of 1279 subjects (men, 41%) aged 59 to 71 years was recruited from the electoral rolls of the city of Nantes (western France). Cognitive performances were evaluated with the Mini-Mental State Examination (MMSE) and seven neuropsychological tests assessing
attention, psychomotor rapidity, verbal abilities, memory, and visuospatial perception. For each
test, subjects were classified into three performance levels with a quartile distribution: 25% highest,
25% lowest, and 50% middle. The intima-media thickness of common carotid arteries and the
presence of plaques in the carotid arteries were assessed with B-mode ultrasound examination.
RESULTS: Only 28% of men and 17% of women had carotid plaques inducing moderate stenosis of
the lumen ( < 40%). After adjustment for possible confounders, odds ratios for poor cognitive
performance associated with plaques were above 1 for all cognitive tests in men. This association
was statistically significant for the MMSE and another test assessing attention skills. There was a
slight association between increase of the common carotid intima-media thickness and poor
cognitive scores in men with plaques. In women, no association was found between cognitive
functions and presence of plaques or intima-media thickness.
CONCLUSIONS: This study indicated a moderate association between atherosclerosis of the
carotid arteries and poor cognitive functioning in men aged 59 to 71 years. In view of these
moderate cross-sectional results, further studies are required to better assess the relationship
between carotid atherosclerosis and cognitive impairment.
Eligibility Form: IS ASYMPTOMATIC ATHEROSCLEROSIS IN CAROTID ARTERIES ASSOCIATED WITH COGNITIVE FUNCTION?
A SYSTEMATIC REVIEW AND META-ANALYSIS

<table>
<thead>
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<th>1. Reference details</th>
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<tr>
<td>Reference citation</td>
</tr>
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<td>First author</td>
</tr>
<tr>
<td>Year of publication</td>
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<td>Title of the paper</td>
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<th>2. Study eligibility</th>
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<tr>
<td>Inclusion of the study</td>
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<td>□ No MMSE cognitive test</td>
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<td>□ No IMT Assessment</td>
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<tr>
<td>□ Other imaging modality not ultrasound</td>
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<td>□ review articles, conference abstract, letters to the editor, case reports</td>
</tr>
<tr>
<td>□ Duplicate</td>
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Notes:

Additional information
Notes:

DO NOT PROCEED IF PAPER EXCLUDED FROM REVIEW

Data Extraction Form
### 3. Study details

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<thead>
<tr>
<th>Study (cohort) name</th>
<th>The EVA Study</th>
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<tr>
<td>Study design</td>
<td>Longitudinal study</td>
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<tr>
<td>Region/country</td>
<td>Nantes (western France)</td>
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<tr>
<td>Sample size</td>
<td>1279</td>
</tr>
<tr>
<td>Mean (range) age</td>
<td>Mean ± SD: mean age, 65.0+/−3.0 years</td>
</tr>
<tr>
<td>Sex</td>
<td>Male, n (%): 526 men</td>
</tr>
<tr>
<td></td>
<td>Female, n (%): 753 women</td>
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<tr>
<td>Follow-up duration</td>
<td>n/a</td>
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<td>Clinical variables (n, %)</td>
<td>n/a</td>
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<tr>
<td>Hypertension</td>
<td>n/a</td>
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<tr>
<td>Diabetes mellitus</td>
<td>n/a</td>
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### 4. Exposure details

<table>
<thead>
<tr>
<th>Hardware: Ultrasound Machine</th>
<th>an Aloka SSD-650 with a 7.5-MHz transducer.</th>
</tr>
</thead>
</table>

The ultrasound examination involved scanning the common carotid arteries, the carotid bifurcations, and the first 2 cm of the internal carotid arteries. The IMT (distance between the media-adventitia interface and the lumen-intima interface) was automatically measured twice on longitudinal B-mode images of the far wall of each common carotid artery at plaque-free sites. The common carotid IMT was defined as the mean of four measurements. All segments of the carotid arteries were scanned longitudinally and transversely to assess the presence of plaques, and a localized echo-structure protruding into the lumen was considered to be a plaque if the distance between the media-adventitia interface and the internal side of the lesion was > or = to 1 mm. The total number of plaques was recorded. For each, maximum thickness was measured perpendicular to the vessel wall. When several plaques were present in the same carotid segment (ie, common carotid artery or bifurcation/origin of the internal carotid artery), plaque thickness measurement was made only for that with the greatest protrusion into the lumen. On the basis of transverse views, the degree of carotid stenosis was defined as (1-residual area/vessel area) times 100%.
5. Outcomes’ details

<table>
<thead>
<tr>
<th>Type has of outcomes used in this review</th>
<th>Outcomes reported in this study (n)</th>
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<tbody>
<tr>
<td><strong>Primary outcome(s)</strong></td>
<td></td>
</tr>
<tr>
<td>Global cognitive function</td>
<td>neuropsychological battery that included seven tests assessing different cognitive functions and a global test (MMSE) of 18 items roughly assessing various cognitive skills with scores ranging from 0 to 30.</td>
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Notes:

