Herniated lumbar disc

Search date July 2008

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ABSTRACT

INTRODUCTION: Herniated lumbar disc is a displacement of disc material (nucleus pulposus or annulus fibrosis) beyond the intervertebral disc space. The highest prevalence is among people aged 30–50 years, with a male to female ratio of 2:1. There is little evidence to suggest that drug treatments are effective in treating herniated disc. METHODS AND OUTCOMES: We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of drug treatments, non-drug treatments, and surgery for herniated lumbar disc? We searched: Medline, Embase, The Cochrane Library, and other important databases up to July 2008 (Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). RESULTS: We found 49 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. CONCLUSIONS: In this systematic review, we present information relating to the effectiveness and safety of the following interventions: acupuncture, advice to stay active, analgesics, antidepressants, bed rest, corticosteroids (epidural injections), cytokine inhibitors (infliximab), discectomy (automated percutaneous, laser, microdisectomy, standard), exercise therapy, heat, ice, massage, muscle relaxants, non-steroidal anti-inflammatory drugs (NSAIDs), percutaneous disc decompression, spinal manipulation, and traction.

QUESTIONS

What are the effects of drug treatments for herniated lumbar disc? . . . 3

What are the effects of non-drug treatments for herniated lumbar disc? . . . 8

What are the effects of surgery for herniated lumbar disc? . . . 18

INTERVENTIONS

DRUG TREATMENTS

Unknown effectiveness

Analgesics . . . 3

Antidepressants . . . 3

Corticosteroids (epidural injections) . . . 3

Cytokine inhibitors . . . 6

Muscle relaxants . . . 6

Unlikely to be beneficial

Non-steroidal anti-inflammatory drugs (NSAIDs) . . . 7

NON-DRUG TREATMENTS

Likely to be beneficial

Spinal manipulation . . . 8

Unknown effectiveness

Acupuncture . . . 10

Advice to stay active . . . 12

Exercise therapy . . . 12

Heat . . . 14

Ice . . . 14

Massage . . . 14

Unlikely to be beneficial

Bed rest . . . 15

Traction . . . 16

SURGERY

Likely to be beneficial

Microdiscectomy (as effective as standard discectomy) . . . 18

Standard discectomy (short-term benefit) . . . 19

Unknown effectiveness

Automated percutaneous discectomy . . . 22

Laser discectomy . . . 22

Percutaneous disc decompression . . . 23

Covered elsewhere in Clinical Evidence

Chronic low back pain

Non-specific acute low back pain

To be covered in future updates

Artificial spinal discs

Key points

- Herniated lumbar disc is a displacement of disc material (nucleus pulposus or annulus fibrosis) beyond the intervertebral disc space.

  The highest prevalence is among people aged 30–50 years, with a male to female ratio of 2:1.

- There is little evidence to suggest that drug treatments are effective in treating herniated disc.

  NSAIDs and cytokine inhibitors don't seem to improve symptoms of sciatica caused by disc herniation.

  We found no evidence examining the effectiveness of analgesics, antidepressants, or muscle relaxants in people with herniated disc.

We found no evidence of sufficient quality to judge the effectiveness of epidural injections of corticosteroids.

- With regard to non-drug treatments, spinal manipulation seems to be more effective at relieving local or radiating pain in people with acute back pain and sciatica with disc protrusion compared with sham manipulation, although concerns exist regarding possible further herniation from spinal manipulation in people who are surgical candidates.

  Neither bed rest nor traction seem effective in treating people with sciatica caused by disc herniation.

  We found insufficient evidence about advice to stay active, acupuncture, massage, exercise, heat, or ice to judge their efficacy in treating people with herniated disc.

- About 10% of people have sufficient pain after 6 weeks for surgery to become a consideration.

  Both standard discectomy and microdiscectomy seem to increase self-reported improvement to a similar extent.

  We found insufficient evidence judging the effectiveness of automated percutaneous discectomy, laser discectomy, or percutaneous disc decompression.

DEFINITION

Herniated lumbar disc is a displacement of disc material (nucleus pulposus or annulus fibrosis) beyond the intervertebral disc space. [1] The diagnosis can be confirmed by radiological examination. However, magnetic resonance imaging findings of herniated disc are not always accompanied by clinical symptoms. [2] [3] This review covers treatment of people with clinical symptoms relating to confirmed or suspected disc herniation. It does not include treatment of people with spinal cord compression, or people with cauda equina syndrome, which require emergency intervention. The management of non-specific acute low back pain and chronic low back pain are covered elsewhere in *Clinical Evidence*.

INCIDENCE/ PREVALENCE

The prevalence of symptomatic herniated lumbar disc is about 1–3% in Finland and Italy, depending on age and sex. [4] The highest prevalence is among people aged 30–50 years, [5] with a male to female ratio of 2:1. [6] In people aged 25–55 years, about 95% of herniated discs occur at the lower lumbar spine (L4/5 and L5/S1 level); disc herniation above this level is more common in people aged over 55 years. [7] [8]

AETIOLOGY/ RISK FACTORS

Radiographical evidence of disc herniation does not reliably predict low back pain in the future, or correlate with symptoms; 19–27% of people without symptoms have disc herniation on imaging. [2] [9] Risk factors for disc herniation include smoking (OR 1.7, 95% CI 1.0 to 2.5), weight-bearing sports (e.g. weight lifting, hammer throw), and certain work activities, such as repeated lifting. Driving a motor vehicle has been suggested to be a risk factor for disc herniation, although evidence is inconclusive (OR 1.7, 95% CI 0.2 to 2.7). [6] [10] [11]

PROGNOSIS

The natural history of disc herniation is difficult to determine, because most people take some form of treatment for their back pain, and a formal diagnosis is not always made. [6] Clinical improvement is usual in most people, and only about 10% of people still have sufficient pain after 6 weeks to consider surgery. Sequential magnetic resonance images have shown that the herniated portion of the disc tends to regress over time, with partial to complete resolution after 6 months in two thirds of people. [12]

AIMS OF INTERVENTION

To relieve pain; increase mobility and function; improve quality of life; and minimise adverse effects of treatments.

OUTCOMES

Primary outcomes: pain, function, or mobility; individuals' perceived overall improvement; quality of life; and adverse effects of treatment. **Secondary outcomes:** return to work; use of analgesia; and duration of hospital admission.

METHODS

Clinical Evidence search and appraisal July 2008. The following databases were used to identify studies for this systematic review: Medline 1966 to July 2008, Embase 1980 to July 2008, and The Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Clinical Trials 2008, Issue 2 (1966 to date of issue). An additional search was carried out of the NHS Centre for Reviews and Dissemination (CRD) — for Database of Abstracts of Reviews of Effects (DARE) and Health Technology Assessment (HTA). We also searched for retractions of studies included in the review. Abstracts of the studies retrieved from the initial search were assessed by an information specialist. Selected studies were then sent to the contributor for additional assessment, using pre-determined criteria to identify relevant studies. Study design criteria for inclusion in this review were published systematic reviews of RCTs and RCTs in any language, at least single blinded, and containing more than 20 individuals of whom more than 80% were followed up. There was no minimum length of follow-up required to include studies. We excluded all studies described as "open", "open label", or not blinded, unless blinding was impossible. We included systematic reviews of RCTs, and RCTs where harms of an included intervention were studied,

applying the same study design criteria for inclusion as we did for benefits. In addition, we use a regular surveillance protocol to capture harms alerts from organisations such as the FDA and the UK Medicines and Healthcare products Regulatory Agency (MHRA), which are added to the reviews as required. We have performed a GRADE evaluation of the quality of evidence for interventions included in this review (see table, p 31). To aid readability of the numerical data in our reviews, we round many percentages to the nearest whole number. Readers should be aware of this when relating percentages to summary statistics such as relative risks (RRs) and odds ratios (ORs). The contributors used confidence interval analysis [13] and Chi-Square Test analysis from PEPI Version 4.0 [14] in their own calculations, which are presented in the review.

QUESTION What are the effects of drug treatments for herniated lumbar disc?

OPTION ANALGESICS

We found no direct information about analgesics in the treatment of people with symptomatic herniated lumbar disc.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found no systematic review or RCTs on the use of analgesics for treatment of people with symptomatic herniated lumbar disc.

Harms: We found no RCTs.

Comment: None.

OPTION ANTIDEPRESSANTS

We found no direct information about antidepressants in the treatment of people with symptomatic herniated lumbar disc.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found no systematic review or RCTs on the use of antidepressants for treatment of people with symptomatic herniated lumbar disc.

Harms: We found no RCTs.

Comment: None.

OPTION CORTICOSTEROIDS (EPIDURAL INJECTIONS)

Pain

Compared with no epidural corticosteroid Epidural corticosteroids may be more effective at improving limb pain at 2 weeks, but may be no more effective after more than 2 weeks in people with disc herniation (very low-quality evidence).

Epidural corticosteroid plus conservative non-operative treatment compared with conservative treatment only Epidural corticosteroids plus conservative non-operative treatment may be no more effective at 6 weeks and 6 months at improving pain scores in people with disc herniation (low-quality evidence).

Compared with standard discectomy Epidural corticosteroid injections may be less effective at 1–3 months at improving leg pain in people with lumbar disc herniation (very low-quality evidence).

Functional improvement

Compared with no epidural corticosteroid Epidural corticosteroids may be no more effective at improving disability as measured by Roland Morris Disability Questionnaire, and Oswestry Disability Index scores or functional outcomes such as straight leg raising and lumbar flexion in people with disc herniation (low-quality evidence).

Compared with standard discectomy Epidural corticosteroid injections may be less effective at 1–3 months at improving Oswestry Disability Index scores in people with lumbar disc herniation (very low-quality evidence).

Mobility

Epidural corticosteroid plus conservative non-operative treatment compared with conservative treatment only Epidural corticosteroids plus conservative non-operative treatment may be no more effective at 6 months at improving mobility scores in people with disc herniation (low-quality evidence).

Patient perception of improvement
Compared with no epidural corticosteroid Epidural corticosteroids may be more effective at increasing subjective global improvement and patient satisfaction in the short term only (2 weeks) but may be no more effective in the longer term (after 2 weeks) in people with disc herniation (very low-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Epidural corticosteroid injections versus no epidural corticosteroid injection:
We found two systematic reviews (search date 1998, 4 RCTs, 265 people; [15] search date 2003, 3 RCTs, 264 people [16]), and two subsequent RCTs [17] [18] assessing epidural corticosteroid injections in people with radicular pain caused by disc herniation. The second systematic review did not perform a meta-analysis because of heterogeneity between study parameters. [16]

The first systematic review compared four different doses of epidural corticosteroid injections (8 mL methylprednisolone 80 mg; 2 mL methylprednisolone 80 mg; 10 mL methylprednisolone 80 mg; and 2 mL methylprednisolone acetate 80 mg) versus placebo (saline or lidocaine [lignocaine] 1 mL or 2 mL) after follow-up periods of 2, 21, and 30 days. [15] The review found limited evidence that epidural corticosteroid increased the proportion of people with self-perceived global improvement (which was not defined) compared with placebo. The result was of borderline significance (subjective global improvement: 73/160 [46%] with corticosteroids *v* 56/172 [33%] with placebo; OR 2.2, 95% CI 1.0 to 4.7). [15]

The second systematic review provided limited evidence from three RCTs. [16] The first identified RCT (randomisation method not reported, 49 people) compared interlaminar perineural injection (triamcinolone 10 mg plus unreported amount of saline) versus one saline interlaminar perineural injection plus saline plus triamcinolone 10 mg intramuscularly to account for a systemic corticosteroid effect. It assessed the following outcomes at 3 weeks and 3 months: visual analogue scale (VAS); straight leg raise; physical examination; and Macnab criteria. The review reported that the RCT found a higher proportion of good results in people treated with corticosteroids (relief at 3 months' follow-up: 54% with corticosteroids *v* 40% with saline placebo injection; P value, significance, and further data not reported). [16] The second identified RCT (160 people with lower-limb pain caused by confirmed disc herniation) reported that corticosteroid injections significantly improved subjective limb pain, straight leg raising, lumbar flexion, and patient satisfaction in the short term at 2 weeks (data not reported), but not after 2 weeks (relief at 12 months' follow-up: 65% with corticosteroid injections *v* 65% with saline placebo injection; absolute data not reported; P value not reported, reported as not significant). [16] The third identified RCT (55 people for whom 6 weeks of physiotherapy [undefined], oral use of NSAIDs, and bracing had failed) compared transforaminal corticosteroid plus anaesthetic (up to 4 injections of betamethasone 1 mL [6 mg/mL] plus bupivacaine 1 mL [0.25%]) versus injections of anaesthetic alone. The review reported that fewer people in the corticosteroid group had surgery after the end of treatment than in the control group (8/28 [29%] with corticosteroids *v* 18/27 [67%] with anaesthetic alone; RR 0.43, 95% CI 0.23 to 0.82; NNT 3, 95% CI 2 to 6, contributors' own calculations). [16]

