Appendix 3 Paper III

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RESEARCH

Effect of caudal epidural steroid or saline injection in chronic lumbar radiculopathy: multicentre, blinded, randomised controlled trial

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Abstract

Objective To assess the efficacy of caudal epidural steroid or saline injection in chronic lumbar radiculopathy in the short (6 weeks), intermediate (12 weeks), and long term (52 weeks).

Design Multicentre, blinded, randomised controlled trial.

Setting Outpatient multidisciplinary back clinics of five Norwegian hospitals.

Participants Between October 2005 and February 2009, 461 patients assessed for inclusion (presenting with lumbar radiculopathy >12 weeks). 328 patients excluded for cauda equina syndrome, severe paresis, severe pain, previous spinal injection or surgery, deformity, pregnancy, ongoing breast feeding, warfarin therapy, ongoing treatment with non-steroidal anti-inflammatory drugs, body mass index >30, poorly controlled psychiatric conditions with possible secondary gain, and severe comorbidity.

Interventions Subcutaneous sham injections of 2 mL 0.9% saline, caudal epidural injections of 30 mL 0.9% saline, and caudal epidural injections of 40 mg triamcinolone acetonide in 29 mL 0.9% saline. Participants received two injections with a two week interval.

Main outcome measures Primary: Oswestry disability index scores. Secondary: European quality of life measure, visual analogue scale scores for low back pain and for leg pain.

Results Power calculations required the inclusion of 41 patients per group. We did not allocate 17 of 133 eligible patients because their symptoms improved before randomisation. All groups improved after the interventions, but we found no statistical or clinical differences between the groups over time. For the sham group (n=40), estimated change in the Oswestry disability index from the adjusted baseline value was −4.7 (95% confidence intervals −0.6 to −8.8) at 6 weeks, −11.4 (−6.3 to −14.5) at 12 weeks, and −14.3 (−10.0 to −18.7) at 52 weeks. For the epidural saline intervention group (n=39) compared with the sham group, differences in primary outcome were −0.5 (−6.3 to 5.4) at 6 weeks, 1.4 (−4.5 to 7.2) at 12 weeks, and −1.9 (−8.0 to 4.3) at 52 weeks; for the epidural steroid group (n=37), corresponding differences were −2.9 (−8.7 to 3.0), 4.0 (−1.9 to 9.9), and 1.9 (−4.2 to 8.0). Analysis adjusted for duration of leg pain, back pain, and sick leave did not change this trend.

Conclusions Caudal epidural steroid or saline injections are not recommended for chronic lumbar radiculopathy.

Trial registration Current Controlled Trials ISRCTN No 12574253.

Introduction

Chronic lumbar radiculopathy is defined as a clinical syndrome of back and leg pain accompanied by sensory, reflex, or motor deficits in a nerve root distribution lasting for more than 12 weeks.[1-4] The lifetime prevalence of lumbar radiculopathy has been reported to be 5.3% in men and 3.7% in women.[5 6] Lumbar radiculopathy due to a prolapsed disc resolves spontaneously in 23-48% of patients, but up to 30% will still have pronounced symptoms after one year, 20% will be out of work, and 5-15% will undergo surgery.[7-10]

Epidural steroid injections for lumbar radiculopathy have been used since 1953.[11] Along with mechanical compression of nerve roots, lumbar radiculopathy can be triggered by different proinflammatory chemical agents,[12-15] causing ectopic neuron firing.[16] Steroids injected into the epidural space or around the affected nerve root are thought to inhibit these inflammatory mediators. However, there is conflicting evidence for a potential

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benefit of epidural steroid injections.[17-21] Some studies have shown a moderate short term benefit,[18-25] whereas others have shown little difference between epidural steroid and placebo injections.[26-28] Studies comparing epidural steroid injections with epidural saline or local anaesthetic injections have shown less benefit from steroids[26 29 30] than those comparing epidural steroid injections with sham or soft tissue injections.[22 23 31 32] Furthermore, recent studies have concluded that epidural local anaesthetic or saline alone could have a positive effect by itself.[33 34]

At the one year follow-up after epidural steroid injection, improvement of pain and disability has been reported for 36% to 43% of the patients.[25 35] However, this outcome does not differ greatly from the natural history of the disease.[36] The true effect of epidural steroid injections might be to reduce radicular pain before natural recovery occurs.[37] Despite the lack of evidence for long term efficacy, the use of epidural steroid injection in the United States increased from 553 to 2055 per 100 000 patients from 1994 to 2001.[38] In the United Kingdom, epidural steroid injection for lumbar radiculopathy was one of the most common therapeutic spine injection procedures in 2002-03.[1]

We aimed to assess the effects of caudal epidural steroid and saline injections compared with subcutaneous sham injections in patients with chronic radiculopathy, by measuring improvements in physical function, health related quality of life, and pain at short term (6 weeks), intermediate term (12 weeks), and long term (52 weeks) follow-up.