6. Available number of participants

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
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<td>Baseline sample size</td>
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<tr>
<td>follow-up</td>
<td>Yes</td>
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<tr>
<td>Total number included in the analysis</td>
<td>Yes</td>
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<tr>
<td>All subjects accounted for</td>
<td>Yes</td>
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Notes:

7. Statistical analysis

<table>
<thead>
<tr>
<th>Statistical method used</th>
<th>Nominal polychotomous logistic regressions [13] (BMDP statistical software) were used to analyze the relationships between each cognitive score distribution of the eight neuropsychological tests and carotid characteristics (presence of plaques, IMT), adjusting for age, education, depressive symptomatology, systolic blood pressure, body mass index, smoking, and alcohol consumption.</th>
</tr>
</thead>
</table>
A Modified Newcastle-Ottawa Quality Assessment for Observational Studies

The quality of included studies was assessed using a modified seven-point criteria derived from Newcastle-Ottawa scale (Wells et al., 2000). Each of the following criteria (A to G) was assigned 1 point if met.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sample</th>
<th>Yes</th>
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<th>NR</th>
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<tbody>
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<th>Exposure</th>
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*‘In accord’ needs to be interpreted reasonably since some studies will precede these guidelines and others, while deviating slightly may not deviate sufficiently to be out of accord with the guidelines.*
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<td>D) Relevant confounders measured†</td>
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<td>Yes = sex, age, smoking, hypertension/blood pressure, diabetes, hyperlipidemia/blood lipids/body mass index</td>
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† relevant confounders listed here were selected on the basis of various components of the Framingham Cardiovascular risk score (https://framinghamheartstudy.org/fhs-risk-functions/cardiovascular-disease-10-year-risk/).
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TOTAL (maximum 7)

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References

Wells, G. et al. (2000) The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses, Ottawa, ON: Ottawa Hospital Research Institute.
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<th>No</th>
<th>NR</th>
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<tbody>
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<td>Sample</td>
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<td>C) Validated measurement tool</td>
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<td>Yes = high-resolution ultrasound system with linear ultrasound transducers at frequencies &gt;7 MHz and measurement protocol for cIMT and plaque in accord with American Society Echocardiography/Mannheim Consensus Guidelines. Data analysis performed independently and blinded using validated analysis system</td>
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************ ‘In accord’ needs to be interpreted reasonably since some studies will precede these guidelines and others, while deviating slightly may not deviate sufficiently to be out of accord with the guidelines.
D) Relevant confounders measured††††††††††††
  Yes = sex, age, smoking, hypertension/blood pressure, diabetes, hyperlipidemia/blood lipids/body mass index
  No = potential confounders not measured or not reported

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Yes</th>
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TOTAL (maximum 7)

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†††††††††††† relevant confounders listed here were selected on the basis of various components of the Framingham Cardiovascular risk score (https://framinghamheartstudy.org/fhs-risk-functions/cardiovascular-disease-10-year-risk/).
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<th>Note</th>
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**Supplementary Table S1A. Longitudinal studies**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>Sampling frame / Health conditions</th>
<th>Sample size</th>
<th>Age (years±SD)</th>
<th>Female (%)</th>
<th>Presence of Plaque (n)</th>
<th>cIMT measurement (mm±SD)</th>
<th>MMSE (score±SD)</th>
<th>Major relevant finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auperin, et al. ¹</td>
<td>France</td>
<td>Community-based sample</td>
<td>Male: 521 Female: 753</td>
<td>65±3</td>
<td>60</td>
<td>Male: Yes (358) Female: Yes (217)</td>
<td>Male: 0.69±0.14 Female: 0.65±0.11</td>
<td>Male: 28.3±2 Female: 27.9±2.3</td>
<td>No evidence of an association between cIMT and MMSE in either sex. Associaton between presence of carotid plaques and impaired MMSE in men. No evidence of an associatio n in women</td>
</tr>
<tr>
<td>Authors</td>
<td>Country</td>
<td>Study Description</td>
<td>Control:</td>
<td>VaD:</td>
<td>AD:</td>
<td>Comparing VaD patients with controls. MMSE was lower, cIMT was greater and carotid plaques more frequent</td>
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<tr>
<td>Watanabe, et al. 2</td>
<td>Japan</td>
<td>Patients with vascular dementia (VaD) and age-matched controls</td>
<td>C: 72±11</td>
<td>VaD: 75±8</td>
<td>AD: 76±9</td>
<td>Control: Yes (15)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VaD: 0.68±0.11</td>
<td>AD: 0.94±0.2</td>
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<tr>
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<td></td>
<td></td>
<td>VaD: Yes (28)</td>
<td>AD: Yes (18)</td>
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<tr>
<td>Haley, et al. 3</td>
<td>USA</td>
<td>Cardiology patients and volunteers</td>
<td>109</td>
<td>69.18±7.43</td>
<td>43</td>
<td>N/A</td>
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<td></td>
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<td></td>
<td>Control: 26±3</td>
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<td></td>
<td></td>
<td></td>
<td>VaD: 13±6</td>
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<td></td>
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<td></td>
<td>AD: 10±5</td>
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</tbody>
</table>

