Epidural Steroid Compared To Placebo Injection In Lumbar Radiculopathy: A Systematic Review And Meta-analysis

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Introduction

- Epidural steroid injections (ESI) are an established treatment for lumbar radiculopathy
- The aim of ESI treatment is to alleviate pain and improve physical functionality and quality of life
- ESI targets the inflammatory processes and immune reactions surrounding the affected nerve root
- There is no consensus on the superiority of steroid in comparison with epidural and non-epidural placebo injections
- This review and meta-analysis explores the validity of ESI treatment compared to placebo in current practice

Methods

- The PubMed, Embase, Cochrane Library and Web of Science databases were searched for eligible studies:
  - Randomized-controlled trials on patients with lumbar radiculopathy comparing ESI to placebo injection
  - ESI: steroid injection into the epidural space
  - Placebo: epidural or non-epidural (e.g., subcutaneous) injection with a local anesthetic, saline or both
  - All epidural techniques (transforaminal (TF), interlaminar (IL) and caudal) were accepted
  - Outcome measure: pain or disability
- Risk of bias
- Primary outcomes
  - Leg pain, back pain and disability (VAS, NRS, RMDQ, ODI)
  - Continuous and proportional data
- Secondary outcomes
  - Complications

Methods

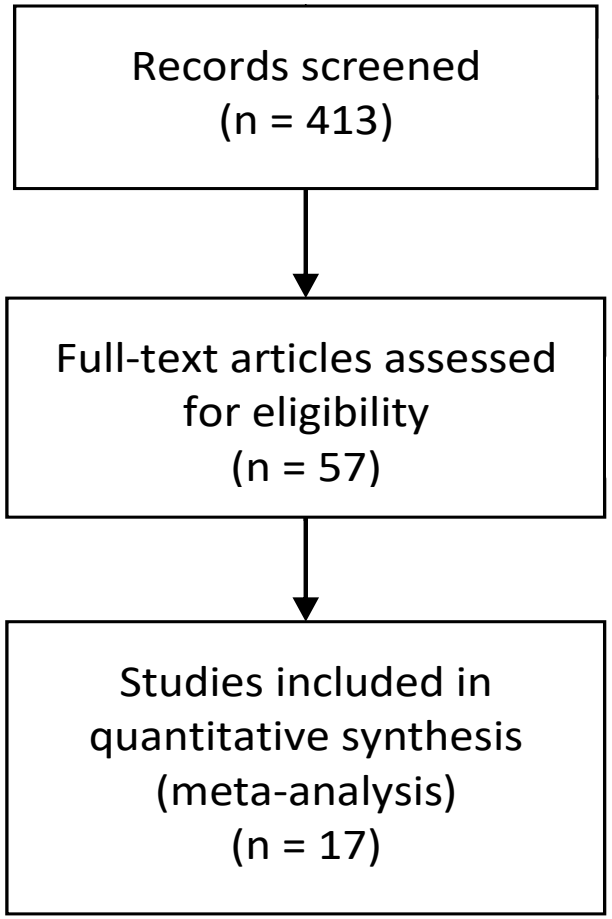
- Statistical analysis – primary outcomes
  - Random-effects model pooled for all epidural approaches together and separately
  - For 6 weeks, 3 months and 6 months follow-up
  - Conversion of scores to 0-100 scale
  - Minimally clinical important difference (MCID): pain – 10 points / disability – 15 points
  - Sensitivity analyses

- Statistical analysis – secondary outcomes
  - Qualitative analysis

Results

- 17 studies included
  - Epidural placebo: 13
  - Non-epidural placebo: 2
  - Both: 2

