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Nonoperative treatment for lumbar spinal stenosis with neurogenic claudication. An updated systematic review.

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		BMJ Open
1 2		BMJ Open 136/bmjopen-2021
3 4	1	Nonoperative treatment for lumbar spinal stenosis with neurogenic claudication. An updated systematic review.
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1	BMJ Open BMJ Open 2021-05
2	Objectives: Neurogenic claudication due to lumbar spinal stenosis (LSS) is a growing public health problem that can significantly
3	impact quality of life in older adults. We aimed to update our previous Cochrane review (2013) to determine the effectiveness of
) 4	nonoperative treatment of LSS with neurogenic claudication.
$\frac{1}{3}$ 5	Design: A systematic review was conducted. We updated our search in CENTRAL, MEDLINE, EMBASE, EINAHL, and ICL
4 5 6	databases from February 2012 to September 2020 for randomized controlled trials where at least 1 arm provided data on nonoperative
5 7 7 3	treatment.
8	Outcome measures: Outcomes included measures of pain, function, health related quality of life and adverse events.
1 2 9	Results: Of 13,817 citations screened, 156 were assessed and 23 new trials were identified and added to the griginal 21 trials. A total
3 4 10	of 3,792 participants with neurogenic claudication randomized to 60 different comparison groups were assessed.
5 7 11	There is moderate quality evidence from 3 trials that: Manual therapy and exercise provides superior and clinically important short-
³ 12	term improvement in symptoms and function compared to medical care or community-based group exercise; Manual therapy,
) I 13	education and exercise delivered using a cognitive-behavioural approach, demonstrates superior and clinically important
2 3 14 4	improvements in walking distance in the immediate to long-term compared to self-directed home exercises; Elucocorticoid plus
5 5 15	lidocaine injection is more effective than lidocaine alone in improving statistical, but not clinically important improvements in pain
7 3 16 9	and function in the short-term.
5 <u>2</u> }	and function in the short-term.
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1		021
1	The remaining 20 new trials demonstrated low or very low-quality evidence for all comparisons and outcome	s, similar to the midnigs
2	of our original review.	4 0n
3	Conclusions: There is moderate quality evidence that a multimodal approach which includes manual therapy	and exercise, with or
4	without education is an effective treatment, and that epidural steroids are not effective for the management of	ELSS with neurogenic
5	claudication. All other nonoperative interventions provided insufficient quality evidence to make conclusions	Son their effectiveness.
6		ownloa
7	This systematic review was registered with PROSPERO registration number CRD42020191860.	wnloaded from
8		B http://www.com/articles/arti
9	ARTICLE SUMMARY	//bmior
10	Strengths and limitations of this study	sen.bmi
11	• This systematic review included a wide range of nonoperative interventions commonly used in clinica	practice.
12	• This review used consistent inclusion and exclusion criteria for neurogenic claudication, which incluse	$\frac{3}{\frac{1}{2}}$ d the corroboration of a
13	diagnosis of lumbar spinal stenosis with imaging.	19, 202
14	• This review used rigorous methods recommended by the Cochrane Back and Neck Pain Review Grou	\mathbf{p} including the use of
15	Grading of Recommendations, Assessment, Development and Evaluation (GRADE) to synthesize and	summarize the quality
16	of the evidence.	rotecte
17	• Only English studies were included in this review.	id by a
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2		
3 4	1	• Most studies had small samples sizes with heterogeneity in interventions tested, limiting ability to pod data.
5 6 7	2	724 on
7 8 9	3	Key words: neurogenic claudication, lumbar spinal stenosis, systematic review, nonoperative treatment, elder dy
10 11 12	4 5	NTRODUCTION 2022
13 14 15	6 7	INTRODUCTION
16 17	8	Lumbar spinal stenosis (LSS) causing neurogenic claudication is a highly prevalent and rapidly growing public health problem among
18 19	9	older adults (1). It is characterized by bilateral or unilateral buttock pain and/or lower extremity discomfort, \vec{p}_{a} and, weakness, or
20 21 22	10	heaviness precipitated by walking and prolonged standing and relieved by stooping forward and sitting (2, 3)
23 24	11	is usually age-related osteoarthritic changes to lumbar intervertebral discs, facets joints and ligaments leading to narrowing of the
25 26	12	central and/or lateral spinal canals and compression and/or ischemia of the spinal nerves (2, 4).
27 28 29	13	Limited walking ability is the dominant impairment in neurogenic claudication and the most common reason for seeking care (5).
29 30 31	14	Limited walking ability due to LSS is associated with a significant decline in functional status, quality of life $\frac{3}{3}$ and independence in this
32 33	15	population (2, 5).
34 35	16	Although lumbar spinal stenosis is the most common reason for spine surgery in older adults, most people with neurogenic
36 37 38	17	claudication receive nonoperative care (6). A course of nonoperative care is also recommended prior to receiving surgical intervention
39 40	18	(7). However, what constitutes effective nonoperative care remains unknown. In 2013 we published a Cochrame review evaluating
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nonoperative treatment for LSS causing neurogenic claudication (8, 9). This review identified 21 randomized	
assessing a variety of nonoperative treatments. However, the quality of the evidence was deemed low or very	$\sum_{q=1}^{N}$ and therefore no
conclusions could be made on the effectiveness of nonoperative treatment for neurogenic claudication. The	aurpose of this study is to
update this systematic review and the evidence for nonoperative treatments for neurogenic claudication. Our	apecific research question
was: What nonoperative interventions are effective in improving outcomes in patients with neurogenic claud	Do
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according to the PRISMA guidelines (10).	com/ o
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Ethics Approval Statement	j.com/ on April 19, 2024 by
Ethics approval was not required for conducting this systematic review.	
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Patient and Public Involvement Statement	rotecte
Patients or the public were not involved in the conduct of this systematic review.	d by cc
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	nonoperative treatment for LSS causing neurogenic claudication (8, 9). This review identified 21 randomized assessing a variety of nonoperative treatments. However, the quality of the evidence was deemed low or very conclusions could be made on the effectiveness of nonoperative treatment for neurogenic claudication. The pupdate this systematic review and the evidence for nonoperative treatments for neurogenic claudication. Our was: What nonoperative interventions are effective in improving outcomes in patients with neurogenic claud spinal stenosis? METHODS This systematic review was registered with PROSPERO registration number CRD42020191860 and was contaccording to the PRISMA guidelines (10). Ethics Approval Statement Ethics approval was not required for conducting this systematic review. Patient and Public Involvement Statement Patients or the public were not involved in the conduct of this systematic review.

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1		BMJ Open BMJ Open-2021
2 3	1	2021-05
4 5 6	2	Population, Interventions, Comparison and Outcomes (PICO Criteria)
7 8	3	The population of interest was individuals with imaging confirmed LSS (central or foraminal, with or without spondylolisthesis) and
9 10 11	4	neurogenic claudication. Neurogenic claudication is a clinical diagnosis and was defined as buttock or leg path and/or aching,
12 13	5	numbness, tingling, weakness, or fatigue with or without back pain, precipitated by standing or walking. There were no age
14 15 16	6	restrictions. The interventions of interest included all nonoperative treatments and the comparison was any treatment including
17 18	7	surgery. Outcomes included at least one of the following measures: walking ability, pain intensity, physical function, quality of life, or
19 20	8	global improvement.
21 22 23 24 25 26 27 28 29	9	Search and Study Selection
	10	Search and Study Selection
	11	We replicated and updated our original electronic database search (from 1966 to January 2011) to September 2020. The search was
	12	performed by an experienced librarian in CENTRAL (Cochrane Library 2011 issue1), Medline, EMBASE, O
30 31 32	13	Chiropractic Literature. The terms "spinal stenosis," "lumbar spinal stenosis," "neurogenic claudication," "lumbar radicular pain,"
33 34	14	"cauda equina," and "spondylosis" were combined with a highly sensitive search strategy to identify randomized controlled trials
35 36	15	(RCTs).
37 38 20		
39 40 41 42 43		ad by g
		(RCTs).
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1	Studies were included if they were RCTs published in peer reviewed English journals, at least one arm of the grial provided data on	
2	effectiveness of a nonoperative treatment and at least 80% of subjects had neurogenic claudication with imaging confirmed LSS.	
3	Studies evaluating subjects with radiculopathy caused by disc herniations without neurogenic claudication we excluded.	
4		
5	Studies with mixed populations were only included if separate data for subjects with neurogenic claudication due to lumbar spinal	
6	stenosis were provided.	
7	ded fro	
8	Two pairs of reviewers independently screened all titles and abstracts identified by the search strategy. Full text of articles deemed to	
9	be potentially relevant were independently assessed by two reviewers who made the final decision for inclusion. A third reviewer was	S
10	consulted if consensus was not reached.	
11	j.com/	
12	Risk of Bias Assessment and Data Analysis	
13	Two reviewers independently assessed methodological risk of bias and performed data extraction. Safety data \vec{s} (intervention side	
14	effects and/or complications) when available were also collected. Risk of bias was assessed using the 12-iten $\frac{\aleph}{2}$	
15	by the Cochrane Back Review Group (11). Discrepancies in risk of bias scoring and data extraction were discussed during a consensu	ıs
16	meeting. Reviewers who were authors of any of the included studies were recused from performing risk of bigs assessment, data	
17	extraction, data analysis or synthesis of their own studies.	
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1	Low risk of bias was defined as fulfilling 6 or more of the 12 criteria including clearly described and appropr	`
2	A), and allocation concealment (Item B), and with no severe flaws. A severe flaw was defined <i>a priori</i> as a s	772
3	deficiency not captured by the 12-item criteria that significantly increases the risk of bias such as very high d	2 20 20 20 20 20 20 20 20 20 2
4	and sample sizes less than 30 subjects per treatment arm.	nuary 20
5		2022. De
6	For each comparison, outcomes were analyzed according to these follow-up time periods: immediate (up to c	e week following the
7	intervention); short-term (between one week and three months); intermediate (between three months and one	vear) and; long-term
8	(one year or longer). Outcome data were pooled, and meta-analyses were performed when trials were judged	to be sufficiently
9	homogeneous, both clinically and statistically.	/bmiop
10	Rehabilitation therapy was defined as treatment that utilized any combination of education, exercise instruction	gn, manual therapy, heat
11	and cold applications, electrotherapy, other physical therapy modalities, orthosis, and other assistive devices.	Multimodal treatment
12	included various combinations of rehabilitation therapy treatments, oral and other mediations, and spinal inje	$\frac{3}{2}$ etions, but not surgery.
13		19, 20:
14	Data Synthesis	2024 by g
15	The quality of the evidence for each outcome and for each comparison was evaluated using GRADE (Grades	F pof Recommendations,
16	Assessment, Development and Evaluation (12, 13) Overall quality of the evidence was based on performance	against five domains: 1)
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BMJ Open risk of bias; 2) consistency of findings; 3) directness of comparisons; 4) precision of estimates; and 5) other opinsiderations such as 724 on 19 selective reporting. The quality of the evidence starts at high when there are consistent findings among at least 75% of RCTs with low risk of bias and consistent, direct, and precise data and with no known or suspected publication bias. It downgrades a level for each domain not met. Treatment effects between comparators (more effective, less effective or no difference) were based on statist ally significant and clinically important differences in outcomes. High quality evidence - all five domains are met; further research is very unlikely to change the confidence in the estimate of effect. Moderate quality evidence - one of the domains is not met; further research is likely to have an important impact on the confidence in the estimate of effect and may change the estimate. Low quality evidence - two domains are not met; further research is very likely to have an important impaction the confidence of the õ estimate of effect and is likely to change the estimate. Very low-quality evidence - three or more domains are not met; there is great uncertainty about the estimateof effect. Evidence provided by a single small trial was considered inconsistent and imprecise and thus provide "low" of "very low" quality evidence, depending on whether it was assessed as having a low or high risk of bias, respectively, and there were no other limitations. copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open BMJ Open Studies with both low risk of bias and inappropriate or unclear randomization and/or treatment allocation techniques were downgraded '24 on 19 by two levels for the "risk of bias" domain. Jar The results below are reported based on statistically significant differences between comparators for each out considered clinically important will be specified when the quality of the evidence is moderate or higher. The MCIDs used are listed in wnloaded from http://bmjopen.bm Table 2. Adverse events for the new studies are detailed when reported by the author eer revie **RESULTS Selection and Description of Included Trials** We screened 13,817 titles and abstracts and assessed 156 full-text articles. This resulted in 44 RCTs meeting the inclusion criteria. including 23 new trials. Figure 1 summarizes original and updated screening results. Supplemental Table 1 describes the characteristics of all included trials. In total, 3,792 participants (1,765 males, 1836 females and 191 participants of undisclosed gender (14, 15) were randomized to one of 60 comparison groups. Seventeen studies evaluated rehabilitation therapy $\frac{1}{2}$ or multimodal care (14, 16-31), 11 assessed epidural injections (32-42), 7 evaluated oral medications (15, 43-48), 6 assessed calciton²/_m (49-54), 2 evaluated acupuncture (55, 56) and 1 assessed spinal manipulation (57). Thirty-eight trials were conducted at tertiary care or university affiliated centres and 6 at medical/rehabilitation clinics (18, 24, 35-38). The mean age of participants was 63.3 years. The duration of symptoms copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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BMJ Open konsiderably amongst the studies with a mean ranging from 12 weeks to 15 years. Follow-up periods approximately and significantly 1 ranging from immediately following the intervention to 10-year post intervention.

 Risk of Bias of Included Studies

 The median and mean number of criteria met was 7 of 12 (range 2-11) (Table 1).

 Table 1. Risk of bias assessment for studies on non-operative treatment for lumbar spinal stenosis with negaring and the spinal stenosis with negaring 2 3 4 5 6 7 led from http://bmjopen.bmj.com/ on April 19, 2024 by guest. Protected by copyright. Total Author Α В С D Е F G Η Κ Calcitonin Eskola 1992 ? ? ? ? ? ? 5 + + + + + _ ? ? ? ? ? ? + 4 Porter 1983 + + + -_ Porter 1988 ? ? ? ? ? ? ? 4 + + + + Podichetty 2004 ? ? + + + ? ? 6 + + + ? 7 Tafazal 2007 ? ? ? + + + 2 + + + + ? 2 ? Sahin 2009 ? 2 4 + + + + **Oral Medications** Prostaglandin Matsudaria 2009 2 ? ? 7* + + + + + + + Methylcabalin Waikakul 2000 ? ? ? ? 5 _ + + + + + Gabapentin ? 3 Yaksi 2007 ? ? + + ? ? ? + Pregabalin Markman 2015 + ? + 10 **** + + + + + + + + Gabapentin 8 **** Park 2017 ? ? ? + + + + + + + + Oxymorphone Hydrochloride Markman 2015 (2) 9 **** # + + + + ? ? + + + + +

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Oral Corticoid													
Rodrigues 2014	+	+	?	?	?	+	+	?	?	?	?	+	5
Rehabilitation Therapy or Multime	odal												
Goren 2010	+	+	-	-	+	+	-	+	+	?	?	+	7 *
Koc 2009	?	?	-	-	+	+	+	-	+	?	?	+	5
Pua 2007	+	+	-	-	+	-	+	+	+	?	-	+	7 *
Whitman 2006	+	?	-	-	+	+	+	+	+	?	?	+	7
Minetama 2019	+	?	-	-	+	+	+	+	?	+	+	+	8 *****
Schneider 2019	+	+		-	+	-	+	+	+	?	+	+	8*
Ammendolia 2018	+	+	-	-	+	+	+	+	+	+	+	+	10 *
Oğuz 2013	?	?	-	- (?	?	+	-	?	?	?	+	2
Homayouni 2015	+	+	- (+	+	+	-	-	+	?	+	7 ****
Marchand 2019	+	+	-	-	+	?	+	+	?	-	+	+	7 ****
Kim 2019	+	+	+	+	+	+	+	+	?	+	+	+	11 *
Spinal Manipulation						-			_				
Passmore 2017	-	+	-	-	+	+	+	-	+	+	+	+	8 ****
Acupuncture		-			•		-						
Kim 2016	+	+	-	-	-	-	+	+	-	+	+	+	7 ****
Qin 2020	+	+	+	-	+	+	+	+	+	-	+	+	10 *
Epidural Injections					1		1		1			1	
Cuckler 1985	?	?	+	+	+	+	+	+	+	?	+	+	9
Fukusaki 1988	?	?	?	?	+	+	+	+	+	?	+	+	7
Zahaar 1991	?	?	+	?	+	+	+	+	+	-	?	-	6
Brown 2012	+	-	+	-	?	+	+	-	?	?	-	+	5
Friedly 2014, 2017, Makris 2016	+	+	+	+	+	+	+	+	?	+	+	+	11 *
Song 2016	?	?	?	?	?	+	+	-	?	+	+	+	5
Milburn 2014	?	?	+	-	+	-	+	-	?	-	-	+	4
Hammerich 2019	+	+	-	-	+	-	+	?	?	-	+	+	6 ****
	+	?	+	-	+	+	?	+	+	+	?	+	8 ****
Sencan 2020	1.			1									

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	+		-	+	?	+	-	+	-	+	+	7 ^

1A Was the method of randomization adequate?, B Was the treatment allocation concealed?, C Was the patient blinded to the intervention?, D Was the care provider 2blinded to the intervention?, E Was the outcome assessor blinded to the intervention?, F Was the drop-out rate described and acceptable?, G Were all randomized 3participants analyzed in the group to which they were allocated?, H Are reports of the study free of suggestion of selective outcome reporting?, I Were the groups similar at 4baseline regarding the most important prognostic indicators?, J Were co-interventions avoided or similar?, K Was the compliance acceptable in all groups?, L Was the timing 5of the outcome assessment similar in all groups?, + Yes, - No, ? Unclear, * Low risk of bias if 6 or more items met, including valid randomization and treatment allocation 6techniques and no severe flaws, ** 2 year follow-up drop out rate 30%, 1 year < 20%; intention to treat inconsistent at 2 year f/u, *** 74 years, **** < 30 participants per treatment arm, ***** Treatment allocation unclear, ^ Severe flaw due to high crossover rates, # Premature end of study 8

- 10 Although 31 studies met 6 or more criteria, only 9 were considered to have low risk of bias (19, 20, 24, 27, $2\frac{3}{5}$, 31, 37, 42, 43, 56).
- 11 Among the remaining 22 studies that met 6 or more criteria, 13 failed to explicitly describe and/or use appropriate randomization
- 12 procedures, allocation concealment, or both (16-18, 30, 32-34, 39, 41, 48, 52, 54, 57); three had severe flaws to high crossover
- 13 rates (21, 22, 25), which made the intention-to-treat analyses uninterpretable and 6 had other serious flaws in Buding premature
- stopping of the trial (47), large number of participants lost to follow-up (40) and small sample size (less than 20 participants per arm)
- 15 (26, 29, 46, 55).
- 16

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17 Evidence of Effect of Interventions

Percutaneous Epidural Adhesiolysis

Surgery vs Physical Therapy

Zucherman 2004, 2005, 2006

Weinstein 2007, 2009, Abdu 2018

Weinstein 2008, 2010, Lurie 2015

+

?

+

+

+

+

+

Karm 2018

Amundsen 2000

Malmivaara 2007

Delitto 2015

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1 2		BMJ Open 36/bmj.open-202
3 4	1	Fifty-three of the 60 comparisons were examined in a single trial, most with small sample sizes. It was only by sizes to combine data
5 6	2	from 2 trials (assessing surgery vs. multimodal treatment) for 1 outcome in a meta-analysis (19, 22). The 5 output studies (all assessing
7 8 9	3	calcitonin) (49-52, 54) were combined qualitatively. The results of these pooled analyses were published in \vec{y} previous reviews (8,
) 10 11	4	9). Heterogeneity in source population, intervention, and outcome instruments precluded pooling of data from other trials.
12 13	5	Supplemental Table 2, a summary of GRADE assessment and outcomes, summarizes the quality of the evidence for outcomes for
14 15	6	each comparison.
16 17 18	7	de fro
19 20	8	Calcitonin
21 22	9	There were no new studies assessing calcitonin. The conclusion from our previous review was that there is very low-quality evidence
23 24 25	10	from 6 trials (49-54) (N= 231) that calcitonin is no better than placebo or paracetamol regardless of mode of $\frac{9}{2}$ dministration or
26 27	11	outcome assessed.
28 29	12	on April
30 31 32	13	Oral Medication We identified 4 new studies assessing 5 oral medications. There is low-quality evidence based on 1 small cross-over trial (46) (N=29),
33 34	14	We identified 4 new studies assessing 5 oral medications. There is low-quality evidence based on 1 small $\operatorname{cross}^{\aleph}$ -over trial (46) (N=29),
35 36	15	that pregabalin does not improve pain, distance walked, function or global health status immediately following the intervention
37 38 39	16	compared to placebo. Adverse events were reported in 64% of the pregabalin group, the most common being dizziness, compared to
40 41	17	35% in the placebo group.
42 43		35% in the placebo group.
44 45 46 47		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 16

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1	\sim
2	A small trial evaluating gabapentin plus conservative care (48) (N=45) provides very low-quality evidence demonstrating no
3	significant improvement in back/leg pain, disability scores or global health in the short-term compared to conservative care plus
) 4	botulinum toxin injection. Five patients (20.8%) reported mild to moderate pain at injection sites for a few days after botulinum toxin
5	injections.
6	
; 7	There is very low-quality evidence from 1 small trial (47) (N=24) that oxymorphone hydrochloride or proposyphene and
8	acetaminophen is no better than placebo in the immediate term for all outcomes assessed.
, 9	acetaminophen is no better than placebo in the immediate term for all outcomes assessed.
-	
10	A single small trial provided very low-quality evidence (15) (N=61) that oral corticoids do not improve outcomes in the short-term
, 11	compared to placebo.
12	On April
13	The original review identified 3 studies assessing oral medications and concluded that there is low-quality evidence that
14	prostaglandins improves walking distance and leg pain in the short-term compared with etodolac (a nonsteroidal anti-inflammatory
15	drug) (43); very low-quality evidence that gabapentin improves walking distance and pain compared with placebo in the intermediate
, 3 16	and long-term(45) and that methylcobalamin (vitamin B 12) plus conservative treatment improves walking details in the
)) 17	intermediate and long-term compared with conservative treatment alone (44).
<u>)</u>	intermediate and long-term compared with conservative treatment alone (44).
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1		BMJ Open BMJ Open BMJ Open P021-057724
2 3	1	
4 5	2	Rehabilitation Therapy and Multi-modal Treatment
6 7 8	3	We identified 8 new studies evaluating 13 rehabilitation therapy and/or multimodal treatment approaches, with one study being
9 10	4	compared to surgery.
11 12	5	
13 14 15	6	There is moderate quality evidence from 1 trial (31) (N=259) that manual therapy and exercise provides superior and clinically
16 17	7	important short-term improvement in symptoms and function compared to medical care or community-based group exercise and that
18 19	8	community-based group exercise improves physical activity in the short-term compared to medical care. There were no reported
20 21 22	9	serious adverse events in any group. There was a significantly greater rate of transient joint soreness associated with the manual
23 24	10	therapy and exercise group (49%) compared with the community-based group exercise (31%) and medical care (6%) groups.
25 26	11	
27 28 29	12	Another trial provides moderate quality evidence (27) (N=104) that comprehensive care (manual therapy, education and exercise
29 30 31	13	delivered using a cognitive-behavioural approach) demonstrates superior and clinically important improvements in walking distance in
32 33	14	the immediate, short, intermediate, and long-term and compared to self-directed home exercise. This study also provides low-quality
34 35 36	15	evidence that comprehensive care improves overall pain and function in the long-term compared to self-directed home exercises. At
37 38	16	12 months, none of the 43 participants in the comprehensive group and 2 of the 46 participants in the self-directed group experienced
39 40	17	adverse events. These adverse events were mostly attributed to a temporary increase in low back and/or leg pain.
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43 44 45 46		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 18
46 47		

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2		1	
3	care, with or without a herbal remedy (Gang-Chuk Tang), improves low back pain in the intermediate term	ompared to oral	
4		11 A A A A A A A A A A A A A A A A A A	
5			
6	A single study assessing supervised physical therapy (manual therapy, exercise, and body weight-supported t	eadmill) (30) (N= 86)	
7	provides low-quality evidence for improved symptoms, function and walking distance in the short-term comp	ared to home exercises.	
8		5 5 7 7	
9	There is very low-quality evidence from 1 study (14) (N=120) that heat, TENS and home exercise instruction	is no better than	
10	isokinetic exercise in the immediate, short and intermediate term for all outcomes and less effective than unle	aded exercises in the	
11	immediate and short-term. Unloaded exercise was also found to be superior to isokinetic exercise in the immediate	$\frac{1}{2}$ diate and short-term.	
12		> > 2	
13	One small single study (26) (N=47) provides very low-quality evidence that aquatic exercise is more effective		
14	(exercise, ultrasound, heat and TENS) in improving pain and walking distance in the immediate term.		
15		5 2 2	
16		4	
17	outcomes in the immediate, but not in the short or intermediate terms.		
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1		BMJ Open
2 3	1	2021-05
4 5	2	There is low-quality evidence from 1 study (25) (N=169) that a structured physical therapy program (education and exercises)
6 7 8	3	provides similar outcomes to decompression surgery in the long-term (2 years follow-up). Nine out of 82 participants receiving
9 10	4	physical therapy reported adverse events consisting of worsening of symptoms whereas 33 out 87 participants reported surgery related
11 12	5	complications, mainly attributable to reoperation, delay in wound healing and surgical site infection.
13 14 15	6	
16 17	7	Our original review identified 9 rehabilitation therapy/multi-modal trials of which 5 were compared to surgical interventions. A meta-
18 19	8	analysis was conducted for 2 of the surgical trials. Two of the original surgical trials have since published 8-year follow-up results (see
20 21 22	9	below). All studies provide either low or very low-quality evidence.
23 24	10	oppen.b
25 26	11	A meta-analysis (8, 9) that includes 2 trials (22) (19) shows that laminectomy improves outcomes only at the 2 year follow-up
27 28 29	12	compared to conservative care. One of these studies shows no difference in outcomes after an 8-year follow-gp (58).
30 31	13	
32 33	14	An interspinous surgical implant (17, 59, 60) was found to be superior to multi-modal treatment (epidural injections, pain medication,
34 35 36	15	education, exercise, back brace, heat/ice, and massage). Another trial (16) provided inconclusive evidence when comparing
37 38	16	laminectomy with or without fusion to lumbar orthosis and education.
39 40		ted by c
41 42 43		laminectomy with or without fusion to lumbar orthosis and education.
44 45		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 20
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1	Among patients with degenerative spondylolisthesis, 1 study (21) shows no difference in outcomes with lam	
2	to conservative care including after an 8-year follow-up (61).	7724 on
3	One study showed that exercise plus ultrasound is no better than exercise plus sham ultrasound but better that	a no treatment, and
4	exercise plus sham ultrasound is better than no treatment (24). Other studies demonstrated that in-patient phy	ä äical therapy (ultrasound, ℵ
5	heat and TENS) is more effective than home exercise plus oral diclofenac (23), unweighted treadmill walkin	g plus exercise is no
6	better than cycling plus exercise (20), and manual therapy, exercise and unweighted treadmill is more effecti	than flexion exercises,
7	walking and sham ultrasound (18).	led fror
8		n http://
9	Epidural Injections	http://bmjop
10	We identified 6 new studies evaluating epidural injections. There is moderate quality evidence from 1 study	(3, 62) (N=400) that
11	glucocorticoid plus lidocaine injection is better than lidocaine alone in improving pain and function at 3 week	s (short-term) but not at
12	6-weeks (short-term), 12 weeks (intermediate-term) or 12 months (long-term). The improved outcomes at 3 y	≥ Beeks were statistically
13	significant but not considered to be of clinical importance (63). A follow-up subgroup analysis (64) using pa	Rent-prioritized Roland-
14	Morris Disability Questionnaire (RMDQ) items, did not change the results. A total 21.5% of patients in the g	tucocorticoid-lidocaine
15	group and 15.5% in the lidocaine alone group reported one or more adverse events (p=0.08). Adverse events	•
16	fever, infection, dizziness, cardiovascular/lung problems, leg swelling and dural puncture.	rotecte
17		d by co
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BMJ Open A small study (36) (N=29) provided very low-quality evidence that an injection of lidocaine is no better than saline injection for all 724 on 19 outcomes in the short-term. There is very low-quality evidence from 1 study (38) (N=57) that steroid injections at the level of maximal steroid improve pain and function in the immediate and short-term compared to steroid injections at 2 levels cephalad to the maximum Nevel of stenosis. A small trial (40) (N=54) provided very low-quality evidence that steroid injections are no better than steroid injections combined with physical therapy (manual therapy and exercise) in improving pain or function in the short-term but are more effective in improving pain in the intermediate and long-term. There is very low-quality evidence from 1 study (41) (N=67) that interlaminar steroid injection improves pair and walking distance in the intermediate but not in the short-term compared to transforaminal steroid injection. in the immediate, short and intermediate term compared to steroid or lidocaine injections and that steroid injections were no better Protected by copyright. than lidocaine for all outcomes and follow-up periods. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open BMJ Open There is very low-quality evidence from 1 small trial (35) (N=38) that minimally invasive lumbar decompression surgery (MILD) is 724 on 19 no better than epidural steroid injections for all outcomes in the short-term. One small trial (39) (N=44) provided very low-quality evidence that an epidural inflatable balloon catheter (ŽiNeu) improves pain and function in the intermediate term but not the short-term compared to a balloon-less catheter (Racz). Minor ant transient adverse events were reported equally in both groups (no data provided), mostly pain and paresthesia at the injection site. nloaded Our original review identified 4 trials evaluating 7 epidural injection approaches, all with very low-quality evidence for all outcomes. Two trials demonstrated that translaminar (32) or caudal (33) steroid injections were no better than placebo. Ewo other trials showed that translaminar epidural steroid plus a block was better than placebo or an epidural block alone (34), that translaminar epidural block was better than placebo (34), and that interlaminar epidural steroid plus a block was better than home exercise plus diclofenac or in-on April 19, 2024 by g patient physical therapy (ultrasound, heat and TENS) (23). Acupuncture We identified 2 new studies assessing acupuncture. There is low quality evidence from 1 trial (56) (N=80) that acupuncture improves back and leg pain, symptoms and function in the immediate, short, and intermediate term compared to sham scupuncture. Three out of 40 participants in the acupuncture group reported short-term pain at the insertion site (1 also had a hematomag and 5 out of the 40 copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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1		open-22
2 3 4 5 6 7 8 9	1	participants in the sham group reported non-serious back pain or fatigue. There is very low-quality evidence from a small trial (55)
	2	(N=50) that acupuncture plus usual care is no better than usual care alone in the short-term for all outcomes. $\frac{1}{9}$
	3	19 ປັງ ອ້າ
10 11	4	Spinal Manipulation
12 13	5	We identified 1 study assessing spinal manipulation. There is very low-quality evidence from a very small trial (57) (N=14) that spinal manipulation.
14 15 16	6	manipulation alone is no better than a wait list control in the immediate term for all outcomes
17 18	7	led from
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	8	n http://
	9	DISCUSSION
	10	We updated our systematic review on nonoperative treatments for LSS causing neurogenic claudication and gentified 23 new trials
	11	that were added to the previous 21 studies. The highest number of studies, 17/44, evaluated rehabilitation the apy/multimodal
	12	treatment, 11 assessed epidural interventions, 7 oral medications, 6 calcitonin, 2 evaluated acupuncture and Bassessed spinal
	13	manipulation. Of the 60 comparisons that were evaluated, 5 comparisons from 3 trials (27, 31, 37) provided not determined and the second secon
	14	evidence. The remaining comparisons provide either low or very low-quality evidence. In our original review all comparisons for all
	15	the interventions assessed were of low or very low-quality evidence. This lack of moderate or high-quality evidence limited our abilit
	16	to make conclusions on the effectiveness of most nonoperative treatments.
39 40 41	17	to make conclusions on the effectiveness of most nonoperative treatments.
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44 45		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 2
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1	There is now moderate evidence that a multimodal structured 6-week program consisting of manual therapy and exercise with or
2	without education is an effective treatment approach (27, 31) for neurogenic claudication and that epidural steroid injections do not
3	provide clinically important improvements in short or long-term outcomes compared to epidural lidocaine in gettions. However, given
4	that these respective findings came from single studies, this evidence lacks consistency and therefore there is $\frac{1}{8}$ possibility that
5	replicating these trials in the future might result in substantially different conclusions. However, a recent clinical practice guideline for ∇
6	the management of LSS leading to neurogenic claudication concurred with our findings and recommended, besed on moderate quality
7	evidence, multimodal care consisting of education with home exercises and manual therapy (65). These guided ines also recommended
8	against the use of epidural steroid injections, based on high quality evidence. A recent systematic review and meta-analysis of RCTs
9	evaluating conservative nonpharmacological therapies for degenerative LSS also concluded, based on low to moderate evidence, that
10	manual therapy and supervised exercises significantly improves outcomes compared to self-directed or group exercises (66). A recent
11	clinical update published in the British Medical Journal recommended supervised exercise and manual therapy as a first line treatment \circ
12	for LSS and recommended against the use of epidural steroid injections (67). More dated systematic reviews $\frac{3}{2}$ id not recommend a
13	combination of education, exercise, manual therapy as an effective treatment for LSS (7, 68, 69). However, these reviews did not
14	include the more recent higher quality trials (27, 31) evaluating this multimodal approach.
15	
16	A multimodal approach to the treatment of LSS would appear to be a rational approach given the complexity of neurogenic
17	claudication with underlying physical, functional, and psychosocial factors impacting recovery (70). There is also a plausible rationale
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1	for the lack of effectiveness of epidural steroid injections for neurogenic claudication since the dominant und	ng
2	pathophysiological mechanism appears to be neuro-ischemia rather than neuro-inflammation (4). $\frac{724}{9}$	
3	an a	
4	Although we cannot make firm conclusions about the effectiveness of nonoperative treatments for neurogenie cla	udication, this
5	review is important because it provides important information regarding the state of current evidence regarding	onoperative
6	treatments. This can be used to inform clinical practice guidelines and aid clinicians and patients in making	al decisions
7	regarding treatment options. This is particularly important with respect to interventions that have higher risk $\frac{1}{2}$	l costs such as
8	epidural injections and surgery. About 25% of all epidural injections are performed for LSS (71, 72) yet the evidence of the second states and surgery.	nce from our current
9	review and those of others (73-75) do not support their use. The number and associated costs of surgical procedur	es for degenerative
10	LSS is growing, especially decompression surgery with complex fusion (76, 77). LSS continues to be the most co	mmon reason for
11	spine surgery in older adults (6, 76). High quality evidence for the effectiveness of surgery is also lacking based o	n our current review
12	and the findings of other systematic reviews (78, 79). Clinical trials evaluating surgery for LSS are difficult $t \frac{3}{2}$	nduct due to
13	challenges in recruitment and blinding (patient and practitioner) and high costs (80). One ongoing clinical trians is	comparing
14	decompression surgery with sham surgery which should help to evaluate the potential role of the placebo effect of $\frac{8}{100}$	f surgery for LSS
15	(81).	
16		
	d by q	
	(81).	
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1	Oral medication is often the first line treatment in primary care management of LSS (5). Pregabalin and gaba	2
2	prescribed medications for LSS despite the growing evidence that these medications are not effective for back	-related leg symptoms
3	and may cause more harm than good (82-84).	
4		5
5	New to this updated review are clinical trials on acupuncture and spinal manipulation, however, the quality of	5
6	insufficient to make conclusions on their effectiveness. A systematic review and meta-analysis of RCTs and	ontrolled clinical trials
7	published in Chinese, found no conclusive evidence for the effectiveness and safety of acupuncture for LSS	5). Passive unimodal
8	treatments such as acupuncture and spinal manipulation are unlikely to provide long-term benefit but more like	ely to provide benefit
9	when combined with a comprehensive approach to managing LSS (27), not unlike recommendations for managing	ging chronic low back
10	pain (86).	5 7 8
11	pain (86).	
12	This review is also important because it provides a comprehensive assessment and identification of significar	,
13	area to guide future research. This includes the need for higher quality studies that assess commonly used nor	operative treatments
14	particularly in primary care settings, that are adequately powered and have low risk of bias and long-term fold	pw-up. Future RCTs
15	should follow the CONSORT guideline (87) when planning trials and reporting study findings in an attempt	b improve transparency
16	and reduce bias.	
17		
	and reduce bias.	
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		1-202
1	The strengths of this review include the evaluation of a wide range of nonoperative interventions and the use	of consistent inclusion
2	and exclusion criteria for neurogenic claudication, which included the corroboration of a diagnosis of LSS w	gh imaging. The use of
3	these criteria to define the study population increases the likelihood that participants in the included studies h	$\frac{1}{2}$ d the diagnosis of
4	neurogenic claudication due to narrowing of the central canal or lateral foraminae (88-90). Other strengths of	ية this review include the
5	use of rigorous methods recommended by The Cochrane Collaboration, the World Health Organization, and	Reference Cochrane Back and
6	Neck Pain Review Group.(13) This included the use of the GRADE method to synthesize and summarize th	gquality of the evidence.
7	Limitations of this review include the potential for language bias because only English articles were accepted	ਉ ਦਿ We also included
8	studies with small samples sizes which are more prone to high risk of bias (91). Over half of the included stu	Even by the second seco
9	subjects per arm at baseline, and none of these studies could be pooled because of high heterogeneity across	studies. However, the
10	exclusion of studies with small samples sizes in this review would not have changed our conclusions. The de	binition of a severe flaw
11	and the criteria used to assess risk of bias (low vs. high) were arbitrary, therefore alternative definitions and o	jiteria could have
12	impacted the findings and conclusions of this review. The validity of MCIDs used in this review is unknown	9 ≥Although most were
13	derived from studies with neurogenic claudication (63, 92, 93) others were based on an arbitrary improvement	$\frac{1}{2}$ at least 30% (94).
14	There are no agreed upon MCIDs in LSS and therefore different MCIDs thresholds could have potentially al	Refered our conclusions.
15	The location and severity of the stenosis on imaging was not deemed important in this review. Imaging finding	ges often do not correlate
16	with patient symptoms or severity and therefore imaging by itself is a not reliable diagnostic tool in this popu	ਤੋਂ fation (67, 95, 96).
17	Neurogenic claudication is the clinical entity of interest in this review and, although usually caused by LSS,	<u> </u>
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1	clinically without imaging (97). Neurogenic claudication symptoms, by definitions improve with flexion, dueto the increased volume
2	around the involved nerve roots irrespective of where the stenosis is located (e.g., centrally or at the lateral recess). However, it is
3	uncertain whether the effectiveness of some interventions, such as epidural steroid injections is dependent on \vec{a} ocation of the spinal
4	stenosis. This is a different research question requiring future research.
5	022. D
6	CONCLUSIONS
7	There is moderate quality evidence that a multimodal approach that includes manual therapy and exercise, with or without education is
8	a safe and effective treatment, and that epidural steroids are not effective for the management of LSS causing neurogenic claudication.
9	All other studies evaluating nonoperative interventions provided insufficient quality evidence, limiting the ability to make conclusions
10	about their effectiveness. With the growing prevalence and significant personal, social, and economic burden of LSS, more high-
11	quality evidence for nonoperative interventions is urgently needed to guide clinical practice.
12	quality evidence for nonoperative interventions is urgently needed to guide clinical practice. 00 00 00 00 00 00 00 00 00 00 00 00 00
13	19, 20
14	CONTRIBUTORSHIP STATEMENT
15	CA was involved in the conception and design of the study, screening of articles, risk of bias assessment, Grade analysis, writing the
16	first draft of the manuscript, revision of the manuscript and administrative support. AB, MS, AF, CC, JO were involved in screening
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3 4	1	of articles, risk of bias assessment, Grade analysis and critical revision of the manuscript. CH, JP, AA, KS, J	1967
5 6	2	screening of articles, risk of bias assessment, data extraction and critical revision of the manuscript.	724 on
7 8	3		19 Jar
9 10 11	4	COMPETING INTERESTS	1uary 2
12 13	5	of articles, risk of bias assessment, Grade analysis and critical revision of the manuscript. CH, JP, AA, KS, S screening of articles, risk of bias assessment, data extraction and critical revision of the manuscript. COMPETING INTERESTS CA received research funding from the Canadian Chiropractic Research Foundation and The Arthritis Socie	022 ty.D
14 15	6	JJY has received funding support from the Danish Foundation for Chiropractic Research and Post-graduate	<
16 17 18	7	Chiropractic Association, the Canadian Memorial Chiropractic College, the National Chiropractic Mutual Ir	।ਈਪ ਉ
19 20	8	Foundation, and the University of Southern Denmark.	m http:
21 22	9	CC holds a Research Chair in Knowledge Translation in the Faculty of Health Sciences, Ontario Tech University	ersi
23 24 25	10	Canadian Chiropractic Research Foundation.	en.bmj
26 27	11	The remaining authors CH, JP, AB, MS, AF, KS, AA, AA2 and JO declare no funding disclosures.	.com/ c
28 29	12		on April
30 31 32	13	 Foundation, and the University of Southern Denmark. CC holds a Research Chair in Knowledge Translation in the Faculty of Health Sciences, Ontario Tech University Canadian Chiropractic Research Foundation. The remaining authors CH, JP, AB, MS, AF, KS, AA, AA2 and JO declare no funding disclosures. FUNDING STATEMENT This work received no specific grant from any funding agency in the public, commercial or not-for-profit set 	19, 20
33 34	14	This work received no specific grant from any funding agency in the public, commercial or not-for-profit se	
35 36	15		uest. P
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Supplemental Tables