The first subsequent RCT (double blind) compared epidural corticosteroid injections (2 mL prednisolone acetate at 2 day intervals for a total of 3 injections) versus placebo (2 mL isotonic saline injection). [17] It found no significant difference between groups in self-rated success of treatment after 35 days (85 people with sciatica caused by herniated disc; people rating improvement as "recovery" or "marked improvement": 21/43 [49%] with corticosteroid *v* 20/42 [48%] with placebo; P = 0.91). The RCT also found no significant difference between corticosteroid injection and placebo injection in pain scores after 35 days or disability/function (mean change in pain scores from baseline measured by unspecified VAS: –30.3 mm with corticosteroid *v* –25.2 mm with control; treatment effect –5.1, 95% CI –18.7 to +8.4; disability/function measured by Roland Morris Disability Questionnaire score; mean change from baseline: –5.3 with corticosteroid *v* –3.2 with control; treatment effect –2.1, 95% CI –5.0 to +0.8). [17] The second subsequent RCT (86 people with leg and back pain caused by herniated disc or foraminal stenosis) compared periradicular infiltration with corticosteroids plus anaesthetic (methylprednisolone 40 mg plus 2 mL bupivacaine 0.25%) versus anaesthetic alone. [18] It found no significant difference between groups in mean changes from baseline at 3 months in Oswestry Disability Index score, or mean VAS scores for back and leg pain (Oswestry Disability Index score [baseline range 47.8–48.4]: 10.8 with corticosteroids plus anaesthetic *v* 12.3 with anaesthetic alone; P = 0.68; back pain mean VAS score [baseline range 34.4–38.1]: 4.8 with corticosteroid plus anaesthetic *v* 8.0 with anaesthetic alone; P = 0.68; leg pain mean VAS score [baseline range 73.0–76.9]: 23.0 with corticosteroids plus anaesthetic *v* 22.2 with anaesthetic alone; P = 0.94). It found no significant difference in patient satisfaction at 3 months (proportion of people rating treatment "good" or "excellent": 45% with corticosteroids plus anaesthetic *v* 49% with anaesthetic alone; P = 0.19). [18]

Epidural corticosteroid plus conservative non-operative treatment versus conservative treatment alone:
We found one RCT (36 people with disc herniation confirmed by magnetic resonance imaging) comparing epidural corticosteroid (3 injections of methylprednisolone 100 mg in 10 mL bupivacaine 0.25% during the first 14 days in hospital) plus conservative non-operative treatment versus conservative treatment alone. [19] Conservative treatment involved initial bed rest and analgesia followed by graded rehabilitation (including hydrotherapy, electroanalgesia, and postural exercise classes) followed by physiotherapy. It found no significant difference between groups in mean pain scores at 6 weeks and 6 months (VAS 0 = no pain, 100 = most pain possible at 6 months: 32.9 [range 0–85] with corticosteroids *v* 39.2 [range 0–100] with conservative treatment; P = 0.18). It found no significant difference in mean mobility scores, in the proportion of people needing back surgery, or in people returning to work within 6 months (mean % mobility scores; Hannover Functional Ability Questionnaire from 0% (lowest mobility) to 100% (highest mobility): 61.8 [range 25–83] with corticosteroids *v* 57.2 [range 17–83] with conservative treatment; P = 0.15; proportion of people needing back surgery: 2/17 [12%] with corticosteroids *v* 4/19 [21%] with conservative treatment; RR 0.56, 95% CI 0.09 to 2.17 contributors' own calculations, reported as not significant; people returning to work within 6 months: 15/17 [88%] with corticosteroids *v* 14/19 [74%] with conservative treatment; RR 1.19, 95% CI 0.75 to 1.33, contributors' own calculations, reported as not significant). [19]

Epidural corticosteroid injection versus discectomy:
We found one systematic review (search date 2007, 1 RCT) comparing epidural injections versus surgery. [20] The identified RCT compared epidural corticosteroid injections (betamethasone 10–15 mg, 1 week apart up to 3 times until successful) versus discectomy (no further details reported) in people who had 6 weeks of unsuccessful non-invasive treatment (physiotherapy, chiropractic treatment, rest, analgesia, or a combination). [21] It found that discectomy significantly improved leg pain and function at 1–3 months' follow-up compared with epidural injection (100 people with lumbar disc herniation greater than 25% cross-sectional area of spinal canal; difference in pain on 11-point VAS scale, results presented graphically; P = 0.001; difference in function on Oswestry Disability Index score, results presented graphically; P = 0.015). The difference between treatments was not sustained at 2–3 years' follow-up (results presented graphically; see comments below).

Harms:

Epidural corticosteroid injections versus no epidural corticosteroid injection:
No serious adverse effects were reported in the RCTs identified by the first systematic review, although 26 people complained of transient headache or transient increase in sciatic pain. [15] The second systematic review noted a 1.9% incidence of headache with epidural injections in one RCT, and a retroperitoneal haematoma in one person having anticoagulation treatment in another RCT. [16] The first subsequent RCT reported that clinically significant adverse effects occurred in 2/43 (5%) people in the corticosteroid group and 3/42 (7%) people in the control group (P = 0.676). [17] It reported headache occurring in two people in each group, and thoracic pain occurring in one person with control. The second subsequent RCT gave no information about adverse effects. [18]

Epidural corticosteroid plus conservative non-operative treatment versus conservative treatment alone:
The RCT gave no information about adverse effects of epidural injections. [19]

Epidural corticosteroid injection versus discectomy:
The RCT found that 2/50 (4%) people in the epidural group had an incidental dural puncture, and 3/50 (6%) people had recurrent disc herniation between a 2- and 3-year follow-up period. [21]

Comment:

Epidural corticosteroid injections versus no epidural corticosteroid injection:
The second subsequent RCT comparing periradicular infiltration of corticosteroids plus anaesthetic versus anaesthetic alone included people with foraminal stenosis (32 [40%] people) or disc herniation (49 [60%] people), and results were not reported separately. However, subgroup analysis found no significant difference in outcomes between groups (absolute date not reported; P = 0.7). [18]

Epidural corticosteroid injection versus discectomy:
The RCT allowed the 27 people in whom the epidural had failed to improve their symptoms (self-assessment) to receive discectomy. [21] This group was analysed as failures for the epidural corticosteroid injections, and also as a separate subgroup. Two further people in each group who completely crossed over to receive other treatment were analysed according to the intervention they received. There seemed to be multiple hypothesis tests without mention of adjusting the analysis to account for this. Also, no attempt was made to blind the measurement of outcomes. These results should therefore be interpreted with caution.

OPTION CYTOKINE INHIBITORS

Pain
Infliximab compared with placebo Infliximab seems to be no more effective at 12 weeks or 12 months at improving leg or back pain scores in people with sciatic pain caused by herniated disc (moderate-quality evidence).

Functional improvement
Infliximab compared with placebo Infliximab may be no more effective at 12 weeks or 12 months at reducing disability index scores in people with sciatic pain caused by herniated disc (low-quality evidence).

Note
A drug safety alert has been issued by the FDA on the risk of clinically significant liver injury associated with natalizumab.

For GRADE evaluation of interventions for herniated lumbar disc, see table , p 31 .

Benefits:

Infliximab versus placebo:
We found one RCT (41 people with acute or subacute [2–12 weeks' duration] sciatic pain, caused by herniated disc confirmed by magnetic resonance imaging) comparing a cytokine inhibitor (infliximab, single iv infusion of 5 mg/kg over 2 hours) versus placebo (saline infusion over 2 hours). [22] Participants had to be eligible for surgery, and were screened for tuberculosis and other infections. The RCT found no significant difference between infliximab and placebo in leg or back pain score reductions at 12 weeks (40 people; median reduction in leg pain score [rated on a 100 mm VAS, details not reported] at 12 weeks: 43 mm with infliximab *v* 50 mm with placebo; P = 0.77; mean difference –7 mm, 95% CI −21 mm to +31 mm; median reduction in back pain score [rated on a 100 mm VAS, details not reported] at 12 weeks: 12 mm with infliximab *v* 4 mm with placebo; P = 0.93, mean difference +8 mm, 95% CI –19 mm to +16 mm). [22] It also found no significant difference between groups in reduction of Oswestry Disability Index scores, median cumulative sick leave, or the proportion of people having discectomy (reduction of Oswestry Disability Index scores: data presented graphically; P = 0.37; median cumulative sick leave: 28 days with infliximab *v* 25 days with placebo; P = 0.91; proportion of people having discectomy: 7/21 [33%] with infliximab *v* 7/19 [37%] with placebo; P = 1.00). [22] The RCT reported 1-year' follow-up data separately. [23] There was no significant difference between infliximab and placebo in leg or back pain score reductions at 1-year' follow-up (median reduction in leg pain score: 38 mm with infliximab *v* 44 mm with placebo; P = 0.98; mean difference –6 mm, 95% CI −30 mm to +32 mm; median reduction in back pain score: 13 mm with infliximab *v* 17 mm with placebo; P = 0.48; mean difference –4 mm, 95% CI −38 mm to +18 mm). There was also no significant difference between groups in reduction of Oswestry Disability Index scores (28 with infliximab *v* 23 with placebo; P = 0.48), median cumulative sick leave (42 days with infliximab *v* 25 days with placebo; P = 0.60), or the proportion of people having discectomy (8/21 [38%] with infliximab *v* 8/19 [42%] with placebo; P = 1.0). [23]

Other cytokine inhibitors (adalimumab, etanercept, or natalizumab):
We found no systematic review or RCTs of adalimumab, etanercept, or natalizumab for herniated disc.

Harms:

Infliximab versus placebo:
There was no significant difference in adverse effects (described as non-serious: rhinitis, diarrhoea, otitis media with sinusitis maxillaris) with infliximab compared with placebo. However, the rate of these adverse effects was higher in the infliximab group (3/21 [14%] with infliximab *v* 0/19 [0%] with placebo; P = 0.23). [23]

Other cytokine inhibitors (adalimumab, etanercept, or natalizumab):
We found no RCTs. A drug safety alert has been issued by the FDA on the risk of clinically significant liver injury associated with natalizumab (www.fda.gov).
Drug safety alert:
A drug safety alert has been issued on the increased risk of lymphoma and other malignancies in children and adolescents, and the risks of leukaemia and new onset psoriasis, associated with TNF blockers (http://www.fda.gov).

Comment: None.

OPTION MUSCLE RELAXANTS

We found no direct information from RCTs about muscle relaxants in the treatment of people with symptomatic herniated lumbar disc.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found no systematic review or RCTs on the use of muscle relaxants for treatment of people with symptomatic herniated lumbar disc.

Harms: We found no RCTs.

Comment: None.

OPTION NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS)

Pain

Compared with placebo NSAIDs may be no more effective at improving global pain at 5–30 days in people with sciatic pain caused by disc herniation (low-quality evidence).

Compared with electroacupuncture We don't know whether NSAIDs are more effective at improving leg or thigh tenderness in people with sciatica caused by disc herniation (very low-quality evidence).

Functional improvement

Compared with electroacupuncture NSAIDs may be less effective at improving straight leg raising in people with sciatica caused by disc herniation (very low-quality evidence).

Note

A drug safety alert has been issued by the European Medicines Agency (EMEA) on the increased risk of gastrointestinal adverse effects and serious skin reactions associated with piroxicam.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

NSAIDs versus placebo:

We found one systematic review (search date 1998, 3 RCTs, 321 people). [15] The included RCTs compared NSAIDs (piroxicam 40 mg/day for 2 days or 20 mg/day for 12 days; indometacin [indomethacin] 75–100 mg 3 times daily; phenylbutazone 1200 mg/day for 3 days or 600 mg/day for 2 days) versus placebo. The review found no significant difference between NSAIDs and placebo in global improvement after 5–30 days (pooled AR for improvement in pain: 80/172 [47%] with NSAIDs *v* 57/149 [38%] with placebo; OR for global improvement 0.99, 95% CI 0.60 to 1.70; see comment below). [15]

NSAIDs versus electroacupuncture:

We found one small RCT (method of randomisation not reported; 40 people with sciatica for more than 2 years caused by disc herniation; verified by magnetic resonance imaging, computed tomography, or x ray; see comment below) comparing an NSAID (diclofenac 50 mg 3 times/day) versus electroacupuncture (electrical stimulator [G6805-II] for 25 minutes/day for 7 days). [24] It found that electroacupuncture significantly increased the average angle of Lasègue's sign during straight leg raising test compared with the NSAID (mean angle: 70.8° with NSAIDs *v* 76.7° with electroacupuncture; mean difference 5.8°, 95% CI 4.6° to 7.0°; P less than 0.05). [24] It measured tenderness outcomes (VAS scores 0 = no tenderness to 10 = extreme tenderness, converted to a scale of 0–100). It found that electroacupuncture significantly improved buttock tenderness VAS scores after treatment compared with an NSAID (mean: 33.3 with NSAID *v* 25.7 with electroacupuncture; mean difference: –7.6, 95% CI –9.3 to –6.0; P less than 0.05). It found no significant difference between groups in mean scores for tenderness in the leg or the posterior side of the thigh at the end of treatment (mean score for tenderness in the leg: 25.3 with NSAIDs *v* 21.0 with electroacupuncture; P greater than 0.05; mean score for posterior side of the thigh: 28.6 with NSAIDs *v* 21.2 with electroacupuncture; P greater than 0.05). [24]

Harms:

NSAIDs versus placebo:

The review reported no adverse effects of NSAIDs. [15] NSAIDs may cause gastrointestinal, cardiovascular, and other complications (see review on NSAIDs). COX-2 inhibitors have been particularly associated with an increased risk of cardiovascular events, leading to the withdrawal of rofecoxib in September 2004. [25] [26] A drug safety alert has been issued by the European Medicines Agency (EMEA) on the increased risk of gastrointestinal adverse effects and serious skin reactions associated with piroxicam (www.emea.europa.eu).

NSAIDs versus electroacupuncture:

The RCT comparing diclofenac versus electroacupuncture gave no information about harms. [24]

Comment:

NSAIDs versus placebo:
The absolute data in the RCTs relate to the outcomes of improvement in pain (3 RCTs) and return to work (1 RCT). [15] However, the meta-analysis used the outcome measure of global improvement. The relationship between these measures is unclear.