Increased cIMT was significantly associated with poorer performance on measures of global cognitive functioning. Increased cIMT was not independently related to performance.
Muller, et al. 4  
Netherlands  
Community-based sample, age-stratified selection and further stratified by cardiovascular disease status  
No CVD: 217  
Subclinical CVD: 125  
Prevalent CVD: 54  
No CVD: 54±10.3  
Subclinical CVD: 66.8±8.1  
Prevalent CVD: 67.7±8.8  
0  
N/A  
No CVD: >28 (n=100, 63%)  
Subclinical CVD: >28 (n=49, 31%)  
Prevalent CVD: >28 (n=11, 7%)  
No CVD: ≤28 (n=117, 50%)  
Subclinical CVD: ≤28 (n=73, 31%)  
Prevalent CVD: ≤28 (n=43, 18%)  
Associatio n of cIMT with MMSE not presented. Thicker cIMT was associated with lower scores on memory functioning.

Singh-Manoux, et al. 5  
UK  
Occupational sample excluding individuals with stroke  
High SES, Male: 1190  
High SES, Female: 185  
Intermediate SES, Male: 1477  
Intermediate SES, Female: 490  
High SES, Male: 62.32±5.61  
High SES, Female: 59.8±5.49  
Intermediate SES, Male: 60±71  
Intermediate SES, Female: 60±5.93  
High SES: 17  
Intermediate SES: 45  
Low SES: 38  
N/A  
N/A  
High SES, Male: 0.8±0.16  
High SES, Female: 0.76±0.13  
Intermediate SES, Male: 0.79±0.16  
Intermediate SES, Female: 0.77±0.13  
High SES, Male: 28.9±1.19  
High SES, Female: 29.16±1.04  
Intermediate SES, Male: 28.71±1.31  
Intermediate SES, Female: 0.77±0.13  
An inverse association between cIMT and cognition was observed only in the low SES group. Evidence that SES
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Design</th>
<th>Sample Description</th>
<th>cIMT</th>
<th>MMSE</th>
<th>cIMT</th>
<th>MMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlsson, et al. 6</td>
<td>USA</td>
<td>Population-based sample</td>
<td>No cognitive impairment: 1358, Cognitive impairment: 180</td>
<td>Low SES, Male: 60.84±6.51, F: 62±5.73</td>
<td>0.82±0.18</td>
<td>Low SES, Male: 27.86±1.7, Female: 28.18±1.55</td>
<td>0.79±0.14</td>
</tr>
<tr>
<td>El-Kattan, et al. 7</td>
<td>Egypt</td>
<td>Vascular surgery patients and age- sex-matched healthy controls / PAD (66.6%)</td>
<td>Control: 10 PAD without CVD: 10, PAD with CVD: 20</td>
<td>Low SES, Male: 141, Low SES, F: 413</td>
<td>74.8±6.6</td>
<td>Low SES, Male: 28.88±1.24, Low SES, Female: 28.18±1.55</td>
<td>0.95±0.23</td>
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</table>

Patients with peripheral arterial disease had higher cIMT and lower MMSE compared to healthy controls.
<table>
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<tr>
<th>Study</th>
<th>Country</th>
<th>Sample Details</th>
<th>n</th>
<th>Mean ± SD</th>
<th>Hypertension (n)</th>
<th>Odds Ratio ± SE</th>
<th>cIMT ± SD</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kearney-Schwartz, et al. ⁸</td>
<td>France</td>
<td>Hypertensive patients with subjective memory complaints but excluding individuals with MMSW ≤24</td>
<td>198</td>
<td>69.3±6.2</td>
<td>53</td>
<td>N/A</td>
<td>0.68±0.09</td>
<td>28.3±2.4</td>
</tr>
<tr>
<td>Zhong, et al. ⁹</td>
<td>USA</td>
<td>Population-based sample</td>
<td>2794</td>
<td>49±9.8</td>
<td>54</td>
<td>N/A</td>
<td>0.65±0.15</td>
<td>28.7±1.3</td>
</tr>
<tr>
<td>Dias, et al. ¹⁰</td>
<td>Brazil</td>
<td>HTN patients and non-HTN, non-cognitively impaired controls identified from Controls: 48 HTN without cognitive impairment: 108 HTN with cognitive Controls: 44.5±7.9 HTN without cognitive impairment: 55.75±8.6 HTN with cognitive C 62.5 HTN without cognitive impairment: 53.7 HTN with cognitive Controls: 0.69±1 HTN without cognitive impairment: 0.89±0.2 HTN with cognitive Controls: 27.77±4.4 HTN without cognitive impairment: 28.44±1.3 HTN with cognitive</td>
<td>HTN without cognitive</td>
<td>N/A</td>
<td>Controls: 0.69±1 HTN without cognitive impairment: 0.89±0.2 HTN with cognitive Controls: 27.77±4.4 HTN without cognitive impairment: 28.44±1.3 HTN with cognitive</td>
<td>Higher cIMT was associated with higher odds ratio of MMSE score ≤24</td>
<td></td>
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</table>
patients referred for investigation of high blood pressure. People with carotid plaques excluded.