- Risk of bias
  - Low-risk: 5
  - Medium-risk: 2
  - High-risk: 10



Results – Leg pain

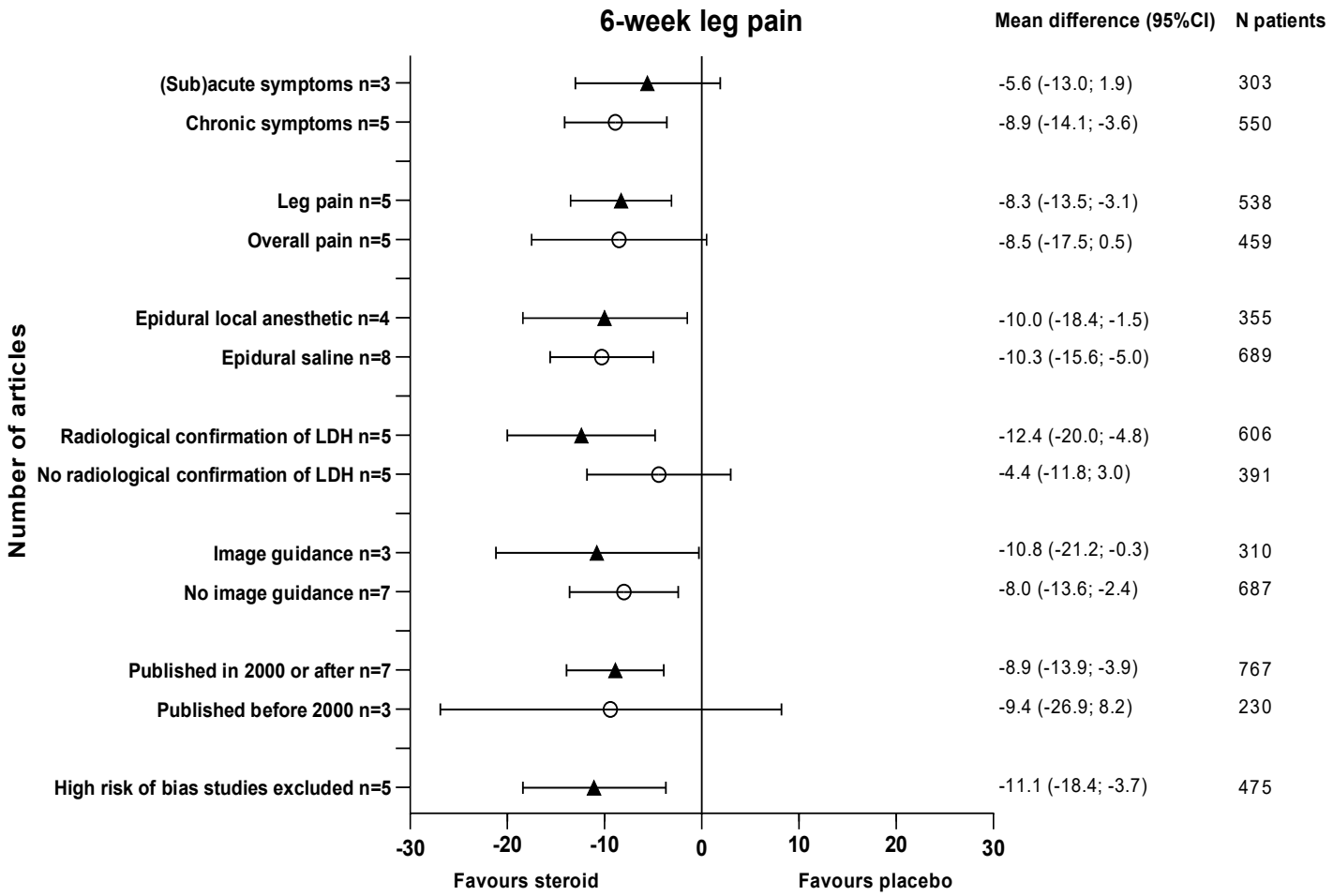
- Epidural steroid is statistically significantly superior to epidural placebo at all follow-up time frames when adjusted for heterogeneity
- Epidural steroid is not superior to non-epidural placebo

	Primary analysis						*Sensitivity analysis for heterogeneity*				
	Number of studies	**Number of patients**	**MD (95% CI)**	**P-value**	**I^2**		**Number of studies**	**Number of patients**	**MD (95% CI)**	**P-value**	**I^2**
Epidural steroid vs. epidural placebo											
6-week FU	10	997	-8.6 (-13.4; -3.9)	<0.01	70%		7	830	-5.9 (-8.7; -3.2)	<0.01	14%
3-month FU	10	1188	-5.2 (-10.1; -0.2)	0.04	83%		7	792	-6.8 (-10.3; -3.2)	<0.01	25%
6-month FU	7	677	-2.7 (-8.0; 2.6)	0.31	75%		4	330	-5.1 (-8.0; -2.3)	<0.01	0%
Epidural steroid vs. non-epidural placebo											
6-week FU	4	399	-8.1 (-17.8; 1.6)	0.10	80%		2	302	-0.1 (-3.9; 3.7)	0.97	0%
3-month FU	3	337	-1.0 (-17.9; 15.8)	0.90	92%		*	-	-	-	-
6-month FU	2	294	1.7 (-2.1; 5.4)	0.38	0%		*	-	-	-	-

CI: confidence interval; FU: follow-up; I^2: degree of heterogeneity; MD: mean difference. *The limited number of studies did not allow for sensitivity analysis of heterogeneity

Results – Leg pain

- Sensitivity analysis 6 wk
  - Caudal and TF performed better than IL
  - Confirmed LDH patients reported better symptom relief than patients with a clinical diagnosis of lumbar radiculopathy
  - Exclusion of high risk-of-bias studies changed the mean difference further towards steroid injections



CI: confidence interval; IL: interlaminar; LDH: lumbar disc herniation; TF: transforaminal

