Pain Management Injection Therapies for Low Back Pain

Appendixes

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Appendix A. Search Strategies

Database: Ovid MEDLINE(R) without Revisions
1     Low Back Pain/ or Spinal Stenosis/ or Radiculopathy/ or ("low back pain" or "spinal adj3 stenosis" or "radiculopathy").mp.
2     spine/ or coccyx/ or intervertebral disk/ or lumbar vertebrae/ or sacrum/ or spinal canal/ or exp back/ or facet joint/ or zygapophysial joint/ or sacroiliac.mp.
3     Chronic Pain/ or (chronic adj3 pain).mp.
4     2 and 3
5     1 or 4
6     Patient Selection/
7     exp Treatment Outcome/
8     Prognosis/ or (prognosis or prognostic).mp.
9     (patient$ adj5 select$).mp.
10    (select$ adj5 method$).mp.
11    or/6-10
12    exp Injections, Spinal/ or exp Injections, Intra-Articular/
13    ((spine$ or spinal$ or epidural or facet or sacroiliac or "medial branch") adj5 (block or injection$)).mp.
14    12 or 13
15    5 and 14
16    5 and 11
17    16 and inject*.mp.
18    11 and 14
19    18 and "low back pain".mp.
20    15 or 17 or 19
21    20 and (random* or control* or cohort).mp.
22    limit 21 to yr="2008 - 2014"

Database: EBM Reviews - Cochrane Central Register of Controlled Trials
1     Low Back Pain/ or Spinal Stenosis/ or Radiculopathy/ or ("low back pain" or "spinal adj3 stenosis" or "radiculopathy").mp.
2     spine/ or coccyx/ or intervertebral disk/ or lumbar vertebrae/ or sacrum/ or spinal canal/ or exp back/ or facet joint/ or zygapophysial joint/ or sacroiliac.mp.
3     Chronic Pain/ or (chronic adj3 pain).mp.
4     2 and 3
5     1 or 4
6     Patient Selection/
7     exp Treatment Outcome/
8     Prognosis/ or (prognosis or prognostic).mp.
9     (patient$ adj5 select$).mp.
10    (select$ adj5 method$).mp.
11    or/6-10
12    exp Injections, Spinal/ or exp Injections, Intra-Articular/
13    ((spine$ or spinal$ or epidural or facet or sacroiliac or "medial branch") adj5 (block or injection$)).mp.
Appendix A. Search Strategies

14  12 or 13
15  5 and 14
16  5 and 11
17  16 and inject*.mp.
18  11 and 14
19  18 and "low back pain".mp.
20  15 or 17 or 19 (1306)
21  limit 20 to yr="2008 - 2014"

Database: EBM Reviews - Cochrane Database of Systematic Reviews
1   low back pain.ti.
2   1 and (epidural or facet or sacroiliac or "medial branch" or injection).mp.
# Appendix B. PICOTS

<table>
<thead>
<tr>
<th>PICOT</th>
<th>Include</th>
<th>Exclude</th>
</tr>
</thead>
</table>
| **Population and Conditions of Interest** | • For all KQs: Adults with subacute (4 to 12 weeks) or chronic (>12 weeks) symptoms of the following:  
  o For epidural corticosteroid injections-Nonradicular low back pain, low back pain with radiculopathy, or spinal stenosis  
  o For facet joint corticosteroid injection and medial branch block- Nonradicular low back pain  
  o For sacroiliac joint corticosteroid injection-Nonradicular back pain in the sacroiliac region | • Persons younger than 18 years of age                                                                                                                                                            |
| **Interventions**      | • All KQs: Epidural corticosteroid injection, facet joint corticosteroid injection, medial branch block, sacroiliac joint corticosteroid joint injection                                                                 | • Intraspinal injections involving anti-tumor necrosis factor agents, radiofrequency denervation, intradiscal electrothermal therapy, chemonucleolysis, and intradiscal methylene blue or ozone |
| **Comparators**        | • For KQ 2: Studies that evaluate the effects of patient characteristics (e.g., age, sex, duration of pain, pain level, expectations of treatment benefits, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, or other treatment received) or findings with interventional diagnostic techniques (e.g., discography, selective nerve root block, facet joint block, medial branch block, sacroiliac joint block), imaging studies, and/or other clinical criteria.  
  • For KQs 1, 3, and 4: Saline epidural, epidural with local anesthetic, non-epidural injection, no injection, surgery, or nonsurgical therapies.                                                                 | • Uncontrolled or pre-post studies                                                                                                                                                                 |
| **Outcomes**           | • For KQs 1, 2, 3: Pain, function, quality of life, opioid use, subsequent surgery, health care utilization  
  • For KQ 4: Harms, including bleeding, infection, neurological events, and systemic complications, such as weight gain, diabetes, osteoporosis, and other endocrinological effects |                                                                                                                                                                                                     |
| **Timing**             | • For all KQs: Outcomes measured 1 week or later after the injection; durability of treatment response will be assessed                                                                                                                                     |                                                                                                                                                                                                     |
| **Setting**            | • For all KQs: No restrictions                                                                                                                                                                        |                                                                                                                                                                                                     |
| **Study Design**       | • For KQs 1-3: randomized trials  
  • For KQ 4: randomized trials or controlled cohort studies                                                                                                                                          |                                                                                                                                                                                                     |

KQ = key question; PICOT = populations; interventions, comparators, outcomes, timing, setting.
Appendix C. Included Studies

Please refer to this section as a reference list for Appendixes E and F.


Appendix C. Included Studies


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Appendix C. Included Studies


Nash T. Facet joints-intra-articular steroids or nerve block. Pain Clinic. 1990;3(2):77-82. PMID: No PMID.


Appendix C. Included Studies


Appendix D. Excluded Studies


Block JP. Epidural steroid or etanercept injections have limited to no benefit for subacute sciatica. Journal of Clinical Outcomes Management. 2012;19(6):245-7. PMID: No PMID. Excluded: Using original studies instead (e.g., meta-analysis, compiled study data, or data from another publication).


Appendix D. Excluded Studies


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Appendix D. Excluded Studies


## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
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| Ackerman, 2007     | RCT         | U.S.            | Radicular pain in S1 dermatomal distribution; L5-S1 disk herniation confirmed by MRI; electromyographic evidence of S1 nerve root involvement; pain intensity >7; duration not specified | Pregnancy; allergies to steroids; steroid use within 3 weeks prior to study; bleeding history; infection; use of anticoagulants; allergies to study medications | Approached: 487 Eligible: 285 Randomized: 90 (30 vs. 30 vs. 30) Analyzed: 90 at 24 weeks | A: Transforaminal epidural injection with 40 mg triamcinolone (1 ml) and saline (4 ml), with fluoroscopic guidance (n=30)  
B: Interlaminar epidural injection with 40 mg triamcinolone (1 ml) and saline (4 ml), with fluoroscopic guidance (n=30)  
C: Caudal epidural injection with 40 mg triamcinolone (1 ml) and saline (19 ml), with fluoroscopic guidance (n=30) |
| Ahadian, 2011      | RCT         | U.S. Two centers | ≥18 years of age; distal radicular pain ≥6 months in duration; previously benefitted from transforaminal epidural steroid injection with betamethasone 6 to 12 mg with recurrence of pain; VAS score ≥50 out of 100 | Pregnancy; infection; coagulopathy; uncontrolled diabetes or hypertension; allergy to iodinated contrast medium; interventional therapies for pain in last 90 days | Approached: 449 Eligible: 98 Randomized: 98 (32 vs. 33 vs. 33) Analyzed: 98 at 12 weeks | A: Transforaminal epidural injection with 12 mg dexamethasone (3 ml), with fluoroscopic guidance (n=32)  
B: Transforaminal epidural injection with 8 mg dexamethasone (2 ml), with fluoroscopic guidance (n=33)  
C: Transforaminal epidural injection with 4 mg dexamethasone (1 ml), with fluoroscopic guidance (n=33) |
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<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
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<tr>
<td>Ackerman, 2007</td>
<td>A vs. B vs. C: Age (mean): 34 vs. 39 vs. 36 years&lt;br&gt;Male: 67% vs. 70% vs. 63%&lt;br&gt;Duration of symptoms (days): 35 vs. 33 vs. 38&lt;br&gt;Baseline pain (0 to 10): 8.6 vs. 8.8 vs. 8.9&lt;br&gt;Baseline ODI (0-70): 30 vs. 33 vs. 37</td>
<td>A vs. B vs. C: Treatments prior to intervention: Not specified&lt;br&gt;Treatments following intervention: Tizanidine and celecoxib; otherwise not specified&lt;br&gt;Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 3 injections performed at 2 week intervals&lt;br&gt;Number of levels: Transforaminal vs. interlaminar vs. caudal&lt;br&gt;Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of different approaches for epidural injections</td>
</tr>
<tr>
<td>Ahadian, 2011</td>
<td>A vs. B vs. C: Age (median): 58 vs. 57 vs. 60 years&lt;br&gt;Male: 53% vs. 70% vs. 88%&lt;br&gt;Duration of symptoms &gt;2 years: 91% vs. 88% vs. 91%&lt;br&gt;Baseline pain (0 to 100): 73 vs. 71 vs. 68&lt;br&gt;Baseline ODI (0 to 50): 23 vs. 24 vs. 24</td>
<td>A vs. B vs. C: Treatments prior to intervention: Previous response to transforaminal epidural injection with betamethasone&lt;br&gt;Treatment following intervention: Not specified&lt;br&gt;L3-L4 disc abnormality: 25% vs. 45% vs. 36%&lt;br&gt;L4-L5 disc abnormality: 31% vs. 39% vs. 27%&lt;br&gt;Central stenosis: 28% vs. 39% vs. 39%&lt;br&gt;Post laminectomy syndrome: 9.4% vs. 15% vs. 3.0%</td>
<td>Number and frequency of injections: Single injection&lt;br&gt;Number of levels: Single level&lt;br&gt;Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Transforaminal epidural injection with different doses of corticosteroid</td>
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### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Author, Year Title</th>
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</table>
| **Ackerman, 2007** | **A vs B vs C:**  
**Pain**  
Complete pain relief (complete, partial, or no pain relief): 30% (9/30) vs. 10% (3/30) vs. 3% (1/30) at 24 weeks: A vs. B, RR 3.0 (95% CI 0.90 to 10.07); A vs. C, RR 9.0 (95% CI 1.21 to 66.71); B vs. C, RR 3.0 (95% CI 0.33 to 27.23)  
Complete or partial pain relief: 83% (25/30) vs. 60% (18/30) vs. 57% (17/30) at 24 weeks: A vs. B, RR 1.39 (95% CI 1.0 to 1.9); A vs. C, RR 1.47 (95% CI 1.03 to 2.10); B vs. C, RR 1.06 (95% CI 0.69 to 1.62)  
Pain (mean, 0-10): 2.4 vs. 5.7 vs. 6.1 at 2 weeks after last injection (p<0.05 for A vs. B or C)  
**Function**  
ODI (mean, 0-70): 14 vs. 13 vs. 14 at 2 weeks after last injection (p>0.05)  
**Other outcomes**  
Beck Depression Inventory (mean, 0-63): 12 vs. 11 vs. 13 at 2 weeks after last injection (p>0.05) |
| **Ahadian, 2011** | **A vs. B vs. C:**  
**Pain**  
Pain (mean, 0-100 VAS, estimated from graph): 73 vs. 71 vs. 68 at baseline; 42 vs. 38 vs. 41 at 4 weeks; 51 vs. 37 vs. 50 at 8 weeks; 52 vs. 45 vs. 54 at 12 weeks (p>0.05 for between group differences at all time points)  
**Function**  
ODI (mean, 0-100 VAS, estimated from graph): 23 vs. 24 vs. 24 at baseline; 18 vs. 17 vs. 18 at 4 weeks; 20 vs. 17 vs. 19 at 8 weeks; 21 vs. 19 vs. 20 at 12 weeks, (p>0.05 for between group differences at all time points)  
**Global improvement**  
Global impression of change <=3 (7 point scale): No difference between groups, data not reported  
Global satisfaction scale >=2 (5 point scale): No difference between groups, data not reported |
<table>
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<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackerman, 2007</td>
<td>24 weeks</td>
<td>A vs. B vs. C: 0% (0/90)</td>
<td>Appears complete</td>
<td>A vs. B vs. C: No infection, headache, intravascular injection, reaction to contrast material, steroid, or subarachnoid injection in any patient</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Ahadian, 2011</td>
<td>12 weeks</td>
<td>A vs. B vs. C: 0% (0/98)</td>
<td>Appears complete</td>
<td>A vs. B vs. C: Paresthesia: 6% (6/98) overall No serious adverse events</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
<td>Inclusion Criteria</td>
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<td>Arden, 2005</td>
<td>RCT</td>
<td>UK, Multicenter Specialty clinics</td>
<td>18 to 70 years of age; back pain with unilateral radicular symptoms, extending below the knee, with signs including reduced SLR and a positive sciatic nerve stretch test; duration 4 weeks to 18 months; normal laboratory results; lumbar spine X-ray to exclude other causes of radicular pain including infection and malignancy</td>
<td>Previous back surgery; bleeding disorder or anticoagulation; bilateral symptoms; previous epidural injection; current litigation relating to sciatica; significant psychological disorder</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 228 (120 vs. 108) Analyzed: 228 (120 vs. 108) at 12 months, including 25 (14 vs. 11) with missing data</td>
<td>A: Interlaminar epidural injection with 80 mg triamcinolone acetonide plus 0.125% bupivacaine (10 ml) (n=120) B: Soft tissue injection into interspinous ligament of normal saline (2 ml) (n=108)</td>
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<tr>
<td>Price, 2005</td>
<td>RCT</td>
<td>UK, Multicenter Specialty clinics</td>
<td>18 to 70 years of age; back pain with unilateral radicular symptoms, extending below the knee, with signs including reduced SLR and a positive sciatic nerve stretch test; duration 4 weeks to 18 months; normal laboratory results; lumbar spine X-ray to exclude other causes of radicular pain including infection and malignancy</td>
<td>Previous back surgery; bleeding disorder or anticoagulation; bilateral symptoms; previous epidural injection; current litigation relating to sciatica; significant psychological disorder</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 228 (120 vs. 108) Analyzed: 228 (120 vs. 108) at 12 months, including 25 (14 vs. 11) with missing data</td>
<td>A: Interlaminar epidural injection with 80 mg triamcinolone acetonide plus 0.125% bupivacaine (10 ml) (n=120) B: Soft tissue injection into interspinous ligament of normal saline (2 ml) (n=108)</td>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<th>Author, Year</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arden, 2005</td>
<td>A vs. B: Age (mean): 43 vs. 44 years Male: 52% vs. 54% Duration of symptoms: Mean not reported (4 weeks to 18 months by inclusion criteria); 38% vs. 35% acute (4 weeks to 4 months) Baseline leg pain (0-100 VAS): 52 vs. 56 Baseline back pain (0-100 VAS): 40 vs. 44 Baseline ODI (0-100): 44 vs. 45</td>
<td>A vs. B: Treatments prior to intervention: Physiotherapy package with education and exercise regimens Treatments following intervention: Not specified HAD depression: 7 vs. 4 Off work with sciatica: 34% vs. 32% Decreased sensation: 78% vs. 63% Absence/decreased ankle reflexes: 32% vs. 32% Decreased power: 42% vs. 43%</td>
<td>Number and frequency of injections: Mean not reported, up to three injections at 3 week intervals if ODI improved less than 75% from baseline Number of levels: Not reported Provider experience: &quot;Operators were all very experienced&quot;</td>
<td>None reported</td>
<td>Soft tissue injection with saline</td>
</tr>
<tr>
<td>Price, 2005</td>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