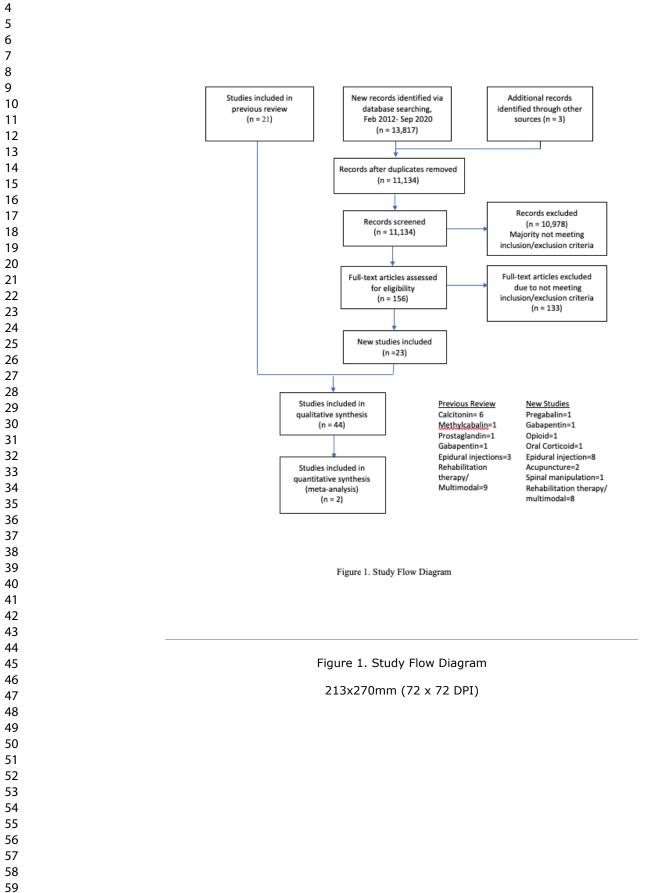
Table 1. Risk of Bias Assessment

Supplemental Table 1. Characteristics of Included Studies

Supplementals Table 2. Summary of Grade Assessment and Outcomes

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Supplemental Table 1. Characteristics of included studies

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Study	Participants and Settings	Interventions	Outcomes/Follow- up	Results (Group 1 is reference group)
	_	(Calcitonin	
Eskola 1992	39 subjects with an average of 6 years of pain, average age of 56.6 years of age, 20 males and 19 females. Setting: Orthopaedic hospital in	 100IU Calcitonin injection every other day for 4 weeks (n=20) 2) Placebo treatment (Miacalcic Sandoz 100IU) every other day for 4 weeks (n=19) 	 VAS Treadmill test Coping with ADLs Digitest Ergojump Blood tests Follow-up: 1, 3, 4, 6 and 12 months 	Between group WMD and 95% CI Pain (VAS) (mm): -0.050 (-0.053 to -0.047) Walking distance (meters)g -18.5 (-240.37 to 203.37) Adverse events: The calcidenin injection group reported minor nausea and rash in 85% of the subjects.
Podichetty 2004	Finland.55 subjects with an average age of 68.5 years and an average of 36.2 weeks of the condition in the intervention group and 29.8 weeks in the placebo group, 33 males and 22 females.Setting: Spinal center in the United States	 400 IU intranasal calcitonin daily for 6 weeks followed by open label 6- week extension (n=36) Placebo nasal spray daily for 6 weeks, followed by open label 6- week extension, during which all patients received 400IU calcitonin (n=19) 	 VAS Walking capacity ODI Stenosis specific questionnaire Satisfaction with pain levels, functional status, and treatment received SF-36 Symptom diary Follow-up: 12 weeks 	Between group MD, 95% FI, p values 12 weeks: Pain VAS (mm): 0.5 (-0.85 to 1.93): p=0.44,0 Walking time (seconds): 42.2 (-86.9 to 170.4): p=0.55 Walking distance (feet): 0.3 (-311.16 to637.84); p=0.0.0.49 SF-36 MCS: -4.22 (-10.41 to1.97); p=0.188 SF-36 PCS: 0.43 (-3.73 to 4.59); p= 0.845 Notest to 10.000 Notest to 10.000 Notest to 10.000 Notest to 10.000 SF-36 PCS: Notest to 10.000 Walking distance (feet): Notest to 10.000 Notest to 10.000
Porter	41 subjects with	1) 100 IU salmon calcitonin injection	1) Walking chart	Insufficient data provided to calculate mean difference in

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1983 Porter 1988	10 in a double blind RCT crossover, 37 males and 4 females with mean age of 55.4 years. Setting: Infirmary in England 42 subjects, 35 male, 7 female	four times per week, sometimes with Maxalon for nausea (n=5) 2) Matching placebo (n=5) Only responders randomized 1) 100 IU of salmon calcitonin injected subcutaneously 4 times per week for	and ability to walk more than 1 mile 2) ODI Follow-up: 10 weeks	walking distance or ODI anong the 10 patients enrolled in RCT. Adverse events: The calcition in injection group reported minor nausea and rash in 40% of the subjects.
1988	male, 7 female, average age of 53.6 years in 20 subjects and 56.7 years in 22 subjects, median duration of back pain reported was 11 years for 19 subjects, and 14 years for 22 subjects. Median duration of claudication was 1.25 years for 20 subjects and 4.5 years for 22 subjects.	 subcutaneously 4 times per week for 8 weeks (n=20) 2) 1 ml of saline injected 4 times per week for 8 weeks (n=22) 	 Claudication threshold 3 level mobility assessment Analgesic requirements 3 level sleep disturbance Treatment success defined as 100% improvement in walking distance and able to walk 800 m. 	Pain score (VAS) (mm): de 4 weeks: -9 8 weeks: -5.5 Walking distance until symptoms onset (meters): 4 weeks: -14 8 weeks: 42 Walking distance until pain prevents walking (meters): 4 weeks: -41 8 weeks: -99 No significant between group differences. No p values or 95 CI provided. Pril 19 2024 by
	Setting: Infirmary in England 45 subjects 31	1) 200 IU intranasal calcitonin daily for	Follow-up: 4 and 8 weeks 1) VAS	Percent change between groups: 8 weeks:

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	ages of 57.65 years in calcitonin group and 54.45 years in paracetamol group. Setting: Physical and Rehabilitation Medicine Department in	 2) Up to 1500mg of paracetamol daily for 8 weeks (n=22) Both groups took part in a physical therapy and exercise program 5 times per week for 15 sessions. 	 3) RMDI 4) Ranges of motion Follow-up: 8 weeks 	VAS with motion: -7.9%, P>0.05 Roland Morris: 8.2%, p>0.05 Walking distance: -15.4%, p>0.05 Ganuary 2022 Downloade	
Tafazal 2007	Turkey40 subjects, 30males, 10females, averageof 67 years in theinterventiongroup and 70.2years in theplacebo group,average of 38.7months withsymptoms in thecalcitonin groupand 30.9 monthsin the placebogroup.Setting:Universityhospital inEngland	 Placebo nasal spray NaCl for 4 weeks (n=20) 200 IU nasal salmon calcitonin for 4 weeks (n=20) 	 VAS Shuttle walking test 4-point subjective outcome of overall assessment (excellent, good, fair, poor) ODI Modified Somatic Perception Questionnaire Modified Zung Depression Score Follow-up: Baseline, 4, 10, 16 weeks	4 weeks: Between group MD 95% CI ODI: -0.7 (1.7 to -3.5) LBOS: -3.0 (-0.6 to -4.7) VAS leg (mm): -10 (-4.0 to -13) VAS back (mm): -6.0 (-6 tg -12) Shuttle walk distance (m) -13 (-7 to -35) 16 weeks: between group MD, p values ODI: 0.1, p=0.44; LBOS: 0.7, p=0.93; VAS leg (mm): -4, p=0.66; VAS back (mm): 16, p=0.63; Shuttle walking distance (m): -11, p=0.39	

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		Or	al Medication	577
Matsudaira 2009	79 subjects, 24 males and 24 females, with an average age of 69.6 years in the Limaprost group and 72.2 in the Etodolac group. Setting:	 Oral prostaglandin E1 derivative (15 g Limaprost) 3 times daily for 8 weeks (n=39) 400 mg of etodolac (NSAID) twice daily for 8 weeks (n=40) 	 SF-36 Verbal pain rating scales Walking distance LBP severity Leg pain severity Leg numbness severity Treatment 	SF-36 subscales MD, p values 8 weeks: physical function, 9.4, p=0.01, role physical: 13. p=0.03, bodily pain: 15.5, p<0.01: General health: 6.6, p=0.08; vitality: 11.3, p=0.22; social functioning: 8.0, p=0 role emotional: 10.2, p=0.27; mental health: 12.2, p<0.01 Secondary outcomes not provided in a way that MD can be extracted: 8 weeks: low back pain: p=0.77; leg pain p=0.08; Leg numbness: p<0.01; walking distance p<0.01; patient subjective improvement p=0.01; patient
	Orthopaedic surgery in a medical faculty in Japan	D _Q	satisfaction Follow-up: 8 weeks	subjective improvement pg0.01; patient satisfaction p<0.
Waikakul 2000	152 subjects, 68 males and 84 females with an average age of 66.8 years. 44 of the subjects had symptoms for less than one month, 98 had symptoms for more than one	 Conservative treatment consisting of education, activity modification, exercise and physical therapy. NSAIDs, muscle relaxants, and analgesics as necessary. Vitamin B1, B6, and B12 3 times per day (n=82) Conservative treatment plus Methlcobalin ESAI, 1.5mg per day in 3 divided doses after meals for 6 months (n=70) 	 Presence of pain on spinal motion Claudication distance Medication intake (NSAIDs, muscle relaxants, and steroids) 	Walking distance Percent able to walk > 1000 meters 6 mo: 71.3% vs. 88.6%, p<0.05 12 mo: 81.3% vs. 97.1%, p<0.05 18mo: 83.8% vs. 97.1% p<0.05 Adverse events: There were no reported adverse effects in subjects in methylocabalin proup
	month. Setting: Hospital in Thailand		Follow-up: every month for two years	pril 19, 2024 by
Yaksi 2007	55 subjects, 22 males, 33 females, average age of 50.8 years. Setting: Hospital	 900 mg of gabapentin per day increased weekly by 300 mg to a maximum of 2400 mg (n=28) Placebo (n=27) 	 VAS - low back and leg pain during movement Walking distance 	Between group differences p values Pain (VAS) (mm) no raw eata 3 rd mo 3.4 vs. 1.9, p =0.039 4 th mo 4.1 vs.2.0, p =0.006 Walking Ability, no raw data
	Setting. Hospital		uistance	

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	department of physical medicine and rehabilitation in Turkey	Both groups received physical therapy exercises, a lumbosacral corset with steel bracing and NSAID treatments	 3) Presence or absence of motor and/or sensory deficits Follow-up: 15 days, 1, 2, 3, 4 	Grp 1: longer walking distance at end of 2^{nd} mo (p < 0.05), 3^{rd} mo (p < 0.05) and 4^{th} mo (p $\stackrel{<}{\leq} 0.005$) Adverse events: some subjects randomized to the gabapentin group (no data specified) experienced mild to moderate drowsiness and/or dizziness
Markman 2015	29 participants, 20 males, 9 females, Eligible subjects were older than 50 years (mean 70.1 years) with at least one level of radiographically confirmed lumbar spinal stenosis and symptoms of neurogenic claudication for at least 3 months. Setting: Hospital in Rochester, New York	 Pregabalin group (n=14) Active placebo (Diphenhydramine) (n=15) Cross over study after 7 day wash out period. Pregabalin was started at 75 mg PO twice daily or diphenhydramine, 6.25 mg) and increased on day 4 to 150 mg PO twice daily (12.5 mg diphenhydramine) for 7 days. Pregabalin was decreased to 75 mg PO twice daily (6.25 mg diphenhydramine) on day 11 for 3 days of tapering. 	months1)NRS - time to first moderate pain symptom during a 15- minute treadmill test (Tfirst) (NRS - greater than 4)Follow-up: day 10 of intervention period	Between group MD, 95% &I, p values Treadmill testing pain at rest (NRS) 0.29 (0.41 to 0.98): p=0.40 Treadmill testing final pain (NRS) 0.25 (-0.44 to 0.94): p=0.46 Treadmill testing distance walked (m) -24.06 (-75.63 to 27.52): p=0.35 Treadmill testing recovery time (min) -0.79 (-1.86 to 0.28): p=0.19 Treadmill testing patient global assessment of pain -0.08 (-0.45 to 0.29): p=0.65 Treadmill testing RMDQ 1.50 (0.38 to 2.62): p=0.01 Adverse events: Complications were reported in 64% of subjects in group 1, the most common being dizziness, compared to 35% in group &
Park 2017	45 subjects, 21 in GPN Group (17 female, 4 males, mean age 66.1± 10.5), and 24 in BTX group (15 female and 9 males, mean age	 Conservative treatments plus gabapentin (group GPN): Gabapentin 300 to 1200mg/d - titrated to patient characteristics, comorbidities, and reported side effects (n=21) Conservative treatments plus BTX 	 NRS - back/leg pain intensity Cramp frequency (no./wk) Cramp severity (0-4 	No statistically significant difference between groups and lack of reporting of quantitative data Adverse events: Five patients (20.8%) in group 2 reported mild to moderate pain at injection sites for a few days.

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	66.2±8.2) Setting: Outpatient department for interventional pain management in Korea	 injection (group BTX): The BTX (botulinum toxin type A [Nabota]) dose was 100U in 5mL of 0.9% saline injected into the gastrocnemius medialis and lateralis. (n=24) Conservative treatments: education, exercise, analgesic medication, injection therapy including epidural injections, and physical therapy 	 criteria) 6) Insomnia severity – (ISI 0-28) 7) ODI 8) Patient global impression of change Follow-up: 2 weeks, 1 and 3 months. 	7724 on 19 January 2022. Downloade
2015 - 2	24 participants, 12 males and 12 females, (mean age 72 years) LSS by imaging with symptoms of neurogenic claudication Setting: Translational Pain Research Center at a University in Rochester, New York	 Oxymorphone hydrochloride (Opana IR, 5 mg) (n=8) Propoxyphene/acetaminophen (Darvocet, 100 mg/650 mg) (n=8) Placebo: 3 separate visits (random order with at least 3 day washout periods) (n=8) 	 NRS (at rest) NRS (final pain rating) AUC 4) Distance walked (m) Recovery time (min) ZCQ Patient global assessment of pain RMDQ ODI Follow-up: Study was prematurely terminated 	Between group MD, 95% GI , p values Treadmill testing pain at est (NRS) Grp 1 vs Grp 3: -0.04 (-0.72 to 0.65): p-0.89 Grp 2 vs Grp 3: -0.27 (-0.95 to 0.41): p=0.32 Grp 1 vs Grp 2: 0.23 (-0.45 to 0.92): p=0.40 Treadmill testing final pain (NRS) Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 2 vs Grp 3: 0.53 (-0.40 to 1.46): p=0.16 Grp 1 vs Grp 2: -0.33 (-1.2¢ to 0.61): p=0.39 Treadmill testing distance walked (m) Grp 1 vs Grp 3: -12.41 (-63 01 to 38.20): p=0.54 Grp 2 vs Grp 3: -23.41 (-73 60 to 26.79): p=0.25 Grp 1 vs Grp 2: 11 (-39.53 GI 61.54): p=0.59 SSSQ symptom severity score Grp 1 vs Grp 3: -0.03 (-0.19 to 0.13): p=0.61 Grp 2 vs Grp 3: 0.01 (-0.15 GI 0.17): p=0.85 Grp 1 vs Grp 3: 0.04 (-0.20 to 0.11): p=0.49 SSSQ physical function score Grp 1 vs Grp 3: 0.04 (-0.16 GI 0.09): p=0.47 Grp 2 vs Grp 3: 0.11 (-0.01 GI 0.23): p=0.03 Grp 1 vs Grp 3: -0.15 (-0.27 to -0.02): p=0.01 Patient global assessment af pain Grp 1 vs Grp 3: -0.03 (-0.5 GI 0.47): p=0.90 Grp 2 vs Grp 3: 0.13 (-0.36 to 0.47): p=0.90 Grp 2 vs Grp 3: 0.13 (-0.36 to 0.47): p=0.52

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					Grp 1 vs Grp 2: -0.15 (-0.64 to 0.34): p=0.44 The study was prematurely terminated because of the removal of propoxyphene/acetaminophen from the US market.
Rodrigues 2014	61 patients with lumbar canal stenosis (50–75 years; canal area < 100 mm ² at L3/L4, L4/L5, and/or L5/S1on MRI; and claudication within 100 m). 31 in the corticoid group (mean age 58.23 (6.38), and 30 in the placebo group (mean age 58.33 (6.19)) Setting: Hospital in São Paulo, Brazil	1)	Oral corticoid group received 1 mg/kg of oral corticoids daily, with a dose reduction of one-third per week for 3 weeks (n=31) Control group was administered placebo for the same period (n=30)	 SF-36 RMDQ 6-min walk test VAS Likert scale Follow-up: 3, 6 and 12 weeks 	Between group comparison VAS (6 weeks) Corticoid vs Placebo: 1.53 200.02 (in favour of placebo)
				rapy and Multimod	
Goren 2010	45 subjects, 13 males, 32 females, average ages in groups of 57.4, 49.13, and 53.06. 7 subjects with pain duration of 3-6 months, 7 with pain duration of 6-12 months, and	 1) 2) 	Stretching and strengthening exercises for lumbar, abdominal, leg muscles as well as low intensity cycling exercises were given as therapeutic exercises. Ultrasound was applied with 1mHz, 1.5W/cm2 intensity, in continuous mode on the back muscle for 10 minutes (n=17) Same as group 1 with Ultrasound on off- mode (n=17)	 VAS (out of 10) Treadmill test at 3 km/h for maximum of 15 minutes or 750m. ODI Analgesic consumption Physiatrist 	Pain (VAS) (mm) within group MD 3 weeks: Grp 1: -2.2 for back pain; -1.47 for leg pain Grp 2: -1.94 for back pain; Grp 3: 0.40 for back pain; 9.54 for leg pain 9

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	31 with pain duration of greater than 12 months. Setting: Rehabilitation center in Turkey	3) No exercise-no treatment (n=16)	assessment Follow-up: End of 3-week treatment period only	Grp 2: 114.94 seconds Grp 3: -66.10 seconds No significant change between groups Disability (ODI) (within group MD) 3 weeks: Grp 1: -3.94 Grp 2: -7.8 Grp 3: -3.6 ODI between groups differences	
Koc 2009	29 subjects, 21 male, 8 female, average ages of 62.6, 61.1, and 53.1 years in the three groups, average pain duration of 5.7 years, 5.0 years, and 5.7 years in the three groups. Setting: Medical school department of physical medicine and rehabilitation in Turkey	 Conservative inpatient physical therapy program 5 days a week for 2 weeks. PT included applications of ultrasound 1.5 W/cm2 for 10min, hot pack for 20min, and TENS for 20min to the lumbar region (n=13) Lumbar epidural steroid injections, 10 ml of solution containing 60mg of triamcinolon acetonide (1.5 mL), 15 mg of 0.5% bupivacain hydrochloride (3 mL), and 5.5 mL of physiologic saline (0.9%NaCl) was injected in 3.5minutes. (n=10) Control group (n=10) All patients included were trained to pursue a home-based therapeutic exercise program performed twice daily for a period of 6 months, and oral diclofenac sodium 75mg was administered to all 	 VAS Treadmill walk test Nottingham Health Profile RMDI Functional testing including finger to floor distance, sit- to-stand, and a weight carrying test Follow-up: 2 weeks, 1, 3 and 6 months 	Grp 1> Grp 3 (p<0.05), Grp 2> Grp 3 (p<0.05) No raw data provided. No significant between group differences for all outcomes an follow-ups except: Pain (VAS) 2 weeks: Grp 2 less pain than Grp 3 p= 0.008 Disability (RMDI) 2 weeks: Grp 2 less disability than Grp 3 p= 0.007 Quality of Life (Nottingham Health Profile) (no data provided) Grp 2 had significantly higher improvement than Grp 3 at 2 weeks in mobility subgroup scores. Adverse events: 1 subject Seported angina pectoralis and 1 reported gastric complaints group not specified).	
Pua 2007	68 subjects, 35 males, 33	 patients twice daily for 2 weeks 1) Unweighted treadmill training: Weeks 1 and 2, participants walked 	1) VAS for pain over past	Pain (VAS) (mm) MD and 95% CI 6 weeks: 2 (-5 to 10)	

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females, averag age of 58 years, 12 week mediar pain duration Setting: Hospit in Singapore	 with a relatively pain-free gait which translated to 30–40% of body weight. In weeks 3 to 6, participants were encouraged to walk at a moderate intensity. The duration of each treadmill session was limited by participant tolerance or to a maximum of 30 minutes. 2x per week for 6 weeks = 12 sessions (n=33) 2) Cycling on upright bicycle: During weeks 1 and 2, participants cycled at their comfortable pace at 50 to 60 rpm. Participants were encouraged to exercise at a moderate intensity and the duration of each cycling session was limited by participant tolerance or to a maximum of 30 minutes. 2x per week for 6 weeks 3 to 6, participants were encouraged to exercise at a moderate intensity and the duration of each cycling session was limited by participant tolerance or to a maximum of 30 minutes. 2x per week for 6 weeks for 12 sessions (n=35) 	week 2) Patient perceived benefit on a 6- point scale 3) ODI 4) RMDI 5) Walking ability Follow-up: 3 and 6 weeks	Disability (ODI), OR, 95% CI 6 weeks: OR 1.10 (0.41 to 298) Patient perceived benefit, OR, 95% CI 6 weeks: OR 0.50 (0.17 to 1948) Walking ability (≥800 m), OR, 95% CI 6 weeks: OR 1.14 (0.44 to 594) V Adverse events: 1 subject fit treadmill group reported increase in pain.
Whitman58 subjects, 31 males, 27 femal 29 (group 1) wi an average age of 70 years, 29 (group 2) with a average age of 68.9, median low back pain duration of 108 months in Grou 1's 29 subjects	week for 6 weeks. Lumbar flexion exercises along with self-pace treadmill walking program, and sub- therapeutic ultrasound. The duration of each treadmill session was based	 Global Rating of Change (15-point scale) NPRS for lower limb Walking Tolerance test ODI Medication consumption Satisfaction subscale of the 	Patient Global Assessment (somewhat better or greater)6 weeks: 41% vs. 79% p<001

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	subjects, lower extremity median pain duration of 48 months in Group 1's 29 subjects and 24 months in Group 2's 29 subjects. Setting: University in the United States	physical therapy (thrust and non thrust) to the thoracic and lumbar spine, pelvis, and lower extremities and specific exercises at discretion based on the underlying impairments. Patients received specific exercises to address impairments in mobility, strength, and/or coordination. Exercises were performed in the clinic and as part of a home exercise program. Patients also underwent a bodyweight supported treadmill ambulation program using a cable and trunk harness system to unload a specific amount of weight from the patient while the patient walks as comfortably as possible on a treadmill (n=29).	Stenosis Scale 7) Additional use of health care resources Follow-up: 6 weeks, 1 year, long term mail survey (averaging 29 months)	Long term: 1.8 (0.6 to 3.0) (5. 2.0 (0.7 to 3.4) Between group MD not statistically significant at any follow period Walking Ability (improvement in meters) within group 95% CI 6 weeks: 176.5 (-9.5 to 362,4) vs. 339.7 (218.4 to 461) 1 year: 130.4 (-55.3 to 316.6) vs. 209.8 (67.5 to 352.1) Between group improvement not statistically significant at follow-up Disability (ODI) within group MD 6 weeks: 6.55 (1.87 to 11.26) vs. 10.48 (6.5 to 14.4) 1 year: 5.03 (1.71 to 8.35) vs. 7.14 (1.5 to 12.8) Between group differences fot statistically significant at an follow-up
Minetama 2019	86 patients, 39 men and 47 women, average age 72.7 years 43 patients (20 men and 23 women, average age 72.3 years to the PT group 43 patients (19 men and 24 women, average age 73.2 years) to the HE group. Duration symptoms 20 months	 Physical therapy + home exercise program (n=43) Home exercise (HE) program alone (n=43) Supervised physical therapy twice a week for 6 weeks, including manual therapy, individually tailored stretching and strengthening exercises, cycling, and body weight-supported treadmill walking. The manual therapy included manipulation, stretching, and massaging of the thoracic and lumbar spine, pelvis, and lower extremities. The individually tailored muscle exercises included those for the trunk (eg, abdominal planks, side bridge, and/or back extension) and lower 	 ZCQ Satisfaction SPWT (m) NRS JOABPEQ- acquired points SF-36 HADS PCS PASS-20 TSK-11 Daily steps Follow-up: 6 weeks 	Between group MD, 95% CI ZCQ - Symptom severity -0.4 (-0.6 to -0.2): statistically significant ZCQ - Physical function -0.4 (-0.6 to -0.2): statistically significant SPWT (m) 455.9 (308.5 to 603.2): statistically significant NRS - Leg pain -1.4 (-2.5 to -0.3): statistically significant SF-36 - Physical functioning 9.2 (2.1 to 16.3): statistically significant SF-36 - Bodily pain 10.4 (3.3 to 17.5): statistically significant Daily steps 723.4 (199.1 to 1,283.5): statistically significant

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Setting: Spine care center at a university hospital in Japan	 extremities (eg, unloading hip and/or knee exercise with ankle weight and/or standing squats). The typical dosage for strengthening exercises was a total of 2 to 3 sets with 10 repetitions, each of 6-second contraction. The typical duration of stretching was three repetitions of 30 seconds. All patients in both groups were asked to take a daily walk that did not exacerbate their lower extremity symptoms using a pedometer and walking diary and to perform a HE program consisting of lumbar flexion exercises including three 30-second bouts of both single and double knee-to-chest exercises, ten 6-second bouts of trunk raises and bridging in the supine position, and a 4-point kneeling exercise at least twice daily. 		57724 on 19 January 2022. Downloaded from http://bmjope	
Schneider 019 259 subjects, 12 males and 137 women with an average age of 72.4, 68 patients had symptoms for less than 6 months, 191 had symptoms for greater than 6 months Setting: Outpatient	 Medical care (MC) (n=88) Group exercise (GE) (n=84) Manual therapy + exercise (MTE) (n=87) 	 SSS SPWT Physical Activity Follow-up: 2 and 6 months	Between group MD, 95% CISSS (2 months) \blacksquare GE vs MC: 0.4 (-1.3 to 2.1)MTE vs MC: -2.0 (-3.6 to -6.4)MTE vs GE: -2.4 (-4.1 to -6.8)SPWT (2 months)GE vs MC: 79.9 (-74.5 to 254.5)MTE vs MC: 122.9 (-25.7 to 271.6)MTE vs GE: 43.0 (-111.8 to 2197.9)Physical activity (2 months)GE vs MC: 28.7 (2.7 to 54.2)MTE vs GE: -8.3 (-34.5 to 27.6)SSS (6 months)GE vs MC: -0.5 (-2.3 to 1.32)	

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	 Physician rendered general guide and on gentle stretching and advice to stay active. Group Exercise: Supervised exercise classes at 2 local senior community centers. 2x 45-min classes/week, 6 weeks. Taught by senior fitness instructors. Participants self-select level of exercise based on fitness level (easy to medium) Manual Therapy + Exercise: 2x 45-minute sessions per week, 6 weeks by either 2 chiropractors or 2 physiotherapists. Sessions included 3 interventions: Warm-up procedure on stationary bicycle Manual therapy procedures (lumbar distraction, hip, lumbar/sacroiliac joint and neural mobilizations Individualized instruction in spinal stabilization exercises and home stretching Practitioner determined what muscles required stretch/strengthening and 		SPWT (6 months) GE vs MC: 86.5 (-75.7 to 278.8) MTE vs MC: 73.8 (-84.1 to 231.7) MTE vs GE: -12.7 (-175.6 (0 150.1) Physical activity (6 months) GE vs MC: 21.3 (-6.9 to 4954) MTE vs MC: -2.9 (-30.1 to 24.3) MTE vs GE: -24.2 (-52.5 to 20.0) Adverse events: There were no reported serious adverse ever in any group. There was a significantly greater rate of transier joint soreness associated with group 3 (49%) compared with group 2 (31%) and group 1 16%).
Ammendolia104 patients, 42018104 patients, 4males and 59females, 48 incomprehensivegroup and 51 iself-directedgroup, with anaverage age of69.4	2) Self-directed (n=51)	 SPWT Distance Clinical Significance 30% improvement in SPWT no. (%) Clinical 	Between group MD, 95% CI, p values SPWT 8 wks: 345.4 (150.0 to 540.7): p=0.00 - 3 mo: 304.1 (77.9 to 530.3) p=0.01 6 mo: 421.0 (181.4 to 660.02): p=0.00 t 12 mo: 473.2 (203.9 to 742.4): p=0.00