Methods

We used a subcutaneous sham injection to control for the possible effect of a high volume saline injected into the epidural space, and we compared epidural steroid injections with epidural saline injections to clarify the effect of steroids.

Participants

We referred patients with lumbar radiculopathy from the catchment area of the University Hospital of North Norway, St Olavs University Hospital, Levanger Hospital, Nordland Hospital, and Buskerud Hospital (population 1 146 076). The general practitioners, neurosurgeons, orthopaedic surgeons, neurologists, manual physiotherapists, and chiropractors working in these areas were informed by letter about the trial.

The inclusion criteria included unilateral lumbar radiculopathy lasting for more than 12 weeks. The intensity of the leg pain, radiating from the back to below the knee, had to be comparable or worse than the back pain. We assessed eligible patients aged between 20 and 60 years consecutively for inclusion and obtained written informed consent. The clinical examination followed a prepared study template to decide whether the patient had a lumbar radiculopathy and to determine the most probable nerve root affected. Trained neurologists or specialists in physical medicine and rehabilitation in cooperation with a physiotherapist undertook the inclusion examinations. We excluded 328 patients presenting with a cauda equina syndrome, severe paresis, severe pain, history of spinal injection or surgery, deformity, pregnancy, ongoing breast feeding, warfarin therapy, ongoing treatment with non-steroidal anti-inflammatory drugs, body mass index of more than 30, poorly controlled psychiatric conditions with possible secondary gain, or severe comorbidity. Twenty four (7%) excluded patients underwent back surgery.

We did magnetic resonance imaging (n=110) or computed tomography (n=6) in all included patients. Experienced radiologists at each centre assessed the images and produced a written report for the investigators. Inclusion in the trial was not dependent on the results from the magnetic resonance imaging and computed tomography. The results did not have to correspond with those from the clinical examination. To be included, the patients had to have clinically proved radiculopathy. We excluded patients who showed severe intraspinal pathology (large disc herniations occupying more than 50% of the spinal canal, spinal stenosis, tumours, bleeding, dural fistula, synovial cysts, or dysraphia).

Each patient completed self administered questionnaires including the outcome measures, which were identical at baseline and follow-up. The baseline questionnaires contained additional questions about demographics, education, duration of pain, work status, avoidance of movement owing to fear of pain, medication, and lifestyle issues. We also monitored clinical signs of lumbar radiculopathy, need for physiotherapy or surgery during follow-up, whether the patient perceived benefit of the intervention, beliefs about fear avoidance,[39] and working capability at each follow-up. All patients received standardised oral and written information about spine anatomy and function at baseline and follow-up. Patients were encouraged to engage in physical activity,[40-43] and received an information brochure.[44] Patients using non-steroidal anti-inflammatory drugs were told to stop this medical treatment.

Randomisation

The clinical research centre at the University Hospital of North Norway used a computer generated block scheme for randomisation, stratified by intervention hospital. The centre was contacted by telephone on the day of intervention. The individuals undertaking the randomisation did not take any further part in the trial.

Outcomes

The Oswestry disability index was the primary outcome measure. The Oswestry disability index questionnaire contains 10 questions on limitations of activities to daily living. Each variable was rated on a 0-5 point scale, added up, and converted into a percentage functional score ranging from 0 to 100 (where 0=no disability).[45-47]

We assessed secondary outcome measures by the European quality of life measure, the visual analogue scale for low back pain, and the visual analogue scale for leg pain. The European quality of life measure is a generic and preference weighted measure of health related quality of life. It evaluates five dimensions: mobility, self care, activities of daily life, pain, and anxiety or depression. For each dimension, the patient describes three possible levels of problems (none, mild to moderate, and severe). This descriptive system contains 243 (35) combinations or index values for health states.[48] We used the value set from the main survey of the EuroQol group,[49] which has been validated for patients with lumbar radiculopathy.[50] Total score range is from −0.594 to 1, where 1 corresponds to perfect health and 0 to death. Negative values are considered to be worse than death.[48] The intensity of leg pain and low back pain was indicated on a horizontal 100 mm visual analogue scale (where 0=no pain).[50 51]

Follow-up

A blinded physiotherapist and doctor followed up patients at 6, 12, and 52 weeks. Use of physiotherapy was recorded during follow-up, but was not routinely offered to the patients. During the study, surgeons independently assessed the need for surgical treatment among patients with increasing pain or paresis.

