

Online Supplementary Materials

Title: contrast extravasation and outcome of endovascular therapy in acute ischemic stroke: a systematic review and meta-analysis

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Table S1. Search strategy in the Medline database.

Steps*	Queries	Number of studies
#1	Search: ((((((Thrombectomy) OR (Endovascular)) OR (reperfusion)) OR (Recanalization)) OR (Aspiration)) OR (retriever)) OR (intra-arterial)) OR (revascularization)	368,970
#2	Search: (((((Blood Brain Barrier[Title/Abstract]) OR (Contrast Staining[Title/Abstract])) OR (Barrier[Title/Abstract])) OR (Contrast[Title/Abstract])) OR (Hyperdensity[Title/Abstract])) OR (high-density[Title/Abstract])	1,250,079
#3	Search: (patients[Title/Abstract]) OR (patient[Title/Abstract])	6,646,483
#4	Search: ((((((Occlusion) OR (Occlusions)) OR (Cerebral Infarction)) OR (Infarction)) OR (stroke)) OR (ischemic)) OR (ischaemia)	1,007,464
#1 and #2 and #3 and #4 and #5	Search: (((((((Occlusion) OR (Occlusions)) OR (Cerebral Infarction)) OR (Infarction)) OR (stroke)) OR (ischemic)) OR (ischaemia)) AND ((patients[Title/Abstract]) OR (patient[Title/Abstract])) AND (((((Blood Brain Barrier[Title/Abstract]) OR (Contrast Staining[Title/Abstract])) OR (Barrier[Title/Abstract])) OR (Contrast[Title/Abstract])) OR (Hyperdensity[Title/Abstract])) OR (high-density[Title/Abstract])) AND ((((((Thrombectomy) OR (Endovascular)) OR (reperfusion)) OR (Recanalization)) OR (Aspiration)) OR (retriever)) OR (intra-arterial)) OR (revascularization))	5,098

*The search strategy for the Embase and the Cochrane Library database was similar to that used for the Medline database. We also examined the reference lists of the included articles to obtain additional relevant studies. There was no limitation on literature language or publication type or time.

Table S2. The raw data to calculate ORs for the association between CE and the outcomes of EVT.

First Author, y of publication	CE		non-CE	
	case	non-case	case	non-case
90 day poor functional outcomes				
Chen 2020			Adjusted OR	
Sun 2019			Adjusted OR	
Chen 2019	27	15	12	28
An 2019	29	21	34	96
Renu 2015			Adjusted	
Rouchaud 2014	11	14	24	14
Nikoubashman 2014	18	6	52	20
Desilles 2013			Adjusted OR	
Kim 2012	19	19	19	11
Yoon 2004	14	7	16	25
Discharge poor functional outcomes				
Chen 2020	45	6	84	31
Shi 2018			Adjusted OR	
Kim 2015	14	19	4	19
Nikoubashman 2014	23	4	67	16
90 day mortality				
Chen 2020	5	46	11	104
An 2019	17	33	32	98
Rouchaud 2014	5	20	13	25
Desilles 2013			Adjusted OR	
Kim 2012	3	35	1	29
Discharge mortality				
Chen 2020	5	46	6	109
Shi 2018	20	134	12	44

ICH

Kim 2020	84	18	8	35
Chen 2020	25	26	37	78
Xu 2019	58	1	54	85
Chen 2019	26	16	15	25
An 2019			Adjusted OR	
Shi 2018			Adjusted OR	
Renu 2015			Adjusted OR	
Kim 2015	21	12	8	15
Rouchaud 2014	32	6	2	25
Nikoubashman 2014	7	16	6	70
Desilles 2013			Adjusted OR	
Jang 2006	18	13	15	48
Yoon 2004	9	12	18	23

sICH

Kim 2020	23	79	1	42
Chen 2020	5	46	8	107
Chen 2019	2	40	0	40
An 2019	9	41	10	120
Kim 2015	13	20	1	22
Nikoubashman 2014	2	25	1	85
Desilles 2013			Adjusted OR	
Kim 2012	5	33	1	29
Yoon 2004	7	14	6	35

Abbreviations: CE = contrast extravasation; EVT = endovascular therapy; OR = odds ratio; ICH = intracranial hemorrhage; sICH = symptomatic intracranial hemorrhage.