### Results

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| Arden, 2005  | A vs. B: Pain | Leg pain (mean improvement from baseline, 0-100 VAS): 12 vs. 10 at 3 weeks; 15 vs. 15 at 6 weeks; 13 vs. 18 at 12 weeks; 17 vs. 20 at 52 weeks (p>0.05 at all time points)  
Leg pain improved >50%: 35% (42/120) vs. 26% (28/108) at 3 weeks, RR 1.35 (95% CI 0.90 to 2.02); 47% (56/120) vs. 41% (44/108) at 6 weeks, RR 1.15 (95% CI 0.85 to 1.54); 43% (52/120) vs. 46% (50/108) at 12 weeks, RR 0.94 (95% CI 0.70 to 1.25); 48% (58/120) vs. 44% (48/108) at 52 weeks, RR 1.09 (95% CI 0.82 vs 1.44)  
Leg pain improved >50%: 35% (42/120) vs. 26% (28/108) at 3 weeks, RR 1.35 (95% CI 0.90 to 2.02); 47% (56/120) vs. 41% (44/108) at 6 weeks, RR 1.15 (95% CI 0.85 to 1.54); 43% (52/120) vs. 46% (50/108) at 12 weeks, RR 0.94 (95% CI 0.70 to 1.25); 48% (58/120) vs. 44% (48/108) at 52 weeks, RR 1.09 (95% CI 0.82 vs 1.44)  
Back pain (mean improvement from baseline, 0-100 VAS): 6 vs. 2 at 3 weeks; 6 vs. 8 at 6 weeks; 4 vs. 7 at 12 weeks, 8 vs. 9 at 52 weeks |
| Price, 2005  | Function ODI (mean improvement from baseline, 0-100): 10 vs. 7 at 3 weeks; 13 vs. 10 at 6 weeks; 12 vs. 12 at 12 weeks;16 vs. 14 at 52 weeks (p>0.05 at all time points) (p>0.05 at all time points)  
ODI (0-100, estimated from figure): 44 vs. 45 at baseline; 32 vs. 39 at 3 weeks (p=0.05); 31 vs. 35 at 6 weeks (p=0.15); 33 vs. 34 at 12 weeks (p=0.92), 29 vs. 33 at 52 weeks (p=0.55)  
ODI improved >75%: 12% (15/120) vs. 3.7% (4/108) at 3 weeks, RR 3.38 (95% CI 1.16 to 9.86); 15% (18/120) vs. 13% (14/108) at 6 weeks, RR 1.16 (95% CI 0.61 to 2.21); 16% (19/120) vs 22% (24/108) at 12 weeks, RR 0.71 (5% CI 0.41 to 1.23); 32% (38/120) vs. 30% (32/108) at 52 weeks, RR 1.07 (95% CI 0.72 to 1.58)  
SF-36: No statistically significant differences (data not reported) |
| Arden, 2005  | Other outcomes Surgery: 13% (15/120) vs. 13% (14/108) through 52 weeks, RR 0.96 (95% CI 0.49 to 1.9)  
Physiotherapy: 26% vs. 23% over 52 weeks  
Other injections: 13% vs. 11% over 52 weeks  
HAD anxiety (mean improvement from baseline): 2 vs. 2 at 3 weeks; 2 vs. 2 at 6 weeks; 2 vs. 3 at 12 weeks; 3 vs. 3 at 52 weeks  
HAD depression (mean improvement from baseline): 1 vs. 1 at 3 weeks; 2 vs. 2 at 6 weeks; 2 vs. 2 at 12 weeks; 2 vs. 2 at 52 weeks  
Analgesic use (mean change in number consumed in a week, baseline 37 vs. 48): -6 vs. -11 at 3 weeks; -8 vs. -13 at 6 weeks; -9 vs. -16 at 12 weeks; -14 vs. -16 at 52 weeks  
Days off work with sciatica (median change, baseline 98 vs. 93): -21 vs -21 at 3 weeks; -21 vs. -21 at 6 weeks; -37 vs. -23 at 12 weeks; -65 vs. -33 at 52 weeks |
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<tr>
<td>Arden, 2005</td>
<td>12 months</td>
<td>A vs. B: 12% (14/120) vs. 10% (11/108)</td>
<td>Appears complete</td>
<td>A vs. B: One post-dural puncture headache Non-specific headache: 3% (4) vs. 4% (4)</td>
<td>UK National Health Service, Health Technology Assessment Programme</td>
<td>Fair</td>
</tr>
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| Aronsohn, 2010 | RCT          | U.S.            | Chronic lumbar discogenic pain; radiculopathy; MRI or CT scans consistent with diagnosis of contained disc herniation at L3-4, L4-5, or L5S-1; ≥50% preserved disc height; duration not specified | Not Reported | Approached: Not reported Eligible: Not reported Randomized: 50 (24 vs. 26) Analyzed: Unclear | A: Epidural injection (approach not reported) with 40 mg methylprednisolone plus 0.25% bupivacaine (3 ml), with fluoroscopic guidance (n=24)  
B: Lumbar discectomy using Stryker disc Dekompressor (n=26) |
| Becker, 2007 | RCT          | Germany         | Unilateral lumbar radicular compression, confirmed by MRI or CT showing herniation of nucleus pulposus or scarring after previous surgery; duration ≥6 weeks; pain intensity moderate to severe | Need for early surgery; additional neurologic illnesses; cervical myopathy; systemic bone or joint illness; previous epidural or epidural perineural injection in the last 3 months; cortisone or opioid use in the last 6 months | Approach: Not reported Eligible: Not reported Randomized: 84 (25 vs. 27 vs. 32) Analyzed: 83 (24 vs. 27 vs. 32) at 24 weeks | A: Perineural epidural injection using oblique interlaminar approach with 10 mg triamcinolone plus unspecified local anesthetic (1 ml), with fluoroscopic guidance (n=24)  
B: Perineural epidural injection using oblique interlaminar approach with 5 mg triamcinolone plus unspecified local anesthetic (1 ml), with fluoroscopic guidance (n=24)  
C: Perineural epidural injection using oblique interlaminar approach with autologous conditioned serum (1 ml), with fluoroscopic guidance (n=24) |
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<td>Aronsohn, 2010</td>
<td>A vs. B: Age (mean): 51 vs. 41 years Male: 56% vs. 64% Duration of symptoms: Not reported Baseline back pain (0-10): 7.1 vs. 7.5 Baseline radicular pain (0-10): 9.3 vs. 9.1 Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not reported Treatments following intervention: Not reported Other patient characteristics: Not reported</td>
<td>Number of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance</td>
<td>Percutaneous microdiscectomy</td>
</tr>
<tr>
<td>Becker, 2007</td>
<td>A vs. B vs. C: Age (mean): 54 years (reports no difference between groups) Male: Reports no difference between groups, data not provided Duration of symptoms: Reports no difference between groups, data not provided Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B vs. C: Treatments prior to intervention: Pain medication discontinued for 2 weeks prior to first injection Treatments following intervention: No additional medical therapy or physical therapy</td>
<td>Number and frequency of injections: 3 injections at 1 week intervals Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance</td>
<td>Perineural epidural injection with different doses of corticosteroid or autologous conditioned serum</td>
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<th>Title</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aronsohn, 2010</td>
<td>A vs. B:</td>
<td>Pain</td>
</tr>
<tr>
<td>Becker, 2007</td>
<td>A vs. B vs. C:</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td></td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Duration of Followup</td>
<td>Loss to Followup</td>
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</tr>
<tr>
<td>Aronsohn, 2010</td>
<td>6 weeks</td>
<td>Not reported</td>
</tr>
<tr>
<td>Becker, 2007</td>
<td>22 weeks</td>
<td>Not reported</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Study Title</td>
<td>Country</td>
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<tr>
<td>Beliveau, 1971</td>
<td>RCT</td>
<td>UK</td>
</tr>
<tr>
<td>Breivik, 1976</td>
<td>RCT</td>
<td>Norway</td>
</tr>
<tr>
<td>Buchner, 2000</td>
<td>RCT</td>
<td>Germany</td>
</tr>
</tbody>