We used a global question on a four point Likert scale to measure the benefit of the intervention at each follow-up.[52] The patients were asked: "What benefit of the treatment have you had?" The response alternatives were: "much", "some", "no benefit", and "I am worse". We recoded these variables into a dichotomous outcome with "much" and "some" benefit representing that the patients had benefited from the treatment.

Intervention

A standardised referral letter for the intervention contained information about the patient's cardiac and pulmonary status, medication, and allergies, but did not include information about back pain and radiculopathy. There were three intervention groups. Group 1 received subcutaneous sham injections of 2 mL 0.9% saline, superficial to the sacral hiatus and not into the spinal canal. Group 2 received caudal epidural injections of 30 mL 0.9% saline. Group 3 received caudal epidural injections of 40 mg triamcinolone acetonide in 29 mL 0.9% saline. All three intervention groups received two injections with a two week interval; the second injection was cancelled if spontaneous recovery had occurred between inclusion and the first intervention.

An experienced anaesthesiologist gave the injections and followed a set template.[53 54] Anatomical landmarks were used to identify the sacral hiatus. In addition, use of an ultrasound machine (Honda Diagnostic Scanner HS-2000 Cine, Honda Electronics Co) capable of examining musculoskeletal tissues with a 10 MHz real time linear array ultrasound transducer increased the precision of the injections.[55-57]

Blinding

We ensured that the patients, outcome assessors, and care providers were blinded during the study period; they were all unaware of the randomisation and intervention given by the anaesthesiologists. The anaesthesiologist giving the injections was not blinded because inclusion of a subcutaneous sham group made this impossible.[58] The injection products were concealed from the patients, and the anaesthesiologists were instructed not to discuss the injection procedure or the products used with the patients.

Statistical analysis

We did sample size calculations for a multicentre multilevel longitudinal model with repeated measurements on the primary continuous outcome variable, the Oswestry disability index. The study was powered to detect an assumed clinically significant difference between one of the two injection groups and the sham group of 10 points on average over time. Based on a standard deviation of 18, a significance level of 5%, a power of 80%, and a correlation coefficient of 0.6 between the three follow-up measurements, the number of patients in each intervention group needed to be 37. Adjusting for losses to follow-up and withdrawals from the study, we set the minimum number of patients to be included in each group to be 41.

The analyses for all outcome measures used all available data on an intention to treat basis. We analysed all patients according to the group to which they were allocated, regardless of crossovers, surgery, withdrawal from the study, or loss to follow-up. In the analysis of outcomes in patients who withdrew or were lost to follow-up, we used the available data in the mixed model analysis. We analysed data with Stata 11.0 (StataCorp) and SPSS 17.0 (SPSS Inc).

Descriptive statistics were presented as means with standard deviations, means with confidence intervals, or numbers with percentages. We assessed groups at baseline by analysis of variance for continuous variables and by Pearson χ^2 tests for categorical variables.

We used linear mixed models to assess differences in time trends between the treatment groups for the primary and secondary outcome measures.[59] We added time to the model as a categorical variable represented by dummy variables to analyse the differences between the groups at different time points. In all mixed model analyses, we made a crude adjustment for the baseline values of the particular outcome variable. In secondary analysis, we made additional adjustments for any duration of back pain, leg pain, and sick leave before inclusion. All tests were two sided using a significance level of 5%.

Results

Between October 2005 and February 2009, 461 patients were assessed for inclusion, and 133 were included in the study (48, University Hospital of North Norway; 20, Nordland Hospital; 26, Levanger Hospital; 27, St Olavs University Hospital; 12, Buskerud Hospital). Of the 328 excluded patients, three exclusions (1%) were because of intraspinal pathology and eight (2%) because of psychiatric conditions. Seventeen patients did not undergo randomisation because their symptoms improved between assessment and randomisation (fig 1⇓). Therefore, we included 116 (25%) patients in the intention to treat analysis.