NSAIDs versus electroacupuncture:
The RCT comparing diclofenac versus electroacupuncture may have included people without a conclusive diagnosis of disc herniation, as x ray was used for diagnosis in some cases. [24] The outcome measures used in this RCT, such as buttock tenderness, may not be comparable to more commonly reported pain measures.

QUESTION What are the effects of non-drug treatments for herniated lumbar disc?

OPTION SPINAL MANIPULATION

Pain
Compared with sham manipulation Active spinal manipulation is more effective at 6 months at relieving local or radiating pain in people with acute back pain and sciatica with disc protrusion (moderate-quality evidence).

Compared with exercise therapy We don't know whether spinal manipulation is more effective at 1 month or at 3–4 months at improving pain scores in people with herniated lumbar disc (very low-quality evidence).

Compared with traction Spinal manipulation may be more effective at increasing the number of people improved or cured (absence of lumbar pain) (low-quality evidence).

Compared with acupuncture plus manipulation Manipulation may be less effective at improving pain in people with herniated lumbar disc (very low-quality evidence).

Functional improvement
Compared with traction Spinal manipulation may be more effective at improving lumbar function and straight leg raising in people with herniated lumbar disc (low-quality evidence).

Quality of life
Compared with sham manipulation Active spinal manipulation may be no more effective than sham manipulation at improving quality-of-life scores in people with acute back pain and sciatica with disc protrusion (low-quality evidence).

Patient perception of improvement
Compared with heat treatment Spinal manipulation may be more effective than three sessions of infrared heat treatment per week at increasing overall self-perceived improvement at 2 weeks in people with herniated lumbar disc (very low-quality evidence).

Compared with exercise therapy We don't know whether spinal manipulation is more effective at 1 month or at 3–4 months at increasing overall self-perceived improvement in people with herniated lumbar disc (very low-quality evidence).

Compared with traction We don't know whether spinal manipulation is more effective at 1 month at increasing overall self-perceived improvement in people with herniated lumbar disc (very low-quality evidence).

Note
Concerns exist regarding possible further herniation from spinal manipulation in people with severe herniation who are surgical candidates.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Spinal manipulation versus placebo or sham treatment:
We found one systematic review (search date 2006) [27] and one subsequent RCT. [28] The review identified no RCTs comparing spinal manipulation versus placebo. The subsequent RCT (102 people with acute back pain [pain less than 10 days and pain-free for the previous 3 months] and sciatica with disc protrusion) compared active spinal manipulation (assessment of range of motion, soft tissue manipulations, and brisk rotational thrusting) versus sham manipulation (soft muscle pressing and no rapid thrusts). [28] Both groups were treated according to a pre-planned 30-day protocol of up to 20 sessions lasting 5 minutes on 5 days a week by experienced chiropractors with the same formal training. Pain scores were assessed using a 10 cm visual analogue scale (VAS; 0 = no pain to 10 = unbearable pain). It found that a higher proportion of people were free of local or radiating pain after active spinal manipulation than after sham manipulation at 6 months (free of local pain [VAS score = 0]: 15/53 [28%] with active manipulation *v* 3/49 [6%] with sham manipulation; P less than 0.005; free of radiating pain [VAS = 0]: 29/53 [55%] with active manipu-

lation *v* 10/49 [20%] with sham manipulation; P less than 0.0001). It found similar rates of treatment failure (defined as stopping of treatment because of no pain reduction) between groups (1/53 [1.9%] with active manipulation *v* 1/49 [2.0%] with sham manipulation; P value and significance not reported). [28] It found no significant difference between active and sham manipulation in quality-of-life scores (mean score for Short Form [SF]-36 Health Survey, physical functioning domain: 67.4 with active manipulation *v* 60.5 with sham manipulation; P value not reported, reported as not significant). [28]

Spinal manipulation versus heat treatment:
We found one systematic review (search date 2006, 1 RCT). [27] The RCT identified by the review compared spinal manipulation (by a physiotherapist, every day if necessary; total number of sessions not reported) versus infra-red heat (3 times weekly). [27] It suggested that spinal manipulation increased overall self-perceived improvement at 2 weeks compared with heat (233 people, 132 people randomised to manipulation and 101 people randomised to heat; 98/123 [80%] with spinal manipulation *v* 56/84 [67%] with heat; P value not reported; reported as significant). [27] However, the RCT provided weak evidence that manipulation may be effective in the short term because of methodological limitations (see comment below).

Spinal manipulation versus exercise therapy:
We identified one systematic review (search date 2006, see comment below) that identified one methodologically weak RCT. [27] The RCT compared four interventions in a factorial design: spinal manipulation, manual traction, exercise therapy, and corsets. It found no significant difference among treatments in overall self-perceived improvement, pain scores, or return to work after 28 days and at 3–4 months (322 people; quantitative results and P values not reported). [27]

Spinal manipulation versus traction:
We identified one systematic review (search date 2006, 2 RCTs). [27] The first RCT (322 people) identified by the review was methodologically weak (see comment below) and compared four interventions in a factorial design (see above for details). It found no significant difference between treatments in overall self-perceived improvement after 28 days (quantitative results and P value not reported). [27] The second RCT identified by the review compared pulling and turning manipulation versus traction. [29] It found that significantly more people were “improved” (absence of lumbar pain, improvement in lumbar functional movement) or “cured” (absence of lumbar pain, straight leg raising of greater than 70°, ability to return to work) with spinal manipulation compared with traction (112 people with symptomatic herniated lumbar disc; 54/62 [87%] with spinal manipulation *v* 33/50 [66%] with traction; P less than 0.05; timescale not reported). [29]

Spinal manipulation versus adding acupuncture to manipulation:
See benefits of acupuncture, p 10 .

Harms:

The review [27] identified one systematic review of adverse effects, [30] and a small retrospective medical record review of 18 people reporting significant worsening of neurological symptoms immediately after spinal manipulation by different chiropractors in New York State. [31] Although people were not scanned before treatment, 12 people had disc herniation (8 of whom had lumbar disc herniation) when scanned by magnetic resonance imaging or computed tomography after the adverse event occurred. Two people had symptoms at the site of the manipulation who had originally presented symptoms elsewhere. The author of the review suggested that imaging should be carried out before manipulation to avoid worsening any existing significant disc herniation. [27] However, this was a small medical record review, and does not state how many people in total received spinal manipulation.

We also found three additional systematic reviews assessing the risks of spinal manipulation. [30] [32] [33] The first additional systematic review identified one review of 135 case reports on serious complications after spinal manipulation, which were published between 1950 and 1980. [32] However, the frequency of these effects was not certain. The case review attributed these complications to cervical manipulation, misdiagnosis, presence of coagulation dyscrasias, presence of herniated nucleus pulposus, or improper techniques.

The second additional systematic review (search date 2001, 5 prospective observational studies) examined evidence of risks associated with spinal manipulation. [33] The largest study identified by the review (4712 treatments in 1058 people having both cervical and lumbar spinal manipulations) found that the most common reaction was local discomfort (53%), followed by headache (12%), tiredness (11%), radiating discomfort (10%), dizziness (5%), nausea (4%), hot skin (2%), and other complaints (2%). The incidence of serious adverse effects is reported as rare, and is estimated from published case series and reports to occur in one in 1–2 million treatments. The most common serious effects were cerebrovascular accidents (total proportion of people having manipulations not reported, rate adverse effect cannot be estimated). However, it is difficult to assess whether

such events are directly related to treatment. The percentages included both cervical and lumbar spinal manipulations, which may overestimate the effect of lumbar spinal manipulations. [33] The authors of the review advise caution in interpreting these results, as they are speculative and based on assumptions about the number of manipulations performed and of unreported cases.

The third additional systematic review (search date not reported; 8 reviews, 9 prospective/retrospective studies, and 2 cross-sectional surveys) examined the safety of spinal manipulation for lumbar disc herniation. [30] It estimated that the risk of causing further disc herniation or cauda equina syndrome by spinal manipulation in people in the US is one in 3.7 million manipulations. The estimates calculated were based on rough estimates in the literature (best available) using what the author thought to be the most accurate, recent, or conservative values. [30] This estimate is also prone to error because of the possible lack of reporting of many cases of disc herniation or cauda equina syndrome. Mild symptoms after spinal manipulation are not included in these calculations. More reliable data are needed on the incidence of specific risks of spinal manipulation. It is unclear whether the populations studied in the RCTs cited included people who were surgical candidates for disc herniation. Concerns exist regarding possible further herniation from spinal manipulation in people who are surgical candidates.

Spinal manipulation versus placebo or sham treatment:
The review gave no information about harms for the identified RCTs. [27]

Spinal manipulation versus heat treatment:
The review gave no information about harms for the identified RCTs. [27] The subsequent RCT comparing spinal manipulation versus heat as a control reported no adverse effects occurring in either group, and that follow-up magnetic resonance imaging scans were unchanged from baseline. [28]

Spinal manipulation versus exercise therapy:
The review gave no information about harms for the identified RCTs. [27]

Spinal manipulation versus traction:
The review gave no information about harms for the identified RCTs. [27] One of these RCTs, comparing spinal manipulation versus traction, found that 2/60 (3%) people receiving traction had syncope; no adverse effects were reported in people receiving manipulation. [29]

Spinal manipulation versus adding acupuncture to manipulation:
See harms of acupuncture, p 10 .

High-velocity, low-amplitude spinal manipulation:
We found one systematic review (search date 2003, 1 RCT and observational studies). [34] The review was unable to draw any conclusions on the safety of high-velocity, low-amplitude spinal manipulation, because of the lack of, or inconsistencies in, reporting adverse effects in the identified studies. [34]

Comment:

Spinal manipulation versus heat treatment:
The review commented that the identified RCT provided weak evidence, because it did not report method of randomisation, group baseline characteristics, whether the control group received the same number of treatments as the other group, what happened to those lost to follow-up at 2 weeks (9/132 [7%] with spinal manipulation *v* 22/123 [18%] with heat), or whether it used intention-to-treat analysis. [27]

Spinal manipulation versus exercise therapy or traction:
The review commented on the methodological weaknesses of the four-arm RCT, which did not describe the method of randomisation, and was not single-blinded. It gave insufficient detail about baseline characteristics for groups at baseline, and may have included people without herniated disc. [27]

OPTION ACUPUNCTURE

Pain
Compared with sham acupuncture We don't know whether acupuncture is more effective at reducing pain intensity at rest in people with acute sciatica caused by disc herniation (very low-quality evidence).

Laser acupuncture compared with sham laser acupuncture We don't know whether laser acupuncture is more effective at reducing pain intensity in people with radicular and pseudo-radicular cervical and lumbar pain caused by stenosis, herniated disc, or both (very low-quality evidence).

Electroacupuncture compared with NSAIDs We don't know whether electroacupuncture is more effective at improving leg or thigh tenderness in people with sciatica caused by disc herniation (very low-quality evidence).

Adding acupuncture to manipulation compared with manipulation alone Adding acupuncture to manipulation may be more effective at improving pain compared with manipulation alone in people with herniated lumbar disc (very low-quality evidence).

Functional improvement
Electroacupuncture compared with NSAIDs Electroacupuncture may be more effective at improving straight leg raising in people with sciatica caused by disc herniation (very low-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Acupuncture versus sham acupuncture:
We found one systematic review (search date 1998) [36] in people with back and neck pain, which identified one small RCT of acupuncture in people with sciatica, and one small crossover RCT of laser acupuncture at traditional points versus sham laser acupuncture. The review did not pool data due to heterogeneity between interventions. The first identified RCT (30 people with acute sciatica) compared acupuncture at electronically detected non-traditional points versus sham acupuncture. The RCT found that acupuncture significantly improved three outcomes compared with sham acupuncture, and that there was an overall benefit of acupuncture. [36] However, the review disagreed with the overall beneficial conclusion of the RCT, only finding a significant difference between groups in 3/12 (25%) outcome measures, and no significant difference between acupuncture and sham acupuncture in pain intensity at rest — the most clinically relevant outcome — after 5 days (absolute numbers and P value not reported). [36] The second identified RCT (42 people, radicular and pseudo-radicular cervical and lumbar pain caused by stenosis, herniated disc, or both) compared laser acupuncture at traditional points versus sham laser acupuncture. The review found no significant difference between groups in reduction of pain intensity after 24 hours, although pain was significantly improved in the laser acupuncture group at 15 minutes, 1 hour, and 6 hours compared with sham laser acupuncture. The sample sizes in both RCTs identified by the review were small, and it is unclear whether the data are generalisable to herniated disc.

Electroacupuncture versus NSAIDs:
See benefits of NSAIDs, p 7 .

Adding acupuncture to manipulation versus manipulation alone:
We found one RCT (58 people with diagnosed herniated lumbar disc confirmed by imaging [details not reported]; duration of illness 24 days to 10 years) comparing acupuncture plus manipulation versus manipulation alone. [35] The RCT found that acupuncture plus manipulation significantly improved pain compared with manipulation alone (VAS: 0 = no pain,10 = unbearable severe pain; change from baseline after 20 sessions: from 4.98 to 0.83 with acupuncture plus manipulation *v* from 4.77 to 2.85 with manipulation alone; P less than 0.01). Acupuncture plus manipulation significantly improved the recovery rate (the proportion of people with 100% improvement according to the Japanese Orthopaedic Association Lumbar Vertebral Disease Therapy Scale: 7/30 [23%] with acupuncture plus manipulation *v* 3/28 [11%] with manipulation alone; P less than 0.05) and the overall effectiveness rate (the proportion of people with improvements of greater than 25% according to the Japanese Orthopaedic Association Lumbar Vertebral Disease Therapy Scale: 28/30 [93%] with acupuncture plus manipulation *v* 24/28 [86%] with manipulation alone; P less than 0.05) compared with manipulation alone after 20 sessions. [35] Acupoints and technique of acupuncture were selected depending on the location of pain, level, and duration of symptoms, and involved 30 minutes' treatment daily for 2 courses of 10 sessions, with 3–5 days gap between courses. Manipulation involved 20 minutes each session of forcible thrusting, pinching, grasping, rolling, and pulling of the lower back and legs, pressing acupoints, relaxing muscles, followed by passive exercises of low back and legs and oblique pulling of the low back. The randomisation procedure used in this study was not clear. The follow-up time was not specified, but was described as evaluated after 20 sessions.