Stefanova, et al. 11 Serbia

Patients with VCD or AD / VCD: Hyperlipidemia (36%) HTN (29%) DM (11%) AD: Hyperlipidemia (62%) HTN (88%) DM (28%)

VCD: 237  AD: 197
VCD: 67.4±8.18  AD: 68.5±9.36
VCD: 52.3  AD: 49
VCD: N/A  AD: N/A
VCD: VCD: Yes  AD: Yes
VCD: AD: 120  155
VCD: 1.11±0.2  AD: 1.15±0.18
VCD: 23.81±2.33  AD: 16±5.9

Higher cIMT and plaque type was correlated with poorer MMSE in VCD. No evidence of a correlation between MMSE and cIMT or plaque in AD group.

Rogne, et al. 12 Norway

Population-based sample / DM (1%)

Median (range): 57 (52-61)

48  N/A  N/A

Median (range): 0.78 (0.69–0.89)

N/A  No evidence of associatio n between
<table>
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<tr>
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<th>CIIMT</th>
<th>Yes</th>
<th>No Cognitive Impairment</th>
<th>Cognitive Impairment</th>
<th>CIIMT Comparison</th>
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<tbody>
<tr>
<td>Xiang, et al. 13</td>
<td>China</td>
<td>Neurology patients / HTN (55%) DM (35%) CHD (10%)</td>
<td>68.1±7.2 Cognitive impairment: 1659 Cognitive impairment: 356</td>
<td>73.2±7.8 Cognitive impairment: 48 Cognitive impairment: 52</td>
<td>N/A</td>
<td>Yes (1377)</td>
<td>0.76±0.14 Cognitive Impairment: ≥24 Cognitive Impairment: &lt;24</td>
<td>1.57±0.15 Cognitive impairment: &lt;24</td>
<td>CIIMT and MMSE. was associated with a higher odds ratio of cognitive impairment (MMSE &lt;24)</td>
</tr>
<tr>
<td>Nagai, et al. 14</td>
<td>Japan</td>
<td>Patients at high risk of cardiovascular disease / HTN (75.9%) DM (13.9%)</td>
<td>79.9±6.4</td>
<td>75</td>
<td>N/A</td>
<td>N/A</td>
<td>1.03±0.3 Cognitive impairment: ≥24 Cognitive Impairment: &lt;24</td>
<td>25.8±4.69</td>
<td>Compared with those with both low blood pressure variability and low IMT, patients with high blood pressure variability and high IMT had lower MMSE score or higher</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Sample Description</td>
<td>Population Sample Size</td>
<td>cIMT (Mean ± SD)</td>
<td>MMSE (Mean ± SD)</td>
<td>NCD, Median (Range)</td>
<td>CD, Median (Range)</td>
<td>Notes</td>
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<tr>
<td>Yano, et al. 15</td>
<td>Japan</td>
<td>Hypertensive patients / HTN (100%)</td>
<td>587</td>
<td>73 ± 8.1</td>
<td>59.0</td>
<td>N/A</td>
<td>N/A</td>
<td>cIMT higher in patients with cognitive impairment (defined as MMSE score ≤ 24)</td>
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<tr>
<td>Liu, et al. 16</td>
<td>China</td>
<td>Community-based sample / HTN (71%) DM (13%)</td>
<td>384</td>
<td>84.65 ± 2.3</td>
<td>67</td>
<td>N/A</td>
<td>N/A</td>
<td>cIMT inversely related to MMSE score.</td>
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<tr>
<td>Alhusaini, et al. 17</td>
<td>Scotland</td>
<td>Population-based cohort / HTN (47.3%) DM (10.1%)</td>
<td>518</td>
<td>72.7 ± 0.73</td>
<td>46.6</td>
<td>N/A</td>
<td>Yes (77)</td>
<td>Data relating cIMT to MMSE not presented. Carotid stenosis was related to lower fluid</td>
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Prevalence of cognitive impairment (based on a MMSE score ≤ 24)
<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Patients Description</th>
<th>n</th>
<th>No Cognitive Impairment</th>
<th>Cognitive Impairment</th>
<th>N/A</th>
<th>N/A</th>
<th>No Cognitive Impairment: Cognitive Impairment:</th>
<th>N/A</th>
<th>No evidence of an association between cIMT and MMSE in a model adjusted for sex, age and years of education. cIMT higher in patients with cognitive impairment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matsumoto, et al.</td>
<td>Japan</td>
<td>Patients undergoing health screening</td>
<td>176</td>
<td>64.6 ±9.6</td>
<td>67.7±12.3</td>
<td>N/A</td>
<td>N/A</td>
<td>1.7 ±0.7</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Muela, et al.</td>
<td>Brazil</td>
<td>Individuals with cerebrovascular disease excluded / HTN</td>
<td></td>
<td>52.1±13.9</td>
<td>51.3±10.1</td>
<td>N/A</td>
<td>N/A</td>
<td>0.7±0.1</td>
<td>N/A</td>
<td>cIMT showed a weak negative correlation with MMSE consistent</td>
</tr>
<tr>
<td>Mworazi, et al. 20</td>
<td>Uganda</td>
<td>Community-based study</td>
<td>HTN (25%)</td>
<td>DM (5%)</td>
<td>210</td>
<td>69.9±7.76</td>
<td>71.4</td>
<td>N/A</td>
<td>Yes (45)</td>
<td>0.9±0.2</td>
</tr>
<tr>
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</table>