After randomisation, we excluded another five patients because of spontaneous improvement before the first injection (fig 1). We analysed 37 patients in the caudal epidural steroid group, 39 in the caudal epidural saline group, and 40 in the sham group (fig 1). We followed up 109 patients at 6 weeks, 105 at 12 weeks, and 99 at 52 weeks (table 1⇓). We did not record any crossovers between the treatment groups. The distribution between treatment groups within each hospital was roughly equal, and adjustment for hospital did not change these results (table 2⇓). Table 3⇓ shows baseline characteristics of the study population. We did not detect any significant differences between treatment groups, except for a significantly higher rate of the presence of ankle tendon reflex difference among patients in the caudal epidural saline group.

The median interval between inclusion and randomisation to the first injection was 3 (range 0-17) weeks, and the median interval between the two injections was 3 (2-5) weeks. This variation was caused by logistical and patient related factors affected by long travelling distance in rural Norway. We did not detect any difference in median time interval between inclusion and randomisation between the groups. We registered no serious complications from the injections. Six (5%) patients experienced local pain during the first injection and declined the second injection, thereby discontinuing the intervention (fig 1). The treatment groups did not differ significantly for the primary and secondary outcomes. Figures 2-5⇓⇓⇓⇓show the between group differences for the primary and secondary outcome variables from baseline to follow-up.

For both the primary and secondary outcome measures at 6, 12, and 52 week follow-up, we did not see any significant differences between the epidural injection groups and the sham group. Furthermore, the observed differences were not clinically important.[60] The estimated change in the Oswestry disability index from the adjusted baseline value for the sham group was −4.7 (95% confidence intervals −0.6 to −8.8) at 6 week follow-up, −11.4 (−6.3 to −14.5) at 12 weeks, and −14.3 (−10.0 to −18.7) at 52 weeks. The observed between group differences at 6, 12, and 52 week follow-up between the epidural injection groups and the sham group were not clinically important. These

results did not change after we adjusted for both the baseline scores and the duration of leg pain, low back pain, and sick leave (tables 4⇓ and 5⇓).

Ancillary analysis

Fear avoidance belief scores decreased significantly from baseline to the 52 week follow-up in all three groups (P<0.001) but did not differ significantly between the groups (table 6⇓). We did not find a significant reduction in the use of pain relief medication from baseline to the 6 week follow-up, nor did we record any significant difference between the intervention groups in the use of paracetamol (P=0.26), non-steroidal anti-inflammatory drugs (P=0.45), or morphine (P=0.70) (table 7⇓).

Between baseline and 52 week follow-up, we detected a significant reduction in patients receiving sickness benefit in the sham group (P=0.01) but not in either of the epidural injection groups. However, there were no significant differences between the groups (P=0.61). At the 52 week follow-up, 28 (28%) patients received sickness benefit: 7 (22%) in the sham group, 10 (30%) in the epidural saline group, and 11 (32%) in the epidural steroid group.

During follow-up, 41 (13%) patients had physiotherapy: 12 (11%) at 6 weeks, 18 (17%) at 12 weeks, and 11 (11%) at 52 weeks, with no significant differences between the groups (P=0.69). Fifteen (15%) patients had back surgery at the 52 week follow-up: one (1%) in the epidural steroid group, six (6%) in the epidural saline group, and eight (8%) in the sham group, with no significant differences between the groups (P=0.07).

At baseline, all patients had clinically verified lumbar radiculopathy (table 1). At 52 week follow-up, 27 (27%) patients still had a lumbar radiculopathy, with no significant differences seen between the groups (P=0.95). At 52 week follow-up, 49 (50%) patients stated that they had received "much" or "some" benefit from the treatment, with no significant differences seen between the groups (P=0.81).

Discussion

This randomised controlled trial compared caudal epidural steroid or saline injections with subcutaneous sham injections. The results confirm the null hypothesis that treatment of chronic lumbar radiculopathy with caudal epidural injection of steroids or isotonic saline has no clinically important effect. We did not find any significant differences between the treatment groups in need of physiotherapy or surgery and the patients receiving sickness benefit. We expected fear avoidance belief scores to be low at baseline and to fall during follow-up, because patients were informed about the favourable prognosis of the lumbar radiculopathy and were repeatedly encouraged to stay active.

Comparison with existing literature

There is conflicting evidence on whether epidural steroid injections are efficacious,[61-63] and if so, what volume, composition, or concentration of injection is best.[29 53 64-70] Two randomised studies found that transforaminal steroid injections, which deposit the medication directly over the affected nerve roots, are more effective than caudal epidural steroid injections in the short term.[63 71] We did not address this issue in our study.