Harms:

Acupuncture versus sham acupuncture:
The review gave no information about harms. [36]

Electroacupuncture versus NSAIDs:
See harms of NSAIDs, p 7 .

Adding acupuncture to manipulation versus manipulation alone:
The RCT reported no information about harms. [35]

Comment: **Electroacupuncture versus NSAIDs:**
See comment on NSAIDs, p 7 .

OPTION ADVICE TO STAY ACTIVE

We found no direct information about advice to stay active in the treatment of people with sciatica caused by lumbar disc herniation.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found one systematic review (search date 1998) of conservative treatments for sciatica caused by disc herniation, which found no RCTs of advice to stay active. [15] We found no subsequent RCTs.

Harms: We found no RCTs.

Comment: None.

OPTION EXERCISE THERAPY

Pain
Compared with spinal manipulation We don't know whether exercise therapy is more effective at 28 days or at 3–4 months at improving pain scores in people with herniated lumbar disc (very low-quality evidence).

Compared with traction We don't know whether exercise therapy is more effective than isometric exercises at achieving global improvement in pain at 1 month in people with herniated lumbar disc (very low-quality evidence).

Functional improvement
Compared with traction We don't know whether exercise therapy is more effective at improving range of lumbar spine movements or straight leg raising in people with herniated lumbar disc (very low-quality evidence).

Adding exercise plus education to conventional non-surgical treatment compared with conventional non-surgical treatment alone We don't know whether adding exercise and education to conventional non-surgical treatment is more effective at 6 months to 3 years at improving lumbodorsal function or decreasing recurrences in people with invertebral disc herniation (low-quality evidence).

Patient perception of improvement
Compared with spinal manipulation We don't know whether exercise therapy is more effective at 1 month or at 3–4 months at increasing overall self-perceived improvement in people with herniated lumbar disc (very low-quality evidence).

Compared with traction We don't know whether isometric exercises are more effective at increasing self-perceived improvement at 28 days to 3–4 months in people with herniated lumbar disc (very low-quality evidence).

Note
We found no direct information about exercise therapy compared with no active treatment for sciatica caused by lumbar disc herniation.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: **Exercise therapy versus placebo or no treatment:**
We found one systematic review (search date 1998) of conservative treatments for sciatica caused by disc herniation. [15] It found no RCTs comparing exercise therapy versus no treatment or placebo. We found no subsequent RCTs.

Exercise therapy versus spinal manipulation:
See benefits of spinal manipulation, p 8 .

Exercise therapy versus traction:
We found two systematic reviews (search dates 1998 [37] and 2006 [27]), each of which identified a different RCT. The first review identified one RCT (50 people admitted for possible surgery for herniated lumbar disc, verified by myelogram) comparing isometric exercise versus manual traction. [37] It found no significant difference in a global measure of improvement between groups at the end of treatment (pain free or improved: 10/24 [38%] with traction *v* 10/26 [42%] with exercise; difference reported as not significant; see comments below). [37] Isometric exercises were done for 20 minutes daily for 5–7 days; abdominal, back, hip, and thigh muscle contractions held for 6–8 seconds, repeated 5–10 times for each muscle group in crook and side-lying, and supine positions.

Manual traction involved 10 minutes of static traction daily for 5–7 days at a force of 300 N. The global measure of improvement used in the RCT comparing exercise versus traction was assessed by a neurologist (blind to intervention received), based on a 4-point scale that ranged from "symptom free" to "unchanged". [37] An improvement was considered as: 15 cm or greater increase in straight leg raising test; 2 cm or greater increase in range of movement of lumbar spine in sagittal plane; 25% or greater reduction in pain measured by pain intensity (visual analogue score 0–10 cm) and pain distribution (pain drawing); or an improvement in activities of daily living (interview graded according to Roland Morris Disability Questionnaire). Only short-term outcomes were measured — long-term effectiveness was not evaluated. The second review identified one methodologically weak RCT (322 people; see comment below) comparing four interventions in a factorial design: exercise therapy, manual traction, spinal manipulation, and corsets. It found no significant difference among treatments in overall self-perceived improvement, pain scores or return to work after 28 days and at 3–4 months (quantitative results and P value not reported). [27]

Adding exercise plus education to conventional non-surgical treatment versus conventional non-surgical treatment alone:
We found one RCT (40 people with invertebral disc herniation) comparing exercise plus education plus conventional non-surgical treatment versus conventional non-surgical treatment alone. [38] It found similar rates of functional improvement between groups at 6 months, but significantly higher "excellent" or "good" efficacy at 3 years, and significantly lower recurrence in the combination group compared with the conventional non-surgical treatment alone group. It found a similar proportion of people in both groups had improvement in lumbodorsal function, "normal" walking, ability to bend at the waist without difficulty, and ability to make active movements when turning over in bed at 6 months (17/85 [20%] with exercise plus education plus conventional non-surgical treatment *v* 14/70 [20%] with conventional non-surgical treatment alone; P less than 0.01; "normal" walking: 18/90 [20%] with exercise plus education plus conventional non-surgical treatment *v* 15/75 [20%] with conventional non-surgical treatment alone; P less than 0.01; bending at the waist without difficulty: 16/80 [20%] with exercise plus education plus conventional non-surgical treatment *v* 11/55 [20%] with conventional non-surgical treatment alone; P less than 0.01). However, this is a small RCT and the results should be interpreted with extreme caution. The authors of the RCT reported a significant difference between the groups in self-assessed function at 6 months, but when these differences were recalculated by the contributor for this *Clinical Evidence* review, they were not significant. [38] It reported significantly more people had "excellent" or "good" efficacy (assessed using the modified Macnab criteria) at 3 years with exercise plus education plus conventional non-surgical treatment than with conventional treatment alone (17/20 [85%] with exercise plus education plus conventional non-surgical treatment *v* 11/20 [55%] with conventional non-surgical treatment alone; P less than 0.01). This just reached significance when recalculated by the contributor for this review. It reported significantly lower recurrence within 3 years in the exercise plus education plus conventional non-surgical treatment group compared with the conventional treatment alone group (4/20 [20%] with exercise plus education plus conventional non-surgical treatment *v* 11/20 [55%] with conventional non-surgical treatment alone; P less than 0.01). Exercise involved dorsal muscle strengthening with self-massage of the lumbar region and hands (frequency not reported). Education involved rehabilitation education (knowledge and understanding about the condition, psychological rehabilitation (dispelling adverse moods, adjusting patient's psychology, and strengthening their resolve and confidence in recovery), and education on preventive methods (advice on posture and activities). Conventional non-surgical treatment was not defined. [38]

Harms:

Exercise therapy versus placebo or no treatment:
The systematic review gave no information about harms. [15]

Exercise therapy versus spinal manipulation:
See harms of spinal manipulation, p 8 .

Exercise therapy versus traction:
The systematic reviews gave no information about harms. [27] [37]

Adding exercise plus education to conventional non-surgical treatment versus conventional non-surgical treatment:
The RCT gave no information about harms. [38]

Comment:

Exercise therapy versus traction:
The second review [27] commented on the methodological weaknesses of the four-arm RCT, which did not describe the method of randomisation, and was not single blinded. It gave insufficient detail about baseline characteristics for groups at baseline, and may have included people without herniated disc.

Adding exercise plus education to conventional non-surgical treatment versus conventional non-surgical treatment:
The RCT was small, and the results should be interpreted with caution. The authors of the RCT reported a significant difference between the groups in self-assessed function at 6 months. [38] However, when these differences were recalculated they were not significant. [38]

OPTION HEAT

Patient perception of improvement
Compared with spinal manipulation Three sessions of infra-red heat treatment per week may be less effective at increasing overall self-perceived improvement at 2 weeks in people with herniated lumbar disc (very low-quality evidence).

Note
We found no direct information about heat compared with no active treatment for sciatica caused by lumbar disc herniation.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Heat versus placebo or no treatment:
We found one systematic review (search date 1998) of conservative treatments for sciatica caused by disc herniation, which identified no RCTs on the use of heat for herniated lumbar disc. [15] We found no subsequent RCTs.

Heat versus spinal manipulation:
See benefits of spinal manipulation, p 8 .

Harms:

Heat versus placebo or no treatment:
We found no RCTs.

Heat versus spinal manipulation:
See harms of spinal manipulation, p 8 .

Comment: None.

OPTION ICE

We found no direct information about ice in the treatment of people with sciatica caused by lumbar disc herniation.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found one systematic review (search date 1998) of conservative treatments for sciatica caused by disc herniation, which identified no RCTs on the use of ice for herniated lumbar disc. [15] We found no subsequent RCTs.

Harms: We found no RCTs.

Comment: None.

OPTION MASSAGE

Pain
Massage/manipulation compared with massage/manipulation plus functional training exercises We don't know whether massage/manipulation is more effective at improving lumbar pain in people with herniated lumbar disc (very low-quality evidence).

Massage/manipulation compared with traction Massage/manipulation may be more effective at improving outcomes in people with herniated lumbar disc (very low-quality evidence).

Functional improvement
Massage/manipulation compared with massage/manipulation plus functional training exercises We don't know whether massage/manipulation is more effective at improving function in people with herniated lumbar disc (very low-quality evidence).

Massage/manipulation compared with traction Massage/manipulation may be more effective at improving outcomes in people with herniated lumbar disc (very low-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

We found one systematic review (search date 1998) of conservative treatments for sciatica caused by disc herniation, which found no RCTs of massage. [15]

Massage/manipulation versus massage/manipulation plus functional training exercises versus traction:
We found one RCT that was a three-arm trial comparing massage/manipulation versus massage/manipulation plus functional training exercises versus traction. [39] It found no significant difference in rates in "significant efficacy" (defined as cure or greater than 60% improvement from baseline in lumbar pain and function) between massage/manipulation compared with massage/manipulation plus functional training exercises (39/55 [71%] with massage/manipulation *v* 39/55 [71%] with massage/manipulation plus functional training exercises; reported as not significant). It found that massage/manipulation significantly improved outcomes compared with traction (39/55 [71%] with massage/manipulation *v* 24/55 [44%] with traction; P greater than 0.05). [39] Massage/manipulation involved 20-minute sessions, three times weekly, for a total of 20 sessions of waist-rolling massage and passive backward stretching, lumbar manual vertebral mobilisation, rotational manipulation, passive hip extension while lying prone, pressure correction, improved lumbar vertebrae inclined turning, prone lying and active backward stretching, forced leg raising, and remedial manipulation. Massage/manipulation plus functional training was as above, plus exercises of the lumbar and abdominal muscles, including stretching and strengthening exercises for the back and legs, for 20–30 minutes, 3 times weekly before going to sleep. People receiving traction had 20 minutes daily for a total of 20 treatments using a TF-4 computerised traction bed, starting at half of body weight and increasing to full body weight. [39]

Harms:

Massage/manipulation versus massage/manipulation plus functional training exercises versus traction:
The RCT gave no information about harms. [39]

Comment:

Although the intervention used in the RCT was called massage, it included spinal manipulation techniques. [39] Therefore, the results may not be comparable with other massage-only interventions.

OPTION BED REST

Pain
Compared with no treatment Bed rest may be no more effective than watchful waiting at improving pain scores at 12 weeks in people with sciatica (low-quality evidence).

Functional improvement
Compared with no treatment Bed rest may be no more effective than watchful waiting at improving disability scores at 12 weeks in people with sciatica (low-quality evidence).

Patient perception of improvement
Compared with no treatment Bed rest may be no more effective than watchful waiting at improving people's perception of improvement at 12 weeks in people with sciatica (low-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Bed rest versus no treatment (watchful waiting):
We found one systematic review [15] and one subsequent RCT. [40] The systematic review (search date 1998) identified no RCTs of bed rest for treatment of people with symptomatic herniated disc. [15] The subsequent RCT (183 people with sciatica, intensity sufficient to justify 2 weeks of bed rest as treatment) compared bed rest at home (instructed to stay in the supine or lateral recumbent position with 1 pillow under the head) versus watchful waiting (advised to be up and about whenever possible) for 2 weeks. [40] Most people had nerve root compression on magnetic resonance imaging (109/161 [68%] people who had magnetic resonance imaging performed). It found no significant difference between bed rest and control in people's perceived improvement, mean pain scores, mean disability scores, or mean satisfaction scores after 12 weeks (perceived improvement: 87% with bed rest *v* 87% with control; OR 1.0, 95% CI 0.4 to 2.9; based on regression analysis; see comment below; mean pain scores; McGill Pain Questionnaire: 8 with bed rest *v* 7 with control; difference –0.6, 95% CI –3.3 to +2.1; based on regression analysis; mean disability scores; revised Roland Morris Disability Questionnaire: 15.2 with bed rest *v* 15.7 with control; difference –0.5, 95% CI –2.6 to +1.6; based on regression analysis; mean satisfaction scores: 7 with bed rest *v* 8 with control; difference –0.1, 95% CI –0.6 to +0.3; based on regression analysis).

Harms:

Bed rest versus no treatment (watchful waiting):
The systematic review [15] and subsequent RCT [40] gave no information about harms.