Table S3. Quality assessment of the included studies*

Reference#	Is the exposed cohort representative	Selection of the non-exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of important factors†	Assessment of outcome	Follow up period	Adequacy of follow up of cohorts	Total quality scores
Kim 2020 ¹	☆	☆	☆	☆	☆☆	☆	—	—	7
Chen 2020 ²	☆	☆	☆	☆	☆☆	☆	—	—	7
Xu 2019 ³	☆	☆	☆	☆	☆	☆	☆	☆	8
Sun 2019 ⁴	☆	☆	☆	☆	☆☆	☆	—	—	7
Chen 2019 ⁵	☆	☆	☆	☆	☆	☆	—	—	6
An 2019 ⁶	☆	☆	☆	☆	—	☆	☆	☆	7
Shi 2018 ⁷	☆	☆	☆	☆	☆	☆	—	—	6
Renú 2015 ⁸	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Kim 2015 ⁹	☆	☆	☆	☆	☆	☆	—	—	6
Rouchaud 2014 ¹⁰	☆	☆	☆	☆	☆	☆	—	—	6
Nikoubashman 2014 ¹¹	☆	☆	☆	☆	☆	☆	—	—	6
Desilles 2013 ¹²	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Kim 2012 ¹³	☆	☆	☆	☆	☆	☆	—	—	6
Jang 2006 ¹⁴	☆	☆	☆	☆	☆	☆	—	—	6
Yoon 2004 ¹⁵	☆	☆	☆	☆	☆	☆	—	—	6

*Newcastle-Ottawa Scale was used to assess the study quality in this meta-analysis.¹⁶ The full score was 9 stars, and the high-quality study was defined as a study with 8 awarded stars.

†A maximum of two stars could be awarded for this item. One star with adjustment for age, two stars if there were additional population demographics or comorbidities.

Table S4. Sensitivity analyses for the pooled analysis of poor functional outcome at 90 days restricted to predefined variables.

Variable	No. of Studies	OR	95% CI	p value	I ²	PI
Study design						0.317
Retrospective	7	1.67	1.13-2.47	0.011	69.0	
Prospective	3	2.77	1.76-4.35	< 0.001	82.6	
Sample size						0.262
≥100	6	2.88	1.48-5.60	0.002	65.9	
<100	4	1.37	0.44-4.23	0.587	80.2	
Assessment strategy of CE						0.039
Dual-energy CT	4	4.45	2.51-7.87	< 0.001	22.8	
NECT and a follow-up NECT or MRI at 24 hours after EVT	6	1.31	0.67-2.57	0.429	67.2	
Study quality						0.510
<8	8	1.94	1.02-3.69	0.044	70.6	
≥8	2	3.74	0.40-35.46	0.250	89.7	
Adjusted for confounders						0.282
No	6	1.62	0.73-3.63	0.238	77.0	
Yes	4	3.43	1.27-9.25	0.015	72.7	

Abbreviations: CE = contrast extravasation; EVT = endovascular therapy; NECT = non-enhanced computed tomography; MRI = magnetic resonance imaging; OR = odds ratio.

Table S5. Sensitivity analyses for the pooled analysis of post-EVT ICH restricted to predefined variables.

Variable	No. of Studies	OR	95% CI	p-values	I ²	PI
Study design						0.511
Retrospective	9	5.80	2.58-13.03	< 0.001	83.4	
Prospective	4	9.29	3.40-25.35	< 0.001	55.1	
Sample size						0.305
≥100	8	9.03	4.00-20.38	< 0.001	78.4	
<100	5	4.15	1.48-11.66	0.007	77.8	
Assessment strategy of CE						0.400
Dual-energy CT	3	3.24	1.50-6.99	0.003	33.6	
NECT and a follow-up NECT or MRI at 24 hours after EVT	10	8.02	3.69-17.43	< 0.001	80.6	
Study quality						0.494
<8	10	5.90	2.78-12.51	< 0.001	81.4	
≥8	3	10.84	2.67-44.05	0.001	70.0	
Adjusted for confounders						0.641
No	9	6.01	2.63-13.73	< 0.001	81.8	
Yes	4	9.10	4.04-20.50	< 0.001	53.0	

Abbreviations: CE = contrast extravasation; NECT = non-enhanced computed tomography; MRI = magnetic resonance imaging; OR = odds ratio; PI, P interaction.

Table S6. Egger's tests for publication bias.

Variables	Egger's tests	
	p-values	95% CIs
Association between CE and poor functional outcome at 90 days	0.68	-5.36-7.85
Association between CE and mortality at 90 days	0.65	-6.37-4.65
Association between CE and post-EVT ICH	0.10	-0.83-8.36
Association between CE and post-EVT sICH	0.05	-0.04-2.96

Abbreviations: CE = contrast extravasation; EVT = endovascular therapy; ICH = intracranial hemorrhage; sICH = symptomatic intracranial hemorrhage; PI, P interaction.