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# Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliveau, 1971</td>
<td>A vs. B: Age (mean): 41 years (overall) Male: 75% Duration of symptoms: Not reported Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>Interlaminar epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Breivik, 1976</td>
<td>A vs. B: Age (mean): Not reported, range 30-63 years Male: 50% vs. 47% Duration of symptoms: Not reported Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Prior surgery: 25% vs. 37% Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean 2.6 vs. 2.5 injections; repeated at weekly intervals for up to 3 injections; 5/16 vs. 11/19 patients received other type of injection after no relief from 3 injections Number of levels: Not reported Provider experience: Not reported</td>
<td>Not reported</td>
<td>Caudal epidural local anesthetic injection</td>
</tr>
<tr>
<td>Buchner, 2000</td>
<td>A vs. B: Age (mean): 37 vs. 32 years Male: 47% vs. 79% Duration of symptoms (weeks): median 8 vs. 8 Baseline pain (0-100): 84 vs. 81 Hannover Functional Ability Questionnaire: 39% vs. 40%</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Bed rest; analgesics; NSAIDS or tramadol; graded rehabilitation including hydrotherapy, electroanalgesia, spinal mobilization physiotherapy</td>
<td>Number and frequency of injections: 3 injections within 14 days Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>No injection</td>
</tr>
</tbody>
</table>
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Beliveau, 1971</td>
<td>A vs. B: Pain</td>
<td>Improved or completely relieved (clinician rated): 75% (18/24) vs. 67% (16/24), RR 1.13 (95% CI 0.78 to 1.62)</td>
</tr>
<tr>
<td>Breivik, 1976</td>
<td>A vs. B: Pain</td>
<td>Pain relief &quot;considerable&quot; (defined as diminution of pain and/or paresis to enable return to work or rehabilitation for other work): 65% (9/16) vs. 26% (5/19) RR 2.14 (95% CI 0.90 to 5.09)</td>
</tr>
<tr>
<td>Buchner, 2000</td>
<td>A vs. B: Pain</td>
<td>Pain (0-100 VAS): 84 vs. 81 at baseline; 31 vs. 37 at 2 weeks; 33 vs. 38 at 6 weeks; 33 vs. 39 at 6 months (p&gt;0.05 at all time points)</td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td>Hannover Functional Ability Questionnaire: 39% vs. 40% at baseline; 64% vs. 57% at 2 weeks; 62% vs. 58% at 6 weeks; 62% vs. 57% at 6 months (p&gt;0.05 at all time points)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Return to work: 88% (15/17) vs. 74% (14/19) at 6 months, RR: 1.20 (95% CI 0.87 to 1.65)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overall results &quot;very good&quot; or &quot;good&quot;: 88% (15/17) vs. 74% (14/19), RR 1.20 (95% CI 0.87 to 1.65) at 6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery: 12% (2/17) vs. 21% (4/19) at 6 months, RR 0.56 (95% CI 0.12 to 2.68)</td>
</tr>
<tr>
<td>Author, Year Title</td>
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</tr>
<tr>
<td>-------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Beliveau, 1971</td>
<td>1 week</td>
<td>Not reported</td>
</tr>
<tr>
<td>Breivik, 1976</td>
<td>Unclear</td>
<td>Not reported</td>
</tr>
<tr>
<td>Buchner, 2000</td>
<td>6 months</td>
<td>None</td>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
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</table>
| Burgher, 2011 | RCT          | US              | ≥18 years of age, intervertebral disc herniation with low back and leg pain due to encroachment of disc material on a spinal nerve root as confirmed by CT or MRI; positive nerve root tension sign with unilateral symptoms at a single level of the lumbosacral spine; duration ≤3 months | Pain intensity was less than 3 of 10 or more than 8 of 10 if already taking opioids; recent spinal trauma; cauda equina syndrome; progressive motor deficit; chronic anticoagulation; infectious etiology; workers' compensation claim; history of adverse reaction to study medications; 1 or more corticosteroid injection in the preceding 4 months; pregnant; severe medical disease | Approached: 33 Eligible: Not reported Randomized: 26 (15 vs. 11) Analyzed: 23 (14 vs. 9) | A: Transforaminal epidural injection with 40 or 80 mg triamcinolone (2 ml) plus 2% lidocaine (1 ml), with fluoroscopic guidance (n=15)  
B: Transforaminal epidural injection with 200 or 400 mcg clonidine (2 ml) plus 2% lidocaine (1 ml), with fluoroscopic guidance (n = 11) |
| Bush, 1991 | RCT          | UK              | Unilateral sciatica associated with paresthesia; positive straight leg raise, duration >1 month; imaging findings not required | Cauda equina syndrome; nonorganic physical signs; other serious pathology; inadequate contraception in women of child-bearing age | Approached: Not reported Eligible: Not reported Randomized: 28 Analyzed: 23 (12 vs. 11) | A: Caudal epidural injection with 80 mg triamcinolone acetone in normal saline with 0.5% procaine hydrochloride (total 25 ml) (n=12)  
B: Caudal epidural injection with saline (25 ml) (n=11) |
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</tr>
</thead>
<tbody>
<tr>
<td>Burgher, 2011</td>
<td>A vs. B: Age (mean): 50 vs. 44 years Male: 67% vs. 82% Duration of symptoms (weeks): 5.3 vs. 5.0 Baseline pain (0-10 NRS): 7.0 vs. 7.0 Baseline ODI (0-50): 29 vs. 31</td>
<td>A vs. B: Treatments prior to intervention: 67% vs. 91% opioids Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean 2.3 vs. 2.0 injections, repeated at 10-14 day intervals Number of levels: 1 Provider experience: Not reported</td>
<td>Fluoroscopic guidance (digital subtraction angiography) with contrast verification</td>
<td>Transforaminal epidural injection with clonidine and local anesthetic</td>
</tr>
<tr>
<td>Bush, 1991</td>
<td>A vs. B: Age (mean): 38 vs. 37 years Male: 83% vs. 45% Duration of symptoms: Not reported Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 2 at 2 week intervals Number of levels: Caudal injection Provider experience: Not reported</td>
<td>None reported</td>
<td>Caudal epidural injection with normal saline</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>Burgher, 2011</td>
<td>A vs. B: Pain</td>
<td>Pain, difference between groups compared with baseline (0-10 NRS): at 2 weeks, 0.11 (95% CI -1.79 to 2.01); at 4 weeks, 1.54 (95% CI -0.52 to 3.60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
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<tr>
<td></td>
<td></td>
<td>Global Assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other outcomes</td>
</tr>
<tr>
<td>Bush, 1991</td>
<td>A vs. B: Pain</td>
<td>Pain (0-100 VAS): at 4 weeks 16 vs. 45  (p not reported); at 1 year 14 vs. 30 (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
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<td></td>
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<th>Quality Rating</th>
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<tbody>
<tr>