Comment: The regression analysis in the RCT adjusted odds ratios and differences between treatments for several variables including baseline differences in age, sex, presence or absence of paresis, disease duration, and people's history with respect to sciatica. [40] We found one further systematic review (search date 1996) of bed rest and advice to stay active in people with acute low back pain, which found three RCTs including people with sciatica or radiating pain. [41] However, no further details were given on the proportion of people in these RCTs with herniated disc. The review concluded there was little evidence on bed rest specifically for herniated lumbar disc, although the RCTs identified questioned the efficacy of bed rest for sciatica. [41]

OPTION TRACTION

Pain

Compared with no traction or sham traction Traction may be no more effective at achieving overall global improvement or pain intensity in people with sciatica caused by lumbar disc herniation (low-quality evidence).

Compared with spinal manipulation Traction may be less effective at increasing the number of people improved or cured (absence of lumbar pain) (low-quality evidence).

Compared with massage/manipulation Traction may be less effective at improving outcomes in people with herniated lumbar disc (very low-quality evidence).

Compared with exercise We don't know whether manual traction is more effective than isometric exercises at achieving global improvement in pain at 1 month in people with herniated lumbar disc (very low-quality evidence).

Functional improvement

Compared with no traction or sham traction Manual traction may be no more effective at improving Oswestry Disability Index scores, mobility of lumbar spine, straight leg raising test, and function in people with sciatica caused by lumbar disc herniation (very low-quality evidence).

Compared with spinal manipulation Traction may be less effective at improving lumbar function and straight leg raising in people with herniated lumbar disc (low-quality evidence).

Compared with exercise therapy We don't know whether traction is more effective at increasing the range of lumbar spine movements or straight leg raising in people with herniated lumbar disc (very low-quality evidence).

Compared with massage/manipulation Traction may be less effective at improving outcomes in people with herniated lumbar disc (very low-quality evidence).

Autotraction compared with passive traction We don't know whether autotraction is more effective at achieving overall global improvement (based on Lasègue's sign, functional ability, and patient's opinion) or at increasing response rates immediately after treatment in people with herniated lumbar disc (very low-quality evidence).

Patient perception of improvement

Compared with no traction or sham traction We don't know whether manual traction is more effective at increasing the number of people reporting complete recovery or much improvement in people with herniated disc (low-quality evidence).

Compared with spinal manipulation We don't know whether traction is more effective at 28 days at increasing overall self-perceived improvement in people with herniated lumbar disc (very low-quality evidence).

Compared with exercise therapy We don't know whether manual traction is more effective than isometric exercises at increasing self-perceived improvement at 28 days to 3–4 months in people with herniated lumbar disc (very low-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Traction versus no traction or sham traction:

We found one systematic review (see comment below) [15] and one subsequent RCT. [42] The review compared global improvement for outcomes measured (including pain intensity, mobility of lumbar spine, straight leg raising test, and function) between traction and a placebo control. It found no significant difference between traction and control in global improvement (search date 1998, 4 RCTs, 329 people with sciatica; OR 1.2, 95% CI 0.7 to 2.0). [15] The subsequent RCT (102 people with herniated disc diagnosed by clinical examination or magnetic resonance imaging) compared manual traction (20 minutes, 3 times weekly: intermittent hold for 45 seconds, rest for 30 seconds, 90° hip flexion and 90° knee flexion, therapist applied force of 35–50% of body weight) versus sham traction (same as manual traction, but therapist applying less than 20% of body weight). [42] People in both groups also received NSAIDs, an advice booklet on appropriate activities for back

protection and back exercises, and application of superficial heat to the back at home. It found no significant difference between groups in mean changes from baseline Oswestry Disability Index scores (mean change: 19.25 with traction *v* 25.25 with sham traction; mean difference +6.00, 95% CI –0.42 to +12.43; P = 0.067). It also found no significant difference between the groups in the proportion of people reporting a complete recovery or much improvement (subjective global improvement: 38/54 [70%] with manual traction *v* 34/48 [71%] with sham traction; P = 0.889). [42]

Traction versus exercise therapy:
See benefits of exercise therapy, p 12 .

Traction versus spinal manipulation:
See benefits of spinal manipulation, p 8 .

Traction versus massage:
See benefits of massage, p 14 .

Autotraction versus passive traction:
The review identified two RCTs from the previous systematic review comparing autotraction versus passive traction. [15] The first RCT compared autotraction (using the Lind technique; held from a few seconds up to a couple of minutes with force between a third and full body weight, session lasting 1 hour) versus manual traction (static traction held by therapist weight up to 30 kg twice, each pull lasting 5 minutes). [43] The RCT found no significant difference between autotraction and manual traction in global assessment by neurologist (based on Lasègue's sign, functional ability, and patient's opinion) immediately after treatment, after 2 weeks, and after 3 months (49 hospitalised people with confirmed herniated disc; AR for "no effect" at 2 weeks: 21/26 [81%] with autotraction *v* 16/23 [70%] with manual traction; at 3 months: results same as for 2 weeks; P values and CIs not reported).

The second RCT compared three sessions of autotraction (Natchev technique with specially designed traction table) versus five sessions of passive traction (static traction held by chain to table of 35% of body weight; sessions of 45 minutes every day for 5 days). [44] In the RCT, people classified their condition as "responsive" (fully recovered or improved), "unchanged", or "worsened". The RCT found that autotraction increased the proportion of people who classified themselves as responders immediately after treatment (44 people with herniated disc verified by computerised tomography scan or magnetic resonance imaging; 17/22 [77%] with autotraction *v* 4/22 [18%] with passive traction; P less than 0.001). [44] It was only possible to determine results immediately after treatment, as non-responders in both groups were given the intervention from the other group, and no intention-to-treat analysis was presented.

Harms:

Traction versus no traction or sham traction:
The first systematic review [15] and RCT [42] did not report adverse effects.

Traction versus exercise therapy:
See harms of exercise therapy, p 12 .

Traction versus spinal manipulation:
See harms of spinal manipulation, p 8 .

Traction versus massage:
See harms of massage, p 14 .

Autotraction versus passive traction:
The first systematic review [15] and RCTs [43] [44] did not report adverse effects.

Comment:

Traction versus no traction or sham traction:
The RCTs identified by the review comparing traction versus placebo used a variety of traction techniques and placebo treatments (comparisons: continuous traction, about 45 kg for 30 minutes/day for up to 3 weeks *v* infra-red heat 3 times/week; intermittent motorised traction force of a third of body weight for 20 minutes/day for 5–7 days *v* simulated traction of 7 kg; motorised traction force of 40–70 kg for 20 minutes/day for 5–7 days *v* simulated traction [force not reported]; autotraction with a force of a third to full body weight in sessions lasting 1 hour plus hyperextension orthosis *v* orthosis only). The review included RCTs in people with sciatica, who may not have had lumbar disc herniation. [15] An earlier systematic review (search date 1992 [45]) identified all four placebo-controlled RCTs identified in the later review, [15] but considered two of these RCTs in acute low back pain rather than herniated lumbar disc. Neither of the RCTs considered to be in people with lumbar disc herniation by both systematic reviews found any significant differences between traction and placebo.

QUESTION What are the effects of surgery for herniated lumbar disc?

OPTION MICRODISCECTOMY

Pain

Compared with conservative treatment Microdiscectomy may be more effective at reducing leg pain intensity at 8 weeks, but may be no more effective at reducing leg or back pain after 6 months to 2 years (very low-quality evidence).

Compared with standard discectomy We don't know whether microdiscectomy is more effective at reducing pain scores in people with lumbar disc herniation (very low-quality evidence).

Video-assisted arthroscopic microdiscectomy compared with standard discectomy We don't know whether video-assisted arthroscopic microdiscectomy is more effective at improving pain scores in people with lumbar disc herniation and associated radiculopathy after failed conservative treatment (low-quality evidence).

Functional improvement

Compared with conservative treatment We don't know whether microdiscectomy is more effective at improving Oswestry Disability index at 6 weeks to 2 years (very low-quality evidence).

Quality of life

Compared with conservative treatment We don't know whether microdiscectomy is more effective at 6 weeks to 2 years at improving quality-of-life scores or the subjective ability to work (low-quality evidence).

Patient perception of improvement

Compared with conservative treatment Microdiscectomy may be more effective at improving patients' perceived recovery at 8 weeks but may be no more effective at 6 months to 2 years (very low-quality evidence).

Compared with standard discectomy Microdiscectomy seems to be equally effective at increasing the number of people with lumbar disc herniation who rate their surgeries as good, almost recovered, or totally recovered at 1 year (moderate-quality evidence).

Video-assisted arthroscopic microdiscectomy compared with standard discectomy We don't know whether video-assisted arthroscopic microdiscectomy is more effective at increasing the number of people "very satisfied" as measured on a 4-point scale in people with proved lumbar disc herniation and associated radiculopathy after failed conservative treatment (moderate-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Microdiscectomy versus conservative treatment:

We found two RCTs comparing microdiscectomy with conservative treatment. [46] [47] The first RCT (56 people) compared microdiscectomy plus physiotherapeutic instructions (including stretching, bending, and muscle-strengthening exercises) at follow-up visits versus the same physiotherapeutic instructions plus continued isometric exercises. [46] It found that leg pain intensity was significantly lower at 6 weeks in the microdiscectomy group than in the control group, but not at 3 months to 2 years (see table 1, p 26). It found no significant difference between groups at 6 weeks to 2 years in back pain, Oswestry Disability Index, subjective ability to work, or quality-of-life scores, although results found that standard discectomy slightly increased levels of improvement compared with non-operative treatment. The RCT may have been too small to detect a significant difference between groups (see table 1, p 26). [46]

The second RCT (283 people with 6–12 weeks of persistent sciatica and radiologically confirmed disc herniation) compared early microdiscectomy (scheduled within 2 weeks of randomisation) versus conservative care (including prescription of painkillers [details not given], advice to resume daily activities, recommendation of a mobilisation scheme based on time rather than pain [compliance not checked], and referral to a physiotherapist if fearful of movement). Subsequent microdiscectomy was considered for the conservative-care group if sciatica persisted 6 months after randomisation, or earlier (within 6 months) in case of increasing leg pain that was not responsive to drugs and progressive neurological deficit (see comment below). [47] The RCT found significantly improved leg pain with early microdiscectomy compared with conservative care at 8 weeks' and 6 months' follow-up. However, there was no significant difference in leg pain score between groups at 1 and 2 years' follow-up (see table 1, p 26). The RCT found significantly improved back pain score, functional status/disability, patients' perceived recovery, and health status at 8 weeks' follow-up with early microdiscectomy compared with conservative care, but no significant differences at 6 months', 1-year', or 2 years' follow-up (see table 1, p 26). [47]

Microdiscectomy versus standard discectomy:

See benefits of standard discectomy, p 19 .

Video-assisted arthroscopic microdiscectomy versus standard discectomy:
We found one RCT comparing video-assisted arthroscopic microdiscectomy versus standard discectomy. [48] It found no significant difference in the proportion of people "very satisfied" on a 4-point satisfaction scale after about 31 months between video-assisted arthroscopic discectomy and standard discectomy (60 people with proved lumbar disc herniation and associated radiculopathy after failed conservative treatment; 22/30 [73%] with microdiscectomy *v* 20/30 [67%] with standard discectomy; RR 1.10, 95% CI 0.71 to 1.34). There was also no significant difference in mean pain score (VAS: 0 = no pain,10 = severe and incapacitating pain; 1.2 with microdiscectomy *v* 1.9 with standard discectomy; reported as not significant). However, the mean duration of postoperative recovery was almost twice as long with open surgery as with microdiscectomy (27 days with microdiscectomy *v* 49 days with standard discectomy; P value not reported).

Microdiscectomy versus automated percutaneous discectomy:
See benefits of automated percutaneous discectomy, p 22 .

Harms:

Microdiscectomy versus conservative treatment:
The first RCT reported that one person (1/28 [4%]) in the microdiscectomy group contracted urosepsis, requiring intravenous antibiotics and a prolonged hospital stay. [46] The second RCT did not report any data on harms of microdiscectomy versus conservative treatment. It reported complications in 3/187 (2%) of all surgically treated people between the two groups (including 2 dural tears and 1 wound haematoma), none of which required further intervention. [47]

Microdiscectomy versus standard discectomy:
See harms of standard microdiscectomy, p 19 .

Video-assisted arthroscopic microdiscectomy versus open discectomy:
The RCT reported one person having open discectomy had leakage of spinal fluid from the dural sac 2 weeks after the operation. [48] No other postoperative complications or neurovascular injuries were observed in either the standard discectomy or microdiscectomy groups. Complication rates were reported inconsistently in studies, making it difficult to combine results to produce overall rates. Rates of complications for all types of discectomy have been compiled (see table 2, p 29). [49]

Microdiscectomy versus automated percutaneous discectomy:
See harms of automated percutaneous discectomy, p 22 .

Comment:

Microdiscectomy versus conservative treatment:
In the second RCT comparing microdiscectomy and conservative therapy, a total of 125/141 (89%) people in the early microdiscectomy group had microdiscectomy as intended. The remaining 16 people spontaneously recovered. A total of 55/142 (39%) people in the conservative-care group went on to have microdiscectomy in the first year, and a further seven (5%) had microdiscectomy in the second year after randomisation. [47] The results presented above are based on an intention-to-treat analysis. The interventions in the two groups may have been too similar to detect a significant difference in the outcomes measured at 6 months' to 2 years' follow-up.

OPTION STANDARD DISCECTOMY

Pain
Compared with conservative treatment We don't know whether standard discectomy is more effective at improving pain at 1–2 years in people with lumbar disc herniation (low-quality evidence).