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(comprehensive) and 71.7 (self- directed) neurogenic claudication >3 months, imaging- confirmed canal narrowing, walk >20m and not surgical candidates in next 12 months Setting: Academic hospital outpatient clinic in Toronto	Education: Self-management strategies via cognitive behavioral approach. Body repositioning (pelvic tilt) when standing and walking. Exercises: Standardized set of exercises demonstrated gradually over 6 weeks and was a part of structured home exercise program. Cycling, muscle stretching, strengthening, conditioning for back and lower extremity fitness and to facilitate lumbar flexion Manual therapy: Spinal manipulation; joint, soft tissue and neural mobilization; lumbar flexion-distraction; and manual muscle stretching applied each visit. Participants received an instructional video and workbook and pedometer. Self-directed: Instructional Video, workbook, pedometer and a single 15-to 30-minute training session with an experienced independent licensed chiropractor, independent of the comprehensive program, Training session: Describe 6-week program, review workbook, explain pedometer use and recording of weekly walking steps. Video and workbook: Educational information and the same exercise	J Open Significance - 50% improvement in SPWT no. (%) 4) ZCQ-S 5) ZCQ-F 6) ZCQ-F 7) ODI 8) ODI walk 9) NRS Back 10) NRS Leg Follow-up: 8 weeks, 3, 6, and 12 months	6 mo: 19 (2-35): p=0.02 12 mo: 22 (4-39): p=0.02 50% improvement in SPWT 8 wks: 26 (8-42): p=0.01 3 mo: 19 (-1.0 to 36): p=0.09 6 mo: 17 (-2 to 35): p=0.09 12 mo: 24 (5-40): p=0.01 ZCQS 8 wks: -0.19 (-0.37 to -0.02): p=0.03 3 mo: -0.15 (-0.37 to 0.08): $= 0.19$ 6 mo: -0.02 (-0.22 to 0.19): $= 0.87$ 12 mo: -0.22 (-0.47 to 0.02): $p=0.07$ ZCQF 8 wks: -0.02 (-0.22 to 0.17): $p=0.81$ 3 mo: -0.18 (-0.39 to 0.03): $= 0.09$ 6 mo: -0.11 (-0.33 to 0.11): $p=0.34$ 12 mo: -0.27 (-0.49 to 0.04): $p=0.02$ ZCQS+ZCQF 8 wks: -0.24 (-0.56 to 0.07): $p=0.13$ 3 mo: -0.36 (-0.75 to 0.03): $= 0.07$ 6 mo: -0.23 (-0.58 to 0.12): $p=0.20$ 12 mo: -0.48 (-0.90 to -0.06]: $p=0.03$ ODI 8 wks: -0.02 (-0.07 to 0.02): $p=0.30$ 3 mo: -0.04 (-0.09 to 0.01): $p=0.13$ 6 mo: -0.03 (-0.08 to 0.02): $p=0.30$ 3 mo: -0.04 (-0.9 to 0.03): $p=0.30$ 9 wks: -0.22 (-0.6 to 0.1): $p=0.13$ 9 wks: -0.22 (-0.6 to 0.1): $p=0.30$ 9 wks: -0.23 (-0.58 to 0.12): $p=0.30$ 9 wks: -0.24 (-0.58 to 0.12): $p=0.30$ 9 wks: -0.02 (-0.07 to 0.02): $p=0.30$ 9 wks: -0.24 (-0.9 to 0.03): $p=0.07$ 9 wks: -0.24 (-0.9 to 0.03): $p=0.07$ 9 wks: -0.24 (-0.9 to 0.03): $p=0.03$ 9 wks: -0.24 (Page 5
	Video and workbook: Educational		3 mo: -0.4 (-0.9 to 0.03): p=0.07 6 mo: -0.9 (-1.3 to -0.4): p<0.001 12 mo: -0.2 (-0.7 to 0.2): p=0.32 NRS Back 8 wks: -1.4 (-2.2 to -0.5): p=0.002 3 mo:-0.6 (-1.4 to 0.3): p=0.23 6 mo: -0.7 (-1.7 to 0.3): p=0.16	
			12 mo: -0.4 (-1.3 to 0.4): p=0.32	

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1 2 3				136/bmjopen-2021-0
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			PV:	NRS Leg 8 wks: $-0.7 (-1.5 \text{ to } 0.1): p=0.09$ 3 mo: $0.05 (-0.85 \text{ to } 0.96): p=0.91$ 6 mo: $-0.9 (-1.9 \text{ to } 0.003): p=0.58$ 12 mo: $-0.5 (-1.6 \text{ to } 0.6): p=0.37$ SF-36 Bodily Pain 8 wks: $2.0 (-4.9 \text{ to } 8.9: p=0.37$ 3 mo: $-4.5 (-12.4 \text{ to } 3.5): p=0.27$ 6 mo: $-3.3 (-10.2 \text{ to } 3.6): p=0.35$ 12 mo: $10 (2.1 \text{ to } 17.9): p=0.013$ SF-36 Physical Function 8 wks: $4.2 (-3.9 \text{ to } 12.4): p=0.31$ 3 mo: $9.2 (1.1 \text{ to } 17.3): p=0.027$ 6 mo: $5.8 (-2.1 \text{ to } 13.6): p=0.15$ 12 mo: $8.2 (0.2 \text{ to } 16.2): p=0.045$ Adverse events: At 12 months, 0 participants out of 43 in group 1 and 2 out of 46 participants in group 2 experienced adverse events that were mostly attributed to a temporary increase in low back and/or leg pain.
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	120 patients, 30 in group 1 with an average age of 57.1 years old, 30 in group 2 with an average age of 55.8 years old and group 3 with an average age of 57.4 years old, LSS symptoms, narrowing by MRI Setting: University	 Standard exercise group (n=30) Isokinetic exercise program (n=30) Unloading exercise group (n=60) All groups physician-guided (5x/week for 3 weeks) then at-home (3x/week) Standard Exercise: 15 sessions of TENS, hot packs with home exercise instruction. Isokinetic exercise: 20 minutes/day, 5 sessions/week for a total of 15 sessions with a physician. Isokinetic exercises: 	 VAS ODI Beck Depression Inventory Follow-up: 4, 12 and 24 weeks	Between group MD, p value VAS After treatment: Grp 1 vs Grp 2:0.37, $p>0.05$ Grp 1 vs Grp 3: 1.36, $p<0.05$ Grp 2 vs Grp 3: 0.99, $p<0.05$ 4^{th} week: Grp 1 vs Grp 2: 1.43, $p>0.05$ Grp 1 vs Grp 3: 1.17, $p<0.04$ Grp 2 vs Grp 3: -0.26, $p>0.05$ 12^{th} week: Grp 1 vs Grp 2: 0.93, $p>0.05$ Grp 1 vs Grp 3: 0.71, $p>0.05$ Grp 1 vs Grp 3: -0.22, $p>0.05$ 24^{th} week: Grp 1 vs Grp 3: -0.22, $p>0.05$ 24^{th} week: Grp 1 vs Grp 2: 1.08, $p>0.05$
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	BMJ	Open	i sey prij	Page :
physical medicine and rehabilitation in Turkey	BMJ of a set of the se	Dpen	Grp 1 vs Grp 3: 0.46, $p>0.0000$ Grp 2 vs Grp 3: -0.62, $p>0.0000$ After treatment: Grp 1 vs Grp 2: -0.8, $p>0.00000$ Grp 1 vs Grp 3: 1.8, $p<0.00000000000000000000000000000000000$	5
			24 th week: Grp 1 vs Grp 2: 35.2, p>0.05 Grp 1 vs Grp 3: 1.9, p>0.05 Grp 2 vs Grp 3: -33.3, p>0.05	5
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	BMJ Ope	en	136/bmjopen-2021-05
Homayouni 201547 subjects, 23 male, 24 female, 24 in group one, mean age 55.56, 12 male, 12 female, 23 in group two, mean age 55.68, 11 male, 12 femaleSetting: University-based pain clinics in Iran	min for each of them. Participants should have attended aquatic physical therapy sessions every other day for a total duration of 24 sessions. Each session included ambulation, side walking, chain walking, forward walking with kickboard, stretching of each muscle group including adductors, abductors, flexors and extensors of the hip, knee flexors and ankle plantar flexors and dorsiflexors.	VAS Walking ability Ilow-up: mediately after grapy, 3 months All between group comp Walking ability Grp 1 > Grp 2: p=0.02 VAS Grp 1 > Grp 2 p=0.001	<u></u>

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	ticipants, 1) nales and	a day at home in the following weeks until the end of the eighth week. (n=25) Exercise 3x week / 6 weeks prior to surgery (n=20)	1) NRS (Pain Intensity)	Between group MD 9 NRS (leg) 9
the integroup averag 66.7 ye and 20 contro with an age of old, wi and dia imagin Setting	l group n average 71.5 years ith history agnostic ng of LSS g: nal hospital	Regular hospital preoperative management with back posture education (n=20)	 2) ROM (Active) 3) Muscle strength (N-m) 4) Walking capacity (seconds) Follow-up: 3 and 6 months 	Preoperative: -2.1, $p<0.05$ Postoperative: 1.1, $p>0.05$ 3 months: 1.1, $p>0.05$ 6 months: 0.3, $p>0.05$ ROM (active) Preoperative: 5, $p<0.05$ Nuscle Strength Preoperative: 45.7, $p<0.001$ Postoperative: 5.1, $p>0.05$ Walking Duration Preoperative: -14.5, $p>0.05$
age 64 women Settin	n 24 (66.7) g: Hospital ul, South	MT1 group: 110 g of Gang-Chuk Tang was administered 3 times a day (Gang-Chuk Tang is an herbal concoction consisting of Eucommiae Cortex, Achyranthis Radix, Rhizoma Cibotii, Sorbus commixta, G. thunbergii, Saposhnikovia Radix, and Acanthopanacis Cortex in equal portions) Daily Mokhuri Chuna therapy (relaxation and mobilization of lumbar joint and back muscle) Daily acupuncture treatment on LI4, ST36, LV3, BL22, BL23, BL24, BL25, and Ashi points. Consultation on precautions related to daily	 VAS for leg pain VAS for low back pain Oxford Claudication Scoring Walking distance Follow-up: 3 and 6 months 	All between group compagisons VAS leg pain (post treatment) MT2 (28.82 \pm 27.46) vs CM \mp (51.82 \pm 25.34) groups: P=0.04 VAS leg pain (6 months) $\stackrel{>}{\rightarrow}$ MT1 (48.91 \pm 23.08) vs CM \mp (72.27 \pm 16.72) groups: P=0.01 MT2 (42.36 \pm 21.29) vs CM \mp groups: P=0.003 VAS low back pain (6 months): MT2 (30.00 \pm 13.48) vs CM \clubsuit (60.82 \pm 18.62) groups: P=0.00 Oxford Claudication Scoring (3 months) MT1 (18.75 \pm 6.52) vs CMT \ddagger 25.82 \pm 6.24) groups: p=0.02 Walking distance (3 months) MT1 vs CMT: p=0.03 Walking distance (6 months) MT1 vs CMT: p=0.01

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		 activity and stepwise walking training for the entire 4 weeks of therapy. (n=12) 2) MT2 group: Mokhuri Chuna, acupuncture, and physician consultation were offered in the same manner and dosage as the MT1 group with the exception that all herbal medications were withheld. (n=11) 3) CMT group: Oral analgesic therapy (aceclofenac 100 mg twice daily and eperisione hydrochloride 50 mg three times daily for 28 days) and three interlaminar epidural steroid injections (5 mg of dexamethasone per injection) at the level of the affected spinal region over a 4-week period were administered. Physiotherapy including heating pad, and transcutaneous electrical nerve simulator, and deep tissue heating therapy five times per week for 4 	erien	The primary outcome of this pilot study was safety as measure by the type and incidence of adverse events (AEs).
		weeks. (n=11)	 Manipulation	April
Passmore 2017	14 patients with degenerative LSS (n=14); Swiss Spinal Stenosis score of M=63.2, standard deviation [SD] = 15.9) (mean age 59.0 (10.6)), 7 in the SM group (4	 Spinal manipulation group: received bilateral high-velocity; low- amplitude spinal manipulation directed toward the lumbar region (by a licensed chiropractor with more than 10 years of clinical experience) (n=7) Non Intervention Group: Waited 5 minutes if they were assigned to the 	 Movement time NPS (Back) NPS (leg) ROM Follow-up: Immediately after intervention 	There was no significant difference between groups for all outcomes. 1. Grp 1 vs. Grp 2, p=0.739 2. Grp 1 vs. Grp 2, p> 0.05 3. Grp 1 vs. Grp 2, p> 0.05 4. Grp 1 vs. Grp 2, p> 0.05 5. 7. 8. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9

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	female, 3 male) (mean age 59.1 (9.3)), 7 in the NI group (3 female, 4 male) (mean age 58.9 (12.6)) Setting: rehabilitation hospital in Winnipeg, Manitoba	no intervention group (n=7)		057724 on 19 January 2022. Downloaded	
		A	cupuncture		
Kim 2016	50 participants mean age of 62.0±9.8 years, acupuncture (n=26), age 65.0±8.7, male / female 12/14, control (n=24), age 58.9±10.2, male / female 10/14. Mean duration of symptoms 33m Setting: Hospital in Yangsan, South Korea	 Acupuncture: 269 acupuncture sessions were administered during the study. 81% (n=21) of patients received at least 10 acupuncture sessions. Electrical acupuncture was applied at least once and bilaterally at back shu points (BL23, BL24, BL25 or BL26) or Jiaji points at L2– L5 spinal levels. Other frequently used points were BL57, BL60, GB39, GB34 and tender points located in the lower extremities (n=26) Control: In total, 255 physical therapy sessions were provided to patients in the control group at their request. 92% (n=22) of patients received at least 10 physical therapy sessions (median 11, range 1–13). (n=24) 	 ODI SF-36 bodily pain SF-36 physical function LBP bothersomene ss LBP intensity Leg pain bothersomene ss Leg pain intensity Self-reported pain-free walking distance (m) Follow-up: 6 weeks, 3 months 	Between group MD, 95% ST ODI 6 wk: -2.2 (-7.0 to 2.6) 3 mo: -2.5 (-8.9 to 3.8) SF-36 BP 6 wk: -8.6 (-18.6 to 1.3) 3 mo: 3.2 (-8.3 to 14.7) SF-36 PF 6 wk: 0.1 (-7.6 to 7.9) 3 mo: 1.3 (-8.3 to 10.9) LBP bothersomeness 6 wk: -0.6 (-11.4 to 10.1) 3 mo: -7.4 (-19.6 to 4.8) LBP intensity 6 wk: -5.1 (-15.5 to 5.3) 3 mo: -13.5 (-26.2 to -0.7) 4 Leg pain bothersomenessy 6 wk: -7.4 (-18.4 to 3.7) 3 mo: -9.2 (-21.6 to 3.2) Leg pain intensity 6 wk: -11.5 (-0.9 to -22.0) 3 mo: -12.6 (-24.6 to -0.6) ctended	
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				136/bmjopen-2021-05 None statistically significant
assig com wee coun grou shar Mea 61.5 with and Dur sym =14 12 n 1 to (309 (51. Sett 2 Cl Dep Acu Neu Gua Hos Dep Acu Neu Beij Hos Inte	gned with 70 ppleting the 8- k treatment rse (38 in acu p and 32 in m acu group). an age of 5 ± 7.9 years a 34 males 46 females. ation of pptoms <3mo (17.5%), 3- no = 1(1.3%), 5 y = 24 %), >5 y =41 3%)	 Acupuncture: Applied by acupuncturists with 5 years of Chinese medical university program and at least 2 year of clinical experience. Sterile disposable steel needles (Hwato Acupuncture, Suzhou, China; 0.30 £ 40 mm/0.30 £ 75 mm) were inserted through adhesive pads. Participants underwent 3 treatments weekly over 8 weeks, and each session persisted for 30 minutes. To maintain "De qi," a sensation of numbness and soreness, acupuncture manipulation (twirling, lifting, and thrusting on needles) was performed every 10 minutes during the treatment. Sham acupuncture: Chosen acupoints, treatment duration, and frequency of sessions were the same as in the acupuncture group. Participants in the sham cohort were treated using a pragmatic placebo needle on the same acupoints, which is similar to the Streitberger needle design (Supplementary Materials). Acupuncturists pretended to manipulate the needle every 10 minutes, but "De qi" was not sought. 	 RMDQ NRS back NRS Leg SSS Symptoms subscale SSS physical function subscale SSS satisfaction subscale SSS satisfaction Self-paced walk test Follow-up: 4 weeks, 8 weeks (end of treatment), 3 months, 6 months	RMDQ 4 wk: -3.6 (-5.2 to -1.9): $p < 0.01$ 8 wk: -2.6 (-3.7 to -1.4): $p < 0.01$ 3 mo: -2.3 (-3.9 to -0.7): $p = 0.005$ 6 mo: -1.8 (-3.6 to -0.3): $p = 0.086$ NRS Back 4 wk: -1.7 (-2.4 to -0.9): $p < 0.001$ 8 wk: -2.3 (-3.0 to -1.5): $p < 0.001$ 8 wk: -2.3 (-3.0 to -1.5): $p < 0.001$ 8 wk: -2.0 (-2.6 to -1.3): $p = 0.007$ NRS Leg 4 wk: -2.0 (-2.6 to -1.3): $p < 0.001$ 8 wk: -2.9 (-2.6 to -1.3): $p < 0.001$ 8 wk: -2.9 (-2.6 to -1.3): $p < 0.001$ 8 wk: -0.9 (-1.2 to -0.6): $p < 0.001$ 8 wk: -0.9 (-1.2 to -0.6): $p < 0.001$ 8 wk: -0.9 (-1.2 to -0.6): $p < 0.001$ 8 wk: -0.5 (-0.8 to -0.3): $p = 0.001$ 8 wk: -0.7 (-1.1 to -0.5): $p < 0.001$ 8 wk: -0.7 (-1.1 to -0.4): $p < 0.001$ 8 wk: $p = 0.648$ 9 wk: $p = 0.29$ 3 mo: $p = 0.133$ 9 were reported pain and 2 reported fatigue. All adverse events were reported as mild or malterate, and none required medical intervention.

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	Epidu	iral injections	72
Cuckler 1985 73 subjects in total, 37 with spinal stenosis, 36 with acute herniated nucleus pulposus, 37 males, 36 female, average age of 48.5 years in the experimental group and 49.5 years in the placebo group. Experimental group average 36.6 months in symptom duration, placebo group averaged 29.4 months.	 Steroid group: 2ml of sterile water containing 80mg of methylprednisolone acetate combined with 5ml of 1% procaine was injected into the epidural space in the region between the 3rd and 4th lumbar vertebrae with the patient in the lateral decubitus position lying on the side of the painful limb (n=42), 20 with stenosis). Placebo group: 2ml of saline combined with 5ml of 1% procaine was injected into the epidural space in the region between the 3rd and 4th lumbar vertebrae with the patient in the lateral decubitus position lying on the side of the painful limb. (n=31, 17 with stenosis) All patients were advised to take mild 	 Subjective percentage of improvement with 75% required to be considered a treatment improvement, if less than 50% after 24 hours was considered a treatment failure Re-injection rates Surgery rates Follow-up: 24 hours, every 3 months up to 30 	Patient Global Assessment (improved by at least 75%) 24 hours: 33% (steroid) vs. 21% (saline) p>0.05 Long term: 33% (saline) vs@14% (saline) p>0.05
Setting: Orthopaedic surgery department in the United States	analgesics (aspirin or acetaminophen) during the post-injection period. Second injection given if less than 50% improvement after 24 hours - considered treatment failure	months, averaging 20.2 months in the steroid group and 21.5 months in the control group.	
Fukusaki 53 subjects, 38 1988 males and 15 female. Group 1 averaged 70 years of age and 79 days of symptoms on average, group 2	 Epidural injection with 8 ml of saline, repeated twice in the first week (n=16) Epidural injection with 8 ml of 1% mepivacaine, repeated twice in the first week. (n=18) Epidural injection with a mixture of 	 Walking distance which was graded according to distance (excellent, good, or poor) Follow-up: 1 week, 1 month, 3 	Walking distance ∞ Percent excellent effect = nkan of > 100m in walking distance1 week: 12.5 % (saline) vs. 55% (block) vs. 63.2% (block +steroid); block or block + steroid > saline, p< 0.05;

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Zahaar 1991	an average of 82 days of symptoms, group 3 averaged 72 years of age and 94 days of symptoms on average Setting: Anaesthesia department in Japan 30 subjects, 37 male and 26 female. Steroid group averaged 46.5 years of age and 36.6 months of symptoms, control group averaged 49 years of age and 29.4 months of symptoms Setting : Medical facility in Egypt	 of methylprednisone, repeated twice in the first week. (n=19) 1) Steroid injection: 5ml of hydrocortisone acetate suspension, 2x2ml carbocaine, 4% Volume completed with sterile saline to 30ml (n=18) 2) Control: 2x2ml of carbocaine, 4% injected into epidural space. Volume completed with sterile saline to 30ml. (n=12) 	 months 1) Subjective percentage of improvement where 75% or more was deemed successful and surgery after injection was considered a failure. Follow-up: 24 hours, then every three months up to 36 mo averaging 20.2 mo in the steroid group and 21.5 mo control group. 	all follow-up periods, p>0.03 Adverse events: no reported complications Patient Global Assessment (improved by at least 75%) 24 hours: 55% (steroid injegion) vs. 50% (control) p> 0.05 Up to 36 mo: 38% (steroid injection) group vs. 33.3% (control) p>0.05 Failures (%) (required surgery) Up to 36 mo: 61% (steroid injection) vs. 66.6% (control) p>0.05
Friedly 2014, 2017 Makris 2016	400 patients, 221 females and 179 males, 200 in the lidocaine group	 Lidocaine + glucocorticoid (1-3 mL of 0.25-1% lidocaine followed by 1- 3 mL triamcinolone (60-120mg), betamethasone (6-12mg), 	 RMDQ NRS (Leg Pain) 	Between group MD, 95% GI, p values RMDQ 3 weeks: -1.8 (-2.8 to -0.9):p<0.001 6 weeks: -1.0 (-2.1 to 0.1): p=0.07
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		BMJ Open		136/bmjopen-2021-05
	with an average age of 68.1 years old and 200 gluocorticoid- lidocaine group with an average age of 68 years old, LSS by CT or MRI. 26% patients symptoms greater than 5 years. Setting: 16	 dexamethasone (8-10mg) or methylprednisone (60-120mg)) (n=200) 2) Lidocaine group (0.25-1% lidocaine alone) (n=200) Physician option for intralaminar and/or transformaminal techniques 	 Follow-up: 3, 6, and 12 weeks, 6 and 12 months Makris 2016 subgroup 1) RMDQ using SIP Weights 2) RMDQ patient- prioritized (LESSER) Follow-up: 3 and 	12 wk: 0.1 (-1.0 to 1.3): $p=0.84$ 6 mo -0.00 (-1.1 to 1.1): $p=0.99$ 12 mo: -0.4 (-1.6 to 0.9): $p=0.55$ NRS (Leg pain) 3 weeks: -0.6 (-1.2 to -0.1): $p=0.02$ 6 weeks: -0. (=0.8 to 0.4): $p=0.48$ 12 wk: 0.1 (-0.5 to 0.7): $p=0.70$ 6 mo: -0.2 (-0.8 to 0.4): $p=0.75$ Subgroup Analysis RMDQ using SIP weight 3 wks: -1.9 (-2.9 to -0.7): $p=0.001$ 6 wks: -1.1 (-2.2 to -0.1): $p=0.04$
	medical centers across the United States	eet	6 weeks	RMDQ patient prioritized (LESSER) 3 wks: -1.8 (-2.8 to -0.8): p=0.001 6 wks: -1.0 (-2.0 to 0.1): p=0.08 Adverse events: A total 255% of patients in group 1 and 15.5% in group 2 reported one or more adverse events (p=0) that included headaches, fever, infection, dizziness, cardiovascular/lung problems, leg swelling and dural punct
Song 2016	29 subjects, 14 males and 15 women with an average age of 58.3 and 61.7 between groups, history of intermittent claudication and lower limb radicular pain or paresthesia	 Lidocaine spinal injection, 40 mg triamcinolone mixed with 10 mL 0.5% lidocaine was used under the guide of fluoroscopy (n=15) Saline spinal injection using same volume (n=14) 	 VAS FRI Follow-up: 1 and 3 months 	No significant difference between groups. VAS 1-month p= 0.696, 3 months p= 0.891 FRI 1-month p=0.983, 3 months p=0.743 UQUEST. Protected

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4 5 6 7 8	Setting: Rehabilitation clinic in Korea			57724 on 19 Ja
9 Milburn 10 2014 11 2014 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 31 32 33 34 35 36 37 38 39 40	57 patients met inclusion criteria, agreed to participate, and were enrolled. 20 patients were male; 37 were female. Mean patient age was 65.3 years (range, 32-88 years). Average duration of symptomatology (pain and/or disability) was 42 months. The mean degree of canal narrowing at the most stenotic level was 6.1 mm (range, 2.5-9.1 mm). The most common maximally stenotic intervertebral level was L4-L5	 Fluoroscopically guided lumbar ILESI performed either at: 1) The level of maximal stenosis (n=30) 2) Two intervertebral levels cephalad, corresponding to a less stenotic level (n=27) Injection was performed with a 20-gauge Tuohy needle using a loss of resistance technique. The injectate consisted of 2 mL of 40 mg/mL methylprednisolone (Pfizer), 2 mL of bupivacaine 0.25% (Hospira), and 2 mL of normal saline for a total injectate volume of 6 mL. 	 NRS - Pain with Ambulation RMDQ Follow-up: 1, 4 and 12 weeks 	All between group comparisons NRS (pain with ambulation) 1 wk: Grp 1 lower pain compared to Grp 2, p=0.045 4 wk: Grp 1 lower pain compared to Grp 2, p=0.049 12 wk: Grp 1 lower compared to Grp 2, p=0.001 4 wk: Grp 1 lower compared to Grp 2, p=0.009 12 wk: Grp 1 lower compared to Grp 2, p=0.003 Month of the second sec

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Prown 2012	(n ¹ / ₄ 42) followed by L3-L4 (n ¹ / ₄ 11) and L5-S1 (n ¹ / ₄ 4). Setting: Clinic in New Orleans, Louisiana	1) Enidural staroid (80 mg	1) VAS	7724 on 19 January 2022.	
Brown 2012	38 patients, 21 males and 17 females, 21 in mild group with an average age of 74.2 years and 17 in ESI group with an average age of 78.7 years, symptomatic LSS patients with painful lower limb neurogenic claudication, able to walk at least 10 feet unaided, (ODI) score > 20 Setting: Pain management clinic in Florida	 Epidural steroid (80 mg triamcinolone acetate) (n=17) Mild lumbar decompression (n=21) 	 VAS ODI ZCQ Patient Satisfaction (0-10) Follow-up: 6 and 12 weeks	VAS 6 and 12 weeks P=0.54 ODI p=0.86 ZCQ p>0.05 Patient satisfaction p>0.05 (0,0) Patient satisfaction p>0.05	
Hammerich 2019	54 patients total, age 67.2 ± 9.7 , 27 male, 27 female, 31 in ESI group, 23 in ESI plus PT. Mean duration of	 ESI (n=31) ESI + PT (n=23) ESI: 1.5 mL of steroid at each site injected with maximal involvement using transforaminal approach. 	 ODI NRS current SF-36 emotional role SF-36 emotional role well-being 	Between group MD, 95% €1, p values ODI € 10 wks: -1.08 (-8.10 to 5.94) p=0.80 6 mo: -4.70 (-11.72 to 2.32) p=0.27 12 mo: -2.72 (-9.74 to 4.30) p=0.52 NRS ♀ 10 wks: -1.68 (-3.08 to -0.29) p=0.07	

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4 5 6 7 8 9 10 11 12 13 14 15 16 17 18		symptoms 14 m Setting: Clinics in Colorado, Texas, South Carolina and New Hampshire	PT: 8-10 sessions PT manual therapy and exercise. Walking program and/or stationary bike, stretching and strengthening exercises.	 5) SF-36 general health perception Follow-up: 10 weeks, 6 and 12 months 	$\begin{array}{c} 6 \text{ mo: } -1.99 \ (-3.38 \text{ to } -0.60) = 0.04 \\ 12 \text{ mo: } -2.44 \ (-3.80 \text{ to } -1.08) = 0.00 \\ \textbf{SF-36 Emotional role} \\ 10 \text{ wks: } -28.53 \ (-49.05 \text{ to } -801) \text{ p} = 0.03 \\ 6 \text{ mo: } -11.25 \ (-31.77 \text{ to } 9.29) \text{ p} = 0.39 \\ 12 \text{ mo: } -10.67 \ (-31.19 \text{ to } 9.85) \text{ p} -0.41 \\ \textbf{SF-36 Emotional well-being} \\ 10 \text{ wks: } -11.26 \ (-19.52 \text{ to } -299) \text{ p} = 0.02 \\ 6 \text{ mo: } 2.69 \ (-5.57 \text{ to } 10.95) \text{ p} = 0.59 \\ 12 \text{ mo: } -5.76 \ (-14.02 \text{ to } 2.59) \text{ p} = 0.24 \\ \textbf{SF-36 General Health Perseption} \\ 10 \text{ wks: } -8.99 \ (-17.20 \text{ to } -0.38) \text{ p} = 0.05 \\ 6 \text{ mo: } -5.56 \ (-13.77 \text{ to } 2.65 \text{ p} = 0.23 \\ 12 \text{ mo: } -5.10 \ (-13.31 \text{ to } 3.11 \text{ p} \text{ p} = 0.27 \\ \end{array}$
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35	Sencan 2020	67 patients. The median age 62.5 years with 18 males and 49 females. Median duration of symptoms was 29 and 24 months in the ILESI and bilateral TFESI groups, respectively Setting: University department Pain Medicine, Istanbul Turkey	 Interlaminar: ILESI, fluoroscopy guided with 1 to 2 mL contrast dye with mixture of 80 mg methylprednisolone acetate, 2 mL saline solution, and 2 mL (0.5%) bupivacaine solution Transforaminal: TFESI, fluoroscopy guided with 1 to 2 mL contrast dye with mixture of 80 mg methylprednisolone acetate, 2 mL saline solution, and 2 mL (0.5%) bupivacaine solution 	 NPS ODI Beck depression scale Walk distance Follow-up: after treatment, 3 weeks and 3 months 	Between Group Median Differences (data not provided), pvaluespNPSafter treatment: $p=0.14$ 3 wks: $p=0.28$ amointo the second
36 37 38 39	Wei 2020	90 patients. Mean age about 65 years, 45 females, 45	 Epidural injection with 2.0mL of lidocaine and 10 mg of TNF-a inhibitor (etanercept) on the affected spinal nerves. 	 VAS (leg) ODI Follow-up: after 	Between Group Mean Differences (data not provided), p values 0 Grp 1 vs Grp 2 0 VAS 0
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males, mean duration of symptoms about 2.8 monthsSetting: University Hospital Jiangsu ChinaKarm 201844 patients total, 20 in the RACZ group (age 66.1 +-12.2, male 9 	 2) Epidural administration with 2mL of lidocaine mixed with 2mL of steroid (diprospan) 3) Epidural injection 4.0mL of lidocaine only. 1) PEA Using a Balloon-less Catheter (Racz) (n = 20) 2) Percutaneous Epidural Decompression and Adhesiolysis Using an Inflatable Balloon Catheter (ZiNeu) (n = 24) 	 treatment, 1,3, 6 months 1) NRS (back pain) 2) NRS (leg pain) 3) ODI Follow-up: 1, 3 and 6 months 	Pa after treatment, 1, 3 and 6 no, Grp 1 greater reduction, p<0.05 ODI 1, 3 and 6 mo, Grp 1 greater reduction, p<0.05 Grp 1 vs Grp 3 VAS after treatment, 1, 3 and 6 no, Grp 1 greater reduction, p<0.05 ODI 1, 3 and 6 mo, Grp 1 greater greduction, p<0.05 Grp 2 vs Grp 3 VAS after treatment, 1, 3 and 6 no, no significant difference, p>0.05 Grp 2 vs Grp 3 VAS after treatment, 1, 3 and 6 no, no significant difference, p>0.05 Between group MD, 95% CI, p values NRS-11 (Back pain) 1 mo:-0.38 (-1.81 to 1.06): $p=0.61$ 3 mo: -1.13 (-2.63 to 0.38): $p=0.14$ 6 mo: -2.02 (-3.58 to 0.45): $p=0.01$ NRS-11 (Leg pain) 1 mo: 0.73 (-0.40 to 1.85): $p=0.26$ 6 mo: -1.88 (-3.15 to 0.61): $p=0.00$ ODI (%) 1 mo: -6.13 (-13.88 to 1.61): $p=0.12$ 3 mo: -6.63 (-14.75 to 1.488 p=0.11 6 mo: -13.74 (-22.18 to 5.30): $p=0.00$ Adverse events: Minor and transient adverse events were reported equally in both grdpps (no data provided), mostly pair and paresthesia at the injection site.
Zucherman191 subjects,2004, 2005,57% male and200643% female inthe X STOP	 X STOP Interspinous Process Decompression System (n=100) Non-operative treatment: Subjects received an epidural steroid injection 	Surgery 1) SF-36 2) ZCQ 3) Worker's compensation claims	Patient global assessment :- (Good result) 2 yrs: 73.1% (surgery) vs. 37.9% (control) (P< 0.001)

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	and 48% female in the non- operative group. Average age of 70 years in the X STOP group and 69.1 years in the non-operative group. Average of 3.5 year symptom duration in the X STOP group and 4.7 years in the non-operative group. Setting: Spine center in the United States	on enrolment and were eligible for additional injections as needed, as well as NSAIDS, analgesic agents, and physical therapy. Physical therapy consisted of education on back care and modalities such as ice packs, heat packs, massage, stabilization exercises, and pool therapy. Braces such as abdominal binders and corsets were permitted, but body jackets and chair back braces were not. (n=91)	 4) ODI 5) Radiographic changes Follow-up: Surgery: 7 (2 yr) Control: 19 (2 yr) 	Surgery better at 6 w, 6 mo, 1 and 2 yr (graphs) (P<0.001) 2 yrs: MPC 45.4% (surgery) vs. 7.4% (control) (P < 0.001) "Clinically relevant improvement (patients)": 2 yrs: 60.2% (surgery) vs. 18.5% (control) (P< 0.001) Symptoms Severity score Surgery better at 6 w, 6 mo and 2 yr (graphs) (P<0.001) 2 yrs: MPC 44.3% (surgery) vs0.4% (control) (P < 0.001) "Clinically relevant improvement (as measured by patients)": 2 yrs: 57% (surgery) vs. 14%% (control) (P < 0.001) ZCQ (global success) 6 mo: 52% (surgery) vs. 9% (control) (P < 0.001) ZCQ (global success) 6 mo: 52% (surgery) vs. 9% (control) (P < 0.001) Quality of life (SF-36) At all post treatment time points (6 w, 6 mo, 1 yr, 2 yr), the mean domain scores documented in the X STOP group were significantly greater than these in the non operative group, v the exception of the mean General Health, Role Emotional, Mental Component <i>Summary scores at 2 years</i>
Weinstein 2007, 2009, Abdu 2018	Subjects with image-confirmed degenerative spondylolisthesis: 304 subjects in the RCT, 303 in the observational cohort, 31% male in the surgical group, 33% male in the surgical group. Average	 Assigned to surgery (standard laminectomy with or without fusion) (n=159) Assigned to non-surgical treatment: Usual non-operative care (n=145) 	 SF-36 bodily pain SF-36 bodily function low back pain bothersomeness scale Leg pain bothersomeness scale DDI Subjective self- 	Adverse events: No completations were reported in group 2 group 1, complications were reported in 11% of subjects including spinous process fracture, coronary ischemia, respiratory distress, hematoma, and 1 death (pulmonary ede All between group comparisons using Intention-to-Treat analysis SF-36 Bodily Pain, DMC, 95% CI 2 yrs: 1.5 (-4.2 to 7.3) 4 yrs: -2 (-8.6 to 4.6) 8 yrs: p=0.85 SF-36 Bodily Function, DEIC, 95% CI 2 yrs: 1.9 (-3.7 to 7.5) 4 yrs: -3.1 (-9.2 to 3.0) 8 yrs: p=0.31 Disability (ODI), DMC, 95% CI 2 yrs: 2.2 (-2.3 to 6.8)

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age of 64.7 yea in the surgical group and 68.2 years in the nor surgical group. Subjects had symptoms for a least 12 weeksSetting: multi- centred orthopaedic departments in the United StatAmundsen 2000100 subjects, 5 male, 46 femal median age of (males were 1.1 years higher th females). Median back p duration was 1- years, median duration of sciatica was 2 years.Setting: Neurology department in a hospital in Norway	 Surgery: Partial or total laminectomy, medial facetectomy, discectomy, and/or removal of osteophytes from the vertebral margins or facet joints. No fusions. (n=13) 	reported improvement, satisfaction with current symptoms and care 7) Stenosis bothersomeness index Follow-up: 6 weeks, 3 and 6 months, 1, 2, 4 and 8 years 1) VAS 2) Verbal Rating Scale 3) Subjective change (better, worse, or unchanged) 4) Work status 5) Subjective rating from evaluating physician and study team (Excellent, Fair, Unchanged, Worse) Follow-up: 6 months, 1, 4 and 10 years	4 yrs: 4.1 (-0.8 to 9.1) 8 yrs: p=0.039 Other outcomes (patient's setisfaction; Stenosis Bothersom Index, Leg Pain Bothersom ness Scale; and Low Back Pair Bothersomeness Scale) were not provided separately for the randomized cohort. Adverse events: group 1 reported 14% intraoperative complication mostly and dural tears and 19% postsurgical complications including 1 death, 11% required additional surgeries at 2 years, Patient global assessment Good result) 1 yr: RR 2.07 (0.98 to 4.38) 4 yrs: <i>RR 1.94 (1.14 to 3.31)</i> 10 yrs: RR 3.18 (0.97 to 1001) Pain (none or mild) 1 yr: NR 4 yrs: RR 1.59 (0.55 to 4.55) Other outcomes (claudication or walking distance; level of activity; and neurologic deficits) were not reported separate for the randomized cohort. 90 00 10 10 10 10 10 10 10 10 1
Malmivaara 94 subjects, 22	 Segmental decompressive surgery with facetectomy (n=50) 	1) 11 point numerical pain	All between group compagisons