<td>Burgher, 2011</td>
<td>4 weeks for pain, function, and global impression of change; 6 months for surgery</td>
<td>A vs. B: 6.7% (1/15) vs. 18% (2/11)</td>
<td>Appears complete</td>
<td>A vs. B: Discomfort at injection site: 27% (4/15) vs. 18% (2/11) Worsening of symptoms: 13% (2/15) vs. 36% (4/11) Lightheadedness: 7% (1/15) vs. 45% (5/11) Drowsiness: 20% (3/20) vs. 18% (2/11) Dry mouth: 20% (3/20) vs. 18% (2/11) Weakness: 7% (1/15) vs. 36% (4/11) Constipation: 7% (1/15) vs. 18% (2/11) Nausea: 13% (2/15) vs. 9% (1/11) 1 group B patient withdrew due to side effects (nausea, lightheadedness)</td>
<td>National Institutes of Health</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Bush, 1991</td>
<td>1 year</td>
<td>A vs. B: 18% (5/28)</td>
<td>Appears complete</td>
<td>A vs. B: Irregular menses: 8% (1/12) vs. 0%</td>
<td>ER Squibb &amp; Sons and the Boots Company PLC</td>
<td>Fair</td>
<td></td>
</tr>
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<tbody>
<tr>
<td>Buttermann, 2004</td>
<td>RCT</td>
<td>USA Single center Surgery clinic</td>
<td>18 to 70 years of age; lumbar disc herniation &gt;25% of cross-sectional area of the spinal canal on MRI or CT; failure to respond to 6 weeks of noninvasive treatments; duration not specified</td>
<td>Cauda equina syndrome; pars defect at the level of the herniation; far-lateral disc herniation; multilevel symptomatic disc herniation; recurrent disc herniation</td>
<td>Approached: 169 Eligible: Not reported Randomized: 100 (50 vs. 50) Analyzed: 71 (23 vs. 48) at 2-3 years (on-treatment analysis)</td>
<td>A: Interlaminar epidural injection with 10 to 15 mg betamethasone, with fluoroscopic guidance in 76% of patients (n=50) B: Discectomy (technique not specified) (n=50)</td>
</tr>
<tr>
<td>Candido, 2013</td>
<td>RCT</td>
<td>US Single center Pain management center</td>
<td>&gt;18 years of age, unilateral lumbosacral radiculopathic pain, MRI findings of degenerative lumbar disc disease including protruding or bulging discs, desiccated discs, or herniated discs with preservation of at least 50% of disc height</td>
<td>Required injections for multi-level disease; a history of previous spinal surgery; lumbar epidural steroid injection(s) in the past year; allergies to study medications, using systemic corticosteroids or chronic opioid use</td>
<td>Approached: Not reported Eligible:137 Randomized:106 (53 vs. 53) Analyzed: 100 (50 vs. 50)</td>
<td>A: Lateral parasagittal interlaminar epidural injection with 120 mg methylprednisolone acetate (2 ml) plus lidocaine 1% (1 ml), with fluoroscopic guidance B: Midline interlaminar epidural injection with 120 mg methylprednisolone acetate (2 ml) plus lidocaine 1% (1 ml), with fluoroscopic guidance</td>
</tr>
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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
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<tr>
<td>Buttermann, 2004</td>
<td>A vs. B:</td>
<td>A vs. B: Treatments prior to intervention: Not specified</td>
<td>Number and frequency of injections: Mean not reported, patients could receive 1-3 at one week intervals based on response</td>
<td>Fluoroscopic guidance in 76% of patients undergoing epidural injection</td>
<td>Epidural steroid injection vs. discectomies vs. crossover</td>
</tr>
<tr>
<td></td>
<td>Age (mean): 41 vs. 40 years Male: Not reported</td>
<td>Treatments following intervention: Not specified Other patient Characteristics: Smokers: 30% vs. 36% Size of disc herniation: 42% vs. 43% Motor deficit: 82% vs. 88%</td>
<td>Number of levels: Single level Provider experience: Not reported</td>
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<tr>
<td></td>
<td>Duration of symptoms (months): 3.3 vs. 3.8</td>
<td></td>
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<tr>
<td></td>
<td>Baseline back pain (0-10): 5.4 vs. 5.2</td>
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<tr>
<td></td>
<td>Baseline leg pain (0-10): 7.4 vs. 7.0</td>
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<tr>
<td></td>
<td>Baseline ODI (0-100): 47 vs. 48</td>
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</tr>
<tr>
<td>Candido, 2013</td>
<td>A vs. B:</td>
<td>A vs. B: Treatments prior to intervention: Pain medications: 54% vs. 64%; Opioid use: 28% vs. 36%; NSAIDS: 54% vs. 62% (p&gt;0.05) Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of intervention: mean number of injections 1.82 vs. 1.88 (p&gt;0.05) Number of levels: Appears to be single Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative epidural steroid injection methods</td>
</tr>
<tr>
<td></td>
<td>Age (mean): 49 v. 49 years Male: 48% vs. 40% (p=0.5)</td>
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<tr>
<td></td>
<td>Duration of symptoms: 14 vs. 14 months</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Baseline pain at rest (mean, 0-10 NRS): 4.9 vs. 5.1</td>
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<tr>
<td></td>
<td>Baseline pain during movement (mean, 0-10 NRS): 7.6 vs. 7.2</td>
<td></td>
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<tr>
<td></td>
<td>Baseline function (mean ODI, 0 to 100): 44.9% vs. 40.6% (p=NS)</td>
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<tr>
<td><strong>Buttermann, 2004</strong></td>
<td><strong>A vs. B:</strong></td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>Back pain (mean, 0-10 VAS, estimated from graph): 5.4 vs. 5.2 at baseline; 2.6 vs. 1.7 at 4-6 months; 2.3 vs. 1.8 at 7-12 months; 2.4 vs. 1.9 at 1-2 years; 1.8 vs. 2.4 at 2-3 years (p&gt;0.05 at all time points)</td>
</tr>
<tr>
<td></td>
<td>Leg pain (mean, 0-10 VAS, estimated from graph): 7.4 vs. 7.0 at baseline; 4.1 vs. 1.4 at 1-3 months; 2.7 vs. 1.2 at 4-6 months; 1.8 vs. 1.1 at 7-12 months; 1.7 vs. 1.2 at 1-2 years; 0.8 vs. 1.5 at 2-3 years (p&gt;0.05 at all time points)</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>ODI (0-100): 47 vs. 48 at baseline; 34 vs. 22 at 1-3 months; 15 vs. 16 at 4-6 months; 14 vs. 14 at 7-12 months; 11 vs. 14 at 1-2 years; 8 vs. 16 at 2-3 years (p&gt;0.05 at all time points except 1-3 months)</td>
</tr>
<tr>
<td></td>
<td>Motor deficit (estimated from graph): 82% (41/50) vs. 88% (44/50) at baseline, RR, 0.93 (95% CI 0.79 to 1.10); 72% (36/50) vs. 38% (19/50) at 1-3 months, RR 1.89 (95% CI 1.28 to 2.81); 30% (8/27) vs. 20% (10/50) at 4-6 months, RR 1.48 (95% CI 0.66 to 3.31); 20% (5/25) vs. 12% (6/50) at 7-12 months, RR 1.67 (95% CI 0.56 to 4.93); 12% (3/24) vs. 8.0% (4/50) at 1-2 years, RR 1.56 (95% CI 0.38 to 6.43); 8.7% (2/23) vs. 4.0% (2/50) at 2-3 years, RR 2.17 (95% CI 0.33 to 14.5)</td>
</tr>
<tr>
<td><strong>Other outcomes</strong></td>
<td>Medication use &quot;much less&quot; (5 category scale, much less to much more): 16% (8/50) vs. 24% (12/50) at 1-3 months, RR 0.43 (95 % CI 0.23 to 0.78); 57% (13/23) vs. 32% (15/47) at 2-3 years</td>
</tr>
</tbody>
</table>