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### Supplementary Table S1B. Longitudinal studies

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>Sampling frame / Health conditions</th>
<th>Sample size</th>
<th>Age, year (mean±SD)</th>
<th>Female, %</th>
<th>Mean follow-up (years)</th>
<th>Presence of Plaque (n)</th>
<th>cIMT measurement (mm±SD)</th>
<th>MMSE (score±SD)</th>
<th>Major relevant finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silvestrini, et al. 21</td>
<td>Italy</td>
<td>Dementia clinic outpatients</td>
<td>66</td>
<td>72.7±6.1</td>
<td>55</td>
<td>1</td>
<td>Yes (52)</td>
<td>1.1±0.3</td>
<td>18.1±3</td>
<td>Higher baseline cIMT was associated with greater decline in MMSE scores</td>
</tr>
<tr>
<td>Viticchi, et al. 22</td>
<td>Italy</td>
<td>Patients referred to Dementia clinic / Hyperlipidemia (55.6%) HTN (65%) DM (29.1%)</td>
<td>Cognitively stable: 96 Developed dementia: 21</td>
<td>Cognitively stable: 75±6 Developed dementia: 77.2±4.28</td>
<td>Cognitively stable:44.8 Developed dementia: 66.7</td>
<td>1</td>
<td>Cognitively stable: Yes (30) Developed dementia: Yes (9)</td>
<td>Cognitively stable : 0.92±0.15 Developed dementia: 1.04±0.16</td>
<td>Cognitively stable 27.14±1.76 Developed dementia: 27±1.56</td>
<td>Patients with abnormal cIMT (&gt;1mm) had higher odds ratio of progressing from mild cognitive impairment to AD dementia</td>
</tr>
<tr>
<td>Zhong, et al. 23</td>
<td>USA</td>
<td>Population-based sample</td>
<td>1311</td>
<td>66.8</td>
<td>59</td>
<td>5 and 10</td>
<td>Yes (682)</td>
<td>0.86±0.21</td>
<td>N/A</td>
<td>Higher cIMT was associated with higher risk of incident</td>
</tr>
<tr>
<td>Buratti, et al. 24</td>
<td>Italy</td>
<td>Patients with high vascular risk</td>
<td>159</td>
<td>Normal cIMT: 68 Pathologic cIMT: 91</td>
<td>Normal cIMT: 69.7±3.6 Pathologic cIMT: 70.2±3.8</td>
<td>NcIMT: 39.7 PciMT: 37.4</td>
<td>3</td>
<td>Normal cIMT: Yes (68) Pathologic cIMT: Yes (91)</td>
<td>Normal cIMT: &lt; 1 Pathologic cIMT: ≥ 1</td>
<td>No evidence of an association between cIMT and change in MMSE score</td>
</tr>
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</tr>
</tbody>
</table>