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years since onset of symptoms, nonsurgical group average 16 years since onset of symptoms. Minimum of 6 months of symptoms for study inclusion.type exercises. Additional individual physiotherapy consisting of passive treatment methods (such as ultrasound and transcutaneous nerve stimulation). (n=44)average, quite poor or very poor.2 yrs: 1.08 (0.70 to 2.42) Walking disability (walking disability	subjects were male, 45% of non-operative subjects were male. Nonoperative group had average age of 62.9 years, surgical group had average age of 63.9 years. Surgical group	2) Non-operative treatment: NSAIDS when indicated and seen one to three times by a physiotherapist, in addition to the standard visit at each follow-up. The physiotherapist gave all patients educational brochure. The patients were encouraged to use their back in a normal way. Pain- relieving body postures were taught as well as basic ergonomics related to lifting and carrying. Individually structured programs included trunk	rating scale for back and leg pain 2) Walking ability (distance without a break) also via treadmill test 3) General health status on a 5 point scale	1 yr: 1.69 (0.41 to 2.96) 2 yr: 1.51(0.25 to 2.77) Back pain, MD, 95% CI 1 yr: 2.33 (1.12 to 3.55) 2 yrs: 2.13(0.98 to 3.28) Disability (ODI), MD, 95% 1yr: 11.3 (4.3to 18.8) 2 yrs: 7.8 (0.8 to14.9) > 10 points reduction (OD 1 yr: 2.16 (1.31to 3.57) 2 yrs: 1.36 (0.88 to 2.10) Walking disability (walking)	724 on 19 Jane CI 2027: RR, 95% CI Downloa
Ť.	averaged 14 years since onset of symptoms, nonsurgical group average 16 years since onset of symptoms. Minimum of 6 months of symptoms for study inclusion. Setting: Research Center	muscle endurance and stretching- type exercises. Additional individual physiotherapy consisting of passive treatment methods (such as ultrasound and transcutaneous nerve stimulation). (n=44) The patients in the surgical group also received the brochure and the instructions	 quite good, average, quite poor or very poor. 4) ODI 5) Ability to complete certain activities of daily 6) living without difficulty, some difficulty, marked difficulties or not at all 7) Radiographic examination Follow-up: 6 months, 1 and 2 	1 yr: 0.93 (0.61 to 2.03) 2 yrs: 1.08 (0.70 to 2.42) Walking disability (walking 1 yr: 0.91 (0.51 to 4.24) 2 yrs: 1.18 (0.67 to 4.72)	d from ge distance <400 m), RR, 95% CI

1 2 3 4 5 6 7 8 9 10	
11 12 13 14 15 16	
17 18 19 20 21 22	
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45 46 47	

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Weinstein 2008, 2010, Lurie 2015	289 in the RCT, 365 in the observational cohort. 62% male in the surgical groups, 59% male in the non- surgical groups. Average age of 63.8 in the surgical group, 66.1 in the non- surgical group. 60% in the surgical group	1) 2)	Assigned to surgery: Standard laminectomy with or without fusion (n=138) Assigned to non-surgical treatment: Usual non-operative care - recommended to include at least active physical therapy, education or counseling with home exercise instruction, and the administration of NSAIDs, if tolerated (n=151)		function Low back pain bothersomene ss scale Leg pain bothersomene ss scale	All between group comparisons using Intention-to-Treat Analysis SF-36 Bodily Pain, DMC, 95% CI 2 yrs: 7.8 (1.5to 14.1)
	and 55% in the non-surgical group had symptoms for over 6 months. Setting: multi- centred- orthopaedic departments in the United States.			we	with current symptoms and care, Stenosis bothersomene ss index llow-up : 6 ceks, 3 and 6 onths, 1, 2, 4, 8	Other outcomes (patient's satisfaction; Stenosis Bothersomeness Index, Leg Pain Bothersomeness Scale; and Low Back Pain Bothersomeness Scale) were not provided separately for the randomized cohort. Adverse events: In group to 10% of patients required transfusions intraoperatively and 5% postoperatively. The most common surgical complication was dural tear, in 9% of patients. At 2 years, reoperation had occurred in 8% of subjects.
Delitto 2015	169 patients, 88 males and 81 females, 87 surgical group with an average age of 66.6 years old and 82 PT group with an average age of 69.8 years old, LSS by computed	1) 2)	Surgical decompressive laminectomies, partial facet resection, and neuroforaminotomies (n=87) PT program: lumbar flexion exercises, exercises and education (n=82)	1) fur	SF-36 physical action llow-up: 2 years	adverse events consisting of worsening of symptoms whereas 33 out 87 participants in group preparted surgery related complications, mainly attributable to reoperation, delay in wound healing and surgical site infection.
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5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45	tomography - criteria of Wiesel and colleagues (18) or magnetic resonance imaging - criteria of Boden and colleagues (2) Setting: Neurologic and orthopedic surgery departments and physical therapy clinics in western Pennsylvania ADLs = Activities of Daily Living, AUC = Area under the pain-intensity curve, BTX = Botox, CI = Confidence Interval, DM from baseline, ESI = Epidural Steroid Injection, FRI = Functional Rate Index, GRP = Group, HADS =Hospital Anxiety and I units, JOABPEQ = Japanese orthopaedic association back pain evaluation questionnaire, LBOS = Low Back Outcome Score Meters, MCS = Mental Component Score, MD = Mean Difference, mm = Millimeters, Mo = Months, MPC = Mean Percent O Rating Scale, NR = Not Reported, ODI = Oswestry Disability Index, OR = Odds Ratio, PASS-20 = Pain Anxiety Symptoms Score, RCT = Randomized Controlled Trial, RMDI = Moland Morris Disability Index, ROM = Range of Motion, RR = Relati Bothersomeness Index, SPWT = Self-Paced Walking Test, SSS = Spinal Stenosis Questionnaire, TSK-11 = Tampa Scale-11, WMD = Weighted Mean Difference, ZCQ = Zurich Claudication Questionnaire FMD = Weighted Mean Difference, ZCQ = Zurich Claudication Questionnaire	Depression Scle, IU = International LBB = Low Back Pain, m = Change, NRS = Numerical Pain Scale, PCS = Physical Component ve Rgk, SBI = Stenosis
46 47		

BMJ Open Supplemental Table 2. Non operative interventions for neurogenic claudication due to lumbar spinal stenosis: A summary of CRADE assessment and outcomes (60 comparisons) 7724 on 1 **GRADE** assessment and outcomes (60 comparisons)

						Walking	ability/pain/function	ية h/quality of القو me	asures	GRADE
Studies	Risk of Bias	Consistency	Directness	Precision	Selective Reporting	Immediate up to 1w	Short-term >1w - 3m	Intermediate 3m – 1 yr	Long term >1yr	
					·	Calcitonin		 مز		
				Ca	alcitonin in	jection vs. placeb	o injection	Ow		
Eskola 1992	High	No No	Yes Yes	No No	Yes		= TWT = VAS	= TWT load = VAS d	= TWT = VAS	+000 +000
Porter 1983	High	No	Yes	No	Yes		? Distance walked	? Distance waked		+000
Porter 1988	High	No No	Yes Yes	No No	Yes		= Distance walked = VAS	m htt		+000 +000
				Cal	citonin nas	al spray vs. place	bo injection	þ://	·	
Podichetty 2004	High	No No No No	Yes Yes Yes Yes	No No No No	Yes		= Distance walked = Time walked = SF-36 = VAS	bmjopen.b		+000 +000 +000 +000 +000
Tafazal 2007	High	No No No No No	Yes Yes Yes Yes Yes Yes	No No No No No	No		= Shuttle walk = VAS leg = VAS back = ODI = Global	omj.com/ on .		+000 +000 +000 +000 +000 +000
					nlus nhysic	al therapy ve par	acetamol plus phy	sical therap		+000
Sahin 2009	High	No No No	Yes Yes Yes Yes	No No No	No	ai merapy vs. pai	= Distance walked = VAS = RMDI	,9 20 20		+000 +000 +000
	1				0	ral Medication	•	4 by		
				0	ral prostagl	andin vs. Etodlac	(NSAID)	gu		
Matsudaira 2009	Low	No No No No	Yes Yes Yes Yes Yes	No No No No	Yes		 > Distance walked # ? SF-36 = LBP > Leg pain > Global # 	lest. Protected		$ \begin{array}{r} ++00 \\ +000 \\ ++00 \\ ++00 \\ ++00 \\ ++00 \end{array} $
			Methylo	cobalami	n (vit B12)	plus conservative	care vs. conservat	ive care 🙎		
Waikakul 2000	High	No	Yes	No	No			> Distance waked #	> Distance walked #	+000

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	Gaba	pentin pl	us physical	therapy.	, corset &]	NSAIDS vs. place	bo plus physical t	herapy, cors	eit& N	SAIDS	
Yaksi	High	No	Yes	No	No	1	= VAS	> Distance v		> Distance	+(
2007	_	No	Yes	No				>VAS	n 19	walked #	+(
		No	Yes	No						> VAS #	
						balin vs. active pla	acebo		Jan		
Markman	High	No	Yes	No	No	= NPS rest/final			uary 2022.		+(
2015		No	Yes	No		= Distance walked			2		+(
		No No	Yes Yes	No No		= Recovery time = Global			022		+(
		No	Yes	No		< RMDQ					+
		110		4					Dow		
			Ga	bapentin	plus conse	ervative vs. conser	vative plus botulin	num	nloaded		
Park	High	No	Yes	No	No		= NPS (Back/leg)		ade		00
2017		No	Yes	No			= ODI		ed .		00
		No	Yes	No			= Global		from		00
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	xx: 1	٦ĭ			· ·	one hydrochloride	vs. placebo		http:	1	
Markman 2015 - 2	High	No No	Yes Yes	No No	No	= NPS rest/final = Distance walked			//b		00
2013 - 2		No	Yes	No		= Recovery Time			njo		00
		No	Yes	No		= ZCQ (s)			pe		00
		No	Yes	No		= ZCQ (f)			://bmjopen.bmj		00
		No	Yes	No		= Global					00
				P	ropoxyphe	ne/acetaminophen	vs. placebo		con		
Markham	High	No	Yes	No	No	= NPS rest/final			T C		00
2015 - 2	_	No	Yes	No		= Distance walked			∿ on April 19,		00
		No	Yes	No		= Recovery Time			Apr		00
		No	Yes	No		= ZCQ (s)			<u>≓</u> →		00
		No No	Yes Yes	No No		< ZCQ (f) # = Global			,e		00
		INO	1 05	INO		- 010081			2024		
			Oxy	morpho	ne hydroch	nloride vs. propoxy	phene/acetamino	phen	4 b		
Markham	High	No	Yes	No	No	= NPS rest/final					0
2015 - 2	Ŭ	No	Yes	No		= Distance walked			lue		- 00
		No	Yes	No		= Recovery Time			st.		00
		No	Yes	No		= ZCQ (s)			Pro		00
		No	Yes	No		> ZCQ (f) #			otec		00
		No	Yes	No		= Global	-1		√ guest. Protected		00
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Rodrigues	High	No	Yes	No	No	= SF-36	7724 on	0000
2014		No	Yes	No		= RMDQ	4 0	0000
		No No	Yes Yes	No No		= 6 min walk < VAS #	n 19	0000
		INO	Yes		hilitation			0000
			E			Therapy and Multimodal Care	nd uary 2022.	
Canan	1	N-	Yes	No	No	und vs. exercise plus sham ultrasou		++00
Goren 2010	low	No No	Yes	No	INO	= 1 W I = VAS back	20	++00
2010		No	Yes	No		= VAS back = VAS leg	022	++00
		No	Yes	No		= ODI		++00
		110	105		xercise plu	s ultrasound vs. no treatment	bownloaded fro	
Goren	Low	No	Yes	No	No	= TWT		++00
2010		No	Yes	No		= VAS back	ade	++00
		No	Yes	No		> VAS leg #	be	++00
		No	Yes	No		> ODI	fro	++00
				Exer	cise plus s	ham ultrasound vs. no treatment		
Goren	Low	No	Yes	No	No	= TWT	http://bmjop	++00
2010		No	Yes	No		= VAS back	//b	++00
		No	Yes	No		> VAS leg #	<u> </u>	++00
		No	Yes	No	1 /1	> ODI #		++00
**	TT: 1	N				s. home exercise program plus oral	diclofenac	
Koc	High	No	Yes	No	Yes	= TWT = VAS	$=$ TWT $\underline{\underline{3}}$	+000
2009		No No	Yes Yes	No No		= VAS = RMDI	= VAS	+000 +000
		No	Yes	No		= NHP	= HNP o	+000
		110			admill wal	king plus exercise vs. cycling plus e		1000
Pua	Low	No	Yes	No	No	= Distance walked		++00
2007	20.0	No	Yes	No	110	= ODI		++00
		No	Yes	No		= RMDI	9, 2	++00
		No	Yes	No		= VAS	202	++00
		No	Yes	No		= Global		++00
	Ma	nual ther	apy, exerci	se and ur	nweighted	treadmill vs. flexion exercise, walki	ng and sham ultrasoun	d
Whitman	High	No	Yes	No	No	= TWT	ues	+000
2006		No	Yes	No		> Global #	st.	+000
		No	Yes	No		= ODI	Pro	+000
		No	Yes	No		= NPRS	otec	+000
				Supe	ervised phy	vsical therapy vs home exercises	ted	
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Minetama	High	No	Yes	No	No		> ZCQ (F) #			+
2019	mgn	No	Yes	No	110		>ZCQ (S) #	24		+
2017		No	Yes	No			> Distance walked #	9		+
		No	Yes	No			> NPS (leg)	1		
		No	Yes	No			> SF-36 PF	ں ب		+
		No	Yes	No			> SF-36 BP	an		+
		No	Yes	No			= Daily Steps	ua		+
		No	Yes	No			Duily Steps	7		+
	I	110			anual thera	py & exercise vs r	nedical care	7724 on 19 January 2022		
Schneider	Low	No	Yes	Yes	No		> ZCQ #	-700		+
2019		No	Yes	Yes			= SPWT	= SPWT		+
		No	Yes	Yes			= PA	= PA <u>S</u>		+
				Manua	l therapy &	& exercise vs. com	munity exercise	$ = \frac{2CQ}{SPWT} \qquad \qquad$		
Schneider	Low	No	Yes	Yes	No		> ZCQ #	= ZCQ		+
2019		No	Yes	Yes			= SPWT	= SPWT =		+
		No	Yes	Yes			= PA	= SPWT from = PA m		+
					Communi	ty exercise vs. mee	dical care	= ZCQ		
Schneider	Low	No	Yes	Yes	No		= ZCQ	= ZCQ		+
2019		No	Yes	Yes			= SPWT	= SPWT		+
		No	Yes	Yes			> PA			+
			Co	mprehens	sive therap	y and exercise vs.	self-directed exerc			
Ammendolia	Low	No	Yes	Yes	No	> SPWT #	> SPWT #	> SPWT #	> SPWT #	+
2018		No	Yes	Yes		> 30% SPWT	> 30% SPWT	> 30% SPWT	>30% SPWT	+
		No	Yes	Yes		> 50% SPWT	= 50% SPWT	= 50% SPWT	> 50% SPWT	+
		No	Yes	Yes		> ZCQ (s)	= ZCQ (s)	$=$ ZCQ (s) $\stackrel{2}{\sim}$	> ZCQ (f) #	+
		No	Yes	Yes		= ZCQ (f)	= ZCQ (f)	= ZCQ (f) S	> ZCQ (s) +	+
		No	Yes	Yes		= ODI	= ODI	>ODI (walk)≱	ZCQ (f)	+
		No	Yes	Yes		> NPS (back) #	= NPS (back)	= NPS (back)=	= ODI	+
		No		Yes		= NPS (leg)	= NPS (leg)	= NPS (leg) $\vec{\omega}$	= NPS (back)	+
						= SF-36 BP	= SF-36 BP	= SF-36 BP N	> SF-36 BP #	+
				-		= SF-36 PF	> SF-36 PF #	$=$ SF-36 PF \aleph	>SF-36 PF #	+
				1	1	ercise vs. isokinet		<u>Š</u>		
Oğuz	High	No	Yes	No	Yes	= VAS	= VAS	= VAS Q = ODI e = TWT		0
2013		No	Yes	No		= ODI	= ODI			0
	1	No	Yes	No	1	= TWT	= TWT	$=$ TWT \therefore		0
<u> </u>		N	X.			xercise vs. unloade		= VAS te = ODI te = TWT d		-
Oğuz	High	No	Yes	No	Yes	< VAS	< VAS	= VAS		0
2013		No No	Yes	No No		< ODI = TWT	= ODI = TWT	= ODI te		
	1	INO	Yes	INO		- 1 W 1	- 1 W I	<u> </u>		0
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				Ia	linatio ar	ercises vs. unloade	d avanaisas	-057724	
Oğuz	High	No	Yes	No	Yes	<vas< td=""><td>= VAS</td><td>= VAS o</td><td>0000</td></vas<>	= VAS	= VAS o	0000
2013	111811	No	Yes	No	1.00	< ODI	< ODI	= ODI	0000
		No	Yes	No	1 1 1 1	< TWT # .	< TWT		0000
	TT. 1	N.	X.			herapy exercise vs.		January	0000
Homayouni 2015	High	No No	Yes Yes	No No	Yes	<pre>> VAS # > Distance walked</pre>	= VAS = Distance walked	ary	0000
2015					se program	vs. routine preope		nagement $\overset{N}{\overset{N}{}}$	0000
Marchand	High	No	Yes	No	Yes	> NPS (leg) #	= NPS (leg)	$=$ NPS (leg) $\stackrel{N}{:}$	0000
2019	Ũ	No	Yes	No		> Duration walked #	= Duration walked	= Duration wasked	0000
Gang-C	huk Tang	; (herbal c	oncoction)	, daily M	okuri Chu	na therapy, daily a	cupuncture, physic	cian consultation	vs. oral aceclofenac,
				ep	idural stere	oid injection, physi	cal therapy	ade	
Kim	Low	No	Yes	No	Yes		= VAS (leg)	$=$ VAS (leg) $\stackrel{o}{=}$	+000
2019		No	Yes	No			= VAS (back) > OCS	> VAS (back)	+000
		No No	Yes Yes	No No			> Distance walked	> Distance waiked	+000 +000
								o://	
Mc	khuri Ch	una, acupi	uncture, an	d physici	an consult	ation vs. oral acecl	ofenac, epidural s	teroid injection, p	hysical therapy
Kim	Low	No	Yes	No	Yes	>VAS (low back)#	= VAS (leg)	> VAS (leg) $#$	+000
2019		No	Yes	No			= VAS (back)	> VAS (back)#	+000
		No No	Yes Yes	No No			= OCS = Distance walked	= OCS = Distance walked	+000 +000
		110	103	110	Sn	inal Manipulation			1000
				I	-	nal manipulation v		n/ or	
Passmore	High	No	Yes	No	No	= NPS (Back)			0000
2017	0	No	Yes	No		= NPS (Leg)		April 19	0000
						Acupuncture		2024	
				Ac	cupuncture	with usual care vs	. usual care		
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Kim	High				No		6 weeks:	772		
2016		No	Yes	No			= ODI	724 on 19 January 2022. Downloaded		0000
		No	Yes	No			= SF-36 BP	n n n		0000
		No	Yes	No			= SF-36 PF	19		0000
		No	Yes	No			= LBP	Jai		0000
		No	Yes	No			= Leg pain	มาเ		0000
		No	Yes	No			= Distance walked	l		0000
		No	Yes	No			3 months: = ODI	20		0000
		No	Yes	No			= SF-36 BP	22		0000
		No	Yes	No			= SF-36 PF			0000
		No	Yes	No			= LBP	O W		0000
		No	Yes	No			= Leg pain	nlo		0000
		No	Yes	No			= Distance walked	ad		0000
		•			Acupunc	ture vs. sham acup		ed		
Qin	Low	No	Yes	No	No	> RMDQ	> RMDQ	>RMDQ q		++00
2020	2011	No	Yes	No		> NRS (back) #	> NRS (back) #	> NRS (back)		++00
		No	Yes	No		> NRS (leg) #	> NRS (leg) #	> NRS (leg) #		++00
		No	Yes	No		> SSS-S #	> SSS-S #	> SSS-S #		++00
		No	Yes	No		> SSS-F #	> SSS-F #	> SSS-F #		++00
		No	Yes	No		= SPWT	= SPWT	= SPWT		++00
					E	pidural Injection		en.		
			Tra	inslamina	ar epidural	steroid injections v	vs. placebo injectio	ons 🖁		
Cuckler 1985	High	No	Yes	No	No	= Global		i.com	=global	+000
			Translan	ninar epi	dural stero	ids plus epidural bl	lock vs. placebo ir	njections 9		
Fukusaki 1988	High	No	Yes	No	No	> Distance walked #	= Distance walked	April		+000
		Г	Translamina	ar epidur	al steroids	plus epidural blocl	k vs. epidural bloc	k injections 🗟		
Fukusaki 1988	High	No	Yes	No	No	= Distance walked	= Distance walked	2024		+000
				Т	ranslamin	ar epidural block v	s. placebo	by		
Fukusaki 1988	High	No	Yes	No	No	> Distance walked #	= Distance walked	gues		+000
		Intralami	nar epidura	l steroid	plus epidu	ral block vs. home	exercise program		fenac	
Koc	High	No	Yes	No	Yes		= TWT			+000
2009	11.5.1	No	Yes	No	Yes		> VAS #	= TWT OF = VAS CONTRACTOR = RMDI		+000
		No	Yes	No	Yes		> RMDI #	= RMDI		+000
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	1	N	*7		**			~	í 	
		No	Yes	No	Yes	us anidural block y	> NHP	= HNP		+000
Koc	II: "1	No	Yes	No	Yes	us epidural block v	= TWT	= TWT		+000
2009	High	No	Yes	No	Yes		= VAS	= VAS = RMDI = HNP	5	+000 +000
2009		No	Yes	No	Yes		= RMDI	= RMDI	-	+000
		No	Yes	No	Yes		= NHP	= HNP		+000
				Cau	dal epidura	al steroids vs. placel	bo injections	ITY 2		
Zahaar 1991	High	No	Yes	No	No	= Global		2022.	= Glob	-+000
1))1			Ν	Aild lum	bar decom	pression vs. epidura	l steroid injectior			
Brown	High	No	Yes	No	No		= VAS	nwn		0000
2012	-	No	Yes	No			= ODI	loa		0000
		No	Yes	No			= ZCQ	de	÷	0000
		No	Yes	No	N_		12 weeks:		5	0000
		No	Yes	No			= VAS = ODI	Om		0000 0000
		No	Yes	No			= ZCQ	na		0000
		110	105	110			Leq	Downloaded from http://		0000
		-		-		vs. glucocorticoid–l		omj		
Friedly 2014,	Low	N	**	* 7	No		3 weeks:	12 weeks:	12 mor	
2017		No No	Yes Yes	Yes Yes			< RMDQ < NPS (leg)	= RMDQ $= NPS (leg)$	= RMI $= NPS$	
		INO	res	res			6 weeks:	6 months:	- NP5	(leg) +++0
		No	Yes	Yes			= RMDQ	= RMDQ		+++0
		No	Yes	Yes			= NPS (leg)	= NPS (leg)		+++0
								n		
							Makris 2016	Apr		
Makris 2016	Low	No	Yes	No	Yes		3 weeks: < RMDQ using SIP	<u>نے</u>	<u>-</u>	0000
Makris 2010	LOW	INO	res	INO	res		Veights	, e		0000
		No	Yes	No	Yes		< RMDQ Patient-			0000
							Prioritized	4		
							(LESSER)) vo		
							6 weeks:	Jue		
		No	Yes	No	Yes		< RMDQ using SIP Weights	st.	-	0000
		No	Yes	No	Yes		= RMDQ Patient-	Pro	ו	0000
		INU	103	110	103		Prioritized	otec	-	0000
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	I I		T	Lidoca	<u>1</u>	injection vs. saline	1 7	724	-	_
Song	High	N	X7	N	No		1 month: = VAS	on		0(
2016		No No	Yes Yes	No No			= VAS = FRI	on 19 January		00
		INO	res	INO			3 months:	ي و		00
		No	Yes	No			= VAS	anc.		00
		No	Yes	No			= FRI	lan		00
	Fluoros				SIS at the	level of maximal	stenosis vs. two int		cephalad	
Milburn	High				No	1 week:	4 weeks:	N.		
2014	6	No	Yes	No		> NPS (walking) #	> NPS (walking) #			00
		No	Yes	No		> RMDQ #	> RMDQ	Downloaded		
		No	Yes	No			12 weeks:	nlo		00
							= NPS (walking)	ad		
		No	Yes	No			> RMDQ	ed		00
		No	Yes	No				fro		00
						jection (ESI) Vs. ES		<u> </u>		
Hammerich	High	No	Yes	No	No		= ODI	= ODI > NPS # = SF-36 ER	= ODI	00
2019		No	Yes	No			= NPS	> NPS #	> NPS #	00
		No	Yes	No			> SF-36 ER #	= SF-36 ER	= SF-36 ER	00
		No	Yes	No			> SF-36 EWB	= SF-36 EWB	= SF-36 EWB	00
		No	Yes	No			> SF-36 GH	= SF-36 GH P	= SF-36 GH	00
			Ι	nterlami	nar vs. trar	nsforaminal epidu	ral steroid injection	<u> </u>		
Sencan 2020	High				Yes	= NPS	3 weeks:			
	C	No	Yes	No			= NPS	3 months: 8 > NPS = 0DI 9		00
		No	Yes	No			= ODI	= ODI 9		00
		No	Yes	No			> BDS	> BDS > Distance walked #		00
		No	Yes	No			= Distance walked			00
		No	Yes	No				19, 2024 by		00
		No	Yes	No				20		00
		No	Yes	No				124		00
		No	Yes	No						00
				TNF alp	oha inhibit	or (Etanercept) vs	. steroid injection	6 months: .t. > VAS # Prote		
Wei 2020	Low	No	Yes	No		> VAS #	1, 3 months:	6 months:		++
		No	Yes	No			> VAS #	>VAS # P		++
		No	Yes	No			> ODI #	> ODI # G		++
				TNF	alpha inh	ibitor (Etanercept) vs. lidocaine	cted		
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			1	1						
Wei 2020	Low	No No	Yes Yes	No No		> VAS #	1, 3 months: > VAS #	6 months: 72 > VAS # 4 > ODI # 9		$^{++00}_{++00}$
		No	Yes	No			> ODI #	> ODI # 9		++00
					Steroi	d vs. lidocain	e injection	6 months: an = VAS a = ODI		
Wei 2020	Low	No	Yes	No		= VAS	1, 3 months:	6 months: an		++00
		No No	Yes Yes	No No			= VAS = ODI	= VAS = ODI		$^{++00}_{++00}$
		110	105		Percutane	ous Epidura	l Adhesiolysis			1100
			Ballo			-	ible balloon catheter (Z	ZiNeu) 🖓		
Karm 2018	High	No No No	Yes Yes Yes	No No No	No		1 month: = NPS (back) = NPS (leg) = ODI	ZiNeu)		0000 0000 0000
		No No No	Yes Yes Yes	No No No	20		3 months: = NPS (back) = NPS (leg) = ODI	d from htt		0000 0000 0000
		INO	Ies	INO	Surger	y vs. Physica		p//br		0000
				Intersp			vs. non operative care	njo		
Zucherman 2004, 2005, Hsu 2006	High	No No	Yes Yes	No No	No		> ZCQ(S)# > ZCQ(F)# > SF-36 PF > SF-36 BP > SF-36 GH > SF-36 ER	> ZCQ(S)# 9 > ZCQ(F)# 9 > SF-36 PF 9 > SF-36 BP 8 > SF-36 GH 9 > SF-36 ER 9	> ZCQ(S)# > ZCQ(F)# > SF-36 PF# > SF-36 BP# > SF-36 GH > SF-36 ER#	$ \begin{array}{r} +000 \\ +000 \\ +000 \\ +000 \\ +000 \\ +000 \\ \end{array} $
		La	minectom	y +/- fusi	on vs. non	operative car	e for degenerative spor			
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Weinstein	High	No	Yes	No	No	= SF-36 BP, PF		2 years:
2007, 2009	Ingn	No	Yes	No	110	= ODI	= SF-36 BP, PF = ODI 4	= SF-36 BP, PF
Abdu 2018		No	Yes	No		= LBPBS	$=$ LBPBS β	= ODI
		No	Yes	No		= LPBI	$=$ LPBI $\vec{\omega}$	= LBPBS
		No	Yes	No		= SBS	= SBS	= LPBI
							anu	= SBS
		No	Yes	No			Jan	4 years:
		No	Yes	No			2	= SF-36 BP, PF
		No	Yes	No			02	= ODI
		No	Yes	No			Ň	= LBPBS
		No	Yes	No			Do	= LPBI
							N N N N N N N N N N N N N N N N N N N	= SBS
		No	Yes	No			= LPBI 19 January 2022. Downloaded from ht	8 years:
		No No	Yes	No			de	= SF-36 BP, PF
		No No	Yes Yes	No No			d fr	= ODI = LBPBS
		No	Yes	No			, ON	= LBPBS = LPBI
		NO	105	INU				= SBS
				Lam	inectomy +	- fusion vs. non operative care		555
Amundsen	High	No	Yes	No	No	?* Pain severity	?* Global	?* Pain severity
2000	e	No	Yes	No			?* Global	? Global
Malmivaara	Low	No	Yes	No	No		= TWT 9	= TWT
2007		No	Yes	No			= SW	= SW
N= 94		No	Yes	No			> VAS leg walk #	> VAS leg walk
		No	Yes	No			> VAS LB wask #	#
		No	Yes	No			> ODI 🗧	> VAS LB walk
							on A	* > ODI
Weinstein	High	No	Yes	No	No	= SF-36 BP	= SF-36 BP <u>5</u> .	2 years:
2008, 2010,	Ũ	No	Yes	No		= SF-36 PF	$=$ SF-36 PF \rightarrow	> SF-36 BP **
Lurie 2015		No	Yes	No		= LBPBS		#
		No	Yes	No		= LPBI	$= LPBI \qquad N \\ = SBS \qquad 4$	= SF-36 PF
		No	Yes	No		= SBS		= LBPBS
		No	Yes	No		= ODI	= ODI	= LPBI
							guest.	= SBS
							est.	= ODI
							U D	4 years:
							ote	=SF-36 BP ** = SF-36 PF
							ecte	= SF-36 PF = LBPBS
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Laminectomy, facet resection, neuroforaminotomy vs. physical therapy = SBS 8 years: +0 0 Delitio High No Yes No 2015 No Yes No Value No Yes No 2015 Yes No Yes Value No Yes No Yes No Yes No Value No Yes Yes Value No Yes No Yes No No Yes Yes No No Yes Stavours intervention (first comparison). < favours control (second comparison), = no difference between intervention and control groups, TWT= Treadmill Walking Text, VAS – Visual Analog Scale for Pain Intensity, RMDI= Sel-36 embers. Sel-36 embers. Subscale, SF-36 PPS = S-36 bysical Encitos Ubscale, SF-36 EWE = SF-36 embers. SF-36 BP-536 BOHS = SF-36 embers. Subscale, SF-36 PP = S-36 bysical Encitos Ubscale, SF-36 EWE = SF-36 embers. SF-36 BP-536 BP-536 BOHS = SF-36 embers. Subscale, SF-36 EWE = SF-36 embers. SF-36 EWE = SF-36 embers. SF-36 BP-536 BOHS = SF-36 embers. Subscale, SF-36 EWE = SF-36 embers. SF-36 EWE = SF-36 embers. SF-36 BP-536						open-20	
Laminectomy, facet resection, neuroforaminotomy vs. physical therapy 2 Delitto High No Yes No No 2 years: = SF-36 -0 2015 No No Yes No No 2 years: = SF-36 -0 > favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and contro groups, TWT= Treadmill Walking Test, VAS = Visual Analog Scale for Pain Intensity, RMDI= Roland-Morris Back Disability Index, NHP= Nottingham Highth Profile, Global= Patient Perceived Improvement, SR = Selective Reporting, ODI= Oswestry Back Disability Index, ?= insufficient data, LBP= Low back Pain Severity Scale, Leg pain= Leg Pain Severity Scale, ? SF-36-No data on overall score, improvement in some subscales, NPRS= Numeric Pain Rating Scale, SF-36 Bodily Pain Subscale, SF-36 General health subscale, LBPBS= Low Back Pain Bothersome Scale, LPBI= Leg Pain Bothersome Index, SBS= Stemain Well-being subscale, SF-36 Subjective Walking, VAS leg= Visual Analog Scale for Leg Pain, VAS LB= Visual Analog Scale for Low Back Pain, VAS leg walking= Visual Analog Scale for Leg pain while walking, SIP= sickness index profile, BDS= Beck Depression Score, LESSER= Lumbar Epidural Steroid Injection for Spinal Stenosis Extended Research, PA = Physical Activity, FRI= Functional Rating Index, TWT= Total Walking Time, SSS= Spinal Stenosis Quationnaire, ?*= no between group statistical comparison, **= SF-36 BP significantly better at 2 years but not 4 years.						21-057	
Laminectomy, facet resection, neuroforaminotomy vs. physical therapy 2 Delitto High No Yes No No 2 years: = SF-36 -0 2015 No No Yes No No 2 years: = SF-36 -0 > favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and contro groups, TWT= Treadmill Walking Test, VAS = Visual Analog Scale for Pain Intensity, RMDI= Roland-Morris Back Disability Index, NHP= Nottingham Highth Profile, Global= Patient Perceived Improvement, SR = Selective Reporting, ODI= Oswestry Back Disability Index, ?= insufficient data, LBP= Low back Pain Severity Scale, Leg pain= Leg Pain Severity Scale, ? SF-36-No data on overall score, improvement in some subscales, NPRS= Numeric Pain Rating Scale, SF-36 Bodily Pain Subscale, SF-36 General health subscale, LBPBS= Low Back Pain Bothersome Scale, LPBI= Leg Pain Bothersome Index, SBS= Stemain Well-being subscale, SF-36 Subjective Walking, VAS leg= Visual Analog Scale for Leg Pain, VAS LB= Visual Analog Scale for Low Back Pain, VAS leg walking= Visual Analog Scale for Leg pain while walking, SIP= sickness index profile, BDS= Beck Depression Score, LESSER= Lumbar Epidural Steroid Injection for Spinal Stenosis Extended Research, PA = Physical Activity, FRI= Functional Rating Index, TWT= Total Walking Time, SSS= Spinal Stenosis Quationnaire, ?*= no between group statistical comparison, **= SF-36 BP significantly better at 2 years but not 4 years.						$\begin{array}{c} 7 \\ 8 \\ 4 \\ 9 \\ 7 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	+000
Laminectomy, facet resection, neuroforaminotomy vs. physical therapy 2 Delitto High No Yes No No 2 years: = SF-36 -0 2015 No No Yes No No 2 years: = SF-36 -0 > favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and contro groups, TWT= Treadmill						$\vec{\Theta}$ = SF-36 PF	+000
Laminectomy, facet resection, neuroforaminotomy vs. physical therapy 2 Delitto High No Yes No No 2 years: = SF-36 -0 2015 No No Yes No No 2 years: = SF-36 -0 > favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and contro groups, TWT= Treadmill						= Stenosis	+00
2015 No Yes No Yes No Yes No > favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and control proups, TWT= Treadmill		Laminectomy, fa	acet resection, neu	roforaminotomy vs.	. physical therapy	×	
> favours intervention (first comparison), < favours control (second comparison), = no difference between intervention and control groups, TWT= Treadmill Walking Test, VAS= Visual Analog Scale for Pain Intensity, RMDI= Roland-Morris Back Disability Index, NHP= Nottingham Health Profile, Global= Patient Perceived Improvement, SR= Selective Reporting, ODI= Oswestry Back Disability Index, ?= insufficient data, LBP= Low back Pain Severity Scale, Leg pain= Leg Pain Severity Scale, ? SF-36= No data on overall score, improvement in some subscales, NPRS= Numeric Pain Rating Scale, §F-36 EPI= SF-36 Bodia pain= Leg Pain Severity Scale, SF-36= FF-36 Physical Function Subscale, SF-36 ER= SF-36 emotional role subscale, SF-36 EWB= SF-36 emotional well-being subscale, SF-36 GH= SF-36 General health subscale, LBPBS= Low Back Pain Bothersome Scale, LPBI= Leg Pain Bothersome Index, SBS= Stengis Bothersome Scale, SW= Subjective Walking, VAS leg= Visual Analog Scale for Leg Pain, VAS LB= Visual Analog Scale for Low Back Pain, VAS leg walking= Visual Analog Scale for Leg pain while walking, SIP= sickness index profile, BDS= Beck Depression Score, LESSER= Lumbar Epidural Steroid Injection for Spinal Stenosis Extended Research, PA = Physical Activity, FRI= Functional Rating Index, TWT= Total Walking Time, SSS= Spinal Stenosis Questionnaire, ?*= no between group statistical comparisons, **= SF-36 BP significantly better at 2 years but not 4 years. GRADE evidence; +000= Very low GRADE evidence, ++00= Low GRADE, +++0= Moderate GRADE evidence, ++++= High GRADE evidence # between group difference meeting the MCID. The MCID used were: ≥1.25 points for back pain and ≥1.5 points for leg pain on §to 100-point Visual Analogue Scale (VAS) and 0 to 10-point Numerical Rating Scale (NRS) for back pain (S8), ≥5 points on 0 - to 24-point Roland-Morris Disability Questionnaire (RMDQ) (59), ≥8 points for conservative treatment and ≥12 points for surgery on 0 - to 100-points for Oswestry Disability Index (ODI) (60) ≥ 0.1 points for th	e	Yes No	No				+00
Walking Test, VAS= Visual Analog Scale for Pain Intensity, RMDI= Roland-Morris Back Disability Index, NHP= Nottingham Hot Profile, Global= Patient Perceived Improvement, SR= Selective Reporting, ODI= Oswestry Back Disability Index, ?= insufficient data, LBP= Low back Pain Severity Scale, Leg pain= Leg Pain Severity Scale, ? SF-36=No data on overall score, improvement in some subscales, NPRS= Numeric Pain Rating Scale, SF-36 BP= SF-36 Bodily Pain Subscale, SF-36 PF= SF-36 Physical Function Subscale, SF-36 ER= SF-36 emotional role subscales, SF-36 EWB= SF-36 EMDI well-being subscale, SF-36 General health subscale, LBPBS= Low Back Pain Bothersome Scale, LPBI= Leg Pain Bothersome Index, SBS= Stemajis Bothersome Scale, SW= Subjective Walking, VAS leg= Visual Analog Scale for Leg Pain, VAS LB= Visual Analog Scale for Low Back Pain, VAS leg waiking= Visual Analog Scale for Leg pain while walking, SIP= sickness index profile, BDS= Beck Depression Score, LESSER= Lumbar Epidural Steroid Injection for Spinal Stenosis Extended Research, PA= Physical Activity, FRI= Functional Rating Index, TWT= Total Walking Time, SSS= Spinal Stenosis Quigtionnaire, ?*= no between group statistical comparisons, **= SF-36 BP significantly better at 2 years but not 4 years. GRADE evidence; +000= Very low GRADE evidence, +++00= Low GRADE, +++0= Moderate GRADE evidence, ++++= High GRADE evidence # between group difference meeting the MCID. The MCID used were: ≥1.25 points for back pain and ≥1.5 points for leg pain on gto 100-point Visual Analogue Scale (VAS) and 0 to 10-point Numerical Rating Scale (NRS) for back pain (58), ≥5 points on 0 to 24-point Roland-Morris Disability Questionnaire (RMDQ) (59), ≥8 points for conservative treatment and ≥12 points for surgery on 0- to 100-points for Oswestry Disability Index (ODI) (60), ≥ 0.1 points for the functional component and 0.36 points for symptom component of the Zurich Claudication Questionnaire (ZCQ) (58), ≥ 0.38 points for combiled symptoms and functional scores of the ZCQ (92), ≥ 30% between-	No	Yes No				e ODI	+00
	for Leg pain while walking, SIP= si Extended Research, PA= Physical A	ckness index profile, BI Activity, FRI= Function	DS= Beck Depression al Rating Index, TWT	Score, LESSER= Lum = Total Walking Time,	bar Epidural Steroid Inje SSS= Spinal Stenosis Qu	ction for Spinal Stenos	