Four randomised placebo controlled trials published between 1971 and 2009 with at least 12 months' follow-up, including between 23 and 183 participants, found no long term effect of caudal epidural steroid injections.[29 30 32 33 72] One study showed a positive effect of caudal epidural steroid injection.[72] However, the reported effect size (change in Oswestry disability index score of 8.1 points) was smaller than what is considered to be the minimal clinically significant difference.[43]

High volumes of epidural solutions have been thought to clear or dilute locally concentrated chemical irritants around the spinal nerve roots.[29 72] In our study, the effect of a high volume, caudal epidural saline injection did not differ from a sham injection. Our results suggest that the effect attributed to isotonic saline probably reflects the spontaneous, natural course of lumbar radiculopathy.[73]

Strengths and limitations

This multicentre randomised controlled study was designed to determine whether high volume, epidural saline injections alone or epidural saline injections in combination with epidural steroid could benefit patients with longstanding radiculopathy. The study population was homogeneous with low psychosocial strain. We carefully selected patients on the basis of clinical criteria and not on strict magnetic resonance imaging findings. This method accords with how epidural steroid injections are used in daily clinical practice, improving the external validity of our study. We used the caudal epidural injection technique with ultrasound guiding to improve the precision. However, we did not use contrast to visualise where the medication spread. The use of large volumes (30 mL) for the epidural injections ensured sufficient spread of the medication, reducing the need for radiography during the injection procedure.

Our power calculation required inclusion of 41 patients in each group to detect a 10 point between group difference for the primary outcome measure. We did not reach this goal because of rapid improvement in 17 patients between inclusion and randomisation. Therefore, the study was slightly underpowered, with four patients missing from the epidural steroid group, two from the epidural saline group, and one from the sham group. However, the study showed no trend towards any group difference after 12 months. We therefore consider it highly unlikely that a larger study population would have affected the results. Furthermore, the patients in our study had longlasting symptoms of radiculopathy (range 26-57 weeks), and our results might not be as relevant for patients with radiculopathy of shorter duration.

Low efficacy, under-dosage, and a dilution effect due to the high volumes injected could have influenced the effect of the caudal epidural steroid injection in our study. The most commonly used steroids for epidural injections are triamcinolone acetonide, betamethasone, and methylprednisolone. One study compared triamcinolone and betamethasone and favoured triamcinolone.[74] When given in equivalent doses, the efficacy of these three steroids is generally considered to be comparable.[22] In one study, researchers also used triamcinolone to compare the effect of lumbar epidural steroid injection with placebo.[22] They gave three 80 mg injections over nine weeks (total dose 240 mg), whereas we used two 40 mg injections over two weeks (total dose 80 mg). The observed effects from the previous study did not differ from our results. It is therefore unlikely that we could have improved the treatment effects by using another steroid, or by increasing the dose of triamcinolone.[75]

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What is already known on this topic

Clinical studies indicate that epidural steroid and saline injections might reduce pain due to acute lumbar radiculopathy in the short term, but the middle term and long term effects are unknown

What this study adds

Neither caudal epidural steroid injections nor caudal epidural saline injections are effective for chronic lumbar radiculopathy and are not recommended as an adjunct to recovery in patients whose symptoms have extended beyond 12 weeks

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Ethical approval: The study protocol was approved by the ethics committee for Medical Research Region 5 Norway.

Data sharing: Technical appendix, statistical code, and dataset are available from the corresponding author.

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Tables

Table 1| Number (%) of patients at follow-up, by randomisation group

Follow-up	Sham group (n=40)	Caudal epidural saline group (n=39)	Caudal epidural steroid group (n=37)	Total no (n=116)
6 weeks	37 (93)	35 (90)	37 (100)	109 (94)
12 weeks	36 (90)	35 (90)	34 (92)	105 (91)
52 weeks	32 (80)	33 (85)	34 (92)	99 (85)

Table 2| **Number of patients at follow-up, by randomisation group**

Follow-up hospital/week	Sham group	Caudal epidural saline group	Caudal epidural steroid group	Total no
University Hospital of North Norway				
6	15	10	13	38
12	14	10	12	36
52	13	9	12	34
Nordland Hospital				
6	8	10	8	26
12	6	6	6	18
52	6	6	5	17
Levanger Hospital				
6	8	10	8	26
12	7	10	6	23
52	6	10	7	23
St Olavs University Hospital				
6	5	7	7	19
12	5	6	7	19
52	5	5	7	17
Buskerud Hospital				
6	3	3	3	9
12	4	3	3	13
52	2	3	3	5

Table 3| Baseline characteristics of study population with chronic lumbar radiculopathy