Compared with epidural corticosteroid injections Standard discectomy may be more effective at 1–3 months at improving leg pain in people with lumbar disc herniation (very low-quality evidence).

Compared with microdiscectomy We don't know whether standard discectomy is more effective at reducing pain scores in people with lumbar disc herniation (very low-quality evidence).

Compared with video-assisted arthroscopic microdiscectomy We don't know whether standard discectomy is more effective at improving pain scores in people with proved lumbar disc herniation and associated radiculopathy after failed conservative treatment (low-quality evidence).

Functional improvement
Compared with conservative treatment We don't know whether standard discectomy is more effective at improving function or Oswestry Disability Index at 1–2 years in people with lumbar disc herniation (low-quality evidence).

Compared with epidural corticosteroid injections Standard discectomy may be more effective at 1–3 months at improving Oswestry Disability Index scores in people with lumbar disc herniation (very low-quality evidence).

Patient perception of improvement
Compared with microdiscectomy Standard discectomy and microdiscectomy seem equally effective at increasing the number of people with lumbar disc herniation who rate their surgeries as good, almost recovered, or totally recovered at 1 year (moderate-quality evidence).

Compared with video-assisted arthroscopic microdiscectomy We don't know whether standard discectomy is more effective at increasing the number of people "very satisfied" as measured on a 4-point scale in people with proved lumbar disc herniation and associated radiculopathy after failed conservative treatment (moderate-quality evidence).

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Standard discectomy versus conservative treatment:
We found one systematic review (search date 2007, 2 RCTs). [20] The first RCT identified by the review compared standard discectomy versus conservative treatment (physiotherapy for 6 weeks). Each person assessed and graded their improvement in terms of pain and function into four categories: "good" (completely satisfied); "fair"; "poor"; and "bad" (completely incapacitated for work because of pain). The RCT found that discectomy significantly increased the proportion of people reporting their improvement as "good" after 1 year compared with conservative treatment (126 people with symptomatic L5/S1 disc herniation; intention-to-treat analysis: 39/60 [65%] with surgery *v* 24/66 [36%] with conservative treatment; RR 1.79, 95% CI 1.30 to 2.18; NNT 3, 95% CI 2 to 9, contributors' own calculations). However, at 4 and 10 years, there was no significant difference in the same outcome (4 years: AR for "good" improvement: 40/60 [67%] with surgery *v* 34/66 [51%] with conservative treatment; RR 1.29, 95% CI 0.96 to 1.56, contributors' own calculations; 10 years: 35/60 [58%] with surgery *v* 37/66 [56%] with conservative treatment; RR 1.04, 95% CI 0.73 to 1.32, contributors' own calculations). The randomisation procedure used in this study was not clear. [20] [51]

The second RCT (501 surgical candidates; mean age 42 years; 42% female, with imaging-confirmed lumbar intervertebral disc herniation and at least 6 weeks of radicular symptoms) compared standard open discectomy versus non-operative treatment individualised to the person. [20] [52] Primary outcome measures were mean changes from baseline scores for Short Form (SF)-36 Bodily Pain, SF-36 Physical Function, and the Oswestry Disability Index assessed at 6 weeks, 3 months, 6 months, 1 year, and 2 years. It found no significant difference between groups in improvements for all outcomes at up to 2 years, although there was a small but consistently greater improvement at each time point with surgery compared with conservative treatment (see table 3, p 30). [20] [52]

Standard discectomy versus epidural corticosteroid injection:
See benefits of epidural corticosteroid injections, p 3 .

Standard discectomy versus microdiscectomy:
We found one systematic review (search date 2007, 3 RCTs, 219 people) [20] and two subsequent RCTs [50] [53] comparing standard discectomy versus microdiscectomy. The review did not perform a meta-analysis of the three RCTs because outcomes were not comparable. The first RCT identified by the review found no significant difference between standard discectomy and microdiscectomy in the proportion of people who rated their operative outcome as "good", "almost recovered", or "totally recovered" at 1 year (60 people with lumbar disc herniation; intention-to-treat analysis: 26/30 [87%] with standard discectomy *v* 24/30 [80%] with microdiscectomy; RR 1.08, 95% CI 0.78 to 1.20). [54] It found similar changes in both groups in pre- and postoperative pain scores, and in time taken to return to work (pain scores: visual analogue scale [VAS]; P value not reported; time taken to return to work: 10 weeks in both groups). The second RCT identified by the review found no significant difference between microdiscectomy and standard discectomy in pain in the legs or back, or in analgesia use at any point during the 6-week follow-up (pain: VAS, not specified; analgesia use: 79 people with lumbar disc herniation; absolute numbers not reported). [55] The third RCT (80 people) identified by the review found that clinical outcomes and duration of sick leave were similar at 15 months, but provided no further details. [20]

The first subsequent RCT (119 people) compared macrodiscectomy versus microdiscectomy. [53] It found no significant difference between groups after surgery in mean Japanese Orthopaedic Association (JOA) score or mean intensity of sciatic pain scores (change in JOA clinical symptoms score from baseline, scale from −6 to +29, higher scores indicating better outcomes [baseline score]: 27 with macrodiscectomy *v* 27 with microdiscectomy; P = 0.08; mean intensity of sciatic pain scores: 1.3 with macrodiscectomy *v* 1.2 with microdiscectomy; P = 0.27). The RCT also reported mean scores for leg pain intensity (see comment below).

The second subsequent RCT (40 people with sciatica that did not respond to conservative treatment, and posterolateral herniated lumbar disc observed on magnetic resonance imaging scans) found no significant differences between open discectomy and microdiscectomy in pain or disability at

3, 6, 12, or 24 months' follow-up (pain: VAS: 0 = no pain,10 = worst pain ever experienced; 24 months, median pain score [range]: 0 [0−6] with open discectomy *v* 1 [0−3] with microdiscectomy; P = 0.15; Oswestry Disability Index [details not reported]: 24 months median [range] score: 10 [0−30] with open discectomy *v* 10 [0−22] with microdiscectomy; P = 0.87). There was also no difference in the mean time to return to work and normal activities between groups (21 days with open discectomy *v* 21 days with microdiscectomy; P = 0.79). [50]

Standard discectomy versus video-assisted arthroscopic microdiscectomy:
See benefits of microdiscectomy, p 18 .

Harms:

Standard discectomy versus conservative treatment:
The first RCT [51] identified by the review [20] gave no information about complications of standard discectomy. The most common intraoperative complication in the second RCT [52] identified by the review [20] was dural tear in 10/243 (4%) people; 230/243 (95%) people reported no intraoperative complications. [52] Superficial wound infection was the most common postoperative complication in 4/243 (2%) people; 226/243 (95%) people reported no postoperative complications. The reoperation rate for recurrent herniation was 5/243 (2%) at 1 year, and 8/243 (3%) at 2 years. [52]

Standard discectomy versus epidural corticosteroid injection:
See harms of epidural corticosteroid injections, p 3 .

Standard discectomy versus microdiscectomy:
The first systematic review found no significant difference between standard discectomy and microdiscectomy in perioperative bleeding, duration of hospital stay, or scar tissue (numbers not reported). [20] The first RCT identified by the review reported one person in each group with a nerve root tear. Additionally, the microdiscectomy group identified one person with a dural leak, and one with suspected discitis. [54] The second RCT identified by the review did not report on the complications of either procedure. [55] Complication rates were reported inconsistently in studies, making it difficult to combine results and produce overall rates. Rates of complications for all types of discectomy have been compiled (see table 2, p 29). [49]

The first subsequent RCT comparing macrodiscectomy versus microdiscectomy found one person in the macrodiscectomy group with superficial infection, and no complications in the microdiscectomy group. [53] It reported that none of the people in the macrodiscectomy group required further surgery, whereas two people in the microdiscectomy group did (fusion for instability of the lumbar vertebrae 4 years after initial surgery, and fenestration for restenosis 3 years after initial surgery). [53] The RCT reported significantly longer mean operating time and duration of hospital stay (mean operating time: 40 minutes with macrodiscectomy *v* 45 minutes with microdiscectomy; P less than 0.0036; mean time in hospital: 8.3 days with macrodiscectomy *v* 8.5 days with microdiscectomy; P less than 0.0004). [53] The RCT reported that no perioperative deaths occurred. [53]

The second subsequent RCT reported one recurrence of disc herniation requiring further surgery in both the open and the microdiscectomy groups. The microdiscectomy group also observed a seroma that resolved spontaneously and completely, and a dural tear requiring conservative treatment with a prolonged hospital stay of 48 hours. [50]

Standard discectomy versus video-assisted arthroscopic microdiscectomy:
See harms of microdiscectomy, p 18 .

Vascular complications:
One systematic review of published reports (search date not reported) found a total of 99 complications of vascular injury as a result of lumbar disc operations. [56] Reported risk factors for vascular complications included: previous disc or abdominal surgery leaving adhesions; chronic disc pathology from disruption or degeneration of anterior annulus fibrosus and anterior longitudinal ligament or peridiscal fibrosis; improper positioning of the patient; retroperitoneal vessels and operated disc in close proximity; and vertebral anomalies, such as hypertrophic spurs compressing vessels during operation. The systematic review did not state the number of operations from which the 99 complications arose. Consequently, we cannot estimate the incidence of adverse vascular events from discectomy. [56]

Comment:

Standard discectomy versus conservative treatment:
The RCT comparing standard discectomy versus conservative treatment had considerable crossover between the two treatment groups. [51] Of 66 people randomised to receive conservative treatment, 17 received surgery; of 60 people randomised to receive surgery, one refused the operation. [51] The results presented above are based on an intention-to-treat analysis. The second RCT comparing standard discectomy versus non-operative treatment had nearly 50% crossover in both directions. [52] Of 232 people randomised to surgery and included in the analysis, only 140/232 (60%) had

surgery. Of the 240 people randomised to non-operative care and included in the intention-to-treat analysis, 107/204 (52%) had surgery. [52]

Standard discectomy versus microdiscectomy:
The first subsequent RCT analysed the difference in scores between groups after surgery, without comparing the change in score from baseline to endpoint between groups. [53] The baseline scores for sciatic pain intensity and JOA scores did not differ significantly at baseline or after surgery. There was, however, a significant difference in leg pain scores at baseline as well as after surgery. Therefore, analysis of the data found neither surgery better than the other. The second subsequent RCT stated that only those participants with a final postoperative follow-up period of at least 2 years were included in this study. [50] The RCT reported no information on the number of people who withdrew. It is unclear whether 40 people were originally recruited for the study, or whether this was adjusted based on the follow-up rate.

Standard discectomy versus epidural corticosteroid injection:
See comment in epidural corticosteroid injections, p 3 .

OPTION AUTOMATED PERCUTANEOUS DISCECTOMY

We found no clinically important results from RCTs about automated percutaneous discectomy compared with either conservative treatment, standard discectomy, or microdiscectomy.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits:

Automated percutaneous discectomy versus conservative treatment:
We found no systematic review or RCTs.

Automated percutaneous discectomy versus standard discectomy:
One systematic review (search date not reported) identified no RCTs comparing automated percutaneous discectomy (APD) versus standard discectomy. [49]

Automated percutaneous discectomy versus microdiscectomy:
We found one systematic review (search date 2007), [20] which identified two RCTs. The review did not perform a meta-analysis. One identified RCT did not meet our inclusion criteria due to a high follow-up loss (greater than 20%) and is not discussed further. The included RCT was stopped prematurely, after an interim analysis at 6 months found that APD was associated with significantly lower success rate than microdiscectomy (71 people with radiographical confirmation of disc herniation; overall outcome classified as "success" or "failure" by clinician and masked observer [details not reported]; AR for "success": 9/31 [29%] with APD *v* 32/40 [80%] with microdiscectomy; P less than 0.001). [57]

Harms:

Automated percutaneous discectomy versus conservative treatment:
We found no RCTs.

Automated percutaneous discectomy versus standard discectomy:
The review found that reoperations for recurrent or persistent disc herniation at the same level as the initial operations were reported more frequently with APD than with standard discectomy (83%, 95% CI 76% to 88% with APD *v* 49%, 95% CI 38% to 60% with standard discectomy). [49]

Automated percutaneous discectomy versus microdiscectomy:
Overall, the review found that reoperations for recurrent or persistent disc herniation at the same level as the initial operations were reported more frequently with APD than with microdiscectomy (83%, 95% CI 76% to 88% with APD *v* 64%, 95% CI 48% to 78% with microdiscectomy). [49] The RCT did not report adverse effects. [57] The mean duration of recovery after surgery was longer in people who had microdiscectomy compared with those who had APD (mean weeks of postoperative recovery [range]: 7.7 weeks [1 week to 26 weeks] with APD *v* 22.9 weeks [4 weeks to 1 year] with microdiscectomy). Complication rates were reported inconsistently in studies, making it difficult to combine results to produce overall rates. Rates of complications for all types of discectomy have been compiled (see table 2, p 29). [49]

Comment:

None.

OPTION LASER DISCECTOMY

We found no direct information about laser discectomy for the treatment of people with symptomatic herniated lumbar disc.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: Three systematic reviews (search dates not reported, [49] 2007, [20] and 2000 [58]) found no RCTs on the effectiveness of laser discectomy meeting *Clinical Evidence* reporting criteria.

Harms: We found no RCTs.

Comment: None.

OPTION PERCUTANEOUS DISC DECOMPRESSION

We found no direct information about percutaneous disc decompression for the treatment of people with symptomatic herniated lumbar disc.

For GRADE evaluation of interventions for herniated lumbar disc, see table, p 31 .