Results – Back pain

- Epidural steroid is not superior to (non-)epidural placebo at all follow-up time frames
- At 3 months follow-up, non-placebo was favoured over steroid
- Sensitivity analysis for heterogeneity was not feasible due to the limited number of studies

	Primary analysis				
	Number of studies	**Number of patients**	**MD (95% CI)**	**P-value**	**I^2**
Epidural steroid vs. epidural placebo					
6-week FU	3	290	-2.9 (-6.8; 0.9)	0.14	0%
3-month FU	2	227	0.7 (-23.5; 25.0)	0.95	94%
6-month FU	2	225	-4.9 (19.9; 10.2)	0.53	84%
Epidural steroid vs. non-epidural placebo					
6-week FU	2	302	-1.7 (-6.6; 3.1)	0.49	34%
3-month FU	2	298	6.9 (1.3; 12.5)	0.02	42%
6-month FU	2	294	1.3 (-2.2; 4.9)	0.46	0%

CI: confidence interval; FU: follow-up; I^2: degree of heterogeneity; MD: mean difference

Results – Disability

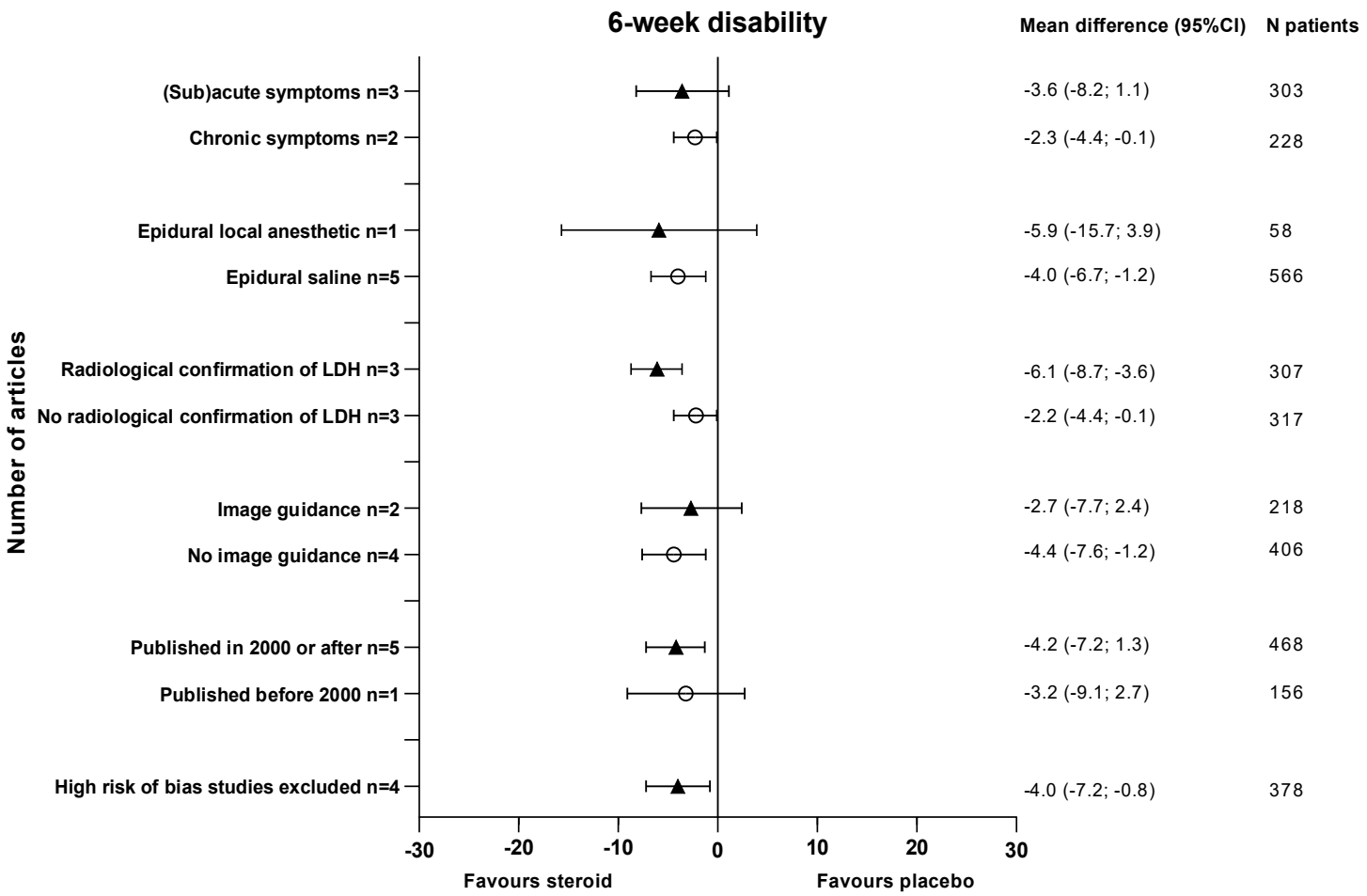
- Epidural steroid is statistically significantly superior to epidural placebo at 6 weeks and 3 months follow-up when adjusted for heterogeneity
- Epidural steroid is not superior to non-epidural placebo