	Sham group (n=40)	Caudal epidural saline group (n=39)	Caudal epidural steroid group (n=37)
Mean (SD) age (years)	42.8 (9.2)	42.8 (11.6)	40.1 (10.0)
Male sex	24 (60)	24 (62)	20 (54)
Mean (SD) body mass index (kg/m²)	26.0 (3.3)	26.1 (3.6)	26.7 (4.5)
Physically demanding work	19 (47)	18 (46)	21 (57)
Received sickness benefit*	22 (55)	26 (67)	25 (68)
Mean (SD) duration of sick leave (weeks)	14.0 (32.8)	21.3 (32.7)	20.1 (37.6)
Mean (SD) duration of leg pain (weeks)	26.7 (22.4)	57.1 (158.0)	42.5 (62.6)
Mean (SD) duration of back pain (weeks)	46.6 (86.3)	63.1 (157.8)	50.4 (64.3)
Use of analgesics			
Paracetamol	13 (33)	9 (23)	11 (30)
NSAID	6 (15)	4 (10)	10 (27)
Morphine	6 (15)	7 (18)	9 (24)
Positive straight leg raising test†	21 (53)	23 (59)	18 (49)
Dermatomal sensory loss	31 (78)	23 (59)	29 (78)
Dermatomal muscle weakness	31 (78)	31 (80)	32 (87)
Knee tendon reflex difference	6 (15)	9 (23)	6 (16)
Ankle tendon reflex difference‡	13 (33)	24 (62)	10 (27)
Clinically suspected level of lumbar radiculopathy			
L2-L3	–	–	1 (3)
L3-L4	3 (8)	2 (5)	2 (5)
L4-L5	12 (30)	11 (28)	14 (38)
L5-S1	25 (63)	26 (67)	20 (54)
MRI or CT findings			
Normal	–	1 (3)	–
Disc protrusion	1 (3)	–	–
Disc herniation	24 (60)	23 (59)	26 (70)
Disc sequestration	14 (35)	14 (36)	11 (30)
Recess stenosis	1 (3)	1 (3)	–
Mean (95% CI) FABQ work	21.6 (17.9 to 25.3)	25.0 (21.9 to 28.1)	23.5 (20.5 to 26.5)
Mean (95% CI) FABQ physical activity	13.0 (11.3 to 14.7)	13.5 (12.1 to 14.9)	11.9 (10.2 to 13.6)
Mean (95% CI) Oswestry disability index	26.3 (22.0 to 30.6)	31.4 (26.9 to 35.9)	32.5 (28.6 to 36.4)
Mean (95% CI) EQ5D	0.54 (0.47 to 0.56)	0.46 (0.35 to 0.56)	0.54 (0.45 to 0.62)
Mean (95% CI) VAS leg pain	48.3 (39.6 to 56.9)	53.5 (45.6 to 61.3)	50.1 (42.5 to 57.7)
Mean (95% CI) VAS back pain	46.3 (39.2 to 54.1)	49.6 (40.3 to 58.2)	46.8 (39.0 to 54.6)

Data are number (%) unless stated otherwise. SD=standard deviation; CI=confidence intervals; NSAID=non-steroidal anti-inflammatory drug; MRI=magnetic resonance imaging; CT=computer tomography; FABQ=fear avoidance beliefs questionnaire; EQ5D=European quality of life measure; VAS=visual analogue scale.
*On full or partial sick leave, government funded rehabilitation, or disability pension.
†When radiating leg pain >60° elevated leg.
‡P=0.004 difference.

Table 4| **Estimated differences in Oswestry disability index score between epidural injection groups and sham group at follow-up**

	Difference (95% confidence intervals) at follow-up		
	6 weeks	12 weeks	52 weeks
Crude analysis*			
Epidural saline injection	−0.5 (−6.3 to 5.4)	1.4 (−4.5 to 7.2)	−1.9 (−8.0 to 4.3)
Epidural steroid injection	−2.9 (−8.7 to 3.0)	4.0 (−1.9 to 9.9)	1.9 (−4.2 to 8.0)
Adjusted analysis†			
Epidural saline injection	−0.6 (−6.6 to 5.4)	1.5 (−4.5 to 7.5)	−2.6 (−8.9 to 3.6)
Epidural steroid injection	−3.2 (−9.1 to 2.7)	3.7 (−2.3 to 9.7)	1.7 (−4.5 to 7.8)

Data based on mixed model analysis with sham group as reference.

*Analysis adjusted for baseline values.