cognitive impairment (MMSE <24). Plaque was not associated with incident cognitive impairment or cognitive test performance.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Sample Description</th>
<th>MCI: 106</th>
<th>MCI Median (Range): 72 (67-76)</th>
<th>AD: 43</th>
<th>AD Median (Range): 72 (67-76)</th>
<th>Follow-up</th>
<th>Outcome</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buratti, et al. 25</td>
<td>Italy</td>
<td>Patients referred to Dementia clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>MCI: Yes (114)</td>
<td>1</td>
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<td></td>
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<td></td>
<td>AD: Yes (53)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>MCI: 27±1</td>
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<td></td>
<td></td>
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<td></td>
<td>AD: 27±1</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Wendell, et al. 26</td>
<td>USA</td>
<td>Community-based sample</td>
<td>1696</td>
<td>46.9±9.3</td>
<td>55</td>
<td>4</td>
<td>N/A</td>
<td>0.69±0.13</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
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<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Weak negative association between cIMT and MMSE in fully adjusted models, consistent with null.</td>
<td></td>
</tr>
</tbody>
</table>
| Falsetti, et al. | Italy | Patients from neurological clinic with mild to moderate cognitive impairment | 310 | 76.86±7.49 | 62.9 | 2 | N/A | pNVAF(-) : 0.97±0.2  pNVAF(+) : 1.11±0.16 | pNVAF(-) : 18.62±5.22  pNVAF(+) : 15.8±5.17 | cIMT weakly associated with progression to probably Alzheimer Disease but results compatible with null. Patients with non-valvular atrial fibrillation (pNVAF(+)) had lower MMSE and higher cIMT compared to pNVAF(-).
| Rouch, et al. 28 | N/A | Consecutive patients attending a memory clinic | 363 | 75.2±7 | 65.6 | 4.5 | No conversion to dementia: Yes (50) Conversion to dementia: Yes (40) | No conversion to dementia: 0.85±0.13 Conversion to dementia: 0.82±0.13 | No conversion to dementia: 28.3±1.6 Conversion to dementia: 26.6±2.6 | Higher cIMT and plaque associated with progression from MCI to dementia based on MMSE score. |
Supplementary Table S1C. Cross-sectional plus longitudinal studies

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>Sampling frame / Health conditions</th>
<th>Sample size</th>
<th>Age (years±SD)</th>
<th>Female (%)</th>
<th>Follow-up (years)</th>
<th>Presence of Plaque (n)</th>
<th>cIMT measurement (mm±SD)</th>
<th>MMSE (score±SD)</th>
<th>Major relevant finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Komulainen, et al. 39</td>
<td>Finland</td>
<td>Population-based sample</td>
<td>91 (CS) 47 (LT)</td>
<td>63.5±3.1 (CS) 75±3.2 (LT)</td>
<td>100</td>
<td>12</td>
<td>N/A</td>
<td>1.02±0.26 (Cross-sectional) 1.25±0.33 (LT)</td>
<td>28.9±1.6 (Cross-sectional) 26.4±2.01 (LT)</td>
<td>There was no evidence of an association between IMT and MMSE score cross-sectionally or after 12-year follow-up, although confidence intervals of estimates were very wide. Associations between high cIMT and poor memory were seen both cross-sectionally and longitudinally.</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Sample Type</td>
<td>Sample Size</td>
<td>Mean (Range)</td>
<td>Age (Mean ± SD)</td>
<td>Sex Ratio</td>
<td>Follow-Up</td>
<td>MMSE Score</td>
<td>cIMT (Mean ± SD)</td>
<td>Rate of Incident Dementia</td>
</tr>
<tr>
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</tr>
<tr>
<td>Carcaillon, et al. (2021)</td>
<td>France</td>
<td>Population-based</td>
<td>5798</td>
<td>73.4 ± 4.8</td>
<td>60.5</td>
<td>7</td>
<td>Yes (3038)</td>
<td>0.71 ± 0.12</td>
<td>N/A</td>
<td>No association</td>
</tr>
<tr>
<td>Kawasaki, et al. (2021)</td>
<td>Japan</td>
<td>Population-based</td>
<td>494</td>
<td>Median (range): 87.2 (86.1–88.7)</td>
<td>55</td>
<td>3</td>
<td>Yes (328)</td>
<td>N/A</td>
<td>N/A</td>
<td>Presence of higher carotid artery plaque score was associated with lower MMSE scores. Weak evidence of an association between plaque score and increase rate of decline in MMSE compatible with null.</td>
</tr>
</tbody>
</table>

Supplementary Table S2. Exposure measures of the included papers.