| **Candido, 2013** | **A vs. B** |
| **Pain** | Pain, Numeric Rating Scale at rest (NRS, 11-point scale, estimated from graph): at baseline, 4.9 vs. 5.1; at 14 days, 2.8 vs. 3; at 28 days, 2.7 vs. 3; at 60 days, 2.6 vs. 3.2; at 120 days, 2.6 vs. 3; at 180 days, 2 vs. 3.2; at 365 days, 2 vs. 3.2 (p>0.05) |
| | Pain, Numeric Rating Scale during movement (NRS, 11-point scale, estimated from graph): at baseline, 7.6 vs. 7.2; at 14 days, 3.3 vs. 4.5; at 28 days, 3.3 vs. 4.5; at 60 days, 3.7 vs. 5; at 120 days, 3.7 vs. 4.7; at 180 days, 3.7 vs. 5; at 365 days, 4 vs. 5 (p>0.05) |
| **Function** | ODI (scores 0-50 multiplied by 2 and presented as a percentage from 0-100, estimated from graph): at baseline: 44.9% vs. 40.6% (p=NS); at 14 days, 25% vs. 28%; at 28 days, 23% vs. 27%; at 60 days, 22% vs. 25%; at 120 days, 24% vs. 27%; at 180 days, 21% vs. 31%; at 365 days, 20% vs. 33% (p>0.05) |
| **Other Outcomes** | Patient Satisfaction (5-point scale, where 1 = complete dissatisfaction and 5 = complete satisfaction, estimated from GRA ph): at 1 day, 3.9 vs. 3.6; at 14 days, 4.1 vs. 2.9; at 28 days, 3.7 vs. 3.4; at 60 days, 3.7 vs. 3.4; at 120 days, 3.5 vs. 3.3; at 180 days, 4 vs. 3.2; at 365 days, 4.1 vs. 3.2 (p-values not reported, but states "better satisfaction" in group A on days 7, 14, 180, and 365.) |
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<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buttermann, 2004</td>
<td>2-3 years</td>
<td>A vs. B: 3% (3/100) at 3 years</td>
<td>46% (23/50) of patients in epidural injection group crossed over to discectomy at 2-3 years</td>
<td>A vs. B: Epidural injection (n=50): 2 incidental dural puncture, 3 recurrent disc herniation Discectomy (n=77, including crossovers): 2 incidental durotomies, 1 seroma</td>
<td>None</td>
<td>Poor</td>
</tr>
<tr>
<td>Candido, 2013</td>
<td>12 months</td>
<td>A vs. B 3 vs. 3</td>
<td>Appears complete</td>
<td>Discomfort and pain at the injection site: 22% vs. 30% (p&gt;0.05) Headache, nonpositional, not related to dural puncture: 22% vs. 12% (p&gt;0.05) Nausea: 6% vs. 14% (p&gt;0.05)</td>
<td>Department of Anesthesiology, Advocate Illinois Masonic Medical Center, Chicago, IL</td>
<td>Fair</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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| Candido, 2008      | RCT          | US Single center Clinical setting unclear | Low back pain; unilateral lumbosacral radiculopathy | Previous spinal surgery; epidural steroid injections in the past year; allergy to study drugs; concurrent systemic steroids; opioid use; pregnancy | Approached: Not reported Eligible: Not reported Randomized: 60 (30 vs. 30) Analyzed: 57 (29 vs. 28) at 6 months | A: Posterolateral interlaminar epidural injection with 80 mg methylprednisolone plus lidocaine 1% (1 ml), with fluoroscopic guidance  
B: Transforaminal epidural injection with 80 mg methylprednisolone plus lidocaine 1% (1 ml), with fluoroscopic guidance |