†Analysis adjusted for duration of leg pain, back pain, and sick leave.

Table 5| **Estimated differences in secondary outcome measures between epidural injection groups and sham group at follow-up**

	Difference (95% confidence intervals) at follow-up		
	6 weeks	12 weeks	52 weeks
Leg pain			
Crude analysis*			
Epidural saline injection	3.2 (−9.1 to 15.5)	2.5 (−9.6 to 14.6)	3.1 (−9.6 to 15.8)
Epidural steroid injection	−1.3 (−13.3 to 10.7)	11.2 (−1.0 to 23.4)	−0.2 (−12.9 to 12.5)
Adjusted analysis†			
Epidural saline injection	2.7 (−9.8 to 15.2)	1.7 (−10.7 to 14.0)	0.5 (−12.4 to 13.4)
Epidural steroid injection	−2.6 (−14.6 to 9.4)	10.0 (−2.2 to 22.3)	−1.4 (−14.1 to 11.4)
Low back pain			
Crude analysis*			
Epidural saline injection	−5.0 (−16.7 to 6.7)	−7.8 (−19.3 to 3.8)	−2.0 (−14.3 to 10.2)
Epidural steroid injection	−4.8 (−16.2 to 6.6)	6.6 (−5.0 to 18.2)	0.0 (−12.1 to 12.2)
Adjusted analysis†			
Epidural saline injection	−6.9 (−18.8 to 5.1)	−9.3 (−21.2 to 2.5)	−4.1 (−16.5 to 8.4)
Epidural steroid injection	−6.4 (−17.9 to 5.1)	5.1 (−6.5 to 16.8)	−1.4 (−13.6 to 10.8)
European quality of life measure			
Crude analysis*			
Epidural saline injection	−0.02 (−0.13 to 0.09)	−0.05 (−0.17 to 0.06)	−0.01 (−0.12 to 0.11)
Epidural steroid injection	−0.05 (−0.16 to 0.06)	−0.12 (−0.23 to −0.00)	−0.05 (−0.17 to 0.06)
Adjusted analysis†			
Epidural saline injection	−0.01 (−0.13 to 0.10)	−0.05 (−0.16 to 0.06)	0.01 (−1.06 to 0.13)
Epidural steroid injection	−0.04 (−0.15 to 0.07)	−0.11 (0.22 to 0.00)	−0.05 (−1.62 to 0.07)

Data based on mixed model analysis with sham group as reference.

*Analysis adjusted for baseline values.

†Analysis adjusted for duration of leg pain, back pain, and sick leave.

Table 6| **Estimated differences in fear avoidance beliefs between epidural injection groups and sham group at follow-up**

	Difference (95% confidence intervals) at follow-up		
Analysis	**6 weeks**	**12 weeks**	**52 weeks**
FABQ regarding physical activity			
Epidural saline injection	−0.24 (−2.69 to 2.21)	−2.10 (−4.66 to −4.5)	−0.24 (−2.69 to 2.21)
Epidural steroid injection	0.60 (−1.84 to 3.03)	−0.67 (−3.22 to 1.87)	0.60 (−1.84 to 3.03)
FABQ regarding work			
Epidural saline injection	0.72 (−3.10 to 4.55)	0.47 (−3.51 to 4.44)	0.72 (−3.10 to 4.55)
Epidural steroid injection	2.31 (−1.48 to 6.11)	2.40 (−1.55 to 6.34)	2.31 (−1.48 to 6.11)

FABQ=fear avoidance beliefs questionnaire. Data based on mixed model analysis with sham group as reference.

Table 7| **Use of pain relief medication at 6 week follow-up**

Drug	Sham group	Caudal epidural saline group	Caudal epidural steroid group
Paracetamol	9 (24.3)	7 (20.0)	9 (24.3)
Non-steroidal anti-inflammatory drugs	2 (5.4)	4 (11.4)	6 (16.2)
Morphine	4 (10.8)	6 (17.1)	3 (8.1)

Data are number (%) of patients.