Benefits: We found one systematic review (search date 2006) that found no RCTs of percutaneous disc decompression for lumbar disc herniation. [59]

Harms: We found no RCTs.

Comment: The systematic review also searched for non-experimental descriptive studies, expert opinion, and clinical experience of respected authorities. [59] These data are not included in this review.

GLOSSARY

Autotraction The person provides the traction force on the traction table by pulling on the bar on the head of the table while his or her pelvis is held by a girdle and chain to the lower end of the table.
Laser discectomy The surgeon places a laser through a delivery device that has been directed under radiographic control to the disc, and removes the disc material using the laser. It uses many of the same techniques used in automated percutaneous discectomy.
Manual traction A form of passive traction. The person lies supine on a plinth with varying degrees of flexion in the hip and knee joints. The traction force is exerted by the therapist using a belt placed around the therapist's back or hips and attached behind and below the person's knees. The traction force is adjusted by the therapist according to patient's symptoms, with a maximum force of about 30 kg as measured by a force transducer in the belt.
Microdiscectomy Removal of protruding disc material, using an operating microscope to guide surgery.
Standard discectomy Surgical removal, in part or whole, of an intervertebral disc, generally with loop magnification (i.e. eyepieces).
Automated percutaneous discectomy Percutaneous disc decompression using a combined irrigation, suction, and cutting device inserted through a cannula.
Cauda equina syndrome Compression of the cauda equina causing symptoms, including changes in perineal sensation (saddle anaesthesia), and loss of sphincter control. A collection of spinal roots descending from the lower part of the spinal cord, which occupy the vertebral canal below the spinal cord.
Japanese Orthopaedic Association (JOA) score for clinical symptoms in people with herniated lumbar disc. Functionality and pain are measured across four parameters, on a scale from −6 to +29, with higher scores indicating better outcomes: first, subjective symptoms (0–9 points; low back pain leg pain, tingling gait, or both); second, clinical signs (0–6 points; straight leg raising test sensory disturbance motor disturbance); third, restriction in activities (0–14 points; turn over while lying, standing, washing, leaning forward, sitting for about 1 hour, lifting or holding a heavy object, walking); and last, urinary bladder function (–6 points maximum).
Lasègue's sign The limitation of straight leg raising in a supine position usually associated with lumbar nerve root compression. Also, in sciatica, added foot dorsiflexion to a straight leg raise results in more pain.
Low-quality evidence Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Macnab criteria A surgeon-reported measure of outcome ranging from excellent (no pain; no restriction of activity), good (occasional back or leg pain of sufficient severity to limit the person's ability to do normal work or enjoy leisure hours), fair (functional capacity but intermittent pain of sufficient severity to curtail or modify work or leisure activities), and poor (no improvement or insufficient improvement to enable increase in activities; further operative intervention required).
Macrodiscectomy Removal of protruding disc material using a 5-cm incision, but without using an operating microscope to guide surgery, in contrast to microdiscectomy.
Moderate-quality evidence Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Oswestry Disability Index Back-specific, self-reported questionnaire measuring pain and function in completing physical and social activities. The scale score ranges from 0 (no disability) to 100 (maximum disability).
Passive traction The person lies supine on a traction table with thighs flexed and supported by pillow over knees. The traction force is adjusted manually by the therapist to about 35% of person's body weight, measured by a dy-

namometer, and then maintained by a chain connection to the foot of the bed. The traction force is adjusted regularly during the treatment session.

Percutaneous disc decompression Any technique for discectomy performed through percutaneous portals inserted with x-ray control, generally removing intradiscal fragments rather than sequestrated extradiscal fragments.

Roland Morris Disability Questionnaire a 24-item, self-reported, disability scale specific to back pain recommended for use in primary care and community studies. Measures daily function in completing activities affected by back pain. The scale score ranges from 0 (no disability) to 24 (severe disability).

Short Form (SF)-36 A health-related quality-of-life scale across eight domains: limitations in physical activities (physical component); limitations in social activities; limitations in usual role activities owing to physical problems; pain; psychological distress and wellbeing (mental health component); limitations in usual role activities because of emotional problems; energy and fatigue; and general health perceptions.

Very low-quality evidence Any estimate of effect is very uncertain.

SUBSTANTIVE CHANGES

Acupuncture One RCT added comparing acupuncture plus manipulation versus manipulation alone. Evaluated and found improvements in pain after 20 sessions. [35] However, overall evidence on acupuncture remains too weak to draw conclusions. Categorisation unchanged (unknown effectiveness).

Cytokine inhibitors Follow-up data for 1 year was added to the RCT comparing infliximab versus placebo, and found no significant difference in pain, disability, cumulative sick leave, or proportion of people having discectomy. [23] Categorisation unchanged (unknown effectiveness).

Microdiscectomy One RCT added comparing early microdiscectomy versus conservative care (including later microdiscectomy if required). It found better outcomes in pain, function/disability, and patient-perceived recovery after 8 weeks with early microdiscectomy, but no significant difference in outcomes between groups at 1 and 2 years' follow-up. [47] One RCT added comparing microdiscectomy and open discectomy found no significant difference between groups in pain or disability at 3, 6, 12, or 24 months' follow-up, or in time to return to work and normal activities. [50] Categorisation unchanged (likely to be beneficial).

Percutaneous disc decompression One systematic review added, which identified no RCTs. [59] Categorisation unchanged (unknown effectiveness).

Spinal manipulation One RCT added comparing manipulation alone versus acupuncture plus manipulation. Evaluated after 20 sessions, it found manipulation alone was less effective at improving pain. [35] Categorisation unchanged (likely to be beneficial).

Standard discectomy One RCT added comparing open discectomy and microdiscectomy. It found no significant difference between groups in pain or disability at 3, 6, 12, or 24 months' follow-up, or in time to return to work and normal activities. [50] Categorisation unchanged (likely to be beneficial).

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Competing interests: JJ, KK, and JOD declare that they have no competing interests.

Disclaimer

TABLE 1 **Results of RCTs comparing microdiscectomy versus conservative treatment.** [46] [47]

	Results	P value; Difference (95% CI)
Leg pain, measured on a 100 mm VAS from 0 = no pain to 100 = worst possible pain [46]		
Baseline	61 with microdiscectomy *v* 57 with conservative treatment	NS
6 weeks	12 with microdiscectomy *v* 25 with conservative treatment	P less than 0.01
3 months	9 with microdiscectomy *v* 16 with conservative treatment	NS
6 months	9 with microdiscectomy *v* 18 with conservative treatment	NS
1 year	6 with microdiscectomy *v* 9 with conservative treatment	NS
2 years	6 with microdiscectomy *v* 15 with conservative treatment	NS
Leg pain, measured on a 100 mm VAS from 0 = no pain to 100 = worst possible pain [47]		
Baseline	67.2 with early surgery *v* 64.4 with conservative care	NS
8 weeks	10.2 with early surgery *v* 27.9 with conservative care	17.7 (12.3 to 23.1)
6 months	8.4 with early surgery *v* 14.5 with conservative care	6.1 (2.2 to 10.0)
1 year	11.0 with early surgery *v* 11.0 with conservative care	0 (–4.0 to +4.0)
2 years	11.0 with early surgery *v* 9.0 with conservative care	–2 (–6.0 to +2.0)
Back pain, measured on a 100 mm VAS from 0 = no pain to 100 = worst possible pain [46]		
Baseline	53 with microdiscectomy *v* 47 with conservative treatment	NS
6 weeks	21 with microdiscectomy *v* 28 with conservative treatment	NS
3 months	15 with microdiscectomy *v* 22 with conservative treatment	NS
6 months	13 with microdiscectomy *v* 20 with conservative treatment	NS
1 year	19 with microdiscectomy *v* 17 with conservative treatment	NS
2 years	11 with microdiscectomy *v* 21 with conservative treatment	NS
Back pain, measured on a 100 mm VAS from 0 = no pain to 100 = worst possible pain [47]		
Baseline	33.8 with early surgery *v* 30.8 with conservative care	NS
8 weeks	14.4 with early surgery *v* 25.7 with conservative care	11.3 (5.6 to 17.4)
6 months	15.5 with early surgery *v* 17.8 with conservative care	+2.3 (–3.6 to +8.2)
1 year	14.2 with early surgery *v* 16.5 with conservative care	+2.3 (–3.6 to +8.2)
2 years	15.9 with early surgery *v* 17.3 with conservative care	+1.4 (–4.5 to +6.3)
Function/disability, Oswestry Low back Pain Disability Score, measured on a scale of 0–100, increasing score indicates greater lower back pain related disability [46]		
Baseline	39 with microdiscectomy *v* 39 with conservative treatment	NS

	Results	P value; Difference (95% CI)
6 weeks	16 with microdiscectomy *v* 22 with conservative treatment	NS
3 months	8 with microdiscectomy *v* 14 with conservative treatment	NS
6 months	8 with microdiscectomy *v* 12 with conservative treatment	NS
1 year	10 with microdiscectomy *v* 11 with conservative treatment	NS
2 years	6 with microdiscectomy *v* 11 with conservative treatment	NS
Function/disability, Modified Roland disability questionnaire, measured on a scale of 0 to 23, increasing score indicates worse functional status [47]		
Baseline	16.5 with early surgery *v* 16.3 with conservative care	NS
8 weeks	6.1 with early surgery *v* 9.2 with conservative care	3.1 (1.7 to 4.3)
6 months	4.0 with early surgery *v* 4.8 with conservative care	+0.8 (–0.5 to +2.1)
1 year	3.3 with early surgery *v* 3.7 with conservative care	+0.4 (–0.9 to +1.7)
2 years	3.1 with early surgery *v* 2.6 with conservative care	+0.5 (–0.8 to +1.8)
Subjective ability to work, measured on a 100 mm VAS where 0 = unable to work to 100 = best possible work ability [46]		
Baseline	44 with microdiscectomy *v* 37 with conservative treatment	NS
6 weeks	68 with microdiscectomy *v* 63 with conservative treatment	NS
3 months	84 with microdiscectomy *v* 70 with conservative treatment	NS
6 months	87 with microdiscectomy *v* 75 with conservative treatment	NS
1 year	82 with microdiscectomy *v* 81 with conservative treatment	NS
2 years	89 with microdiscectomy *v* 79 with conservative treatment	NS
Quality of life, *15-D quality of life score, measured on a scale from 0 to 1.0; increasing score indicates better subjective general health and function* [46]		
Baseline	0.83 with microdiscectomy *v* 0.84 with conservative treatment	NS
6 weeks	0.92 with microdiscectomy *v* 0.89 with conservative treatment	NS
3 months	0.94 with microdiscectomy *v* 0.91 with conservative treatment	NS
6 months	0.95 with microdiscectomy *v* 0.90 with conservative treatment	NS
1 year	0.95 with microdiscectomy *v* 0.94 with conservative treatment	NS
2 years	0.95 with microdiscectomy *v* 0.93 with conservative treatment	NS
Health status, SF-36 bodily pain questionnaire, measured on a scale from 0 to 100; increasing score indicates less severe symptoms [47]		
Baseline	21.9 with early surgery *v* 23.9 with conservative care	NS
8 weeks	62.8 with early surgery *v* 54.4 with conservative care	–8.4 (–13.5 to –3.2)
6 months	76.1 with early surgery *v* 72.8 with conservative care	–3.3 (–8.4 to +1.8)
1 year	81.2 with early surgery *v* 78.5 with conservative care	–2.7 (–7.9 to +2.6)
2 years	78.4 with early surgery *v* 80.7 with conservative care	+2.3 (–2.7 to +7.3)

	Results	P value; Difference (95% CI)
Health status, SF-36 physical functioning questionnaire, measured on a scale from 0 to 100; increasing score indicates less severe symptoms [47]		
Baseline	33.9 with early surgery *v* 34.6 with conservative care	NS
8 weeks	71.2 with early surgery *v* 61.9 with conservative care	–9.3 (–14.2 to –4.4)
6 months	79.1 with early surgery *v* 77.6 with conservative care	–1.5 (–6.4 to +3.4)
1 year	84.2 with early surgery *v* 82.0 with conservative care	–2.2 (–7.2 to +2.8)
2 years	82.3 with early surgery *v* 83.6 with conservative care	+1.3 (–3.7 to +6.3)
Patients' perceived recovery, % of people with "complete" or "nearly complete" scores on a 7-point Likert scale of global perceived recovery [47]		
Baseline	-	-
8 weeks	81.2 with early surgery *v* 36.5 with conservative care	44.7 (34.2 to 55.0)
6 months	77.4 with early surgery *v* 70.8 with conservative care	+6.6 (–3.7 to +17.0)
1 year	85.7 with early surgery *v* 82.5 with conservative care	+3.2 (–5.4 to +11.9)
2 years	81.3 with early surgery *v* 78.9 with conservative care	+2.4 (–7.2 to +12.0)

NS, reported as not significant; VAS, visual analogue scale.