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PRISMA 2020 Checklist

136/bmjopen-202

Section and Topic	ltem #	Checklist item	Location where item is reported
TITLE		4 0	
Title	1	Identify the report as a systematic review.	Page 1
ABSTRACT	-		
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION		<u>ک</u> ہ	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 6-7
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 7
METHODS	•		
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 9
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 8-9
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 8-9
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 9
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 9
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 8 &
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. 음	Page 8-10 Suppleme Table 1
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 9-10
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 11-1
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 11-
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 11-
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Suppleme Table 2
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used	Page 10
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	NA



PRISMA 2020 Checklist

		BMJ Open	Page 88 of 87
PRIS!	ΜΔϽ	BMJ Open 66 10 10 10 10 10 10 10 10 10 10 10 10 10	
Section and Topic	ltem #	Checklist item	Location where item is reported
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	NA
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Figure 1
Study characteristics	17	Cite each included study and present its characteristics.	Supplementa Table 1
Risk of bias	18	Present assessments of risk of bias for each included study.	Table 1
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Supplementa Table 1 & 2
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Table 2
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Supplementa Table 2
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	NA
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	NA
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Supplementa Table 2
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 25-26
	23b	Discuss any limitations of the evidence included in the review.	Page 28-29
	23c	Discuss any limitations of the review processes used.	Page 28-29
	23d	Discuss implications of the results for practice, policy, and future research.	Page 28
OTHER INFORMAT	ΓΙΟΝ	4 	
Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 7
protocol	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	NA
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 30
Competing interests	26	Declare any competing interests of review authors.	Page 30
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	NA
From: Page MJ, McKen	ızie JE, B	Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: For peer Fexnervolumityformatio/fpinisitplettich/miveorp/isited.astotetr/guilcletig/	10.1136/bmj.n71

Nonoperative treatment for lumbar spinal stenosis with neurogenic claudication: An updated systematic review.

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1 2 3 4	1	Nonoperative treatment for lumbar spinal stenosis with neurogenic claudication: An updated systematic review.
5	2	7724
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ge 5 of 95	BMJ Open
1	BMJ Open 130/bmjopen-2021-05
2	Objectives: Neurogenic claudication due to lumbar spinal stenosis (LSS) is a growing health problem in older adults. We updated our
3	previous Cochrane review (2013) to determine the effectiveness of nonoperative treatment of LSS with neurogenic claudication.
4	Design: A systematic review.
5	Data Sources : CENTRAL, MEDLINE, EMBASE, CINAHL, and ICL databases were searched and updated to July 22 nd , 2020.
6	Eligibility criteria: We only included randomized controlled trials published in English where at least 1 arm provided data on
7	nonoperative treatment and included participants diagnosed with neurogenic claudication with imaging configured LSS.
8	Data Extraction and synthesis: Two independent reviewers extracted data and assessed risk of bias using the Cochrane Risk of Bias
9	Tool One. Grading of Recommendations Assessment, Development, and Evaluation (GRADE) was used for evidence synthesis.
10	Results: Of 15,200 citations screened, 156 were assessed and 23 new trials were identified.
11	There is moderate quality evidence from 3 trials that: Manual therapy and exercise provides superior and cline cally important short-
12	term improvement in symptoms and function compared to medical care or community-based group exercise; Annual therapy,
13	education and exercise delivered using a cognitive-behavioural approach, demonstrates superior and clinically important
14	improvements in walking distance in the immediate to long-term compared to self-directed home exercises;
15	lidocaine injection is more effective than lidocaine alone in improving statistical, but not clinically important amprovements in pain
16	and function in the short-term.
	and function in the short-term.
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	BMJ Open	
1	The remaining 20 new trials demonstrated low or very low-quality evidence for all comparisons and outcome	s, like the findings of our
2	original review.	724
3	Conclusions: There is moderate quality evidence that a multimodal approach which includes manual therapy	and exercise, with or
4	without education is an effective treatment, and that epidural steroids are not effective for the management of	LSS with neurogenic
5	claudication. All other nonoperative interventions provided insufficient quality evidence to make conclusions	on their effectiveness.
6		
7	This systematic review was registered with PROSPERO registration number CRD42020191860.	nden fre
8		
9	ARTICLE SUMMARY	
10	Strengths and limitations of this study	from http://bminen.hm
11	• This systematic review included a wide range of nonoperative interventions commonly used in clinica	practice.
12	• This review used consistent inclusion and exclusion criteria for neurogenic claudication, which include	$\frac{2}{5}$ d the corroboration of a
13	diagnosis of lumbar spinal stenosis with imaging.	10 202
14	• This review used rigorous methods recommended by the Cochrane Back and Neck Pain Review Grout	\mathbf{p} including the use of
15	Grading of Recommendations, Assessment, Development and Evaluation (GRADE) to synthesize and	summarize the quality
16	of the evidence.	
17	Only English studies were included in this review.	
	 of the evidence. Only English studies were included in this review. 	
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Page	7 of 95	BMJ Open BMJ Open
1 2 3 4 5	1	• Most studies had small samples sizes with heterogeneity in interventions tested, limiting ability to po
6 7 8 9	2 3	Key words: neurogenic claudication, lumbar spinal stenosis, systematic review, nonoperative treatment, elderly
10 11 12 13 14 15	4 5 6 7	INTRODUCTION Uary 2022. Downld
16 17	8	Lumbar spinal stenosis (LSS) causing neurogenic claudication is a highly prevalent and rapidly growing public health problem among
18 19	9	older adults (1). It is characterized by bilateral or unilateral buttock pain and/or lower extremity discomfort, \vec{p}_{ain} , weakness, or
20 21	10	heaviness precipitated by walking and prolonged standing and relieved by stooping forward and sitting (2, 3)
22 23 24	11	is usually age-related osteoarthritic changes to lumbar intervertebral discs, facets joints and ligaments leading to narrowing of the
25 26	12	central and/or lateral spinal canals and compression and/or ischemia of the spinal nerves (2, 4).
27 28	13	Limited walking ability is the dominant impairment in neurogenic claudication and the most common reason for seeking care (5).
29 30 31	14	Limited walking ability due to LSS is associated with a significant decline in functional status, quality of life $\frac{3}{3}$ and independence in this
32 33	15	population (2, 5).
34 35	16	Although lumbar spinal stenosis is the most common reason for spine surgery in older adults, most people with neurogenic
36 37	17	claudication receive nonoperative care (6). A course of nonoperative care is also recommended prior to receiving surgical intervention
38 39 40	18	(7). However, what constitutes effective nonoperative care remains unknown. In 2013 we published a Cochrame review evaluating
41 42 43 44 45 46		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml
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		BMJ Open BMJ Open 28
1 2		pen-20
2 3 4	1	nonoperative treatment for LSS causing neurogenic claudication (8, 9). This review identified 21 randomized trials
5 6	2	assessing a variety of nonoperative treatments. However, the quality of the evidence was deemed low or very good and therefore no
7 8 9 10 11	3	conclusions could be made on the effectiveness of nonoperative treatment for neurogenic claudication. The $p_{\underline{g}}^{\underline{g}}$ pose of this study is to
	4	update this systematic review and the evidence for nonoperative treatments for neurogenic claudication. Our $\frac{1}{8}$
12 13	5	was: What nonoperative interventions are effective in improving outcomes in patients with neurogenic claud $\frac{1}{2}$
14 15 16	6	spinal stenosis?
17 18	7	ed for
19 20	8	n http://
21 22 23	9	METHODS
24 25	10	This systematic review was registered with PROSPERO registration number CRD42020191860 and was conducted and reported
26 27	11	according to the PRISMA guidelines (10). We used methods recommended by the Cochrane Back Review Goup (11).
28 29	12	Ethics Approval Statement
30 31 32	13	Ethics approval was not required for conducting this systematic review.
33 34	14	
35 36	15	Patient and Public Involvement Statement
37 38 39	16	Patients or the public were not involved in the conduct of this systematic review.
40 41	17	d by c
42 43 44		Patient and Public Involvement Statement Potential of this systematic review. Patients or the public were not involved in the conduct of this systematic review. 7
45 46 47		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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 Population, Interventions, Comparison and Outcomes (PICO Criteria)
 Population of interest was individuals with imaging confirmed LSS (central or foraminal, with or without spondylolisthesis) and

 neurogenic claudication. Neurogenic claudication is a clinical diagnosis and was defined as buttock or leg pain and/or aching, numbness, tingling, weakness, or fatigue with or without back pain, precipitated by standing or walking. There were no age restrictions. The interventions of interest included all nonoperative treatments and the comparison was any treatment including surgery. Outcomes included at least one of the following measures: walking ability, pain intensity, physical function, quality of life, or Jh. global improvement. from http://bmjo

Search and Study Selection

We replicated and updated our original electronic database search (from 1966 to January 2011) to July 22nd 2920. The search was performed by an experienced librarian in CENTRAL (Cochrane Library 2011 issue1), Medline, EMBASE, CANAHL and Index to Chiropractic Literature. The terms "spinal stenosis," "lumbar spinal stenosis," "neurogenic claudication," "lumbar radicular pain," "cauda equina," and "spondylosis" were combined with a highly sensitive search strategy to identify randomized controlled trials (RCTs). Reference lists of selected studies and previous reviews were also searched to identify additional articles. Supplemental file 1 guest. Protected by copyright. provides details on the full search strategies used for all databases.

BMJ Open Studies were included if they were RCTs published in peer reviewed English journals, at least one arm of the grial provided data on effectiveness of a nonoperative treatment and at least 80% of subjects had neurogenic claudication with imaging confirmed LSS. Studies evaluating subjects with radiculopathy caused by disc herniations without neurogenic claudication were excluded. Studies with mixed populations were only included if separate data for subjects with neurogenic claudication due to lumbar spinal ownloaded from stenosis were provided. Two pairs of reviewers independently screened all titles and abstracts identified by the search strategy. Full text of articles deemed to be potentially relevant were independently assessed by two reviewers who made the final decision for inclusion. A third reviewer was consulted if consensus was not reached. **Risk of Bias Assessment and Data Analysis** Two reviewers independently assessed methodological risk of bias and performed data extraction. Safety data $\vec{a_{k}}$ (intervention side effects and/or complications) when available were also collected. The Cochrane Risk of Bias Tool 1 was used that included the 12-item criteria recommended by the Cochrane Back Review Group (11). Discrepancies in risk of bias scoring and data extraction were resolved with discussion and if necessary, with a third reviewer until consensus was reached. Reviewers whon were authors of any of ed by copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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1	the included studies were recused from performing risk of bias assessment, data extraction, data analysis or s	Southesis of their own
2	studies.	24 on
3	Low risk of bias was defined as fulfilling 6 or more of the 12 criteria including clearly described and appropriate the second s	ate randomization (Item
4	A), and allocation concealment (Item B), and with no severe flaws. A severe flaw was defined <i>a priori</i> as a s	arious methodological
5	deficiency not captured by the 12-item criteria that significantly increases the risk of bias such as very high c	Popout or cross-over rates
6	and sample sizes less than 30 subjects per treatment arm.	ownloa
7		ded fro
8	For each comparison, outcomes were analyzed according to these follow-up time periods: immediate (up to o	and the second s
9	intervention); short-term (between one week and three months); intermediate (between three months and one	ear) and; long-term
10	(one year or longer). Outcome data were pooled, and meta-analyses were performed when trials were judged	to be sufficiently
11	homogeneous, both clinically and statistically.	j.com/ a
12	Rehabilitation therapy was defined as treatment that utilized any combination of education, exercise instruction	gn, manual therapy, heat
13	and cold applications, electrotherapy, other physical therapy modalities, orthosis, and other assistive devices	Multimodal treatment
14	included various combinations of rehabilitation therapy treatments, oral and other mediations, and spinal inje	
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1	The quality of the evidence for each outcome and for each comparison was evaluated using GRADE (Grades	\rightarrow
2	Assessment, Development and Evaluation (12, 13) Overall quality of the evidence was based on performance	\mathcal{A}_{g} against five domains: 1)
3	risk of bias; 2) consistency of findings; 3) directness of comparisons; 4) precision of estimates; and 5) other	Önsiderations such as
4	selective reporting.	1uary 2022
5		.022. E
6	The quality of the evidence starts at high when there are consistent findings among at least 75% of RCTs with	low risk of bias and
7	consistent, direct, and precise data and with no known or suspected publication bias. It downgrades a level for	geach domain not met.
8	Treatment effects between comparators (more effective, less effective or no difference) were based on statist	Beally significant and
9	clinically important differences in outcomes.	://bmjo
10		նոյօpeո.bm
11	High quality evidence - all five domains are met; further research is very unlikely to change the confidence	j. o
12	Moderate quality evidence - one of the domains is not met; further research is likely to have an important is	g Bepact on the confidence
13	in the estimate of effect and may change the estimate.	rii 19, 2
14	Low quality evidence - two domains are not met; further research is very likely to have an important impact	by the confidence of the
15	estimate of effect and is likely to change the estimate.	/ guest
16	estimate of effect and is likely to change the estimate. Very low-quality evidence - three or more domains are not met; there is great uncertainty about the estimate	gof effect.
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BMJ Open BMJ Open "Over your of the second state of the second sta evidence, depending on whether it was assessed as having a low or high risk of bias, respectively, and there were no other limitations. Studies with both low risk of bias and inappropriate or unclear randomization and/or treatment allocation techniques were downgraded Jary 2022. by two levels for the "risk of bias" domain. The results below are reported based on statistically significant differences between comparators for each out on the statistically significant differences between comparators for each out of the statistical st by authors. Differences considered clinically important will be specified when the quality of the evidence is moderate or higher. The MCIDs we used are listed in Supplemental Table 2. Adverse events for the new studies are detailed when reported by the authors. bmjopen.bmj.com/ on April **RESULTS Selection and Description of Included Trials** We screened 15,200 titles and abstracts and assessed 156 full-text articles. This resulted in 44 RCTs meeting the inclusion criteria, including 23 new trials. Figure 1 summarizes original and updated screening results. Supplemental Table 1 describes the characteristics of all included trials. In total, 3,792 participants (1,765 males, 1836 females and 191 participants of undisclosed gender (14, 15) were randomized to one of 60 comparison groups. Seventeen studies evaluated rehabilitation therapy or multimodal care (14, 16-31), 11 assessed epidural injections (32-42), 7 evaluated oral medications (15, 43-48), 6 assessed calciton (49-54), 2 evaluated copyright

BMJ Open acupuncture (55, 56) and 1 assessed spinal manipulation (57). Thirty-eight trials were conducted at tertiary care or university affiliated centres and 6 at medical/rehabilitation clinics (18, 24, 35-38). The mean age of participants was 63.3 years. The duration of symptoms varied considerably amongst the studies with a mean ranging from 12 weeks to 15 years. Follow-up periods also varied significantly nuary 2022. Downloaded from ranging from immediately following the intervention to 10-year post intervention. **Risk of Bias of Included Studies** The median and mean number of criteria met was 7 of 12 (range 2-11), see Table 1. is with neurogenic claudication //bmjopen.bmj.com/ on April 19, 2024 by guest. Protected by copyright.

Author	Α	В	С	D	Ε	F	G	Н	1	J	Κ	L	Total
Calcitonin													
Eskola 1992	?	?	+	+	+	?	+	-	?	?	?	+	5
Porter 1983	?	?	-	?	?	+	+	?	-	?	+	+	4
Porter 1988	?	?	+	?	?	-	+	+	?	?	?	+	4
Podichetty 2004	?	?	+	+	+	-	+	-	+	?	?	+	6
Tafazal 2007	?	?	+	+	+	+	+	+	-	?	?	+	7
Sahin 2009	?	?	-	-	+	-	?	+	+	?	?	+	4
	· · · · · ·												
Oral Medications													
Prostaglandin													
Matsudaria 2009	+	+	-	-	+	+	+	?	+	?	?	+	7*
Methylcabalin	· · · ·												
Waikakul 2000	-	?	-	-	+	+	+	?	+	?	?	+	5
Gabapentin	·				•		•	•				•	•
Yaksi 2007	?	?	-	-	-	?	+	+	?	?	?	+	3
Pregabalin													
Markman 2015	+	+	+	+	+	+	+	+	?	+	-	+	10 ****

Gabapentin							
Park 2017	+	?	+	+	+	+	+
Oxymorphone Hydrochloride			•				•
Markman 2015 (2)	+	+	+	+	+	-	?
Oral Corticoid	<u> </u>	1	1	1	1	1	<u>I</u>
Rodrigues 2014	+	+	?	?	?	+	+
<u> </u>			1			1	
Rehabilitation Therapy or Multime	odal						
Goren 2010	+ /	+	-	-	+	+	-
Koc 2009	?	?		-	+	+	+
Pua 2007	+	+	-	-	+	-	+
Whitman 2006	+	?	-	-	+	+	+
Minetama 2019	+	?	- <	-	+	+	+
Schneider 2019	+	+	-	-	+		+
Ammendolia 2018	+	+	-	-	+	+	+
Oğuz 2013	?	?	-	-	?	?	+
Homayouni 2015	+	+	-	-	+	+	+
Marchand 2019	+	+	-	-	+	?	+
Kim 2019	+	+	+	+	+	+	+
Spinal Manipulation							
Passmore 2017	-	+	-	-	+	+	+
Acupuncture							
Kim 2016	+	+	-	-	-	-	+
Qin 2020	+	+	+	-	+	+	+
Epidural Injections		-	1		1	1	1
Cuckler 1985	?	?	+	+	+	+	+
Fukusaki 1988	?	?	?	?	+	+	+
Zahaar 1991	?	?	+	?	+	+	+
Brown 2012	+	-	+	-	?	+	+
Friedly 2014, 2017, Makris 2016	+	+	+	+	+	+	+
Song 2016	?	?	?	?	?	+	+

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Milburn 2014	?	?	+	-	+	-	+	-	?	-	-	+	4
Hammerich 2019	+	+	-	-	+	-	+	?	?	-	+	+	6 ****
Sencan 2020	+	?	+	-	+	+	?	+	+	+	?	+	8 *****
Wei 2020	+	+	+	-	-	+	-	+	?	+	+	+	8 *
Percutaneous Epidural Adhesiolysi	s												
Karm 2018	+	?	+	-	+	-	+	+	?	-	-	+	6 ****
Surgery vs Physical Therapy													
Zucherman 2004, 2005, 2006	?	+	-	-	+	+		+	+	?	+	+	>6 **
Weinstein 2007, 2009, Abdu 2018	+	+		-	+	+	+	+	?	?	-	+	>6 ***
Amundsen 2000	+	?	-	-	-	+	+	+	-	?	-	?	4
Malmivaara 2007	+	+	-	-	+	+	+	+	+	?	?	+	8 *
Weinstein 2008, 2010, Lurie 2015	+	+			+	-	+	+	?	?	-	+	6 ^
Delitto 2015	+	+	-	-	+	?	+	-	+	-	+	+	7 ^

 136/bmjopen-2021-057724 on 19 January 2022. Downloaded from e intervention?, D Was the care provider d acceptable?, G Were all randomized acceptable?, G Were all randomized 3participants analyzed in the group to which they were allocated?, H Are reports of the study free of suggestion of selective outcome reporting?, I Were the groups similar at 4baseline regarding the most important prognostic indicators?, J Were co-interventions avoided or similar?, K Was the compliance acceptable in all groups?, L Was the timing 5 of the outcome assessment similar in all groups?, + Yes, - No, ? Unclear, * Low risk of bias if 6 or more items met, including valid randomization and treatment allocation 6techniques and no severe flaws, ** 2 year follow-up drop out rate 30%, 1 year < 20%; intention to treat inconsistent at 2 year f/u, **** prop out rate <20% at 1 year, >20% at 74 years, **** < 30 participants per treatment arm, ***** Treatment allocation unclear, ^ Severe flaw due to high crossover rates, # Premature end of study

- Although 31 studies met 6 or more criteria, only 9 were considered to have low risk of bias (19, 20, 24, 27, 2^k/₅, 31, 37, 42, 43, 56).
 - Among the remaining 22 studies that met 6 or more criteria, 13 failed to explicitly describe and/or use appropriate randomization
 - procedures, allocation concealment, or both (16-18, 30, 32-34, 39, 41, 48, 52, 54, 57); three had severe flaws glue to high crossover
 - rates (21, 22, 25), which made the intention-to-treat analyses uninterpretable and 6 had other serious flaws ingluding premature

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1 2	5 BMJ Open 2021	
3 1 4	stopping of the trial (47), large number of participants lost to follow-up (40) and small sample size (less than 30	participants per arm)
5 6 2 7	(26, 29, 46, 55).	
7 8 3 9	19 Jan	
10 4 11	Evidence of Effect of Interventions	
12 13 5	Fifty-three of the 60 comparisons were examined in a single trial, most with small sample sizes. It was only pos	sible to combine data
14 15 6	from 2 trials (assessing surgery vs. multimodal treatment) for 1 outcome in a meta-analysis (19, 22). The 5 of	r studies (all assessing
16 17 7 18	calcitonin) (49-52, 54) were combined qualitatively. The results of these pooled analyses were published in our	previous reviews (8,
19 8 20 8	9). Heterogeneity in source population, intervention, and outcome instruments precluded pooling of data from \vec{p} of \vec{p}	ther trials.
21 22 9	Supplemental Table 2, a summary of GRADE assessment and outcomes, summarizes the quality of the evidence	e for outcomes for
23 24 10 25	each comparison.	
26 27 11		
28 29 12	Calcitonin On April	
30 31 13 32	There were no new studies assessing calcitonin. The conclusion from our previous review was that there is $v \vec{e}$	low-quality evidence
33 14 34	from 6 trials (49-54) (N= 231) that calcitonin is no better than placebo or paracetamol regardless of mode of $\frac{8}{9}$ dr	ninistration or
³⁵ 36 15	outcome assessed.	
37 38 16		
39 40 17 41	outcome assessed. Protected by copyright	
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1	We identified 4 new studies assessing 5 oral medications. There is low-quality evidence based on 1 small cross	`
2	that pregabalin does not improve pain, distance walked, function or global health status immediately following	
3	compared to placebo. Adverse events were reported in 64% of the pregabalin group, the most common being	dizziness, compared to
4	35% in the placebo group.	
5		
6	A small trial evaluating gabapentin plus conservative care (48) (N=45) provides very low-quality evidence de	nonstrating no
7	significant improvement in back/leg pain, disability scores or global health in the short-term compared to con	servative care plus
8	botulinum toxin injection. Five patients (20.8%) reported mild to moderate pain at injection sites for a few da	s after botulinum toxin
9	injections.	
10		5 5 7
11	There is very low-quality evidence from 1 small trial (47) (N=24) that oxymorphone hydrochloride or propos	wphene and
12	acetaminophen is no better than placebo in the immediate term for all outcomes assessed. A single small trial provided very low-quality evidence (15) (N=61) that oral corticoids do not improve outcomes	
13		2 2 2
14	A single small trial provided very low-quality evidence (15) (N=61) that oral corticoids do not improve outco	mes in the short-term
15	compared to placebo.	
16		
	compared to placebo.	
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1		BMJ Open 136/bmjopen-20
2 3 4	1	The original review identified 3 studies assessing oral medications and concluded that there is low-quality evidence that
5 6 7	2	prostaglandins improves walking distance and leg pain in the short-term compared with etodolac (a nonsterong al anti-inflammatory
7 8 9	3	drug) (43); very low-quality evidence that gabapentin improves walking distance and pain compared with placebo in the intermediate
10 11	4	and long-term(45) and that methylcobalamin (vitamin B 12) plus conservative treatment improves walking dE_{\aleph} tance in the
12 13	5	intermediate and long-term compared with conservative treatment alone (44).
14 15 16	6	whoad
17 18	7	Rehabilitation Therapy and Multi-modal Treatment
19 20	8	We identified 8 new studies evaluating 13 rehabilitation therapy and/or multimodal treatment approaches, with one study being
21 22 23	9	compared to surgery.
23 24 25	10	
26 27	11	There is moderate quality evidence from 1 trial (31) (N=259) that manual therapy and exercise provides superior and clinically
28 29	12	important short-term improvement in symptoms and function compared to medical care or community-based $\frac{3}{2}$ so that that
30 31 32	13	community-based group exercise improves physical activity in the short-term compared to medical care. There were no reported
33 34	14	serious adverse events in any group. There was a significantly greater rate of transient joint soreness associated with the manual $\frac{2}{9}$
35 36	15	therapy and exercise group (49%) compared with the community-based group exercise (31%) and medical $case = (6\%)$ groups.
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44 45 46 47		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 18

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1	Another trial provides moderate quality evidence (27) (N=104) that comprehensive care (manual therapy, edgeation and exercise	
2	delivered using a cognitive-behavioural approach) demonstrates superior and clinically important improvements in walking distant	nce in
3	the immediate, short, intermediate, and long-term and compared to self-directed home exercise. This study also provides low-qual	lity
4	evidence that comprehensive care improves overall pain and function in the long-term compared to self-directed home exercises.	At
5	12 months, none of the 43 participants in the comprehensive group and 2 of the 46 participants in the self-directed group experien	iced
6	adverse events. These adverse events were mostly attributed to a temporary increase in low back and/or leg pain.	
7	Aded from the second seco	
8	There is low-quality evidence from 1 trial (28) (N=34) that a form of manual therapy (Mokuri Chuna), acuputed the complete and physician	L
9	care, with or without a herbal remedy (Gang-Chuk Tang), improves low back pain in the intermediate term compared to oral	
10	aceclofenac, epidural steroids and physical therapy (heat and TENS).	
11	acectorenac, epidural steroids and physical merapy (neat and TENS).	
12	A single study assessing supervised physical therapy (manual therapy, exercise, and body weight-supported teadmill) (30) (N= 8	6)
13	provides low-quality evidence for improved symptoms, function and walking distance in the short-term compared to home exercise	ses.
14	024 by 1	
15	There is very low-quality evidence from 1 study (14) (N=120) that heat, TENS and home exercise instruction is no better than	
16	isokinetic exercise in the immediate, short and intermediate term for all outcomes and less effective than unloged exercises in the	e
17	immediate and short-term. Unloaded exercise was also found to be superior to isokinetic exercise in the immediate and short-term	1.
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5 6	2	One small single study (26) (N=47) provides very low-quality evidence that aquatic exercise is more effective than physical therapy
7 8 9	3	(exercise, ultrasound, heat and TENS) in improving pain and walking distance in the immediate term. $\frac{1}{2}$
9 10 11	4	20 Interview 20
12 13	5	Another small single trial (29) (N=40) provides very low-quality evidence that a pre-surgical exercise program improves post-surgical ∇
14 15 16	6	outcomes in the immediate, but not in the short or intermediate terms.
17 18	7	ed from
19 20	8	There is low-quality evidence from 1 study (25) (N=169) that a structured physical therapy program (education and exercises)
21 22 23	9	provides similar outcomes to decompression surgery in the long-term (2 years follow-up). Nine out of 82 participants receiving
23 24 25	10	physical therapy reported adverse events consisting of worsening of symptoms whereas 33 out 87 participants reported surgery related
26 27	11	complications, mainly attributable to reoperation, delay in wound healing and surgical site infection.
28 29 30	12	n April
30 31 32	13	Our original review identified 9 rehabilitation therapy/multi-modal trials of which 5 were compared to surgical interventions. A meta-
33 34	14	analysis was conducted for 2 of the surgical trials. Two of the original surgical trials have since published $8 - \frac{12}{2}$ ar follow-up results (see
35 36	15	below). All studies provide either low or very low-quality evidence.
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A meta-analysis (8, 9) that includes 2 trials (22) (19) shows that laminectomy improves outcomes only at the 2 year follow-up
compared to conservative care. One of these studies shows no difference in outcomes after an 8-year follow- $\frac{5}{80}$ (58).
An interspinous surgical implant (17, 59, 60) was found to be superior to multi-modal treatment (epidural injections, pain medication,
education, exercise, back brace, heat/ice, and massage). Another trial (16) provided inconclusive evidence when comparing
laminectomy with or without fusion to lumbar orthosis and education.
Among patients with degenerative spondylolisthesis, 1 study (21) shows no difference in outcomes with lam $\frac{1}{2}$
to conservative care including after an 8-year follow-up (61).
One study showed that exercise plus ultrasound is no better than exercise plus sham ultrasound but better than and
exercise plus sham ultrasound is better than no treatment (24). Other studies demonstrated that in-patient physical therapy (ultrasound,
heat and TENS) is more effective than home exercise plus oral diclofenac (23), unweighted treadmill walking plus exercise is no
better than cycling plus exercise (20), and manual therapy, exercise and unweighted treadmill is more effective than flexion exercises,
walking and sham ultrasound (18).
24 by g
Epidural Injections Injections We identified 6 new studies evaluating epidural injections. There is moderate quality evidence from 1 study (7, 62) (N=400) that
We identified 6 new studies evaluating epidural injections. There is moderate quality evidence from 1 study $\vec{\beta}_{R}^{2}$ 7, 62) (N=400) that
glucocorticoid plus lidocaine injection is better than lidocaine alone in improving pain and function at 3 weeks (short-term) but not at
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	6-weeks (short-term), 12 weeks (intermediate-term) or 12 months (long-term). The improved outcomes at 3 w		
	significant but not considered to be of clinical importance (63). A follow-up subgroup analysis (64) using part	Sent-prioritized Roland-	
	Morris Disability Questionnaire (RMDQ) items, did not change the results. A total 21.5% of patients in the g	fucocorticoid-lidocaine	
	group and 15.5% in the lidocaine alone group reported one or more adverse events (p=0.08). Adverse events		
		2022. Downloa	
	A small study (36) (N=29) provided very low-quality evidence that an injection of lidocaine is no better than	a saline injection for all	
	outcomes in the short-term.	n http:/	
	e	http://bmiop	
	There is very low-quality evidence from 1 study (38) (N=57) that steroid injections at the level of maximal st	enosis improve pain and	
	function in the immediate and short-term compared to steroid injections at 2 levels cephalad to the maximum	evel of stenosis.	
	$O_{D_{1}}$		
	A small trial (40) (N=54) provided very low-quality evidence that steroid injections are no better than steroid	jnjections combined	
	with physical therapy (manual therapy and exercise) in improving pain or function in the short-term but are n		
	improving pain in the intermediate and long-term.	ipst F	
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 There is very low-quality evidence from 1 study (41) (N=67) that interlaminar steroid injection improves paig-and walking distance in