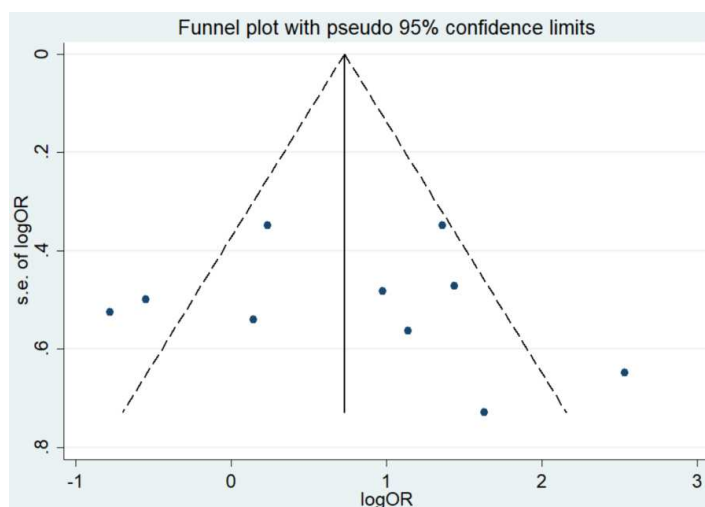


Figure S1. Funnel plot for publication bias test for the associations between contrast extravasation and poor functional outcomes at 90 days.

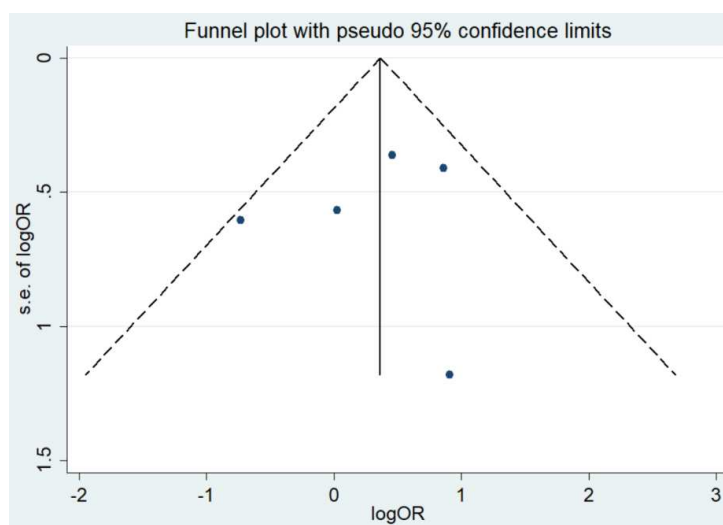


Figure S2. Funnel plot for publication bias test for the associations between contrast extravasation and mortality at 90 days.

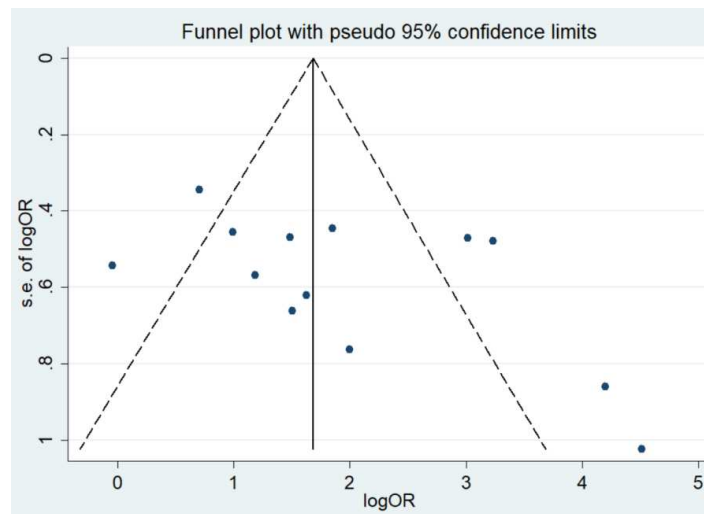


Figure S3. Funnel plot for publication bias test for the associations between contrast extravasation and intracranial haemorrhage.

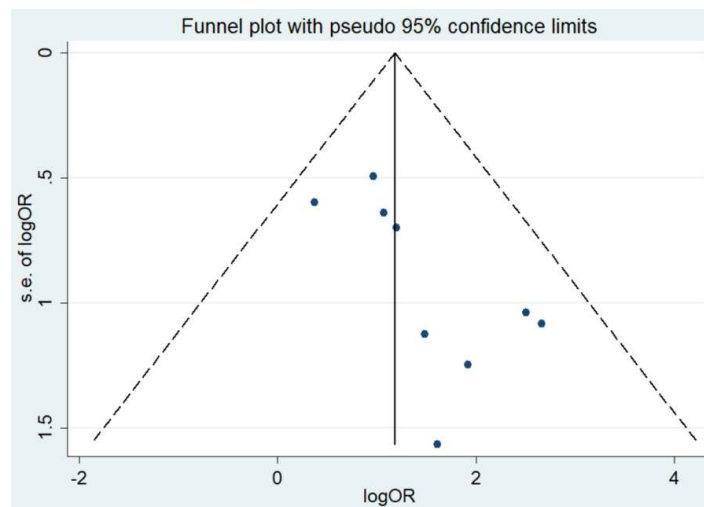


Figure S4. Funnel plot for publication bias test for the associations between contrast extravasation and symptomatic intracranial haemorrhage.

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