Figures

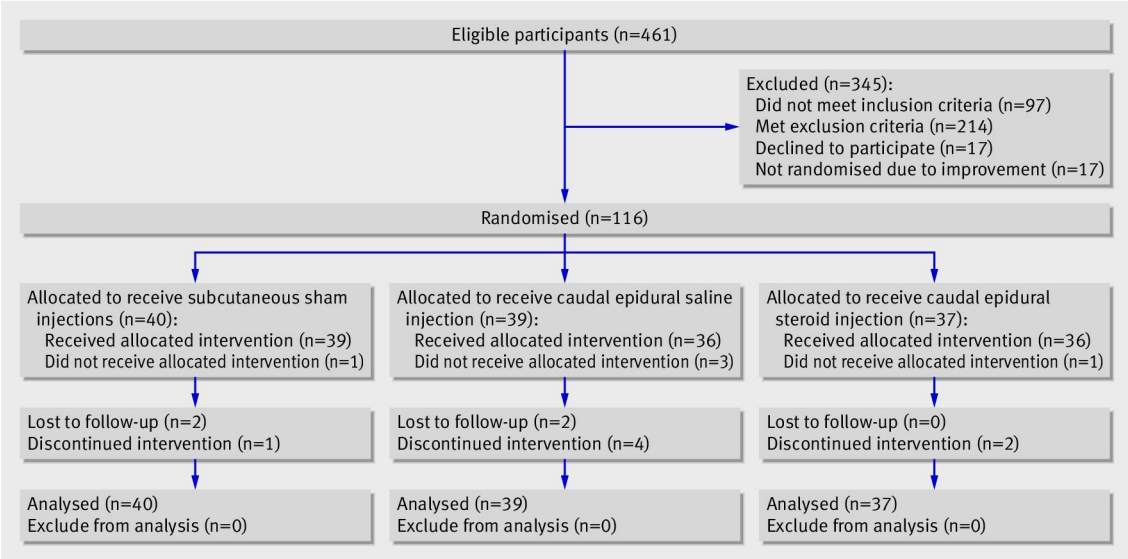

Fig 1 Flow of participants in study

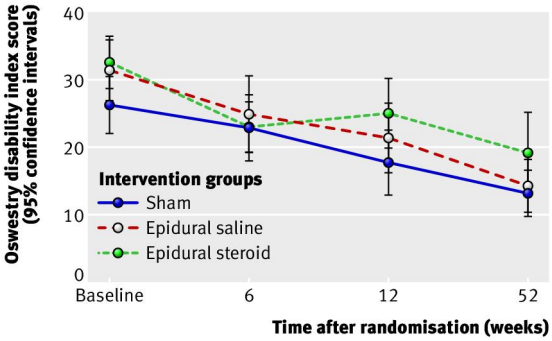

Fig 2 Mean Oswestry disability index score at follow-up

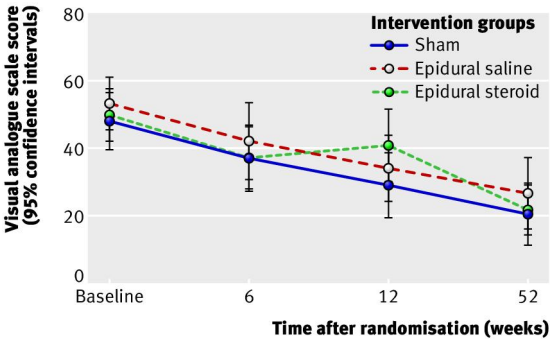

Fig 3 Mean visual analogue scale score for leg pain at follow-up

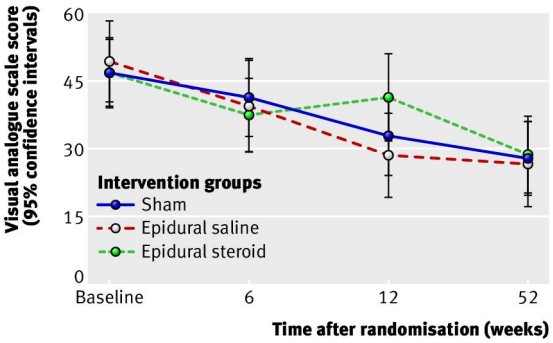

Fig 4 Mean visual analogue scale score for back pain at follow-up

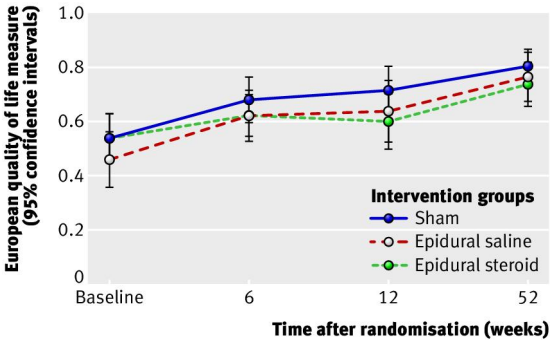

Fig 5 Repeated measurement of mean score for European quality of life measure