 '24 on 19 the intermediate but not in the short-term compared to transforaminal steroid injection. A 3-arm trial (42) (N=30) provided low-quality evidence that TNF alpha inhibitor (Etanercept) injections improved pain and function in the immediate, short and intermediate term compared to steroid or lidocaine injections and that steroid injections were no better vnloaded than lidocaine for all outcomes and follow-up periods. There is very low-quality evidence from 1 small trial (35) (N=38) that minimally invasive lumbar decompression surgery (MILD) is no better than epidural steroid injections for all outcomes in the short-term. One small trial (39) (N=44) provided very low-quality evidence that an epidural inflatable balloon catheter (ŽiNeu) improves pain and function in the intermediate term but not the short-term compared to a balloon-less catheter (Racz). Minor and transient adverse events |9, 2024 by were reported equally in both groups (no data provided), mostly pain and paresthesia at the injection site. Our original review identified 4 trials evaluating 7 epidural injection approaches, all with very low-quality evaluation of all outcomes. Two trials demonstrated that translaminar (32) or caudal (33) steroid injections were no better than placebo. Two other trials showed that translaminar epidural steroid plus a block was better than placebo or an epidural block alone (34), that translaminar epidural block copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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1 2 3 4 5 6 7	1 2	BMJ Open BMJ Open was better than placebo (34), and that interlaminar epidural steroid plus a block was better than home exercises plus diclofenac or inpatient physical therapy (ultrasound, heat and TENS) (23). BMJ Open Acupuncture Acupuncture
8 9	3	
10 11	4	Acupuncture
12 13	5	We identified 2 new studies assessing acupuncture. There is low quality evidence from 1 trial (56) (N=80) that acupuncture improves
14 15	6	back and leg pain, symptoms and function in the immediate, short, and intermediate term compared to sham
16 17 18	7	40 participants in the acupuncture group reported short-term pain at the insertion site (1 also had a hematomation and 5 out of the 40
19 20	8	participants in the sham group reported non-serious back pain or fatigue. There is very low-quality evidence from a small trial (55)
21 22	9	(N=50) that acupuncture plus usual care is no better than usual care alone in the short-term for all outcomes.
23 24	10	(N=50) that acupuncture plus usual care is no better than usual care alone in the short-term for all outcomes.
25 26 27	11	Spinal Manipulation
27 28 29	12	We identified 1 study assessing spinal manipulation. There is very low-quality evidence from a very small trig (57) (N=14) that spinal
30 31	13	manipulation alone is no better than a wait list control in the immediate term for all outcomes $\frac{1}{100}$
32 33	14	manipulation alone is no better than a wait list control in the immediate term for all outcomes DISCUSSION
34 35 36	15	We updated our systematic review on nonoperative treatments for LSS causing neurogenic claudication and genetified 23 new trials
37 38	16	that were added to the previous 21 studies. The highest number of studies, 17/44, evaluated rehabilitation the apy/multimodal
39 40 41 42	17	treatment, 11 assessed epidural interventions, 7 oral medications, 6 calcitonin, 2 evaluated acupuncture and sessed spinal
43 44 45 46		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 24

BMJ Open anipulation. Of the 60 comparisons that were evaluated, 5 comparisons from 3 trials (27, 31, 37) provided indicate quality evidence. The remaining comparisons provide either low or very low-quality evidence. In our original review all comparisons for all the interventions assessed were of low or very low-quality evidence. This lack of moderate or high-quality evidence limited our ability ıary 2022. D to make conclusions on the effectiveness of most nonoperative treatments. There is now moderate evidence that a multimodal structured 6-week program consisting of manual therapy and exercise with or without education is an effective treatment approach (27, 31) for neurogenic claudication and that epidural steroid injections do not provide clinically important improvements in short or long-term outcomes compared to epidural lidocaine in ections. However, given that these respective findings came from single studies, this evidence lacks consistency and therefore there is possibility that replicating these trials in the future might result in substantially different conclusions. However, a recent clinical practice guideline for the management of LSS leading to neurogenic claudication concurred with our findings and recommended, based on moderate quality evidence, multimodal care consisting of education with home exercises and manual therapy (65). These guidelines also recommended against the use of epidural steroid injections, based on high quality evidence. A recent systematic review and meta-analysis of RCTs evaluating conservative nonpharmacological therapies for degenerative LSS also concluded, based on low to moderate evidence, that manual therapy and supervised exercises significantly improves outcomes compared to self-directed or group exercises (66). A recent clinical update published in the British Medical Journal recommended supervised exercise and manual therapy as a first line treatment for LSS and recommended against the use of epidural steroid injections (67). More dated systematic reviews add not recommend a copyright For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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BMJ Open combination of education, exercise, manual therapy as an effective treatment for LSS (7, 68, 69). However, these reviews did not 1 724 on 19 include the more recent higher quality trials (27, 31) evaluating this multimodal approach. 2 3 د ۵ A multimodal approach to the treatment of LSS would appear to be a rational approach given the complexity of neurogenic 4 claudication with underlying physical, functional, and psychosocial factors impacting recovery (70). There is also a plausible rationale 5 for the lack of effectiveness of epidural steroid injections for neurogenic claudication since the dominant underlying 6 ed from http: pathophysiological mechanism appears to be neuro-ischemia rather than neuro-inflammation (4). 7 8 Although we cannot make firm conclusions about the effectiveness of nonoperative treatments for neurogenic claudication, this 9 review is important because it provides important information regarding the state of current evidence regarding nonoperative 10 treatments. This can be used to inform clinical practice guidelines and aid clinicians and patients in making clinical decisions 11 regarding treatment options. This is particularly important with respect to interventions that have higher risk and costs such as 12 epidural injections and surgery. About 25% of all epidural injections are performed for LSS (71, 72) yet the evidence from our current 13 review and those of others (73-75) do not support their use. The number and associated costs of surgical procedures for degenerative 14 LSS is growing, especially decompression surgery with complex fusion (76, 77). LSS continues to be the most common reason for 15 spine surgery in older adults (6, 76). High quality evidence for the effectiveness of surgery is also lacking based on our current review 16 and the findings of other systematic reviews (78, 79). Clinical trials evaluating surgery for LSS are difficult to conduct due to 17 copyright 26 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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1	challenges in recruitment and blinding (patient and practitioner) and high costs (80). One ongoing clinical tried is comparing
2	decompression surgery with sham surgery which should help to evaluate the potential role of the placebo effect of surgery for LSS
3	(81).
4	(81).
5	Oral medication is often the first line treatment in primary care management of LSS (5). Pregabalin and gabapentin are commonly
6	prescribed medications for LSS despite the growing evidence that these medications are not effective for back related leg symptoms
7	and may cause more harm than good (82-84).
8	
9	New to this updated review are clinical trials on acupuncture and spinal manipulation, however, the quality of the evidence was
10	insufficient to make conclusions on their effectiveness. A systematic review and meta-analysis of RCTs and some on the conclusion of the c
11	published in Chinese, found no conclusive evidence for the effectiveness and safety of acupuncture for LSS (35) . Passive unimodal
12	treatments such as acupuncture and spinal manipulation are unlikely to provide long-term benefit but more likely to provide benefit
13	when combined with a comprehensive approach to managing LSS (27), not unlike recommendations for managing chronic low back
14	pain (86).
15	guest. Pr
16	This review is also important because it provides a comprehensive assessment and identification of significant knowledge gaps in this $\frac{1}{2}$
17	area to guide future research. This includes the need for higher quality studies that assess commonly used not goperative treatments $\frac{1}{8}$
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BMJ Open particularly in primary care settings, that are adequately powered and have low risk of bias and long-term follow-up. Future RCTs should follow the CONSORT guideline (87) when planning trials and reporting study findings in an attempt \breve{b} improve transparency 9 January and reduce bias.

The strengths of this review include the evaluation of a wide range of nonoperative interventions and the use of consistent inclusion and exclusion criteria for neurogenic claudication, which included the corroboration of a diagnosis of LSS with imaging. The use of these criteria to define the study population increases the likelihood that participants in the included studies had the diagnosis of neurogenic claudication due to narrowing of the central canal or lateral foraminae (88-90). Other strengths of this review include the use of rigorous methods recommended by The Cochrane Collaboration, the World Health Organization, and the Cochrane Back and Neck Pain Review Group.(13) This included the use of the GRADE method to synthesize and summarize the quality of the evidence. Limitations of this review include the potential for language bias because only English articles were accepted. We also included studies with small samples sizes which are more prone to high risk of bias (91). Over half of the included studies had less than 30 subjects per arm at baseline, and none of these studies could be pooled because of high heterogeneity across studies. However, the exclusion of studies with small samples sizes in this review would not have changed our conclusions. The definition of a severe flaw and the cut-off point of 6 or more to differentiate trials of low from high risk of bias were arbitrary, therefore alternative definitions and cut-off points or the use of other risk of bias tools could have impacted the findings and conclusions of this review. The validity of MCIDs used in this review is unknown. Although most were derived from studies with neurogenic claudication (63, 92, 93) others opyright

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1	were based on an arbitrary improvement of at least 30% (94). There are no agreed upon MCIDs in LSS and t	2
2	thresholds could have potentially altered our conclusions. The location and severity of the stenosis on imagin	b was not deemed
3	important in this review. Imaging findings often do not correlate with patient symptoms or severity and there	Tore imaging by itself is a
4	not reliable diagnostic tool in this population (67, 95, 96). Neurogenic claudication is the clinical entity of in	arest in this review and,
5	although usually caused by LSS, the diagnosis is made clinically without imaging (97). Neurogenic claudica	Reference to the symptoms, by
6	definitions improve with flexion, due to the increased volume around the involved nerve roots irrespective or	s where the stenosis is
7	located (e.g., centrally or at the lateral recess). However, it is uncertain whether the effectiveness of some in	terventions, such as
8	epidural steroid injections is dependent on location of the spinal stenosis. This is a different research question	2
9	research. CONCLUSIONS	/bmjopen.bmj.com/ o
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11	CONCLUSIONS	.com/ c
12	There is moderate quality evidence that a multimodal approach that includes manual therapy and exercise, w	5
13	a safe and effective treatment, and that epidural steroids are not effective for the management of LSS causing	neurogenic claudication.
14	All other studies evaluating nonoperative interventions provided insufficient quality evidence, limiting the al	vility to make conclusions
15	about their effectiveness. With the growing prevalence and significant personal, social, and economic burder	<u> </u>
16	quality evidence for nonoperative interventions is urgently needed to guide clinical practice.	Protected
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CONTRIBUTORSHIP STATEMENT

CA was involved in the conception and design of the study, screening of articles, risk of bias assessment, Grade analysis, writing the 3 first draft of the manuscript, revision of the manuscript and administrative support. AB, MS, AF, CC, JO were involved in screening 4 of articles, risk of bias assessment, Grade analysis and critical revision of the manuscript. CH, JP, AA, KS, JY, AA participated in 5 vnloaded from http://b screening of articles, risk of bias assessment, data extraction and critical revision of the manuscript. 6

COMPETING INTERESTS 8

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5		2022.
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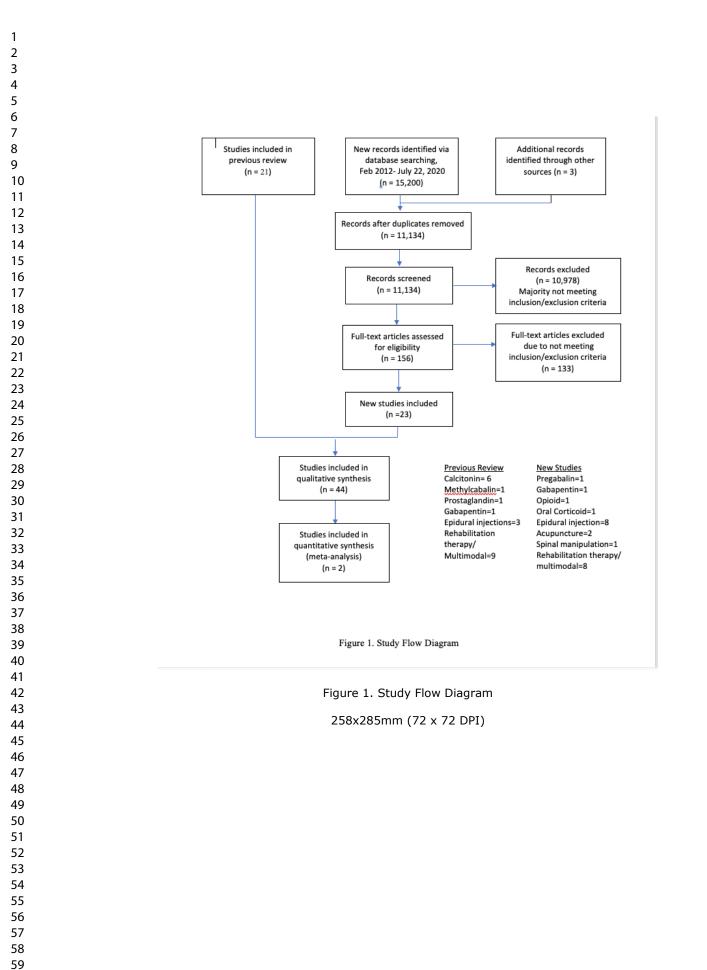
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27	25 exp vertebral canal stenosis/ (12543)
29	26 (spin* adj5 stenosis).ti,ab. (9011)
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32	29 (Spin* adj2 Osteophytosis).ti,ab. (26)
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35	31 lumbar radicular pain.ti,ab. (316)
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Suppleme	BMJ Open Supplemental Table 1. Characteristics of included studies			
Study	Participants and Settings	Interventions	Outcomes/Follow- up	Results (Group 1 is reference group)
		(Calcitonin	
Eskola 1992	39 subjects with an average of 6 years of pain, average age of 56.6 years of age, 20 males and 19 females. Setting: Orthopaedic hospital in Finland.	 100IU Calcitonin injection every other day for 4 weeks (n=20) 2) Placebo treatment (Miacalcic Sandoz 100IU) every other day for 4 weeks (n=19) 	 VAS Treadmill test Coping with ADLs Digitest Ergojump Blood tests Follow-up: 1, 3, 4, 6 and 12 months 	Between group WMD and 95% CI Pain (VAS) (mm): -0.050 (-0.053 to -0.047) Walking distance (meters) -18.5 (-240.37 to 203.37) Adverse events: The calcitenin injection group reported minor nausea and rash in 8% of the subjects.
Podichetty 2004	55 subjects with an average age of 68.5 years and an average of 36.2 weeks of the condition in the intervention group and 29.8 weeks in the placebo group, 33 males and 22 females. Setting: Spinal center in the United States	 400 IU intranasal calcitonin daily for 6 weeks followed by open label 6- week extension (n=36) Placebo nasal spray daily for 6 weeks, followed by open label 6- week extension, during which all patients received 400IU calcitonin (n=19) 	 VAS Walking capacity ODI Stenosis specific questionnaire Satisfaction with pain levels, functional status, and treatment received SF-36 Symptom diary Follow-up: 12 weeks 	Between group MD, 95% FI, p values 12 weeks: Pain VAS (mm): 0.5 (-0.85 to 1.93): p=0.44, Walking time (seconds): 42.2 (-86.9 to 170.4): p=0.55 Walking distance (feet): 163.3 (-311.16 to637.84); p=0.0.49 SF-36 MCS: -4.22 (-10.41 to1.97); p=0.38 SF-36 PCS: 0.43 (-3.73 to 4.59); p= 0.84 Vage St. Difficient data provided to calculate mean difference in
Porter	41 subjects with	1) 100 IU salmon calcitonin injection	1) Walking chart	Insufficient data provided to calculate mean difference in

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1983	10 in a double blind RCT	four times per week, sometimes with Maxalon for nausea (n=5)	and ability to walk more	Walking distance or ODI anong the 10 patients enrolled in RCT.
	crossover, 37 males and 4 females with mean age of 55.4 years.	2) Matching placebo (n=5)Only responders randomized	than 1 mile 2) ODI Follow-up: 10 weeks	Adverse events: The calcitetion group reported minor nausea and rash in 40% of the subjects.
Porter 1988	Infirmary in England 42 subjects, 35 male, 7 female, average age of 53.6 years in 20 subjects and 56.7 years in 22 subjects, median duration of back pain reported was 11 years for 19 subjects, and 14 years for 22 subjects. Median duration of claudication was 1.25 years for 20 subjects and 4.5	 1) 100 IU of salmon calcitonin injected subcutaneously 4 times per week for 8 weeks (n=20) 2) 1 ml of saline injected 4 times per week for 8 weeks (n=22) 	 VAS Claudication threshold 3 level mobility assessment Analgesic requirements 3 level sleep disturbance Treatment success defined as 100% improvement in walking distance and 	Difference in median score from baseline between groups Pain score (VAS) (mm): 4 weeks: -9 8 weeks: -5.5 Walking distance until symptoms onset (meters): 4 weeks: -14 8 weeks: 42 Walking distance until pain prevents walking (meters): 4 weeks: -41 8 weeks: -99 No significant between group differences. No p values or 95% CI provided.
Sahin 2009	years for 22 subjects. Setting: Infirmary in England 45 subjects 31 males and 14 females, average	 200 IU intranasal calcitonin daily for 8 weeks (n=23) 	able to walk 800 m. Follow-up: 4 and 8 weeks 1) VAS 2) Walking capacity	Percent change between g2oups: 8 weeks: VAS at rest: 4.7%, p>0.056

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1 2 3 4			136/bmjopen-2021-05		
- 5 6 7 8 9 10 11 12 13 14 15 16 17 Tafazal 2007 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	ages of 57.65 years in calcitonin group and 54.45 years in paracetamol group.2) Up to 1500mg of paracetamol daily for 8 weeks (n=22)Both groups took part in a physical therapy and exercise program 5 times per week for 15 sessions.Both groups took part in a physical therapy and exercise program 5 times per 	 weeks 1) VAS 2) Shuttle walking test 	VAS with motion: -7.9%, B=0.05 Roland Morris: 8.2%, p>0.05 Walking distance: -15.4%, p>0.05 Walking distance: -15.4%, p>0.05 Walking distance: -15.4%, p>0.05		
41 42 43 44 45 46 47	For peer review only - http://bmjop	en.bmj.com/site/abou	t/guidelines.xhtml		

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	Q	I Medication	P 136/bmjopen-2021-0577
Matsudaira79 subjects, 24 males and 24 females, with an average age of 	 Oral prostaglandin E1 derivative (15 g Limaprost) 3 times daily for 8 weeks (n=39) 400 mg of etodolac (NSAID) twice daily for 8 weeks (n=40) 	 SF-36 Verbal pain rating scales Walking distance LBP severity Leg pain severity Leg numbness severity Leg numbness Follow-up: 8 	SF-36 subscales MD, p values 8 weeks: physical function, 9.4, p=0.01, role physical: 13.7, p=0.03, bodily pain: 15.5, 6<0.01: General health: 6.6, p=0.08; vitality: 11.3, p=0.92; social functioning: 8.0, p=0.17 role emotional: 10.2, p=0.97; mental health: 12.2, p<0.01. Secondary outcomes not provided in a way that MD can be extracted: 8 weeks: low back pain: p=0.77; leg pain p=0.08; Leg numbness: p<0.01; walking distance p<0.01; patient subjective improvement p=0.01; patient subjective improvement p=0.01; patient satisfaction p<0.01 all in favor of limaprost
Waikakul152 subjects, 68 males and 84 females with an average age of 66.8 years. 44 of the subjects had symptoms for less than one month, 98 had symptoms for more than one month.Setting:Hospital in Thailand	 Conservative treatment consisting of education, activity modification, exercise and physical therapy. NSAIDs, muscle relaxants, and analgesics as necessary. Vitamin B1, B6, and B12 3 times per day (n=82) Conservative treatment plus Methlcobalin ESAI, 1.5mg per day in 3 divided doses after meals for 6 months (n=70) 	weeks 1) Presence of pain on spinal motion 2) Claudication distance 3) Medication intake (NSAIDs, muscle relaxants, and steroids) Follow-up: every month for two years	gastrointestinal upset. Walking distance Percent able to walk > 1000 meters 6 mo: 71.3% vs. 88.6%, p<30.05 12 mo: 81.3% vs. 97.1%, p< 0.05 18mo: 83.8% vs. 97.1% p<0.05 Adverse events: There were no reported adverse effects in subjects in methylocabalin proup
Yaksi 55 subjects, 22 2007 males, 33 females, average age of 50.8 years.	 900 mg of gabapentin per day increased weekly by 300 mg to a maximum of 2400 mg (n=28) Placebo (n=27) 	 VAS - low back and leg pain during movement Walking distance 	Between group difference p values Pain (VAS) (mm) no raw gata 3^{rd} mo 3.4 vs. 1.9, p =0.039 v 4^{th} mo 4.1 vs.2.0, p =0.006 $\frac{1}{6}$ Walking Ability, no raw data

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2 3 4 5		department of	Both groups received physical therapy	3) Presence or	Grp 1: longer walking distance at end of 2^{nd} mo (p < 0.05), 3^{rd}
6 7 8 9 10		physical medicine and rehabilitation in Turkey	exercises, a lumbosacral corset with steel bracing and NSAID treatments	absence of motor and/or sensory deficits	mo (p <0.05) and 4 th mo (p $\succeq 0.005$) Adverse events: some subjects randomized to the gabapentin group (no data specified) experienced mild to moderate drowsiness and/or dizziness
10 11 12 13			2	Follow-up: 15 days, 1, 2, 3, 4 months	ry 2022.
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	Markman 2015	29 participants, 20 males, 9 females, Eligible subjects were older than 50 years (mean 70 .1 years) with at least one level of radiographically confirmed lumbar spinal stenosis and symptoms of neurogenic claudication for at least 3 months. Setting: Hospital in Rochester, New York	 Pregabalin group (n=14) Active placebo (Diphenhydramine) (n=15) Cross over study after 7 day wash out period. Pregabalin was started at 75 mg PO twice daily or diphenhydramine, 6.25 mg) and increased on day 4 to 150 mg PO twice daily (12.5 mg diphenhydramine) for 7 days. Pregabalin was decreased to 75 mg PO twice daily (6.25 mg diphenhydramine) on day 11 for 3 days of tapering. 	 NRS - time to first moderate pain symptom during a 15- minute treadmill test (Tfirst) (NRS - greater than 4) Follow-up: day 10 of intervention period 	Between group MD, 95% $\&$ I, p values Treadmill testing pain at fest (NRS) 0.29 (0.41 to 0.98): p=0.40 \bigcirc Treadmill testing final pair (NRS) 0.25 (-0.44 to 0.94): p=0.46 Treadmill testing distance walked (m) -24.06 (-75.63 to 27.52): p=0.35 Treadmill testing recovery time (min) -0.79 (-1.86 to 0.28): p=0.12 Treadmill testing patient global assessment of pain -0.08 (-0.45 to 0.29): p=0.66 Treadmill testing RMDQ b 1.50 (0.38 to 2.62): p=0.01 Adverse events: Complications were reported in 64% of subjects in group 1, the most common being dizziness, compared to 35% in group $$
33 34 35 36 37 38 39	Park 2017	45 subjects, 21 in GPN Group (17 female, 4 males, mean age 66.1± 10.5), and 24 in BTX group (15 female and 9 males, mean age	 Conservative treatments plus gabapentin (group GPN): Gabapentin 300 to 1200mg/d - titrated to patient characteristics, comorbidities, and reported side effects (n=21) Conservative treatments plus BTX 	 NRS - back/leg pain intensity Cramp frequency (no./wk) Cramp severity (0-4 	No statistically significant difference between groups and lack of reporting of quantitative data Adverse events: Five patients (20.8%) in group 2 reported mild to moderate pain at injection sites for a few days.
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66.2±8.2) Setting: Outpatient department for interventional	injection (group BTX): The BTX (botulinum toxin type A [Nabota]) dose was 100U in 5mL of 0.9% saline injected into the gastrocnemius medialis and lateralis. (n=24)	 criteria) 6) Insomnia severity – (ISI 0-28) 7) ODI 8) Patient global 	57724 on 19 Janu
pain management in Korea	Conservative treatments: education, exercise, analgesic medication, injection therapy including epidural injections, and physical therapy	Follow-up: 2weeks, 1 and 3months.	21-057724 on 19 January 2022. Downloade
Markman24 participants, 12 males and 12 females, (mean age 72 years) LSS by imaging with symptoms of neurogenic claudicationSetting: Translational Pain Research Center at a University in Rochester, New York	 Oxymorphone hydrochloride (Opana IR, 5 mg) (n=8) Propoxyphene/acetaminophen (Darvocet, 100 mg/650 mg) (n=8) Placebo: 3 separate visits (random order with at least 3 day washout periods) (n=8) 	 NRS (at rest) NRS (final pain rating) AUC 4) Distance walked (m) Recovery time (min) ZCQ Patient global assessment of pain RMDQ ODI Follow-up: Study was prematurely terminated	Between group MD, 95% GI, p values Treadmill testing pain at pest (NRS) Grp 1 vs Grp 3: -0.04 (-0.72 to 0.65): p-0.89 Grp 2 vs Grp 3: -0.27 (-0.92 to 0.41): p=0.32 Grp 1 vs Grp 2: 0.23 (-0.45 to 0.92): p=0.40 Treadmill testing final pain (NRS) Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 2 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 2 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: 0.2 (-0.74 to 1.14): p=0.60 Grp 1 vs Grp 3: -12.41 (-63:91 to 38.20): p=0.16 Grp 1 vs Grp 3: -12.41 (-63:91 to 38.20): p=0.54 Grp 2 vs Grp 3: -23.41 (-73:60 to 26.79): p=0.25 Grp 1 vs Grp 2: 11 (-39.53 to 61.54): p=0.59 SSSQ symptom severity score Grp 1 vs Grp 3: -0.03 (-0.19 to 0.13): p=0.61 Grp 2 vs Grp 3: 0.01 (-0.15 to 0.17): p=0.85 Grp 1 vs Grp 3: 0.04 (-0.16 to 0.09): p=0.47 Grp 2 vs Grp 3: 0.11 (-0.01 to 0.23): p=0.03 Grp 1 vs Grp 2: -0.15 (-0.27 to -0.02): p=0.01 Patient global assessment of pain Grp 1 vs Grp 3: -0.03 (-0.52 to 0.47): p=0.90

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2014	61 patients with lumbar canal stenosis (50–75 years; canal area < 100 mm ² at L3/L4, L4/L5, and/or L5/S1on MRI; and claudication within 100 m). 31 in the corticoid group (mean age 58.23 (6.38), and 30 in the placebo group (mean age 58.33 (6.19)) Setting: Hospital in São Paulo, Brazil	 Oral corticoid group received 1 mg/kg of oral corticoids daily, with a dose reduction of one-third per week for 3 weeks (n=31) Control group was administered placebo for the same period (n=30) 	 SF-36 RMDQ 6-min walk test VAS Likert scale Follow-up: 3, 6 and 12 weeks 	Grp 1 vs Grp 2: -0.15 (-0.64 to 0.34): p=0.44 The study was prematurely terminated because of th removal of propoxyphene accetaminophen from the U market. Between group comparison VAS (6 weeks) Corticoid vs Placebo: 1.53 0.02 (in favour of placebo) Downloaded from http://bmjopen.bmj. Downloaded from http://bmjopen.bmj. Og
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2010	45 subjects, 13 males, 32 females, average ages in groups of 57.4, 49.13, and 53.06. 7 subjects with pain duration of 3-6 months, 7 with pain duration of 6-12 months, and	 Stretching and strengthening exercises for lumbar, abdominal, leg muscles as well as low intensity cycling exercises were given as therapeutic exercises. Ultrasound was applied with 1mHz, 1.5W/cm2 intensity, in continuous mode on the back muscle for 10 minutes (n=17) Same as group 1 with Ultrasound on off- mode (n=17) 	 VAS (out of 10) Treadmill test at 3 km/h for maximum of 15 minutes or 750m. ODI Analgesic consumption Physiatrist 	Pain (VAS) (mm) within group MD 3 weeks: Grp 1: -2.2 for back pain; -1.47 for leg pain Grp 2: -1.94 for back pain; 2.47 for leg pain Grp 3: 0.40 for back pain; 8.54 for leg pain Between groups differences Leg pain: Grp 3 (ps0.01), Grp 2> Grp 3 (p<0.0

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31 with pain duration of greater than 12 months. 3) No exercise-no treatment (n=16) assessment Grp 2: 114.94 seconds Grp 3: -66.10 seconds No significant change between groups Setting: Rehabilitation center in Turkey Setting: Rehabilitation center in Turkey Bisability (ODI) (within group MD) 3 weeks: Grp 1: -3.94 Koc 29 subjects, 21 1) Conservative inpatient physical 1) VAS No raw data provided.		BM.	l Open	F 136/bmjopen-2021-05
Koc 200929 subjects, 21 male, 8 female, average ages of (52.6, 61.1, and 53.1 years in the three groups, a and 5.7 years in the three groups.1)Conservative inpatient physical therapy program 5 days a week for 2 20 Treadmill walk test 30 Nottingham Health Profile 50 Functional duration of 5.7 years, 5.0 years, and 5.7 years in the three groups.1)Conservative inpatient physical the lumbar region (n=13) 20 Lumbar epidural steroid injections, 10 ml of solution containing 60mg of at 5.7 years in the three groups.No raw data provided. weeks. P1 included applications of the three groups.No raw data provided. weeks. P1 20 RMDI 20 Weeks: Grp 2 less pain that Grp 3 p= 0.008 testing including finger to floor distance, sithe department of physical medicine and rehabilitation in 	duration of greater than 12 months. Setting: Rehabilitation	3) No exercise-no treatment (n=16)	Follow-up: End of 3-week treatment	Grp 2: 114.94 seconds Grp 3: -66.10 seconds No significant change between groups Disability (ODI) (within group MD) 3 weeks: Grp 1: -3.94 Grp 2: -7.8 Grp 3: -3.6 ODI between groups differences
	 male, 8 female, average ages of 62.6, 61.1, and 53.1 years in the three groups, average pain duration of 5.7 years, 5.0 years, and 5.7 years in the three groups. Setting: Medical school department of physical medicine and rehabilitation in 	 therapy program 5 days a week for 2 weeks. PT included applications of ultrasound 1.5 W/cm2 for 10min, hot pack for 20min, and TENS for 20min to the lumbar region (n=13) 2) Lumbar epidural steroid injections, 10 ml of solution containing 60mg of triamcinolon acetonide (1.5 mL), 15 mg of 0.5% bupivacain hydrochloride (3 mL), and 5.5 mL of physiologic saline (0.9%NaCl) was injected in 3.5minutes. (n=10) 3) Control group (n=10) All patients included were trained to pursue a home-based therapeutic exercise program performed twice daily for a period of 6 months, and oral diclofenac sodium 75mg was administered to all 	 2) Treadmill walk test 3) Nottingham Health Profile 4) RMDI 5) Functional testing including finger to floor distance, sit- to-stand, and a weight carrying test Follow-up: 2 weeks, 1, 3 and 6 	No raw data provided. No significant between group differences for all outcomes and follow-ups except: Pain (VAS) 2 weeks: Grp 2 less pain than Grp 3 p= 0.008 Disability (RMDI) 2 weeks: Grp 2 less disability than Grp 3 p= 0.007 Quality of Life (Nottingham Health Profile) (no data provided) Grp 2 had significantly higher improvement than Grp 3 at 2 weeks in mobility subgroup scores. Adverse events: 1 subject eported angina pectoralis and 1 reported gastric complaints egroup not specified).

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4 females, average age of 58 years 6 12 week media pain duration 9 12 week media pain duration 9 Setting: Hospinin Singapore 11 Singapore 12 13 14 15 16 17 18 19 20 21 23 24 25 26	 with a relatively pain-free gait which translated to 30–40% of body weight. In weeks 3 to 6, participants were encouraged to walk at a moderate intensity. The duration of each treadmill session was limited by participant tolerance or to a maximum of 30 minutes. 2x per weeks 1 and 2, participants cycled at their comfortable pace at 50 to 60 rpm. Participants were encouraged to exercise at a moderate intensity and the duration of each cycling session was limited by participant tolerance or to a maximum of 30 minutes. 2x per week for 6 weeks 3 to 6, participants were encouraged to exercise at a moderate intensity and the duration of each cycling session was limited by participant tolerance or to a maximum of 30 minutes. 2x per week for 6 weeks for 12 sessions (n=35) week 1 and 2, participants were instructed to assume a flexed posture. In weeks 3 to 6, participants were encouraged to exercise at a moderate intensity and the duration of each cycling session (n=35) week 2) Patient perceived benefit, OR, 95% CI 6 weeks: OR 0.10 (0.41 to \$98) Patient perceived benefit on a 6- point scale benefit on a 6- point scale ablity (>2800 m), 30, 95% CI b Patient perceived benefit, 0, 0, 95% CI b Walking ability (>2800 m), 30, 95% CI c Weeks: OR 1.14 (0.44 to 5, 94) c Walking ability c Walking ability
27Whitman58 subjects, 31282006males, 27 fema2929 (group 1) w30an average age3170 years, 2932(group 2) with33average age of3468.9, median la35back pain36uration of 108371's 29 subjects38and 60 months39Group 2's 29404142434444	 week for 6 weeks. Lumbar flexion exercises along with self-pace treadmill walking program, and sub- therapeutic ultrasound. The duration of each treadmill session was based on that patient's tolerance on that specific day and could extend up to 45 minutes. (n=29) Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Therapy, Exercise and Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Walking Group: 45-60 minutes twice per week for 6 weeks - Manual Manual Walking Group: 45-60 minutes
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	subjects, lower extremity median pain duration of 48 months in Group 1's 29 subjects and 24 months in Group 2's 29 subjects. Setting: University in the United States	physical therapy (thrust and non thrust) to the thoracic and lumbar spine, pelvis, and lower extremities and specific exercises at discretion based on the underlying impairments. Patients received specific exercises to address impairments in mobility, strength, and/or coordination. Exercises were performed in the clinic and as part of a home exercise program. Patients also underwent a bodyweight supported treadmill ambulation program using a cable and trunk harness system to unload a specific amount of weight from the patient while the patient walks as comfortably as possible on a treadmill (n=29).	 Stenosis Scale Additional use of health care resources Follow-up: 6 weeks, 1 year, long term mail survey (averaging 29 months) 	Long term: 1.8 (0.6 to 3.0) (5. 2.0 (0.7 to 3.4) Between group MD not statistically significant at any follow-up period Walking Ability (improvement in meters) within group MD 95% CI 6 weeks: 176.5 (-9.5 to 362,4) vs. 339.7 (218.4 to 461) 1 year: 130.4 (-55.3 to 316.5) vs. 209.8 (67.5 to 352.1) Between group improvement not statistically significant at any follow-up Disability (ODI) within group MD 6 weeks: 6.55 (1.87 to 11.25) vs. 10.48 (6.5 to 14.4) 1 year: 5.03 (1.71 to 8.35) vs. 7.14 (1.5 to 12.8) Between group differences for statistically significant at any follow-up
Minetama 2019	86 patients, 39 men and 47 women, average age 72.7 years 43 patients (20 men and 23 women, average age 72.3 years to the PT group 43 patients (19 men and 24 women, average age 73.2 years) to the HE group. Duration symptoms 20 months	 Physical therapy + home exercise program (n=43) Home exercise (HE) program alone (n=43) Supervised physical therapy twice a week for 6 weeks, including manual therapy, individually tailored stretching and strengthening exercises, cycling, and body weight-supported treadmill walking. The manual therapy included manipulation, stretching, and massaging of the thoracic and lumbar spine, pelvis, and lower extremities. The individually tailored muscle exercises included those for the trunk (eg, abdominal planks, side bridge, and/or back extension) and lower 	 ZCQ Satisfaction SPWT (m) NRS JOABPEQ- acquired points SF-36 HADS PCS PASS-20 TSK-11 Daily steps Follow-up: 6 weeks	Between group MD, 95% CI ZCQ - Symptom severity -0.4 (-0.6 to -0.2): statistically significant ZCQ - Physical function -0.4 (-0.6 to -0.2): statistically significant SPWT (m) 455.9 (308.5 to 603.2): statistically significant NRS - Leg pain -1.4 (-2.5 to -0.3): statistically significant SF-36 - Physical function g 9.2 (2.1 to 16.3): statistically significant SF-36 - Bodily pain 10.4 (3.3 to 17.5): statistically significant Daily steps 723.4 (199.1 to 1,283.5): statistically significant

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[Setting: Spine	extremities (eg, unloading hip and/or		
	care center at a university hospital in Japan	knee exercise with ankle weight and/or standing squats). The typical dosage for strengthening exercises was a total of 2 to 3 sets with 10 repetitions, each of 6- second contraction. The typical duration of stretching was three repetitions of 30 seconds.		724 on 19 January 2022. Downloaded from http://bmjop
		All patients in both groups were asked to take a daily walk that did not exacerbate their lower extremity symptoms using a pedometer and walking diary and to perform a HE program consisting of lumbar flexion exercises including three		. Downloaded from
Schneider	259 subjects, 122	 30-second bouts of both single and double knee-to-chest exercises, ten 6-second bouts of trunk raises and bridging in the supine position, and a 4-point kneeling exercise at least twice daily. 1) Medical care (MC) (n=88) 	1) SSS	Between group MD, 95% &I
2019	males and 137 women with an average age of 72.4, 68 patients	 Group exercise (GE) (n=84) Manual therapy + exercise (MTE) 	 2) SPWT 3) Physical Activity 	SSS (2 months) 3 GE vs MC: 0.4 (-1.3 to 2.1) 3 MTE vs MC: -2.0 (-3.6 to -6.4) 4 MTE vs GE: -2.4 (-4.1 to -6.8) 5
	had symptoms for less than 6 months, 191 had symptoms for greater than 6 months	(n=87) Medical Care: 3 visits to a physical medicine physician over 6 weeks. Primarily prescription of oral medications in any combination of nonnarcotic analgesics, anticonvulsants,	Follow-up: 2 and 6 months	SPWT (2 months)
	Setting: Outpatient research clinic in Pittsburgh	antidepressants. Optional referral for epidural steroid injections if inadequate pain relief by oral medication, severe neurogenic claudication, and/or patient preference.		MTE vs GE: -8.3 (-34.5 to \$7.6) SSS (6 months) GE vs MC: -0.5 (-2.3 to 1.33 MTE vs MC: -1.1 (-2.8 to 0.66) MTE vs GE: -0.6 (-2.4 to 12)