TABLE 2 **Reported complications from surgical procedures.** [49]

	Standard discectomy		Microdiscectomy		Percutaneous discectomy	
Complications	**Mean, 95% CI**	**Number of studies***	**Mean, 95% CI**	**Number of studies***	**Mean, 95% CI**	**Number of studies***
Operative mortality	0.15%, 95% CI 0.09% to 0.24%	25	0.06%, 95% CI 0.01% to 0.42%	8	–	3
Total wound infections	1.97%, 95% CI 1.97% to 2.93%	25	1.77%, 95% CI 0.92% to 3.37%	16	–	2
Deep wound infections	0.34%, 95% CI 0.23% to 0.50%	17	0.06%, 95% CI 0.01% to 0.23%	8	–	2
Discitis	1.39%, 95% CI 0.97% to 2.01%	25	0.67%, 95% CI 0.44% to 1.02%	20	1.43%, 95% CI 0.42% to 4.78%	8
Dural tear	3.65%, 95% CI 1.99% to 6.65%	17	3.67%, 95% CI 2.03% to 6.58%	16	0	2
Total nerve root injuries	3.45%, 95% CI 2.21% to 5.36%	8	0.84%, 95% CI 0.24% to 2.92%	12	0.30%, 95% CI 0.11% to 0.79%	6
Permanent nerve root injuries	0.78%, 95% CI 0.42% to 1.45%	10	0.06%, 95% CI 0% to 0.26%	8	–	6
Thrombophlebitis	1.55%, 95% CI 0.78% to 1.30%	13	0.82%, 95% CI 0.49% to 1.35%	4	Not reported	0
Pulmonary emboli	0.56%, 95% CI 0.29% to 1.07%	14	0.44%, 95% CI 0.20% to 0.98%	5	Not reported	0
Meningitis	0.30%, 95% CI 0.15% to 0.60%	5	Not reported	0	Not reported	0
Cauda equina syndrome	0.22%, 95% CI 0.13% to 0.39%	3	Not reported	0	Not reported	0
Psoas haematoma	Not reported	0	Not reported	0	4.65%, 95% CI 1.17% to 15.50%	5
Transfusions	0.70%, 95% CI 0.19% to 2.58%	6	0.17%, 95% CI 0.08% to 0.39%	11	Not reported	0

*81 studies were included; 2 RCTs, 7 non-randomised controlled trials, 10 case-control studies, and 62 case series.

TABLE 3 **Results of an RCT comparing standard discectomy versus conservative treatment.** [52]

Follow up	Comparison	Treatment effect
SF-36 Bodily Pain mean improvement in pain on a scale from 0 to 100 from baseline		
At 3 months	30.5 with standard discectomy *v* 27.6 with conservative treatment	+2.9, 95% CI –2.2 to +8.0
At 1 year	39.7 with standard discectomy *v* 36.9 with conservative treatment	+2.8, 95% CI –2.3 to +7.8
At 2 years	40.3 with standard discectomy *v* 37.1 with conservative treatment	+3.2, 95% CI –2.0 to +8.4
SF-36 Physical Function mean improvement on a scale from 0 to 100 from baseline score		
At 3 months	27.7 with standard discectomy *v* 24.9 with conservative treatment	+2.8, 95% CI –2.5 to +8.1
At 1 year	27.7 with standard discectomy *v* 24.9 with conservative treatment	+2.8, 95% CI –2.5 to +8.1
At 2 years	35.9 with standard discectomy *v* 35.9 with conservative treatment	0, 95% CI –5.4 to +5.5
Oswestry Disability Index mean reduction in disability score from baseline on a scale from 0 to 100		
At 3 months	–26.0 with standard discectomy *v* –21.3 with conservative treatment	–4.7, 95% CI –9.3 to –0.2
At 1 year	–26.0 with standard discectomy *v* –21.3 with conservative treatment	–4.7, 95% CI –9.3 to –0.2
At 2 years	–31.4 with standard discectomy *v* –28.7 with conservative treatment	–2.4, 95% CI –7.4 to +1.9

SF-36, Short Form-36.

TABLE **GRADE evaluation of interventions for herniated lumbar disc**

Important outcomes	Pain, functional improvement, mobility, patient perception of improvement, quality of life, adverse effects								
Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
What are the effects of drug treatments for herniated lumbar disc?									
4 (380) [16] [17] [18]	Pain	Epidural corticosteroids *v* no epidural corticosteroids	4	–2	–1	0	0	Very low	Quality points deducted for incomplete reporting of results, and for not reporting method of randomisation. Consistency point deducted for different outcomes at different endpoints
4 (380) [16] [17] [18]	Functional improvement	Epidural corticosteroids *v* no epidural corticosteroids	4	–2	0	0	0	Low	Quality points deducted for incomplete reporting of results, and for not reporting method of randomisation
5(645) [15] [16] [17] [18]	Patient perception of improvement	Epidural corticosteroids *v* no epidural corticosteroids	4	–2	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, and for not reporting method of randomisation. Directness point deducted for not defining outcome measured
1 (36) [19]	Pain	Epidural corticosteroid plus conservative non-operative treatment *v* conservative treatment only	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for wide range of interventions used in comparison
1 (36) [19]	Mobility	Epidural corticosteroid plus conservative non-operative treatment *v* conservative treatment only	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for wide range of interventions used in comparison
1 (100) [21]	Pain	Epidural corticosteroid *v* standard discectomy	4	–3	–1	0	0	Very low	Quality points deducted for sparse data and methodological flaws (incomplete reporting of results, lack of blinding). Consistency point deducted for different results at different endpoints
1 (100) [21]	Functional improvement	Epidural corticosteroid *v* standard discectomy	4	–3	–1	0	0	Very low	Quality points deducted for sparse data and methodological flaws (incomplete reporting of results, lack of blinding). Consistency point deducted for different results at different endpoints
1 (41) [22] [23]	Pain	Infliximab *v* placebo	4	–1	0	0	0	Moderate	Quality point deducted for sparse data
1 (41) [22] [23]	Functional improvement	Infliximab *v* placebo	4	–2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (321) [15]	Pain	NSAIDs *v* placebo	4	0	0	–2	0	Low	Directness points deducted for few comparators and for differences in outcomes measured
1 (40) [24]	Pain	NSAIDs *v* electroacupuncture	4	–2	0	–2	0	Very low	Quality points deducted for sparse data and for not reporting method of randomisation. Directness points deducted for possible inclusion of people without disc herniation, and uncertainty about generalisability of outcomes measured
1 (40) [24]	Functional improvement	NSAIDs *v* electroacupuncture	4	–2	0	–1	0	Very low	Quality points deducted for sparse data, and for not reporting method of randomisation. Directness point deducted for possible inclusion of people without disc herniation.
What are the effects of non-drug treatments for herniated lumbar disc?									
1 (102) [28]	Pain	Spinal manipulation *v* placebo or sham treatment	4	–1	0	0	0	Moderate	Quality point deducted for sparse data

Important outcomes	Pain, functional improvement, mobility, patient perception of improvement, quality of life, adverse effects								
Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
1 (102) [28]	Quality of life	Spinal manipulation *v* placebo or sham treatment	4	–2	0	0	0	Low	Quality points deducted for sparse data, and for incomplete reporting of results
1 (233) [27]	Patient perception of improvement	Spinal manipulation *v* heat	4	–3	0	0	0	Very low	Quality points deducted for incomplete reporting of results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about intention-to-treat analysis, poor follow-up) and uncertainty about groups receiving equal number of treatments
1 (322) [27]	Pain	Spinal manipulation *v* exercise therapy	4	–3	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about blinding). Directness point deducted for inclusion of people without herniated disc
1 (322) [27]	Patient perception of improvement	Spinal manipulation *v* exercise therapy	4	–3	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about blinding). Directness point deducted for inclusion of people without herniated disc
1 (322) [27]	Patient perception of improvement	Spinal manipulation *v* traction	4	–3	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about blinding). Directness point deducted for inclusion of people without herniated disc
1 (112) [29]	Pain	Spinal manipulation *v* traction	4	–2	0	0	0	Low	Quality points deducted for sparse data and for uncertainty about endpoint
1 (112) [29]	Functional improvement	Spinal manipulation *v* traction	4	–2	0	0	0	Low	Quality points deducted for sparse data and for uncertainty about endpoint
1 (42) [36]	Pain	Laser acupuncture *v* sham laser acupuncture	4	–2	0	–2	0	Very low	Quality points deducted for sparse data, and incomplete reporting of results. Directness points deducted for inclusion of people without disc herniation
1 (30) [36]	Pain	Acupuncture *v* sham acupuncture	4	–2	0	–2	0	Very low	Quality points deducted for sparse data, and incomplete reporting of results. Directness points deducted for inclusion of people without disc herniation, and for conflicting results about benefits of outcomes measured
1(58) [35]	Pain	Adding acupuncture to manipulation *v* manipulation alone	4	–3	0	–1	0	Very low	Quality points deducted for sparse data, not reporting method of randomisation and for unspecified follow-up time. Directness point deducted for no long-term results
2 (372) [37] [27]	Pain	Exercise therapy *v* traction	4	–3	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, no long-term results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about blinding). Directness point deducted for inclusion of people without herniated disc
1 (50) [37]	Functional improvement	Exercise therapy *v* traction	4	–3	0	0	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and no long-term results

Important outcomes	Pain, functional improvement, mobility, patient perception of improvement, quality of life, adverse effects								
Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
1 (322) [27]	Patient perception of improvement	Exercise therapy *v* traction	4	–3	0	–1	0	Very low	Quality points deducted for incomplete reporting of results, and methodological flaws (not reporting method of randomisation, group baseline characteristics, uncertainty about blinding). Directness point deducted for inclusion of people without herniated disc
1 (40) [38]	Functional improvement	Adding exercise plus education to conventional non-surgical treatment *v* conventional non-surgical treatment alone	4	–1	–1	0	0	Low	Quality point deducted for sparse data. Consistency point deducted for conflicting results on analysis
1 (110) [39]	Pain	Massage/manipulation *v* massage/manipulation plus functional training exercises *v* traction	4	–1	0	–2	0	Very low	Quality point deducted for sparse data. Directness points deducted for unclear measurement of outcomes, and for including spinal massage techniques (uncertainty about generalisability of results with other massage-only interventions)
1 (110) [38]	Functional improvement	Massage/manipulation *v* massage/manipulation plus functional training exercises *v* traction	4	–1	0	–2	0	Very low	Quality point deducted for sparse data. Directness points deducted for unclear measurement of outcomes, and for including spinal massage techniques (uncertainty about generalisability of results with other massage-only interventions)
1 (183) [40]	Pain	Bed rest *v* no treatment	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for uncertainty about generalisability of results for people with herniated lumbar disc
1 (183) [40]	Functional improvement	Bed rest *v* no treatment	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for uncertainty about generalisability of results for people with herniated lumbar disc
1 (183) [40]	Patient perception of improvement	Bed rest *v* no treatment	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for uncertainty about generalisability of results for people with herniated lumbar disc
4 (329) [15]	Pain	Traction *v* no traction or sham traction	4	–1	0	–1	0	Low	Quality point deducted for incomplete reporting of results. Directness point deducted for inclusion of people without disc herniation
5 (431) [15] [42]	Functional improvement	Traction *v* no traction or sham traction	4	–1	0	–2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for inclusion of people without disc herniation and for inclusion of other interventions
1 (102) [42]	Patient perception of improvement	Traction *v* no traction or sham traction	4	–1	0	–1	0	Low	Quality point deducted for sparse data. Directness point deducted for inclusion of other interventions
2 (93) [43] [44]	Functional improvement	Autotraction *v* passive traction	4	–3	–1	–1	0	Very low	Quality points deducted for sparse data, incomplete reporting of results, and no intention-to-treat analysis. Consistency point deducted for conflicting results. Directness point deducted for assessing different outcomes
What are the effects of surgery for herniated lumbar disc?									
2 (339) [46] [47]	Pain	Microdiscectomy *v* conservative treatment	4	–1	–1	–1	0	Very low	Quality point deducted for methodological flaw (high crossover between interventions). Consistency point deducted for different results at different endpoints. Directness point deducted for multiple interventions in comparison.

Important outcomes	Pain, functional improvement, mobility, patient perception of improvement, quality of life, adverse effects								
Number of studies (participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
2 (339) [46] [47]	Functional improvement	Microdiscectomy *v* conservative treatment	4	–1	–1	–1	0	Very low	Quality point deducted for methodological flaw (high crossover between interventions). Consistency point deducted for different results at different endpoints. Directness point deducted for multiple interventions in comparison.
1 (56) [46]	Quality of life	Microdiscectomy *v* conservative treatment	4	–1	0	–1	0	Low	Quality points deducted for sparse data. Directness point deducted for multiple interventions in comparison.
1 (283) [47]	Patient perception of improvement	Microdiscectomy *v* conservative treatment	4	–1	–1	–1	0	Very low	Quality point deducted for methodological flaw (high crossover between interventions). Consistency point deducted for different results at different endpoints. Directness point deducted for multiple interventions in comparison.
1 (60) [48]	Pain	Video-assisted arthroscopic microdiscectomy *v* standard discectomy	4	–2	0	0	0	Low	Quality points deducted for sparse data, and incomplete reporting of results
1 (60) [48]	Patient perception of improvement	Video-assisted arthroscopic microdiscectomy *v* standard discectomy	4	–1	0	0	0	Moderate	Quality point deducted for sparse data
2 (627) [20] [52]	Pain	Standard discectomy *v* conservative treatment	4	0	–2	0	0	Low	Consistency points deducted for conflicting results and different results at different endpoints
2 (627) [20] [52]	Functional improvement	Standard discectomy *v* conservative treatment	4	0	–2	0	0	Low	Consistency points deducted for conflicting results, and different results at different endpoints
1 (60) [54]	Patient perception of improvement	Standard discectomy *v* microdiscectomy	4	–1	0	0	0	Moderate	Quality point deducted for sparse data
5 (378) [38] [20] [53] [54] [50]	Pain	Standard discectomy *v* microdiscectomy	4	–1	0	–2	0	Very low	Quality point deducted for incomplete reporting of results. Directness points deducted for uncertainty about outcomes in one study, and for uncertainty about baseline differences in another study

Type of evidence: 4 = RCT; 2 = Observational
Consistency: similarity of results across studies
Directness: generalisability of population or outcomes
Effect size: based on relative risk or odds ratio