<table>
<thead>
<tr>
<th>Reference</th>
<th>IMT Measurement sites</th>
<th>Scanning techniques</th>
<th>Intra-observer reproducibility, blinded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auperin, et al. 1</td>
<td>Bilateral CCA, including the carotid bifurcation, and the first 2 cm of the ICA</td>
<td>Scanned longitudinally and transversely to assess the presence of plaques</td>
<td>Inter-reader agreement regarding the presence of plaques was excellent (κ coefficient=.90).</td>
</tr>
<tr>
<td>Watanabe, et al. 2</td>
<td>Bilateral CCA including the carotid bifurcation and from 10 mm below the bifurcation, Anterolateral and posterolateral angles of CCA with beam focused on the far wall</td>
<td>All measurements were determined by the same examiner, who was blinded to clinical history or risk factor profile.</td>
<td></td>
</tr>
<tr>
<td>Komulainen, et al. 29</td>
<td>Bilateral far wall of CCA and bifurcation</td>
<td>N/A</td>
<td>sonographers were blinded to the randomization status of the study participants</td>
</tr>
<tr>
<td>Haley, et al. 3</td>
<td>Left, far wall CCA 1 cm proximal to the carotid bulb</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Muller, et al. 4</td>
<td>Bilateral distal CCA</td>
<td>N/A</td>
<td>the intra-class correlation coefficient (ICC) for repeated IMT-measurement was 84%</td>
</tr>
<tr>
<td>Singh-Manoux, et al. 5</td>
<td>Bilateral CCA</td>
<td>Longitudinal images triggered on the R-wave of the ECG</td>
<td>N/A</td>
</tr>
<tr>
<td>Silvestrini, et al. 21</td>
<td>Bilateral CCA</td>
<td>of IMT taken as the thickest plaque-free region on the near and far walls in longitudinal images</td>
<td>N/A</td>
</tr>
<tr>
<td>Carlsson, et al. 6</td>
<td>Bilateral, distal CCA, bifurcation, and the proximal portion of ICA</td>
<td>near and far walls scanned in each vessel segment (total of 12 sites)</td>
<td>N/A</td>
</tr>
<tr>
<td>Study</td>
<td>Arteries assessed</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td>El-Kattan, et al.</td>
<td>No details provided</td>
<td>Arteries assessed using longitudinal views and checked for the state of arterial wall and the presence of thrombi</td>
<td></td>
</tr>
<tr>
<td>Kearney-Schwartz, et al.</td>
<td>Bilateral CCA</td>
<td>Arteries assessed using longitudinal views</td>
<td></td>
</tr>
<tr>
<td>Zhong, et al.</td>
<td>Bilateral, near and far walls of CCA, bifurcation and ICA</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Dias, et al.</td>
<td>Bilateral CCA</td>
<td>The intima-media thickness was measured in near and far walls over a 1-cm segment of the artery located approximately 0.5 cm below the carotid-artery bulb and considered not to contain any plaque</td>
<td></td>
</tr>
<tr>
<td>Zhong, et al.</td>
<td>Bilateral CCA</td>
<td>Near and far walls</td>
<td></td>
</tr>
</tbody>
</table>

The reproducibility of IMT and plaque assessment was good. In a 10% sample (n=280) of participant scans that were re-graded the mean difference in IMT was 0.0019 mm and kappa statistics for plaque assessment ranged from 0.58 (ICA) to 0.71 (bifurcation) with 97.3% agreement within ±1 for the number of sites with plaque.

The variability between IMT measurements less than 2%.; analysis performed by a physician blinded to the patient’s clinical data.