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in any group. There was a star	31.7) 150.1) () (4.3) (0) no reported serious adverse events inificantly greater rate of transient a group 3 (49%) compared with (5%).
ts, 45 591) Comprehensive (n=48)1) SPWT DistanceBetween group MD, 95%C SPWT8 in asive 51 in ed ed e of e of2) Self-directed (n=51)1) SPWT DistanceBetween group MD, 95%C SPWT1) Significance - 30%3 wks: 345.4 (150.0 to 540.5): 3 mo: 304.1 (77.9 to 530.3) Ep 30%3 mo: 304.1 (77.9 to 530.3) Ep 30%2x/week of 15-20-minute treatment h an e of later.2x/week of 15-20-minute treatment improvement improvement improvement30% improvement improvement improvement): p=0.00 p=0.01 p=0.00): p=0.00 Γ

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(comprehensive and 71.7 (self- directed) neurogenic claudication >3 months, imagin confirmed cana narrowing, wall >20m and not surgical candidates in next 12 months Setting: Academic hospital outpatient clinic in Toronto	 via cognitive behavioral approach. Body repositioning (pelvic tilt) when standing and walking. Exercises: Standardized set of exercises demonstrated gradually over 6 weeks and was a part of structured home exercise program. Cycling, muscle stretching, strengthening, conditioning for back and lower extremity fitness and to facilitate lumbar flexion Manual therapy: Spinal manipulation; joint, soft tissue and neural mobilization; lumbar flexion-distraction; and manual muscle stretching applied each visit. 	Significance - 50% improvement in SPWT no. (%) 4) ZCQ-S 5) ZCQ-F 6) ZCQ-S + ZCQ-F 7) ODI 8) ODI walk 9) NRS Back 10) NRS Leg Follow-up: 8 weeks, 3, 6, and 12 months	6 mo: 19 (2-35): p=0.02 12 mo: 22 (4-39): p=0.02 50% improvement in SPWT 8 wks: 26 (8-42): p=0.01 3 mo: 19 (-1.0 to 36): p=0.095 12 mo: 24 (5-40): p=0.01 ZCQS 8 wks: -0.19 (-0.37 to -0.02): p=0.03 3 mo: -0.15 (-0.37 to 0.08): \mathbb{B} =0.19 6 mo: -0.02 (-0.22 to 0.17): \mathbb{B} =0.87 12 mo: -0.22 (-0.47 to 0.02): \mathbb{B} =0.07 ZCQF 8 wks: -0.02 (-0.22 to 0.17): \mathbb{B} =0.81 3 mo: -0.18 (-0.39 to 0.03): \mathbb{B} =0.09 6 mo: -0.11 (-0.33 to 0.11): \mathbb{B} =0.34 12 mo: -0.27 (-0.49 to 0.04): \mathbb{B} =0.02 ZCQS+ZCQF 8 wks: -0.24 (-0.56 to 0.07): \mathbb{B} =0.13 3 mo: -0.48 (-0.90 to -0.06): \mathbb{B} =0.07 6 mo: -0.23 (-0.58 to 0.12): \mathbb{B} =0.07 6 mo: -0.23 (-0.75 to 0.03): \mathbb{B} =0.07 6 mo: -0.23 (-0.75 to 0.03): \mathbb{B} =0.07 6 mo: -0.24 (-0.70 to 0.02): \mathbb{B} =0.33 3 mo: -0.04 (-0.09 to 0.01): \mathbb{B} =0.13 6 mo: -0.02 (-0.07 to 0.02): \mathbb{B} =0.30 0DI 8 wks: -0.02 (-0.07 to 0.02): \mathbb{B} =0.30 0DI 8 wks: -0.02 (-0.07 to 0.02): \mathbb{B} =0.30 0DI 8 wks: -0.2 (-0.6 to 0.1): \mathbb{P} =0.14 3 mo: -0.4 (-0.9 to 0.01): \mathbb{P} =0.30 0DI 8 wks: -0.2 (-0.6 to 0.1): \mathbb{P} =0.14 3 mo: -0.4 (-0.9 to 0.03): \mathbb{P} =0.03 0DI 8 wks: -0.2 (-0.7 to 0.2): \mathbb{B} =0.30 0DI 8 wks: -0.2 (-0.7 to 0.2): \mathbb{B} =0.30 0DI 8 wks: -1.4 (-2.2 to -0.5): \mathbb{P} =0.001 12 mo: -0.2 (-0.7 to 0.2): \mathbb{P} =0.32 NRS Back 8 wks: -1.4 (-2.2 to -0.5): \mathbb{P} =0.002 3 mo: -0.6 (-1.4 to 0.3): \mathbb{P} =0.13 6 mo: -0.7 (-1.7 to 0.3): \mathbb{P} =0.13 8 wks: -1.4 (-1.3 to 0.4): \mathbb{P} =0.32

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			NRS Leg NRS Leg 8 wks: $-0.7 (-1.5 \text{ to } 0.1)$: p=0.09 3 mo: $0.05 (-0.85 \text{ to } 0.96)$: p=0.91 6 mo: $-0.9 (-1.9 \text{ to } 0.003)$: p=0.58 12 mo: $-0.5 (-1.6 \text{ to } 0.6)$: p=0.37 SF-36 Bodily Pain 8 wks: $2.0 (-4.9 \text{ to } 8.9: p=0.57)$ 3 mo: $-4.5 (-12.4 \text{ to } 3.5)$: p=0.27 6 mo: $-3.3 (-10.2 \text{ to } 3.6)$: p=0.35 12 mo: 10 (2.1 \text{ to } 17.9): p=0.013 SF-36 Physical Function 8 wks: $4.2 (-3.9 \text{ to } 12.4)$: p=0.31 3 mo: 9.2 (1.1 to 17.3): p=0.027 6 mo: 5.8 (-2.1 to 13.6): p=0.15 12 mo: 8.2 (0.2 to 16.2): p=0.045
Oğuz 2013 120 patie in group an averag 57.1 year in group 2 an averag 55.8 year and group an averag 57.4 year LSS sym narrowin MRI Setting: Universit	1 with ge age of s old, 302) Isokinetic exercise program (n=30)2 with ge age of s old p 3 with ge age of s old, ptoms, g by3) Unloading exercise group (n=60)All groups physician-guided (5x/week for 3 weeks) then at-home (3x/week)Standard Exercise: 15 sessions of TENS, hot packs with home exercise instruction.Isokinetic exercise: 20 minutes/day, 5 sessions/week for a total of 15 sessions	1) VAS 2) ODI 3) Beck Depression Inventory or Follow-up: 4, 12 and 24 weeks	1 and 2 out of 46 participants in group 2 experienced adverse events that were mostly attributed to a temporary increase in low back and/or leg pain. Between group MD, p value VAS After treatment: Grp 1 vs Grp 2:0.37, p>0.05 Grp 1 vs Grp 3: 1.36, p<0.05 Grp 2 vs Grp 3: 0.99, p<0.05 4^{th} week: Grp 1 vs Grp 2: 1.43, p>0.05 Grp 1 vs Grp 3: 1.17, p<0.05 Grp 2 vs Grp 3: -0.26, p>0.85 12^{th} week: Grp 1 vs Grp 2: 0.93, p>0.05 Grp 1 vs Grp 3: 0.71, p>0.05 Grp 2 vs Grp 3: -0.22, p>0.85 24^{th} week: Grp 1 vs Grp 2: 1.08, p>0.05

department of physical medicine and rehabilitation in Turkey	rates of 60°/sec, 120°/sec, 180°/sec with 70° of body movement (50° flexion to 20° extension) Each session had 3 sets, each set had 5 repetitions at described velocity, with 20s rest between each set. Unloaded exercise: 5 sessions of unloading exercise per week, for a total of 15 sessions with a physician. Walking with unloading exercise devise: session 1-5 = 45% body weight, session 6-15 = 30% body weight. Treadmill walking at 1.2 km/hr for 20 minutes, or until pain due to neurogenic claudication was felt. Subjects advised to follow exercise program s at home at least 3x/week after discharge.	Grp 1 vs Grp 3: 0.46, $p>0.05$ Grp 2 vs Grp 3: -0.62, $p>0.05$ ODI After treatment: Grp 1 vs Grp 2: -0.8, $p>0.09$ Grp 1 vs Grp 3: 1.8, $p<0.05$ Grp 1 vs Grp 3: 2.6, $p<0.05$ Grp 1 vs Grp 3: 2.6, $p>0.05$ Grp 1 vs Grp 3: 2.6, $p>0.05$ Grp 1 vs Grp 3: 1.1, $p<0.05$ I2 th week: Grp 1 vs Grp 3: 1.3, $p>0.05$ Grp 1 vs Grp 3: 1.3, $p>0.05$ Grp 1 vs Grp 3: 0.3, $p>0.05$ Grp 1 vs Grp 3: 0.3, $p>0.05$ Grp 1 vs Grp 3: 0.5, $p>0.05$ Grp 1 vs Grp 3: 0.1, $p>0.05$ Grp 1 vs Grp 3: -1.5, $p>0.05$ Grp 1 vs Grp 3: -1.15, $p>0.05$ Grp 3: -1.15, $p>0.05$ Grp 4: -1.15
		Grp 1 vs Grp 3: -18.4, p>0.65 Grp 2 vs Grp 3: -64.3, p<0.95 12 th week: Grp 1 vs Grp 2: 52.23 p>0.45 Grp 1 vs Grp 3: -0.67 p>0.65 Grp 2 vs Grp 3: -52.9 p>0.65 Grp 1 vs Grp 2: 35.2, p>0.65 Grp 1 vs Grp 3: 1.9, p>0.055 Grp 2 vs Grp 3: -33.3, p>0.65 Grp 2 vs Grp 3: -32.5 Grp 3 vs Grp 3 vs G

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Homayouni 47 subjects, 23	1) Treatment in therapeutic pools with	1) VAS	All between group comp	136/bmjopen-2021-057
2015 2015 2015 2015 2015 2015 2015 2015	water temperature of 29–30 degrees Celsius. Every aquatic session started with warm up and ended with cool down, with duration of 10–15 min for each of them. Participants should have attended aquatic physical therapy sessions every other day for a total duration of 24 sessions. Each session included ambulation, side walking, chain walking, forward walking with kickboard, stretching of each muscle group including adductors, abductors, flexors and extensors of the hip, knee flexors and ankle plantar flexors and dorsiflexors.	 2) Walking ability Follow-up: Immediately after therapy, 3 months 	Walking ability Grp 1 > Grp 2: p=0.02 VAS Grp 1 > Grp 2 p=0.001	anuary 2022. Downloaded from http://bmjopen.bmj.com/ on April 19, 2024 by guest. Protected by copyright.

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		a day at home in the following weeks until the end of the eighth week. (n=25)		57724 on
Marchand 2019	40 participants, 17 females and 23 males, 20 in the intervention group with an average age of 66.7 years old and 20 in the control group with an average age of 71.5 years old, with history and diagnostic imaging of LSS Setting: Regional hospital in Quebec	 Exercise 3x week / 6 weeks prior to surgery (n=20) Regular hospital preoperative management with back posture education (n=20) 	 NRS (Pain Intensity) ROM (Active) Muscle strength (N-m) Walking capacity (seconds) Follow-up: 3 and 6 months	Between group MD NRS (leg) Preoperative: -2.1, $p<0.05$ Postoperative: 1.1, $p>0.05$ 3 months: 1.1, $p>0.05$ 6 months: 0.3, $p>0.05$ ROM (active) Preoperative: 5, $p<0.05$ Muscle Strength Preoperative: 45.7, $p<0.001$ Postoperative: 5.1, $p>0.05$ Walking Duration Preoperative: -14.5, $p>0.05$
Kim 2019	34 subjects, mean age 64 (5.3), women 24 (66.7) Setting: Hospital in Seoul, South Korea	 MT1 group: 110 g of Gang-Chuk Tang was administered 3 times a day (Gang-Chuk Tang is an herbal concoction consisting of Eucommiae Cortex, Achyranthis Radix, Rhizoma Cibotii, Sorbus commixta, G. thunbergii, Saposhnikovia Radix, and Acanthopanacis Cortex in equal portions) Daily Mokhuri Chuna therapy (relaxation and mobilization of lumbar joint and back muscle) Daily acupuncture treatment on LI4, ST36, LV3, BL22, BL23, BL24, BL25, and Ashi points. Consultation on precautions related to daily 	 VAS for leg pain VAS for low back pain Oxford Claudication Scoring Walking distance Follow-up: 3 and 6 months 	All between group compages VAS leg pain (post treatment) MT2 (28.82 \pm 27.46) vs CM (51.82 \pm 25.34) groups: P=0.04 VAS leg pain (6 months) \xrightarrow{P} MT1 (48.91 \pm 23.08) vs CM (72.27 \pm 16.72) groups: P=0.01 MT2 (42.36 \pm 21.29) vs CM groups: P=0.003 VAS low back pain (6 months): MT2 (30.00 \pm 13.48) vs CM (60.82 \pm 18.62) groups: P=0.001 Oxford Claudication Scoring (3 months) MT1 (18.75 \pm 6.52) vs CMT (25.82 \pm 6.24) groups: p=0.02 Walking distance (3 months) MT1 vs CMT: p=0.03 \square Walking distance (6 months) MT1 vs CMT: p=0.01 \square

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		2)	activity and stepwise walking training for the entire 4 weeks of therapy. (n=12) MT2 group: Mokhuri Chuna, acupuncture, and physician consultation were offered in the same manner and dosage as the MT1 group with the exception that all herbal medications were withheld. (n=11) CMT group: Oral analgesic therapy (aceclofenac 100 mg twice daily and eperisione hydrochloride 50 mg three times daily for 28 days) and three interlaminar epidural steroid injections (5 mg of dexamethasone per injection) at the level of the affected spinal region over a 4-week period were administered. Physiotherapy including heating pad, and transcutaneous electrical nerve simulator, and deep tissue heating	24.04	by the type and incidence o	Stanuary 2022. Downloaded from http://bmiopen.bmi.com/ on Ap
			therapy five times per week for 4 weeks. (n=11)		O_{Δ}	on Apr
			Spina	l Manipulation		
Passmore 2017	14 patients with degenerative LSS (n=14); Swiss Spinal Stenosis score of M=63.2, standard deviation [SD] = 15.9) (mean age 59.0 (10.6)), 7 in	1)	Spinal manipulation group: received bilateral high-velocity; low- amplitude spinal manipulation directed toward the lumbar region (by a licensed chiropractor with more than 10 years of clinical experience) (n=7) Non Intervention Group: Waited 5	 Movement time NPS (Back) NPS (leg) ROM Follow-up: Immediately after intervention	outcomes. 1. Grp 1 vs. Grp 2, p=0.739 2. Grp 1 vs. Grp 2, p> 0.05 3. Grp 1 vs. Grp 2, p> 0.05 4. Grp 1 vs. Grp 2, p> 0.05	v quest.
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4 5 7 8 9 10 11 12 13 14 15 16		female, 3 male) (mean age 59.1 (9.3)), 7 in the NI group (3 female, 4 male) (mean age 58.9 (12.6)) Setting: rehabilitation hospital in Winnipeg, Manitoba		no intervention group (n=7)				724 on 19 January 2022. Downloaded	
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18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39	Kim 2016	50 participants mean age of 62.0±9.8 years, acupuncture (n=26), age 65.0±8.7, male / female 12/14, control (n=24), age 58.9±10.2, male / female 10/14. Mean duration of symptoms 33m Setting: Hospital in Yangsan, South Korea	2)	Acupuncture: 269 acupuncture sessions were administered during the study. 81% (n=21) of patients received at least 10 acupuncture sessions. Electrical acupuncture was applied at least once and bilaterally at back shu points (BL23, BL24, BL25 or BL26) or Jiaji points at L2– L5 spinal levels. Other frequently used points were BL57, BL60, GB39, GB34 and tender points located in the lower extremities (n=26)	1) 2) 3) 4) 5) 6) 7) 8) Fo	ODI SF-36 bodily pain	LBP intensity 6 wk: -5.1 (-15.5 to 5.3) 3 mo: -13.5 (-26.2 to -0.7) Leg pain bothersomeness	http://bmjopen.bmj.com/ on April 19, 2024 by guest. F	
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assigned with 70 completing the 8- week treatment course (38 in acu group and 32 in sham acu group). Mean age of 61.5±7.9 years with 34 males and 46 females. Duration of	Acupuncture: Applied by acupuncturists with 5 years of Chinese medical university program and at least 2 year of clinical experience. Sterile disposable steel needles (Hwato Acupuncture, Suzhou, China; 0.30 £ 40 mm/0.30 £ 75 mm) were inserted through adhesive pads. Participants	 RMDQ NRS back NRS Leg SSS Symptoms subscale SSS physical 	None statistically significant Page 4 wk: -3.6 (-5.2 to -1.9): p<0.001 8 wk: -2.6 (-3.7 to -1.4): p<0.001 3 mo: -2.3 (-3.9 to -0.7): p=0.005 6 mo: -1.8 (-3.6 to -0.3): p=0.086
course (38 in acu group and 32 in sham acu group). Mean age of 61.5±7.9 years with 34 males and 46 females. Duration of	and at least 2 year of clinical experience. Sterile disposable steel needles (Hwato Acupuncture, Suzhou, China; 0.30 £ 40 mm/0.30 £ 75 mm) were inserted through	Symptoms subscale	6 mo: -1.8 (-3.6 to -0.3): p= .086
symptoms <3 mo	underwent 3 treatments weekly over 8 weeks, and each session persisted for 30 minutes. To maintain "De qi," a sensation of numbness and	function subscale 6) SSS satisfaction subscale 7) Self-paced	NRS Back 4 wk: -1.7 (-2.4 to -0.9): p < 001 8 wk: -2.3 (-3.0 to -1.5): p < 0.001 3 mo: -1.7 (-2.6 to -0.8): p < 0.001 6 mo: -1.2 (-2.1 to -0.3): p < 0.007 NRS Leg 4 wk: -2.0 (-2.6 to -1.3): p < 0.001 8 wk: -2.9 (-2.6 to -1.3): p < 0.001
=14 (17.5%), 3-12 mo = 1(1.3%), 1 to 5 y = 24 (30%), >5 y = 41 (51.3%) Setting: 2)	soreness, acupuncture manipulation (twirling, lifting, and thrusting on needles) was performed every 10 minutes during the treatment. Sham acupuncture: Chosen acupoints, treatment duration, and	walk test Follow-up: 4 weeks, 8 weeks (end of treatment), 3 months, 6 months	3 mo: -2.4 (-3.3 to -1.4): $p \le 0.001$ 6 mo: -2.1 (-3.0 to -1.2): $p \le 0.001$ SSS Symptoms Subscale 4 wk: -0.6 (-0.8 to -0.4): $p \le 0.001$ 8 wk: -0.9 (-1.2 to -0.6): $p \le 0.001$ 3 mo: -0.9 (-1.2 to -0.6): $p \le 0.001$ 6 mo: -1.0 (-1.3 to 0.6): $p \le 0.001$
2 Clinical Sites - Department of Acupuncture and Neurology, Guang'anmen Hospital Department of Acupuncture and Neurology, Beijing Fengtai Hospital of	frequency of sessions were the same as in the acupuncture group. Participants in the sham cohort were treated using a pragmatic placebo needle on the same acupoints, which is similar to the Streitberger needle design (Supplementary Materials). Acupuncturists pretended to manipulate the needle every 10 minutes, but "De qi" was not sought.	4	SSS Physical Function Subscale 4 wk: -0.5 (-0.8 to -0.3): p<0.001
Integrated Traditional and Western Medicine.			Adverse events: 3 participants in group 1 reported pain after needle insertion and 1 had amenatoma. 3 participants in group reported back pain and 2 reported fatigue. All adverse events were reported as mild or moderate, and none required medical intervention.

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		Epid	ural injections	772
Cuckler 1985	73 subjects in total, 37 with spinal stenosis, 36 with acute herniated nucleus pulposus, 37 males, 36 female, average age of 48.5 years in the experimental group and 49.5 years in the placebo group. Experimental group average 36.6 months in symptom duration, placebo group averaged	 Steroid group: 2ml of sterile water containing 80mg of methylprednisolone acetate combined with 5ml of 1% procaine was injected into the epidural space in the region between the 3rd and 4th lumbar vertebrae with the patient in the lateral decubitus position lying on the side of the painful limb (n=42), 20 with stenosis). Placebo group: 2ml of saline combined with 5ml of 1% procaine was injected into the epidural space in the region between the 3rd and 4th lumbar vertebrae with the patient in the lateral decubitus position lying on the side of the painful limb. (n=31, 17 with stenosis) 	 Subjective percentage of improvement with 75% required to be considered a treatment improvement, if less than 50% after 24 hours was considered a treatment failure Re-injection rates Surgery rates 	Patient Global Assessment (improved by at least 75%) 24 hours: 33% (steroid) vs. 21% (saline) p>0.05 Long term: 33% (saline) vs. 21% (saline) p>0.05
Fukusaki 1988	29.4 months. Setting: Orthopaedic surgery department in the United States 53 subjects, 38 males and 15 female. Group 1	 All patients were advised to take mild analgesics (aspirin or acetaminophen) during the post-injection period. Second injection given if less than 50% improvement after 24 hours - considered treatment failure 1) Epidural injection with 8 ml of saline, repeated twice in the first week (n=16) 	hours, every 3 months up to 30 months, averaging 20.2 months in the steroid group and 21.5 months in the control group. 1) Walking distance which was graded	Walking distance Percent excellent effect = nean of > 100m in walking distan 1 week: 12.5 % (saline) vs. 55% (block) vs. 63.2% (block +
	averaged 70 years of age and 79 days of symptoms on average, group 2 averaged 69 years of age and	 Week (n=16) 2) Epidural injection with 8 ml of 1% mepivacaine, repeated twice in the first week. (n=18) 3) Epidural injection with a mixture of 8 ml of 1% mepivacaine and 40 mg 	was graded according to distance (excellent, good, or poor) Follow-up: 1 week, 1 month, 3	steroid); block or block + steroid > saline, $p < 0.05$; 1 mo: 6.3% (saline) vs. 16.2% (block) vs. 15.8% (block + steroid) $p > 0.05$ 3 mo: 6.3 (saline) vs. 5.6% (block) vs. 5.3% (block + steroid) 0.05 No significant difference between block vs. block + steroid a
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	an average of 82 days of symptoms, group 3 averaged 72 years of age and 94 days of symptoms on average Setting: Anaesthesia department in Japan		of methylprednisone, repeated twice in the first week. (n=19)	months	all follow-up periods, p>0.6 Adverse events: no reporte	
Zahaar 1991	30 subjects, 37 male and 26 female. Steroid group averaged 46.5 years of age and 36.6 months of symptoms, control group averaged 49 years of age and 29.4 months of symptoms Setting : Medical facility in Egypt	1)	Steroid injection: 5ml of hydrocortisone acetate suspension, 2x2ml carbocaine, 4% Volume completed with sterile saline to 30ml (n=18) Control: 2x2ml of carbocaine, 4% injected into epidural space. Volume completed with sterile saline to 30ml. (n=12)	 Subjective percentage of improvement where 75% or more was deemed successful and surgery after injection was considered a failure. Follow-up: 24 hours, then every three months up to 36 mo averaging 20.2 mo in the steroid group and 21.5 mo control group. 	24 hours: 55% (steroid injed Up to 36 mo: 38% (steroid p>0.05 Failures (%) (required surg Up to 36 mo: 61% (steroid	bijection) vs. 66.6% (control) p>0.0 bin com/ on Abril 19. 2024 by quest
Friedly 2014, 2017 Makris 2016	400 patients, 221 females and 179 males, 200 in the lidocaine group	1)	Lidocaine + glucocorticoid (1-3 mL of 0.25-1% lidocaine followed by 1- 3 mL triamcinolone (60-120mg), betamethasone (6-12mg),	 RMDQ NRS (Leg Pain) 	Between group MD, 95% RMDQ 3 weeks: -1.8 (-2.8 to -0.9): 6 weeks: -1.0 (-2.1 to 0.1):	5 m m 2 2 0.001

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	 with an average age of 68.1 years old and 200 gluocorticoid- lidocaine group with an average age of 68 years old, LSS by CT or MRI. 26% patients symptoms greater than 5 years. Setting: 16 medical centers across the United States 	dexamethasone (8-10mg) or methylprednisone (60-120mg)) (n=200) 2) Lidocaine group (0.25-1% lidocaine alone) (n=200) Physician option for intralaminar and/or transformaminal techniques	 Follow-up: 3, 6, and 12 weeks, 6 and 12 months Makris 2016 subgroup 1) RMDQ using SIP Weights 2) RMDQ patient-prioritized (LESSER) Follow-up: 3 and 6 weeks 	12 wk: 0.1 (-1.0 to 1.3): p=0.84 6 mo -0.00 (-1.1 to 1.1): p=0.99 12 mo: -0.4 (-1.6 to 0.9): p=0.55 NRS (Leg pain) 3 weeks: -0.6 (-1.2 to -0.1): p=0.02 6 weeks: -0. (=0.8 to 0.4): p=0.48 12 wk: 0.1 (-0.5 to 0.7): p=0.70 6 mo: -0.2 (-0.8 to 0.4): p=0.47 12 mo: 0.1 (-0.5 to 0.7): p=0.75 Subgroup Analysis RMDQ using SIP weight 3 wks: -1.9 (-2.9 to -0.7): p=0.001 6 wks: -1.1 (-2.2 to -0.1): p=0.04 RMDQ patient prioritized (LESSER) 3 wks: -1.8 (-2.8 to -0.8): p=0.001 6 wks: -1.0 (-2.0 to 0.1): p=0.08 Adverse events: A total 2 55% of patients in group 1 and 15.5% in group 2 reported one or more adverse events (p=0 that included headaches, fever, infection, dizziness, cardiovascular/lung problems, leg swelling and dural punctu
Song 2016	29 subjects, 14 males and 15 women with an average age of 58.3 and 61.7 between groups, history of intermittent claudication and lower limb radicular pain or paresthesia	 Lidocaine spinal injection, 40 mg triamcinolone mixed with 10 mL 0.5% lidocaine was used under the guide of fluoroscopy (n=15) Saline spinal injection using same volume (n=14) 	 VAS FRI Follow-up: 1 and 3 months 	No significant difference between groups. VAS 1-month p= 0.696, 3 monthsp= 0.891 FRI 1-month p=0.983, 3 monthsp=0.743 by guest. Protected by copyright

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	Setting: Rehabilitation clinic in Korea			057724 on 19 Ja	
Milburn 2014	57 patients met inclusion criteria, agreed to participate, and were enrolled. 20 patients were male; 37 were female. Mean patient age was 65.3 years (range, 32-88 years). Average duration of symptomatology (pain and/or disability) was 42 months. The mean degree of canal narrowing at the most stenotic level was 6.1 mm (range, 2.5-9.1 mm). The most common maximally stenotic intervertebral level was L4-L5	 Fluoroscopically guided lumbar ILESI performed either at: 1) The level of maximal stenosis (n=30) 2) Two intervertebral levels cephalad, corresponding to a less stenotic level (n=27) Injection was performed with a 20-gauge Tuohy needle using a loss of resistance technique. The injectate consisted of 2 mL of 40 mg/mL methylprednisolone (Pfizer), 2 mL of bupivacaine 0.25% (Hospira), and 2 mL of normal saline for a total injectate volume of 6 mL. 	 NRS - Pain with Ambulation RMDQ Follow-up: 1, 4 and 12 weeks 	All between group comparisons NRS (pain with ambulation) 1 wk: Grp 1 lower pain compared to Grp 2, p=0.045 4 wk: Grp 1 lower pain compared to Grp 2, p=0.049 12 wk: Grp 1 lower compared to Grp 2, p=0.001 4 wk: Grp 1 lower compared to Grp 2, p=0.009 12 wk: Grp 1 lower compared to Grp 2, p=0.003	

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4 5 6 7 8 9		(n ¹ / ₄ 42) followed by L3-L4 (n ¹ / ₄ 11) and L5-S1 (n ¹ / ₄ 4).				7724 on 19 January 2022
10 11 12		Setting: Clinic in New Orleans, Louisiana				
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33	Brown 2012	38 patients, 21 males and 17 females, 21 in mild group with an average age of 74.2 years and 17 in ESI group with an average age of 78.7 years, symptomatic LSS patients with painful lower limb neurogenic claudication, able to walk at least 10 feet unaided, (ODI) score > 20 Setting: Pain management clinic in Florida	 Epidural steroid (80 mg triamcinolone acetate) (n=17) Mild lumbar decompression (n=21) 	 VAS ODI ZCQ Patient Satisfaction (0-10) Follow-up: 6 and 12 weeks	VAS 6 and 12 weeks P=0.54 ODI p=0.86 ZCQ p>0.05 Patient satisfaction p>0.05	Downloaded from http://bmiopen.hmi.com/ on April 19 2024
34 35 36 37 38 39	Hammerich 2019	54 patients total, age 67.2 ± 9.7 , 27 male, 27 female, 31 in ESI group, 23 in ESI plus PT. Mean duration of	 ESI (n=31) ESI + PT (n=23) ESI: 1.5 mL of steroid at each site injected with maximal involvement using transforaminal approach. 	 ODI NRS current SF-36 emotional role SF-36 emotional well-being 	Between group MD, 95% ODI 10 wks: -1.08 (-8.10 to 5.94 6 mo: -4.70 (-11.72 to 2.32) 12 mo: -2.72 (-9.74 to 4.30) NRS 10 wks: -1.68 (-3.08 to -0.24	p=0.80 p=0.27 p=0.52
40 41 42 43 44 45 46			For peer review only - http://bmjope	n.bmj.com/site/abou		

		BM	J Open	136/bmjopen-2021-05
	symptoms 14 m Setting: Clinics in Colorado, Texas, South Carolina and New Hampshire	PT: 8-10 sessions PT manual therapy and exercise. Walking program and/or stationary bike, stretching and strengthening exercises.	 5) SF-36 general health perception Follow-up: 10 weeks, 6 and 12 months 	$\begin{array}{c} & \overbrace{6 \text{ mo: -1.99}(-3.38 \text{ to -0.60})}_{\bullet} = 0.04 \\ 12 \text{ mo: -2.44}(-3.80 \text{ to -1.08})_{P} = 0.00 \\ \textbf{SF-36 Emotional role} \\ 10 \text{ wks: -28.53}(-49.05 \text{ to -801}) \text{ p} = 0.03 \\ 6 \text{ mo: -11.25}(-31.77 \text{ to 9.29}) \text{ p} = 0.39 \\ 12 \text{ mo: -10.67}(-31.19 \text{ to 9.29}) \text{ p} = 0.39 \\ 12 \text{ mo: -10.67}(-31.19 \text{ to 9.55}) \text{ p} - 0.41 \\ \textbf{SF-36 Emotional well-being} \\ 10 \text{ wks: -11.26}(-19.52 \text{ to -299}) \text{ p} = 0.02 \\ 6 \text{ mo: 2.69}(-5.57 \text{ to 10.95}) \text{ p} = 0.59 \\ 12 \text{ mo: -5.76}(-14.02 \text{ to 2.59}) \text{ p} = 0.24 \\ \textbf{SF-36 General Health Perseption} \\ 10 \text{ wks: -8.99}(-17.20 \text{ to -0.38}) \text{ p} = 0.05 \\ 6 \text{ mo: -5.56}(-13.77 \text{ to 2.65}) \text{ p} = 0.23 \\ 12 \text{ mo: -5.10}(-13.31 \text{ to 3.119}) \text{ p} = 0.27 \\ \end{array}$
Sencan 2020	67 patients. The median age 62.5 years with 18 males and 49 females. Median duration of symptoms was 29 and 24 months in the ILESI and bilateral TFESI groups, respectively Setting: University department Pain Medicine, Istanbul Turkey	 Interlaminar: ILESI, fluoroscopy guided with 1 to 2 mL contrast dye with mixture of 80 mg methylprednisolone acetate, 2 mL saline solution, and 2 mL (0.5%) bupivacaine solution Transforaminal: TFESI, fluoroscopy guided with 1 to 2 mL contrast dye with mixture of 80 mg methylprednisolone acetate, 2 mL saline solution, and 2 mL (0.5%) bupivacaine solution 	 NPS ODI Beck depression scale Walk distance Follow-up: after treatment, 3 weeks and 3 months 	Between Group Median Differences (data not provide values NPS after treatment: p=0.14 3 wks: p=0.28 3 mo: p=0.047 ODI 3 wks: p=0.93 3 mo: p=0.65 Beck Depression Scale 3 wks: p=0.048 3 wks: p=0.048 3 wks: p=0.048 3 mo: p=0.03 Walking Distance 3 wks: p=0.23 3 mo: p=0.048
Wei 2020	90 patients. Mean age about 65 years, 45 females, 45	 Epidural injection with 2.0mL of lidocaine and 10 mg of TNF-a inhibitor (etanercept) on the affected spinal nerves. 	 VAS (leg) ODI Follow-up: after 	Between Group Mean Differences (data not provided values Values 0 Grp 1 vs Grp 2 0 VAS 0