	Primary analysis					*Sensitivity analysis for heterogeneity*				
	Number of studies	**Number of patients**	**MD (95% CI)**	**P-value**	**I^2**	**Number of studies**	**Number of patients**	**MD (95% CI)**	**P-value**	**I^2**
Epidural steroid vs. epidural placebo										
6-week FU	6	624	-4.1 (-6.5; -1.6)	<0.01	35%	5	531	-2.5 (-4.5; -0.5)	0.01	0%
3-month FU	9	981	-2.5 (-5.5; 0.5)	0.10	71%	8	912	-4.1 (-5.9; -2.3)	<0.01	0%
6-month FU	6	653	-1.0 (-5.4; 3.5)	0.67	84%	2	239	-2.6 (-6.1; 0.8)	0.14	0%
Epidural steroid vs. non-epidural placebo										
6-week FU	2	302	-0.8 (-3.3; 1.6)	0.52	25%	*	-	-	-	-
3-month FU	2	298	4.0 (-3.0; 11.0)	0.26	83%	*	-	-	-	-
6-month FU	2	294	2.8 (-3.9; 9.5)	0.41	84%	*	-	-	-	-

CI: confidence interval; FU: follow-up; I^2: degree of heterogeneity; MD: mean difference. *The limited number of studies did not allow for sensitivity analysis of heterogeneity

Results – Disability

- Sensitivity analysis 6 wk
  - Caudal, IL and TF approaches resulted in equal treatment outcome
  - No evident subgroups of patients could be identified that benefitted more from one of two treatments



CI: confidence interval; IL: interlaminar; LDH: lumbar disc herniation; TF: transforaminal

Results – Proportional data for leg pain and disability

- Epidural steroid is not superior to epidural placebo for all follow-up time frames
- Proportional data on treatment success was not available for non-epidural placebo studies

	Primary analysis					*Sensitivity analysis for heterogeneity*				
	Number of studies	**Number of patients**	**RR (95% CI)**	**P-value**	**I^2**	**Number of studies**	**Number of patients**	**RR (95% CI)**	**P-value**	**I^2**
≥50% improvement in pain scores										
6-week FU	2	150	2.3 (0.9; 5.9)	0.08	81%	*	-	-	-	-
3-month FU	5	487	1.1 (1.0; 1.3)	0.15	51%	4	418	1.1 (1.0; 1.2)	0.29	0%
6-month FU	5	487	1.1 (0.9; -1.3)	0.24	60%	2	178	1.0 (0.7; 1.4)	0.98	24%
≥50% improvement in ODI scores										
6-week FU	3	360	1.1 (0.9; 1.2)	0.43	28%	2	240	1.1 (1.0; 1.3)	0.09	0%
3-month FU	3	360	1.1 (0.9; 1.4)	0.50	72%	2	240	1.0 (0.8; 1.1)	0.66	0%

CI: confidence interval; FU: follow-up; I^2: degree of heterogeneity; MD: mean difference. *The limited number of studies did not allow for sensitivity analysis of heterogeneity

Results – Complications

- No adverse events: 5/17 studies

- Severe adverse event: 1 study
  - Retroperitoneal haematoma (n = 1)

- Minor adverse events:
  - Local pain at injections site (15.6%)
  - Headache (14.2%)
  - Nausea (8.2%)
  - Tinnitus (5.5%)
  - Intravascular infiltration (4.1%)

Discussion

- ESI results in greater improvement of leg pain and disability in comparison with epidural placebo
- Treatment differences are small and do not meet MCID standards
- For back pain and comparisons with non-epidural placebo no strong conclusions can be drawn due to the quality and limited number of studies
- There may be subgroups of patients that benefit more from steroid injections than other patient groups
- Based on the current evidence, ESI is effective for short-term pain management and improvement of functional status, but benefits are limited compared to placebo

Summary points

- There is no consensus on the superiority of steroid in comparison with epidural and non-epidural placebo injections for patients with lumbar radiculopathy
- ESI can result in greater improvement of symptoms of leg pain and disability on the short-term in comparison with epidural placebo, but treatment differences are limited
- ESI can be considered a safe therapy
- Future research should focus on subgroups of patients with lumbar radiculopathy that benefit more from ESI treatment compared to placebo than others
- In clinical practice, physicians and patients should discuss the possible small short-term benefits and complications of ESI in a process of shared decision-making

Disclosures

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All other authors declare that they have no conflict of interest