The reproducibility of IMT and plaque assessment was good. The mean inter-grader difference in IMT was 0.03 mm; and for plaque, the kappa coefficient was 0.76 and percent agreement was 90%.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Location</th>
<th>Methodology</th>
<th>Inter-rater correlation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viticchi, et al.</td>
<td>Bilateral, distal segment of CCA</td>
<td>Measurement of near and far wall IMT on longitudinal image of 1.5cm segment of CCA that precedes the carotid bifurcation. Measurement made with an automated system at the thickest point where there were no plaques.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Stefanova, et al.</td>
<td>Far wall of CCA, ICA during diastole</td>
<td>During diastole measurements were done in a supine position with head elevated up to 45°, and tilted to the either side for 30°, depending on the side examined.</td>
<td>The inter-rater correlation reliability assessed for 50 randomly selected patients from both groups was excellent (0.932). Physicians that performed ultrasound examinations were blinded to clinical data.</td>
<td></td>
</tr>
<tr>
<td>Rogne, et al.</td>
<td>Right, far and near wall CCA, bulb</td>
<td>Measurement of IMT was performed in 10-mm segments of the far and near wall of the common carotid artery in the most proximal 10-mm segment of the bulb. The CCA, the bifurcation and the internal carotid artery were examined for plaque presence.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Xiang, et al.</td>
<td>Bilateral, far wall CCA</td>
<td>Measurement of far wall cIMT in longitudinal B-mode images of the CCA, the carotid bifurcations, and the first 2 cm of the ICA at plaque-free sites.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Nagai, et al.</td>
<td>Bilateral, far wall CCA</td>
<td>CCA scanned bilaterally in longitudinal and transverse projections. The image was focused on the far wall of the artery.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Yano, et al.</td>
<td>Bilaterally at CCA, the bulb, and ICA</td>
<td>CCA, the bulb, and ICA measured from both transverse and longitudinal orientations. Region with the thickest IMT measured.</td>
<td>Coefficient of variation within 10%. Scan performed blind to patient’s data.</td>
<td></td>
</tr>
<tr>
<td>Buratti, et al.</td>
<td>Bilateral CCA</td>
<td>N/A</td>
<td>inter-reader correlation coefficient of 0.88</td>
<td></td>
</tr>
<tr>
<td>Buratti, et al.</td>
<td>Bilateral CCA</td>
<td>A longitudinal image of the distal segment of common carotid arteries was taken, and the measurement was obtained with an automatic system at the thickest point where there were no plaques on the proximal and distal wall.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Region Scanned</td>
<td>Methods/Findings</td>
<td>Observers/Details</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
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<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Carcaillon, et al.</td>
<td>Bilateral CCA, bulb, and ICA</td>
<td>Scanned longitudinally and transversally to detect plaques.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Kawasaki, et al. 31</td>
<td>Bilateral CCA, ICA</td>
<td>N/A</td>
<td>All examinations were performed by a single physician blinded to the subject’s clinical information</td>
<td></td>
</tr>
<tr>
<td>Liu, et al. 16</td>
<td>Bilateral CCA</td>
<td>Three B-mode images were obtained using anterior, lateral, and medial angles. Maximum IMT in the right or left CCA used.</td>
<td>Scanning done by certified ultrasonographer who was unaware of the subjects' clinical details</td>
<td></td>
</tr>
<tr>
<td>Wendell, et al. 26</td>
<td>Left CCA</td>
<td>Far wall IMT measured over a region 1.5 cm proximal to the carotid bifurcation</td>
<td>Intraobserver correlation between repeated carotid IMT measurements on 10 participants was 0.96 (p &lt;0.001).</td>
<td></td>
</tr>
<tr>
<td>Rouch, et al. 28</td>
<td>Bilateral CCA</td>
<td>Near and far wall IMT measured in longitudinal images. Longitudinal and transverse images examined for plaques</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Alhusaini, et al. 17</td>
<td>Far walls of CCA, and bulb*</td>
<td>Far wall cIMT measured as the mean of 3 caliper measurements over a 1cm-long segment of the CCA and carotid bulb</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Matsumoto, et al. 18</td>
<td>Bilateral, far wall CCA, ICA</td>
<td>Far wall maximum cIMT of the bilateral CCA, ICA measured at end-diastole in longitudinal images</td>
<td>Certified sonographers who were blinded with cognitive test results carried out the carotid ultrasonography</td>
<td></td>
</tr>
<tr>
<td>Muela, et al. 19</td>
<td>Left CCA</td>
<td>Near and far wall cIMT was measured at the thickest point of the distal CCA, not including plaques using a computer program</td>
<td>an experienced observer who were blinded with Clinical condition carried out the carotid ultrasonography</td>
<td></td>
</tr>
<tr>
<td>Falsetti, et al. 27</td>
<td>Bilateral CCA</td>
<td>cIMT measurements made on 1.5 cm segment of CCA artery preceding carotid bifurcation in a longitudinal image using a semiautomatic system</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Mworozi, et al. 20</td>
<td>CCA, ICA*</td>
<td>Participants scanned in both supine and semi recumbent positions, with the head slightly hyperextended and rotated 45 degrees away from the side being examined</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
**Abbreviations:** (ICA) internal carotid artery, (ECA) the external carotid artery, (CCA) common carotid artery, (CIMT) carotid intima-media thickness, (N/A) not applicable. *not clear whether measured bilaterally.
**Supplementary Table S3.** The quality of included studies assessed using a modified seven-point criteria derived from Newcastle-Ottawa scale.  

<table>
<thead>
<tr>
<th>Reference</th>
<th>Quality score Newcastle-Ottawa scale (0-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auperin, et al. 1</td>
<td>3</td>
</tr>
<tr>
<td>Watanabe, et al. 2</td>
<td>5</td>
</tr>
<tr>
<td>Komulainen, et al. 29</td>
<td>4</td>
</tr>
<tr>
<td>Haley, et al. 3</td>
<td>4</td>
</tr>
<tr>
<td>Muller, et al. 4</td>
<td>4</td>
</tr>
<tr>
<td>Singh-Manoux, et al. 5</td>
<td>4</td>
</tr>
<tr>
<td>Silvestrini, et al. 21</td>
<td>4</td>
</tr>
<tr>
<td>Carlsson, et al. 6</td>
<td>4</td>
</tr>
<tr>
<td>El-Kattan, et al. 7</td>
<td>4</td>
</tr>
<tr>
<td>Kearney-Schwartz, et al. 8</td>
<td>4</td>
</tr>
<tr>
<td>Zhong, et al. 9</td>
<td>4</td>
</tr>
<tr>
<td>Dias, et al. 10</td>
<td>4</td>
</tr>
<tr>
<td>Zhong, et al. 23</td>
<td>4</td>
</tr>
<tr>
<td>Viticchi, et al. 22</td>
<td>6</td>
</tr>
<tr>
<td>Stefanova, et al. 11</td>
<td>4</td>
</tr>
<tr>
<td>Rogne, et al. 12</td>
<td>4</td>
</tr>
<tr>
<td>Xiang, et al. 13</td>
<td>4</td>
</tr>
<tr>
<td>Nagai, et al. 14</td>
<td>4</td>
</tr>
<tr>
<td>Yano, et al. 15</td>
<td>3</td>
</tr>
<tr>
<td>Authors, et al.</td>
<td>Count</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>Buratti, et al. 24</td>
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References


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