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	males, mean duration of symptoms about 2.8 months Setting: University Hospital Jiangsu China	 Epidural administration with 2mL of lidocaine mixed with 2mL of steroid (diprospan) Epidural injection 4.0mL of lidocaine only. 	treatment, 1,3, 6 months	after treatment, 1, 3 and 6 ms, Grp 1 greater reduction, p<0.05 ODI 1, 3 and 6 mo, Grp 1 greater reduction, p<0.05 Grp 1 vs Grp 3 VAS after treatment, 1, 3 and 6 ms, Grp 1 greater reduction, p<0.05 ODI 1, 3 and 6 mo, Grp 1 greater Preduction, p<0.05 ODI 1, 3 and 6 mo, Grp 1 greater Preduction, p<0.05 Grp 2 vs Grp 3 VAS after treatment, 1, 3 and 6 mso, no significant difference, p>0.05 ODI 1, 3 and 6 mo, no significant difference, p>0.05 ODI 1, 3 and 6 mo, no significant difference, p>0.05 ODI
Karm 2018	 44 patients total, 20 in the RACZ group (age 66.1 +-12.2, male 9 (45.0%), and 24 in the ZiNeu group (Age 65.5 +-6.4 18 females, 26 males. Setting: Single- center, academic, outpatient interventional pain management clinic in Korea 	 PEA Using a Balloon-less Catheter (Racz) (n = 20) Percutaneous Epidural Decompression and Adhesiolysis Using an Inflatable Balloon Catheter (ZiNeu) (n = 24) 	 NRS (back pain) NRS (leg pain) ODI Follow-up: 1, 3 and 6 months 	Between group MD, 95% GI, p values NRS-11 (Back pain) 1 mo:-0.38 (-1.81 to 1.06): $p=0.61$ 3 mo: -1.13 (-2.63 to 0.38): $p=0.14$ 6 mo: -2.02 (-3.58 to 0.45): $p=0.01$ NRS-11 (Leg pain) 1 mo: 0.73 (-0.40 to 1.85): $p=0.21$ 3 mo: -0.69 (-1.89 to 0.52): $p=0.26$ 6 mo: -1.88 (-3.15 to 0.61): $p=0.00$ ODI (%) 1 mo: -6.13 (-13.88 to 1.61): $p=0.12$ 3 mo: -6.63 (-14.75 to 1.48): $p=0.11$ 6 mo: -13.74 (-22.18 to 5.36): $p=0.00$ Adverse events: Minor an Ptransient adverse events were reported equally in both groups (no data provided), mostly pain and paresthesia at the injection site.
			Surgery	ů Ú
Zuchermar 2004, 200 2006	5	 X STOP Interspinous Process Decompression System (n=100) Non-operative treatment: Subjects received an epidural steroid injection 	 SF-36 ZCQ Worker's compensation claims 	Patient global assessment [®] : (Good result) P 2 yrs: 73.1% (surgery) vs. 35.9% (control) (P< 0.001)
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	and 48% female	on enrolment and were eligible for	4) ODI	Surgery better at 6 w, 6 mo and 2 yr (graphs) (P<0
	in the non-	additional injections as needed, as	5) Radiographic	2 yrs: MPC 45.4% (surgery vs. 7.4% (control) ($P < 0$
	operative group.	well as NSAIDS, analgesic agents,	changes	"Clinically relevant improvement (patients)":
	Average age of	and physical therapy. Physical		2 yrs: 60.2% (surgery) vs. 19.5% (control) (P< 0.001
	70 years in the X	therapy consisted of education on		Symptoms Severity score 딸
	STOP group and	back care and modalities such as ice		Surgery better at 6 w, 6 mo al and 2 yr (graphs) (P<0
	69.1 years in the	packs, heat packs, massage,	F U	2 yrs: MPC 44.3% (surgery) vs0.4% (control) (P <
	non-operative	stabilization exercises, and pool	Follow-up:	"Clinically relevant improgement (as measured by
	group. Average of 3.5 year	therapy. Braces such as abdominal binders and corsets were permitted,	Surgery: 7 (2 yr) Control: 19 (2 yr)	patients)": N 2 yrs: 57% (surgery) vs. 14\string% (control) (P < 0.001)
	symptom	but body jackets and chair back	Control. 19 (2 yr)	$Z Q (global success) \leq 2 V(S, S7% (surgery) vs. 143% (control) (F < 0.001)$
	duration in the X			6 mo: 52% (surgery) vs. 9% (control) (P value not re
	STOP group and	braces were not. (n=91)		1 yr: 59% vs 12% (P value b ot reported)
	4.7 years in the			2 yrs: 48.4% (surgery) vs. 49% (control) (P < 0.001)
	non-operative			Quality of life (SF-36)
	group.			At all post treatment time points (6 w, 6 mo, 1 yr, 2 y
				mean domain scores documented in the X STOP gro
	Setting: Spine		0.	significantly greater than these in the non operative g
	center in the United States			the exception of the mean General Health, Role Emo
	United States			Mental Component Summary scores at 2 years
				Adverse events: No complexations were reported in
				group 1, complications were reported in 11% of subj
				including spinous process fracture, coronary ischemi
			· · · · · · · · · · · · · · · · · · ·	respiratory distress, hematoma, and 1 death (pulmon
Weinstein	Subjects with	1) Assigned to surgery (standard	1) SF-36 bodily	All between group compagesons using Intention-to
2007, 2009,	image-confirmed	laminectomy with or without fusion)	pain	
Abdu 2018	degenerative	(n=159)	2) SF-36 bodily function	SF-36 Bodily Pain, DMC, 95% CI 2 yrs: 1.5 (-4.2 to 7.3)
	spondylolisthesis: 304 subjects in	2) Assigned to non-surgical treatment:	3) low back pain	2 yrs: 1.3 (-4.2 to 7.3) 4 yrs: -2 (-8.6 to 4.6)
	the RCT, 303 in	Usual non-operative care (n=145)	bothersomeness	8 yrs: p=0.85
	the observational		scale	SF-36 Bodily Function, DEIC, 95% CI
	cohort, 31% male		4) Leg pain	2 yrs: 1.9 (-3.7 to 7.5)
	in the surgical		bothersomeness	4 yrs: -3.1 (-9.2 to 3.0)
	group, 33% male		scale	8 yrs: p=0.31
	in the surgical		5) ODI	Disability (ODI), DMC, 95% CI
	group. Average		6) Subjective self-	2 yrs: 2.2 (-2.3 to 6.8)

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	Amundsen 2000	age of 64.7 years in the surgical group and 68.2 years in the non- surgical group. Subjects had symptoms for at least 12 weeks Setting: multi- centred orthopaedic departments in the United States 100 subjects, 54 male, 46 female, median age of 59 (males were 1.5 years higher than females). Median back pain duration was 14 years, median duration of sciatica was 2 years. Setting: Neurology department in a hospital in Norway	 Surgery: Partial or total laminectomy, medial facetectomy, discectomy, and/or removal of osteophytes from the vertebral margins or facet joints. No fusions. (n=13) Conservative therapy: Lumbar orthosis use for 1 month worn during the day for all activities plus instruction and back school." (n=18) 	reported improvement, satisfaction with current symptoms and care 7) Stenosis bothersomeness index Follow-up: 6 weeks, 3 and 6 months, 1, 2, 4 and 8 years 1) VAS 2) Verbal Rating Scale 3) Subjective change (better, worse, or unchanged) 4) Work status 5) Subjective rating from evaluating physician and study team (Excellent, Fair, Unchanged, Worse) Follow-up: 6 months, 1, 4 and 10 years	4 yrs: 4.1 (-0.8 to 9.1) 8 yrs: p=0.039 Other outcomes (patient's set isfaction; Stenosis Bothersomeness Index, Leg Pain Bothersomeness Scale; and Low Back Pain Bothersomeness Scale) were not provided separately for the randomized cohort. Adverse events: group 1 reported 14% intraoperative complications mostly and dural tears and 19% postsurgical complications including 1 Grath, 11% required additional surgeries at 2 years,
	Malmivaara 2007	94 subjects, 22% of surgical	 Segmental decompressive surgery with facetectomy (n=50) 	1) 11 point numerical pain	
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subjects were male, 45% of non-operative subjects were male. Nonoperative group had average age of 62.9 years, surgical group had average age of 63.9 years. Surgical group averaged 14 years since onset of symptoms, nonsurgical group average 16 years since onset of symptoms. Minimum of 6 months of symptoms for study inclusion. Setting: Research Center in Finland	PMJ 2) Non-operative treatment: NSAIDS when indicated and seen one to three times by a physiotherapist, in addition to the standard visit at each follow-up. The physiotherapist gave all patients educational brochure. The patients were encouraged to use their back in a normal way. Painrelieving body postures were taught as well as basic ergonomics related to lifting and carrying. Individually structured programs included trunk muscle endurance and stretching-type exercises. Additional individual physiotherapy consisting of passive treatment methods (such as ultrasound and transcutaneous nerve stimulation). (n=44)	 P Open rating scale for back and leg pain 2) Walking ability (distance without a break) also via treadmill test 3) General health status on a 5 point scale (very good, quite good, average, quite poor or very poor. 4) ODI 5) Ability to complete certain activities of daily 6) living without difficulty, marked difficulties or not at all 7) Radiographic examination 	1 yr: 1.69 (0.41 to 2.96) 2 yr: 1.51(0.25 to 2.77) Back pain, MD, 95% CI 1 yr: 2.33 (1.12 to 3.55) 2 yrs: 2.13(0.98 to 3.28) Disability (ODI), MD, 95% 1yr: 11.3 (4.3to 18.8) 2 yrs: 7.8 (0.8 to14.9) > 10 points reduction (OD 1 yr: 2.16 (1.31to 3.57) 2 yrs: 1.36 (0.88 to 2.10) Walking disability (walking 1 yr: 0.93 (0.61 to 2.03) 2 yrs: 1.08 (0.70 to 2.42) Walking disability (walking 1 yr: 0.91 (0.51 to 4.24) 2 yrs: 1.18 (0.67 to 4.72)	00000000000000000000000000000000000000
		Follow-up: 6 months, 1 and 2 years		st Protect
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Weinstein 2008, 2010, Lurie 2015	 289 in the RCT, 365 in the observational cohort. 62% male in the surgical groups, 59% male in the non- surgical groups. Average age of 63.8 in the surgical group, 66.1 in the non- surgical group. 60% in the surgical group and 55% in the non-surgical group had symptoms for over 6 months. Setting: multi- centred- orthopaedic departments in the United States. 	1) 2)	Assigned to surgery: Standard laminectomy with or without fusion (n=138) Assigned to non-surgical treatment: Usual non-operative care - recommended to include at least active physical therapy, education or counseling with home exercise instruction, and the administration of NSAIDs, if tolerated (n=151)	we mo	pain SF-36 bodily function Low back pain bothersomene ss scale Leg pain bothersomene ss scale ODI Subjective self-reported improvement, satisfaction with current symptoms and care,	All between group comparisons using Intention-to-Treat Analysis SF-36 Bodily Pain, DMC, 95% CI 2 yrs: 7.8 (1.5 to 14.1) 4 yrs: 0.3 (-6.4 to 7) 8 yrs: p=0.25 SF-36 Bodily Function, DMC, 95% CI 2 yrs: 0.1 (-6.4 to 6.5) 4 yrs: -3.2 (-9.9 to 3.6) 8 yrs: p=0.89 Disability (ODI), DMC, 95% CI 2 yrs: -3.5 (-8.7 to 1.7) 4 yrs: 0.2 (-5.2 to 5.7) 8 yrs: p=0.87 Other outcomes (patient's satisfaction; Stenosis Bothersomer Index, Leg Pain Bothersomeness Scale; and Low Back Pain Bothersomeness Scale) were not provided separately for the randomized cohort. Adverse events: In group 10% of patients required transfusions intraoperatively. and 5% postoperatively. The most common surgical complication was dural tear, in 9 of patients. At 2 years, reoperation had occurred in 8% of subjects.			
Delitto 2015	169 patients, 88 males and 81 females, 87 surgical group with an average age of 66.6 years old and 82 PT group with an average age of 69.8 years old, LSS by computed	1) 2)	Surgical decompressive laminectomies, partial facet resection, and neuroforaminotomies (n=87) PT program: lumbar flexion exercises, exercises and education (n=82)	fu	SF-36 physical nction bllow-up: 2 years	2 years -SF-36 Physical Finction, MD and 95% CI 0.9 (7.9 to 9.6) Adverse events: 9 out of 82 participants in group 2 reported adverse events consisting of worsening of symptoms wherea out 87 participants in group 2 reported surgery related complications, mainly attributable to reoperation, delay in wound healing and surgical site infection.			

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14 15	Neurologic and	
15	colleagues (2) Setting: Neurologic and orthopedic surgery departments and physical therapy clinics in western	oa
17	surgery	d
18	departments and	fro
19	physical therapy clinics in western	3
20	Pennsylvania	dt dt
21	ADLs = Activities of Daily Living, AUC = Area under the pain-intensity curve, BTX = Botox, CI = Confidence Interval, DMC	= Difference in mean change
22	from baseline, ESI = Epidural Steroid Injection, FRI = Functional Rate Index, GRP = Group, HADS =Hospital Anxiety and De	
23	Units, JOABPEQ = Japanese orthopaedic association back pain evaluation questionnaire, LBOS = Low Back Outcome Score, 1	
24	Meters, MCS = Mental Component Score, MD = Mean Difference, mm = Millimeters, Mo = Months, MPC = Mean Percent Cl	
25	Rating Scale, NR = Not Reported, ODI = Oswestry Disability Index, OR = Odds Ratio, PASS-20 = Pain Anxiety Symptoms S	
26	Score, RCT = Randomized Controlled Trial, RMDI = Roland Morris Disability Index, ROM = Range of Motion, RR = Relativ	$R_{is}^{O}k, SBI = Stenosis$
27	Bothersomeness Index, SPWT = Self-Paced Walking Test, SSS = Spinal Stenosis Questionnaire, TSK-11 = Tampa Scale-11, V	AS Visual Analogue Scale,
28	WMD = Weighted Mean Difference, ZCQ = Zurich Claudication Questionnaire	on .
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 BMJ Open Supplemental Table 2. Non operative interventions for neurogenic claudication due to lumbar spinal stenosis: A summary of CRADE assessment and outcomes (60 comparisons) 7724 on 19 **GRADE** assessment and outcomes (60 comparisons)

						Walking	ability/pain/function	n/quality of lige mea	asures	GRADE
Studies	Risk of Bias	Consistency	Directness	Precision	Selective Reporting	Immediate up to 1w	Short-term >1w - 3m	Intermediate 3m – 1yr	Long term <u>>1</u> yr	
	•					Calcitonin				
				С	alcitonin in	jection vs. placeb	o injection	Oow		
Eskola 1992	High	No No	Yes Yes	No No	Yes	<u> </u>	= TWT = VAS	= TWT or a state of the state o	= TWT = VAS	+000 +000
Porter 1983	High	No	Yes	No	Yes		? Distance walked	? Distance waked		+000
Porter 1988	High	No No	Yes Yes	No No	Yes		= Distance walked = VAS	om htt		+000 +000
1700		110	105		lcitonin nas	al spray vs. place		.t p ://		.000
Podichetty 2004	High	No No No	Yes Yes Yes Yes	No No No No	Yes		= Distance walked = Time walked = SF-36 = VAS	/bmjopen.b		+000 +000 +000 +000 +000
Tafazal 2007	High	No No No No No	Yes Yes Yes Yes Yes Yes	No No No No No	No		= Shuttle walk = VAS leg = VAS back = ODI = Global	mj.com/ on A		+000 +000 +000 +000 +000 +000
	- I	Cal	citonin na	sal sprav	plus physic	cal therapy vs. par	acetamol plus phy	sical therap¥	-	
Sahin 2009	High	No No No	Yes Yes Yes	No No No	No		= Distance walked = VAS = RMDI	19, 202		+000 +000 +000
					C	Dral Medication	·	4 by		
				0	ral prostag	landin vs. Etodlad	(NSAID)	gu		
Matsudaira 2009	Low	No No No No	Yes Yes Yes Yes Yes	No No No No	Yes		 > Distance walked # ? SF-36 = LBP > Leg pain > Global # 	est. Protectec		$ \begin{array}{c} ++00 \\ +000 \\ ++00 \\ ++00 \\ ++00 \\ ++00 \end{array} $
			Methylo	cobalami	n (vit B12)	plus conservative	care vs. conservat			
Waikakul 2000	High	No	Yes	No	No			> Distance w&ked #	> Distance walked #	+000

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	Gaba	nentin n	lus nhysical	therapy	corset &	NSAIDS vs. placel	bo plus physical th	N	NSAIDS	
Yaksi	High	No	Yes	No	No		= VAS	> Distance waked	> Distance	+000
2007	8	No	Yes	No				VAC J	walked #	+000
		No	Yes	No					> VAS #	
						<u>balin vs. active pla</u>	icebo	Janu		
Markman	High	No	Yes	No	No	= NPS rest/final		Jan		+000
2015		No	Yes	No		= Distance walked		N N		+000
		No	Yes	No		= Recovery time		02		+000
		No No	Yes Yes	No No		= Global < RMDQ		2		+000 +000
		INO		4				Dow		+000
			Gal	papentin	plus conse	ervative vs. conserv		ium no		
Park	High	No	Yes	No	No		= NPS (Back/leg)	ade		0000
2017		No	Yes	No			= ODI	d		0000
		No	Yes	No			= Global	fror		0000
)vymornho	ne hydrochloride	vs. placebo	Jan		
Markman	High	No	Yes	No	No	= NPS rest/final				0000
2015 - 2	Ingn	No	Yes	No	INO	= Distance walked		br		0000
2015 - 2		No	Yes	No		= Recovery Time		njo		0000
		No	Yes	No		= ZCQ (s)		pe e		0000
		No	Yes	No		= ZCQ (f)		n.b		0000
		No	Yes	No		= Global		<u>, </u>		0000
				P	ropoxyphe	ne/acetaminophen	vs. placebo	con		
Markham	High	No	Yes	No	No	= NPS rest/final		2		0000
2015 - 2	_	No	Yes	No		= Distance walked		on .		0000
		No	Yes	No		= Recovery Time		Ap		0000
		No	Yes	No		= ZCQ (s)				0000
		No	Yes	No		< ZCQ (f) #		,9		0000
		No	Yes	No		= Global		202		0000
			Oxv	morpho	ne hvdroch	loride vs. propoxy	phene/acetaminor	com/ on April 19, 2024 b		
Markham	High	No	Yes	No	No	= NPS rest/final	<u> </u>			0000
2015 - 2	U	No	Yes	No		= Distance walked		Jue		0000
		No	Yes	No		= Recovery Time		st.		0000
		No	Yes	No		= ZCQ (s)		Pro		0000
		No	Yes	No		> ZCQ (f) #		ote		0000
		No	Yes	No		= Global	1	y guest. Protected		0000
					Ora	l corticoid vs. place	ebo	<u>o</u>		
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Rodrigues	High	No	Yes	No	No		= SF-36		~		0
2014	mgn	No	Yes	No	110		= RMDQ		724 on 19		0
-		No	Yes	No			$= 6 \min \text{ walk}$		on		0
		No	Yes	No			< VAS #		19		0
				Reha	bilitation	Therapy and Mul	timodal Care		പ്പ		
			E			und vs. exercise pl		ıd	Janua		
Goren	low	No	Yes	No	No		= TWT		र.		+
2010		No	Yes	No			= VAS back		2022.		+
		No	Yes	No			= VAS leg		12		+
		No	Yes	No			= ODI		<u> </u>		+
				E		<u>is ultrasound vs. no</u>			own		
Goren	Low	No	Yes	No	No		= TWT		loa		+
2010		No	Yes	No			= VAS back		de		+
		No	Yes	No			> VAS leg #		d fr		+
		No	Yes	No			> ODI		loaded from		+
			I	T		ham ultrasound vs.			5		
Goren	Low	No	Yes	No	No		= TWT	-	Ę.		+
2010		No	Yes	No			= VAS back		/br		+
		No No	Yes Yes	No No			> VAS leg # > ODI #		ttp://bmjop		++
		INO			41. august 1.				pen.		+
17	TT: 1	<u> </u>				s. home exercise pi	= TWT			1	
Koc 2009	High	No No	Yes Yes	No No	Yes		= 1 W I = VAS	= TWT = VAS	<u>≓</u> .		+
2009		No	Yes	No			= VAS = RMDI	= VAS = RMDI	§		+
		No	Yes	No			= NHP	= HNP	pmi.com/ o		+
	I	110			admill wal	king plus exercise			D		
Pua	Low	No	Yes	No	No	king plus excicise	= Distance walked	Kereise	Å Pr		+
2007	Low	No	Yes	No	110		= ODI		April 19, 2024		+
		No	Yes	No			= RMDI		9		+
		No	Yes	No			= VAS		202		+
		No	Yes	No			= Global				+
	Ma	nual thera	apy, exerci	se and ur	weighted	treadmill vs. flexio	n exercise, walkir	ng and sham	ĭultras	ound	
Whitman	High	No	Yes	No	No		= TWT				+
2006	Ũ	No	Yes	No			> Global #		st.		+
		No	Yes	No			= ODI		Pro		+
		No	Yes	No			= NPRS		ote		+
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Minetama	High	No	Yes	No	No		> ZCQ (F) #	7:		+00
2019	U	No	Yes	No			>ZCQ (S) #	724 on 19 January		+00
		No	Yes	No			> Distance walked #	on		+00
		No	Yes	No			> NPS (leg)			
		No	Yes	No			> SF-36 PF	ے ب		+00
		No	Yes	No			> SF-36 BP	an		+00
		No	Yes	No			= Daily Steps	Lai		+00
		No	Yes	No			Duny Steps	V 2		+00
					anual thera	apy & exercise vs	medical care	2022		
Schneider	Low	No	Yes	Yes	No		> ZCQ #	700		+++
2019		No	Yes	Yes			= SPWT	= SPWT Q		+++
		No	Yes	Yes			= PA	= 2CQ $= SPWT$ $= PA$		+++
				Manua	l therapy a	& exercise vs. co	mmunity exercise			
Schneider	Low	No	Yes	Yes	No		> ZCQ #	= ZCQ		+++
2019		No	Yes	Yes			= SPWT	= SPWT =		+++
		No	Yes	Yes			= PA	= SPWT from		+++
					Communi	ty exercise vs. m	edical care	htt		
Schneider	Low	No	Yes	Yes	No		= ZCQ			+++
2019		No	Yes	Yes			= SPWT	= ZCQ = SPWT = PA		+++
		No	Yes	Yes			> PA	= PA 💆		+++
			Cor	nprehens	sive therap	y and exercise v	s. self-directed exerc	ise 🗳		
Ammendolia	Low	No	Yes	Yes	No	> SPWT #	> SPWT #	> SPWT #	> SPWT #	+++
2018		No	Yes	Yes		> 30% SPWT	> 30% SPWT	> 30% SPWT	>30% SPWT	+++
		No	Yes	Yes		> 50% SPWT	= 50% SPWT	= 50% SPWT = ZCO(s)	> 50% SPWT	+++
		No	Yes	Yes		> ZCQ (s)	= ZCQ (s)		> ZCQ (f) #	++0
		No	Yes	Yes		= ZCQ (f)	= ZCQ (f)	= ZCQ (f) S	> ZCQ (s) +	++0
		No	Yes	Yes		= ODI	= ODI	> ODI (walk)≱	ZCQ (f)	++0
		No	Yes	Yes		> NPS (back) #	= NPS (back)	= NPS (back) =	= ODI	++0
		No		Yes		= NPS (leg)	= NPS (leg)	= NPS (leg) $\vec{\omega}$	= NPS (back)	++0
						= SF-36 BP	= SF-36 BP	= SF-36 BP N	> SF-36 BP #	++0
						= SF-36 PF	> SF-36 PF #	= SF-36 BP = SF-36 PF N	>SF-36 PF #	++0
					tandard ex	ercise vs. isokine		4 by		
Oğuz	High	No	Yes	No	Yes	= VAS	= VAS	= VAS guest = ODI est:		000
2013		No	Yes	No		= ODI	= ODI	= ODI 6		000
		No	Yes	No		=TWT	= TWT	= TWT		000
			1			xercise vs. unloa		= VAS tec = ODI tec = TWT by		
Oğuz	High	No	Yes	No	Yes	< VAS	< VAS	=VAS		000
2013		No	Yes	No		< ODI	= ODI	= ODI te		000
		No	Yes	No		= TWT	= TWT	= TWT		000
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	1		1			ercises vs. unloade			
Oğuz	High	No	Yes	No	Yes	< VAS	= VAS	= VAS o	0000
2013		No	Yes	No		< ODI	< ODI	$= VAS \qquad O = ODI \qquad 10$	0000
		No	Yes	No	1 1 1 1	< TWT # .	< TWT		0000
** :	xx: 1	ŊĬ	X 7			herapy exercise vs.	= VAS	Janu	
Homayouni 2015	High	No No	Yes Yes	No No	Yes	<pre>> VAS # > Distance walked</pre>	= VAS = Distance walked	uary	0000
2013					se program	vs. routine preope		N)	0000
Marchand	High	No	Yes	No	Yes	> NPS (leg) #	= NPS (leg)	$= NPS (leg) \stackrel{N}{=}$	0000
2019	Ingn	No	Yes	No	103	> Duration walked #	= Duration walked	= Duration wasked	0000
Gang (huk Tana	(herbal co			okuri Chu			5	vs. oral aceclofenac,
Gang-C	nuk Tang	(IICIDAI CO	Jicoction	•		bid injection, physi	1 · 1 ·		
Kim	Low	No	Yes	No	Yes		= VAS (leg)	= VAS (leg)	+000
2019	Low	No	Yes	No	165		= VAS (back)	$>$ VAS (back) $\vec{\sigma}$	+000
2019		No	Yes	No	\sim		> OCS	$= OCS$ \exists	+000
		No	Yes	No			> Distance walked	> Distance watked	+000
								o://	
Mo	okhuri Chu	· 1		d physici		ation vs. oral acecl	· 1	J <u>-</u> , / 1	hysical therapy
Kim	Low	No	Yes	No	Yes	>VAS (low back)#	= VAS (leg)	> VAS (leg) $#$	+00
2019		No	Yes	No			= VAS (back)	> VAS (back)	+00
		No	Yes	No			= OCS	= OCS	+000
		No	Yes	No			= Distance walked	= Distance watked	+000
						inal Manipulation			
P	xx: 1	٦ĭ	X 7			nal manipulation v	s. waiting	on	
Passmore	High	No	Yes Yes	No	No	= NPS (Back)		Ap	0000
2017		No	res	No		= NPS (Leg)		April 1	0000
						Acupuncture		9, 2	
				Ac	rununcture	with usual care vs	usual care	024	
				11	Jupuneture	with usual care vs	. usual care	4 b)	
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0000		724		6 weeks: = ODI		No	No	Yes	No	High	Kim 2016
0000		on on		= SF-36 BP			No	Yes	No		2010
0000		10		= SF-36 PF			No	Yes	No		
0000		ي و		=LBP			No	Yes	No		
0000		anu		= Leg pain			No	Yes	No		
0000		Jan		= Distance walked			No	Yes	No		
		N		3 months:							
0000		022		= ODI			No	Yes	No		
0000		2		= SF-36 BP			No	Yes	No		
0000		Q		= SF-36 PF = LBP			No No	Yes Yes	No No		
0000		n		= LBP = Leg pain			No No	Yes	No No		
0000		Dac		= Distance walked			No	Yes	No		
0000		ed			ture vs. sham acup	Acupunc	110	1.00	110		
++00		fror	> RMDQ > NRS (bac	> RMDQ	> RMDQ	No	No	Yes	No	Low	Qin
++00		ick)	> NRS (bac	> NRS (back) #	> NRS (back) #		No	Yes	No		2020
++00		g) 🚝	> NRS (leg	> NRS (leg) #	> NRS (leg) #		No	Yes	No		
++00		://b	> SSS-S #	> SSS-S #	> SSS-S #		No	Yes	No		
++00 ++00		://bmjop	> SSS-F # = SPWT	> SSS-F # = SPWT	> SSS-F # = SPWT		No No	Yes Yes	No No		
++00		open.	- SP W I	- 5P W I	pidural Injection	F	INO	res	INO		
		J.bm	ns	s placebo injectio	steroid injections v		nslamina	Tra			
+000	=global				= Global	No	No	Yes	No	High	Cuckler
	8	.com/								8	1985
		on	jections		ids plus epidural bl		inar epic				
+000		April		= Distance walked	> Distance walked #	No	No	Yes	No	High	Fukusaki 1988
		ns ío	 c injection	vs. enidural block	plus epidural block	alsteroids	r enidura	ranslamina	Т		1900
+000		22		= Distance walked	= Distance walked	No	No	Yes	No	High	Fukusaki
		2024								8	1988
		by		. placebo	ar epidural block va	ranslamina	Т				
+000		gues		= Distance walked	> Distance walked #	No	No	Yes	No	High	Fukusaki 1988
	ac	dielofen	plus oral o	exercise program	ral block vs. home	plus epidu	steroid	nar epidural	Intralamin		
+000			= TWT	= TWT		Yes	No	Yes	No	High	Koc
+000		otected	= VAS	> VAS #		Yes	No	Yes	No	-	2009
+000		bed	= RMDI	> RMDI #		Yes	No	Yes	No		
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		N-	Yes	N-	Yes		> NHP		05		+0
		No It	res tralamina	No r enidura	l steroid pl	us epidural block v	r > nnP	= HNP	⁷ 24		+0
Koc	High	No	Yes	No	Yes		= TWT	= TWT	<u>0</u>		+0
2009	ing.	No	Yes	No	Yes		= VAS	= VAS	19		+0
		No	Yes	No	Yes		= RMDI	= RMDI	Jar		+0
		No	Yes	No	Yes		= NHP	= HNP	19 Januarv		+0
						l steroids vs. place	bo injections				
Zahaar 1991	High	No	Yes	No	No	= Global			2022.	= Global	+0
			l	Mild lum	bar decom	pression vs. epidura	al steroid injection		Downloaded from http://		
Brown	High	No	Yes	No	No		= VAS		vn		00
2012		No	Yes	No			= ODI		oa		00
		No	Yes	No			= ZCQ		de		00
		No	Yes	No			12 weeks:		o ≠		
		N.	V	N.	NO.		= VAS		om		00
		No No	Yes Yes	No No			= ODI = ZCQ		- H		00
		INO	1 05	INO			- ZCQ		.		00
]	Lidocaine	vs. glucocorticoid-	lidocaine		om		
Friedly 2014,	Low				No		3 weeks:	12 weeks:	ope	12 months:	
2017		No	Yes	Yes			< RMDQ	= RMDQ	<u>n.</u>	= RMDQ	++
		No	Yes	Yes			< NPS (leg)	= NPS (leg)	B	= NPS (leg)	++
		N.	V	V			6 weeks:	6 months:	<u>.</u> .		++
		No No	Yes Yes	Yes Yes			= RMDQ = NPS (leg)	= RMDQ = NPS (leg)	Ĭ		++
		INO	105	105			- NI S (leg)	- NI S (leg)	q		
							Makris 2016		Þ		
							3 weeks:		oril		
Makris 2016	Low	No	Yes	No	Yes		< RMDQ using SIP		19		00
							Weights		 N		
		No	Yes	No	Yes		< RMDQ Patient-		022		00
							Prioritized		ç Ç		
							(LESSER)		Q		
		No	Yes	No	Yes		6 weeks: < RMDQ using SIP		ues		
		INU	1 05	INU	1 05		Weights		ř.		00
		No	Yes	No	Yes		= RMDQ Patient-		ro		00
		110		1.0			Prioritized		tec		00
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-				Lidoca		injection vs. saline	1 2	7724		
Song	High				No		1 month:	on 19 January		
2016		No	Yes	No			= VAS	-		000
		No	Yes	No			= FRI	9		000
							3 months:	lan		
		No	Yes	No			= VAS	ua		000
		No	Yes	No	~~~ 4		= FRI			000
		scopically	guided lui	nbar ILE			stenosis vs. two int		ls cephalad	
Milburn	High				No	1 week:	4 weeks:	22.		
2014		No	Yes	No		> NPS (walking) #	> NPS (walking) #	D D		000
		No	Yes	No		> RMDQ #	> RMDQ	Ň		
		No	Yes	No			12 weeks:	l l		000
							= NPS (walking)	ad		
		No	Yes	No			> RMDQ	ed		000
		No	Yes	No				Downloaded from		000
			-	Epidura	al steroid in	jection (ESI) Vs. ESI				
Hammerich	High	No	Yes	No	No		= ODI	= ODI > NPS # = SF-36 ER	= ODI	000
2019		No	Yes	No			= NPS	> NPS #	> NPS #	000
		No	Yes	No			> SF-36 ER #	= SF-36 ER	= SF-36 ER	000
		No	Yes	No			> SF-36 EWB	= SF-36 EWB	= SF-36 EWB	000
		No	Yes	No			> SF-36 GH	= SF-36 GH 🔂	= SF-36 GH	000
			l,		l	C ' 1 ' 1	1 / 11. /	<u> </u>		
				Interlami			al steroid injection			-
Sencan 2020	High				Yes	= NPS	3 weeks:	3 months: 8 > NPS 9 = ODI 9		
		No	Yes	No			= NPS	>NPS 2		000
		No	Yes	No			= ODI	= ODI 9		000
		No	Yes	No			> BDS	> BDS > Distance waked		000
		No	Yes	No			= Distance walked		#	000
		No	Yes	No				19,		000
		No	Yes	No				20		000
		No	Yes	No				022		000
		No	Yes	No				4 b		000
	<u> </u>	NU	105		ha inhihit	or (Etanercept) vs.	steroid injection			000
		N	N7	-		· · · · · ·	v			
Wei 2020	Low	No	Yes	No		> VAS #	1, 3 months:	6 months:		++0
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		No	Yes	No			> ODI #	> ODI # 6		++0
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Subjective W for Leg pain Extended Res ?*= no betwe GRADE evid # between gr Scale (VAS) (59), ≥8 poin component as	alking, VA while walki search, PA= ten group st lence; +000 oup differer and 0 to 10 ts for conse and 0.36 poin	S leg= Visua ng, SIP= sic Physical A atistical com Very low ce meeting -point Nume rvative treat nts for symp	al Analog Sc kness index p ctivity, $FRI=$ nparisons, ** GRADE evic the MCID. T erical Rating ment and ≥ 12 tom compone	ale for Leg profile, BD Functiona = SF-36 Bl dence, ++0 the MCID of Scale (NRS 2 points for ent of the Z	Pain, VAS DS= Beck De I Rating Inde P significant 0= Low GRA used were: <u>2</u> S) for back p r surgery on Curich Claud	me Scale, LPBI= Leg P LB= Visual Analog Sca pression Score, LESSE ex, TWT= Total Walkin ly better at 2 years but a ADE, +++0= Moderate ≥1.25 points for back pa bain (58), ≥5 points on 0- to 100-points for Os ication Questionnaire (stance, global improver	ale for Low Back Pai $R = Lumbar Epiduration and Time, SSS = Spinal not 4 years. GRADE evidence, + ain and \geq1.5 points forD- to 24-point Rolandwestry Disability IndZCQ) (58), \geq 0.38 pc$	n, VAS leg wa l Steroid Inject l Stenosis Que +++= High G or leg pain on (l-Morris Disab ex (ODI) (60) pints for combr	king= V fon for S tionnai ADE e to 100- to 200- to 200 p	Visual Analog S Spinal Stenosis re, vidence point Visual An estionnaire (RM oints for the fun	cale alog DQ) ction



PRISMA 2020 Checklist

		,	BMJ Open BMJ Open	Page 94 of 95
1	PRISN	/A 2(BMJ Open 8665770000000000000000000000000000000000	
4	Section and Topic	ltem #	Checklist item	Location where item is reported
	TITLE			
	Title	1	Identify the report as a systematic review.	Page 1
8 4	ABSTRACT			
9 A	Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
10 📊	NTRODUCTION			<u> </u>
	Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 6-7
12 13 C	Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 7
<u> </u>	METHODS			
-	Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 9
6 Ir	nformation	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 8-9
18 S 19 20	Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 8-9 & Supplemental File 1
22	Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 9
~ 4	Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 9
7	Data items		List and define all outcomes for which data were sought. Specify whether all results that were compatible with each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 8 & 10
8 9 0		10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 8-10 Supplemental Table 1
	Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how men reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 9-10
4 E	Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 11-12
5 S	Synthesis methods		Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 11-12
7 8	Ī		Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 11-12
9	Ī	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Supplemental Table 2
41 42			Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used	Page 10
3		13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analyas, meta-regression).	N/A
14 15		13f	Describe any sensitivity analyses conducted to assess toobusteess of the synthesized could lines.xhtml	NA
15 <u> </u>	L	L		<u> </u>



PRISMA 2020 Checklist

Pag	e 95 of 95		BMJ Open		
1	ge 95 of 95 BMJ Open BM				
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36	Section and Topic	ltem #	Checklist item		Location where item is reported
	Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting bias $\frac{1}{3}$).		NA
	Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.		NA
	RESULTS				
	Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of records identified in the number of records identified identified in the number of records identified id	nber of studies included	Figure 1
		16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded	ided.	Figure 1
	Study characteristics	17	Cite each included study and present its characteristics.		Supplemental Table 1
	Risk of bias	18	Present assessments of risk of bias for each included study.		Table 1
	Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect es (e.g. confidence/credible interval), ideally using structured tables or plots.		Supplemental Table 1 & 2
	Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.		Table 2
		20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the		Supplemental Table 2
		20c	Present results of all investigations of possible causes of heterogeneity among study results.		NA
		20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.		NA
	Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.		NA
	Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.		Supplemental Table 2
	DISCUSSION		pr		
	Discussion	23a	Provide a general interpretation of the results in the context of other evidence.		Page 25-26
		23b	Discuss any limitations of the evidence included in the review.		Page 28-29
		23c	Discuss any limitations of the evidence included in the review.		Page 28-29
		23d	Discuss implications of the results for practice, policy, and future research.		Page 28
	OTHER INFORMAT	ΓΙΟΝ			-
	Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review	was not registered.	Page 7
37		24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared. \vec{a}		NA
41 42 43 44		24c	Describe and explain any amendments to information provided at registration or in the protocol.		NA
	Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the give	ew.	Page 30
	Competing interests	26	Declare any competing interests of review authors.		Page 30
	Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; deta e studies; data used for all analyses; analytic code; any other materials used in the review. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	extracted from included	NA



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