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</tr>
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<tbody>
<tr>
<td>Candido, 2008</td>
<td>A vs. B: Age (mean): 52 vs. 52 years Male: 57% vs. 40% Duration of symptoms &lt;3 months: 24% vs. 7.1% Baseline pain (0-10 VAS): 6.8 vs. 6.3 Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of intervention: Appears to be single Number of levels: Appears to be single Provider experience: Attending physicians supervising fellows</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative epidural steroid injection methods</td>
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<tr>
<td>Candido, 2008 A vs. B: Pain</td>
<td>Pain intensity (mean, 0-100 VAS): 63 vs. 63 at baseline; 41 vs. 49 at 2 weeks (p=0.31); 52 vs. 53 at 1 month (p=0.94); 47 vs. 43 at 3 months (p=0.68); 41 vs. 47 at 6 months (p=0.46)</td>
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</tr>
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<tbody>
<tr>
<td>Candido, 2008</td>
<td>6 months</td>
<td>None reported</td>
<td>2 in transforaminal injection group and 1 in parasagittal interlaminar group did not receive treatment and were excluded</td>
<td>A vs. B: 1 parasagittal interlaminar group had paresthesia requiring procedure to be aborted (excluded from analysis)</td>
<td>Not reported</td>
<td>Fair</td>
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| Carette, 1997      | RCT          | Canada          | >18 years of age; sciatica for >4 weeks and <1 year with constant or intermittent pain in one or both legs radiating below knee; nerve root irritation based on positive straight leg raise and/or motor, sensory, or reflex deficits, with CT evidence of herniated disk corresponding to clinical findings; ODI >20 | Cauda equina syndrome; CT findings of nerve root compression from causes other than herniated disk; epidural steroid injection in the preceding year; prior low back surgery; pregnant; known blood-coagulation disorder or allergy to local anesthetics | Approached: Not reported Eligible: Not reported Randomized: 158 (78 vs. 80) Analyzed: 156 (77 vs. 79) at 3 months | A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) plus isotonic saline (8 ml) (n=78)  
B: Interlaminar epidural injection with isotonic saline (1 ml) (n=80) |
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<tr>
<td>Carette, 1997</td>
<td>A vs. B: Age (mean): 39 vs. 41 years Male: 72% vs. 59% Duration of symptoms (weeks): 12.9 vs. 13.0 Baseline pain (0 to 100): 66 vs. 62 Baseline ODI (0 to 100): 50 vs. 50</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Acetaminophen, otherwise not specified Other patient characteristics: Disability compensation: 24% vs. 21% First episode of sciatica: 76% vs. 76% L4-L5: 49% vs. 51% L5-S1: 45% vs. 48%</td>
<td>Number and frequency of injections: Mean 2.1 injections, repeated injections permitted at 3 and 6 weeks for failure to improve Number of levels: Single level Provider experience: Not reported</td>
<td>None reported</td>
<td>Interlaminar epidural injection with saline</td>
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<tr>
<td>Carette, 1997</td>
<td>A vs. B: (differences are difference in change from baseline; ANCOVA results adjusted for male sex and living partner performed but reported as similar to unadjusted and not presented)</td>
<td><strong>Pain</strong>&lt;br&gt; Pain (0-100 VAS): 66 vs. 62 at baseline; 45 vs. 49 at 3 weeks, difference -8.6 (95% CI -18 to 0.3); 39 vs. 40 at 3 months, difference -4.0 (95% CI -15 to 7.2)&lt;br&gt; McGill Present Pain Intensity (0-5): 2.6 vs. 2.8 at baseline; 2.2 vs. 2.4 at 3 weeks, difference 0.0 (95% CI -0.4 to 0.4); 1.9 vs. 1.9 at 3 months, difference 0.2 (95% CI -0.3 to 0.7)&lt;br&gt; McGill Pain-rating Index (0-77): 28 vs. 26 at baseline; 20 vs. 22 at 3 weeks; difference -3.4 (95% CI -8.1 to 1.3), 18 vs. 18 at 3 months, difference -1.2 (95% CI -7.2 to 4.9)</td>
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<td></td>
<td><strong>Function</strong>&lt;br&gt; ODI (0-100): 50 vs. 50 at baseline, 42 vs. 44 at 3 weeks, difference -2.5 (95% CI -7.1 to 2.2); 32 vs. 35 at 3 months, difference -1.9 (95% CI -9.3 to 5.4)&lt;br&gt; ODI &lt;=20: 20% (15/77) vs. 16% (13/80) at 3 weeks, RR 1.20 (95% CI 0.61 to 2.35); 38% (29/77) vs. 42% (33/79) at 3 months, RR 0.90 (95% CI 0.61 to 1.33)&lt;br&gt; Marked or very marked improvement: 33% (25/76) vs. 30% (23/78) at 3 weeks, RR 1.12 (95% CI 0.70 to 1.78); 55% (41/74) vs. 56% (43/77) at 3 months, RR 0.99 (95% CI 0.75 to 1.32)&lt;br&gt; Sickness Impact Profile, Overall (0 to 100): 22 vs. 21 at baseline; 16 vs. 18 at 3 weeks; difference -2.5 (95% CI -5.2 to 0.1); 12 vs. 13 at 3 months, difference -1.2 (95% CI -5.2 to 2.8) (no differences on physical or psychosocial dimensions subscales)&lt;br&gt; Restricted activity in previous 2 weeks (number of days): 9.9 vs. 9.7 at baseline; 8.9 vs. 7.9 at 3 weeks; difference 0.8 (95% CI -0.6 to 2.2); 5.9 vs. 5.4 at 3 months; difference 0.3 (95% CI -1.8 to 2.5)</td>
<td></td>
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<tr>
<td></td>
<td><strong>Other outcomes</strong>&lt;br&gt; Underwent surgery: 26% (n=77) vs. 25% (n=79) at 12 months (p=0.90, log-rank test)&lt;br&gt; Returned to work within 3 months: 33% (14/43) vs. 44% (18/41), RR 0.74 (95% CI 0.43 to 1.29)&lt;br&gt; Lack of efficacy withdrawal: 15% (12/78) vs. 25% (20/80) at 3 months, RR 0.62 (95% CI 0.32 to 1.17)</td>
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<tr>
<td>Carette, 1997</td>
<td>3 months</td>
<td>A vs. B: 1.3% (1/78) vs. 1.2% (1/80)</td>
<td>Appears complete</td>
<td>A vs. B: Dural puncture: 1.3% (1/78) vs. 1.2% (1/80) Transient headache: 27% (21/78) vs. 20% (16/80) (p=0.30)</td>
<td>Medical Research Council of Canada and the Canadian Arthritis Society</td>
<td>Fair</td>
</tr>
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<tr>
<td>Cocelli, 2009</td>
<td>RCT</td>
<td>Turkey</td>
<td>20-55 years of age; acute discal radiculopathy &lt;3 months duration not responding to conservative management; radiologic disc bulge corresponding to symptoms; ODI score &gt;20</td>
<td>Bilateral symptoms; neurological deficits; prior lumbar disc surgery; severe medical comorbidities; urinary retention; allergy to study drugs</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 70 (40 vs. 30) Analyzed: 70 at 6 months</td>
<td>A: Interlaminar epidural injection with 10 mg betamethasone dipropionate and 4 mg betamethasone sodium phosphate plus 0.125% bupivacaine (total 20 ml) (n=40) B: Interlaminar epidural injection with 80 mg triamcinolone acetonide plus 0.125% bupivacaine (total 20 ml) (n=40)</td>
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<tr>
<td>Cocelli, 2009</td>
<td>A vs. B: Age (mean): 49 vs. 50 years Male: 25% vs. 40% Duration of symptoms (weeks): 3 vs. 3 Baseline pain (0-10 VAS): 9.5 vs. 9.3 Baseline ODI (0-100): 51 vs. 62</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Amitriptyline 10 mg starting on day of injection to 50 mg/day for 6 months and postural exercise program L3-L4: 20% vs. 20% L4-L5: 55% vs. 60% L5-S1: 20% vs. 20%</td>
<td>Not reported</td>
<td>None reported</td>
<td>Head-to-head comparison of alternative corticosteroids</td>
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<td>Cocelli, 2009</td>
<td>A vs. B:</td>
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<td>Pain (0-10 VAS): 9.5 vs. 9.3 at baseline, 5.7 vs. 1.1 at 2 weeks; 0.8 vs. 0.0 at 6 weeks; 0.0 vs. 0.0 at 3 months; 0.0 vs. 0.0 at 6 months</td>
</tr>
<tr>
<td></td>
<td>ODI (0-100): 51 vs. 62 at baseline, 36 vs. 32 at 2 weeks; 25 vs. 23 at 6 weeks; 22 vs. 22 at 3 months; 19 vs. 20 at 6 months</td>
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<tr>
<td>Cocelli, 2009</td>
<td>6 months</td>
<td>Reports none</td>
<td>Appears complete</td>
<td>A vs. B: &quot;No side effects related to this treatment in any of the patients&quot;</td>
<td>Not reported</td>
<td>Fair</td>
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| Cohen, 2012        | RCT          | US and Germany Multicenter Pain clinics | 18 to 70 years of age; lumbosacral radiculopathy for 4 weeks to 6 months; leg pain as or more severe than back pain; failure of conservative therapy; MRI evidence of pathologic disc condition correlating with symptoms | Coagulopathy; systemic infection; unstable medical or psychiatric condition; previous spinal surgery; previous epidural steroid injection; allergy to contrast dye | Approached: 164 Eligible: 96 Randomized: 84 (28 vs. 26 vs. 30) Analyzed: 84 at 1 month (primary analysis) | A. Transforaminal epidural injection with 60 mg methylprednisolone acetate in 2 ml sterile water and 0.5% bupivacaine (0.5 ml), with fluoroscopic guidance (n=28)  
B. Transforaminal epidural injection with 4 mg etanercept in 2 ml sterile water and 0.5% bupivacaine (0.5 ml), with fluoroscopic guidance (n=26)  
C. Transforaminal epidural injection with 2 ml sterile water and 0.5% bupivacaine (0.5 ml), with fluoroscopic guidance (n=30) |
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<tr>
<td>Cohen, 2012</td>
<td>A vs. B vs. C: Age (mean): 43 vs. 41 vs. 41 years; Male: 79% vs. 69% vs. 63%; Duration of symptoms (months): 2.61 vs. 2.67 vs. 2.82; Baseline leg pain (0-10): 5.71 vs. 6.62 vs. 6.31; Baseline back pain (0-10): 5.30 vs. 6.08 vs. 4.75; Baseline ODI (0-100): 42.93 vs. 41.12 vs. 40.87</td>
<td>A vs. B vs. C: Treatments prior to intervention: Not reported; Treatments following intervention: Analgesic medications; Other patient characteristics: Disability/worker’s compensation/medical board: 4 % vs. 12% vs. 10%; Baseline opioid therapy: 39% vs. 39% vs. 47%; L4-5: 29% vs. 35% vs. 27%; L5-S1: 43% vs. 50% vs. 47%</td>
<td>Number and frequency of injections: 86% vs. 88% vs. 93% received 2 injections (2nd injection two weeks after first); Number of levels: 1-2 levels, dose divided for multiple levels Provider experience: Board-certified pain medicine physician or attending or pain-management fellow at teaching hospital</td>
<td>Fluoroscopic guidance with contrast verification of nerve root and epidural space</td>
<td>Transforaminal epidural injection with etanercept and local anesthetic; Transforaminal epidural injection with saline and local anesthetic</td>
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<td>Cohen, 2012</td>
<td>A vs. B vs. C: <em>(difference ANCOVA adjusted for study site, sex, duration of pain, opioid use, baseline outcome score)</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pain</td>
<td>Leg Pain (0-10 NRS): 5.71 vs. 6.62 vs. 6.31 at baseline; 2.54 vs. 3.56 vs. 3.78 at 1 month, difference -1.26 (95% CI -2.79 to 0.27) for A vs. C, -1.01 (95% CI -2.60 to 0.58) for A vs. B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Back pain (0-10 NRS): 5.30 vs. 6.08 vs. 4.75 at baseline; 3.49 vs. 4.41 vs. 4.01 at 1 month, difference -0.52 (95% CI -1.85 to 0.81) for A vs. C, -0.92 (95% CI -2.28 to 0.44) for A vs. B</td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td>ODI (0-100): 42.9 vs. 41.1 vs. 40.9 at baseline, 24.1 vs. 40.3 vs. 30.0 at 1 month, difference -5.87 (95% CI -15.6 to 3.85) for A vs. C, -16.2 (95% CI -26.0 to -6.27) for A vs. B</td>
</tr>
<tr>
<td></td>
<td>Global Assessment</td>
<td>Global Perceived Effect positive (pain improved and patient satisfied): at 1 month: 82% (23/28) vs. 58% (15/26) vs. 57% (17/30) (p=0.14); A vs. B adjusted OR 3.16 (95% CI 0.88 to 11.3), A vs. C adjusted OR 3.12 (95% CI 0.91 to 10.8), B vs. C adjusted OR 0.99 (95% CI 0.33 to 2.94); 65% vs. 50% vs. 48% at 3 months, 63% vs. 45% vs. 48% at 6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Success (&gt;=50% decrease in leg pain and positive Global Perceived Effect): at 1 month 75% (21/28) vs. 42% (11/26) vs. 50% (15/30), A vs. C adjusted OR 3.63 (95% CI 1.10 to 12.0), A vs. B adjusted OR 2.62 (95% CI 0.82 to 8.37), B vs. C adjusted OR 0.72 (95% CI 0.24 to 2.16); at 3 months 50% (14/28) vs. 42% (11/26) vs. 43% (13/30); at 6 months 29% (8/28) vs. 38% (10/26) vs. 40% (12/30), A vs. B RR 0.74 (95% CI 0.35 to 1.59), A vs. C RR 0.71 (95% CI 0.34 to 1.48), B vs. C RR 0.96 (95% CI 0.50 to 1.85)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Surgery: at 12 months 21% (6/28) vs. 23% (6/26) vs. 17% (5/30); A vs. B RR 0.93 (95% CI 0.34 to 2.52), A vs. C RR 1.29 (95% CI 0.44 to 3.74), B vs. C RR 1.38 (95% CI 0.48 to 4.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remained on active duty: at 12 months 100% (15/15) vs. 93% (13/14) vs. 90% (17/19); A vs. B: RR 1.04 (95% CI 0.61 to 1.77); A vs. C: RR 1.06 (95% CI 0.64 to 1.74); B vs. C: RR 1.06 (95% CI 0.64 to 1.74)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesic use decreased &gt;=20%: 63% (17/28) vs. 36% (9/30) vs. 50% (14/30) at 1 month (p=0.24), A vs. B adjusted OR 3.0 (95% CI 0.83 to 10.8), A vs. C adjusted OR 1.67 (95% CI 0.48 to 5.77), B vs. C adjusted OR 0.56 (95% CI 0.16 to 1.89); 92% (11/12) vs. 65% (7/11) vs. 75% (9/12) at 6 months, A vs. B RR 1.44 (95% CI 0.89 to 2.32), A vs. C RR 1.22 (95% CI 0.85 to 1.76), B vs. C RR 0.84 (95% CI 0.49 to 1.47)</td>
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<tr>
<td>Cohen, 2012</td>
<td>6 months; surgery and remained on active duty assessed through 1 year</td>
<td>None</td>
<td>Appears complete</td>
<td>A vs. B. vs. C: Worsening pain: 4% (1/28) vs. 19% (5/26) vs. 20% (6/30) New neurological symptom: 0% (1/28) vs. 4% (1/26) vs. 3% (1/30) Nonlocal infection: 0% (0/28) vs. 4% (1/26) vs. 10% (3/30) Nonlocal rash: 4% (1/28) vs. 0% vs. 0%</td>
<td>John P. Murtha Neuroscience and Pain Institute, International Spinal Intervention Society, the Center for Rehabilitation Sciences Research</td>
<td>Good</td>
</tr>
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<td>Author, Year Title</td>
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<td>--------------------------------------------------------------------------</td>
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<tr>
<td>Cohen, 2012b</td>
<td>RCT</td>
<td>USA Multicenter Pain clinics</td>
<td>Age &gt;18 years; signs and symptoms of lumbosacral radiculopathy; leg pain as great as or greater than back pain; agreement to receive injection regardless of MRI findings</td>
<td>Previous back surgery; duration of pain &gt;4 years; treated with epidural steroid injection within the past 2 years; serious neurologic deficit; serious psychiatric disease</td>
<td>Approached: 323 Eligible: Unclear Randomized: 132 (67 vs. 65) Analyzed: 132</td>
<td>A: Transforaminal epidural injection with 60 mg methylprednisolone, 0.25% bupivacaine (1 ml), and saline (0.5 ml) (total 3 ml) or interlaminar epidural injection with 60 mg methylprednisolone, 0.25% bupivacaine (1 ml), and saline (1.5 ml) (total 4 ml), with fluoroscopic guidance; treatment and level based on MRI findings (n=67) B: Injection as above, based on history and physical examination findings (n=65)</td>
</tr>
<tr>
<td>Cuckler, 1985</td>
<td>RCT</td>
<td>USA &gt;1 center Type of clinics not reported</td>
<td>Acute unilateral sciatica and well defined, discrete neurological findings or neurogenic claudication; failed to improved with at least two weeks of non-invasive therapy; duration of symptoms not specified; imaging findings not required</td>
<td>Lumbar surgery for similar symptoms or any lumbar surgery within 6 months</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 73 (42 vs. 31) Analyzed: 73 at 20-22 months</td>
<td>A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) and 1% procaine (5 ml) (n=42) B: Interlaminar epidural injection with saline (2 ml) and 1% procaine (5 ml) (n=31)</td>
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<th>Number of Levels</th>
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<th>Imaging Guidance</th>
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</tr>
</thead>
</table>
| Cohen, 2012b        | A vs. B: Age (mean): 51 vs. 53  
Duration of symptoms (years): 1.5 vs. 1.6  
Baseline leg pain (0-10 NRS): 6.6 vs. 6.7  
Baseline back pain (0-10 NRS): 6.1 vs. 6.1  
Baseline ODI (0-100): 44 vs. 45 | A vs. B: Treatments prior to intervention: Not specified  
Treatments following interventions: Not specified  
Opioid use: 37% vs. 31% | Number and frequency of injections: Could undergo second injection after 1 month, 66% vs. 77% underwent two injections  
Number of levels: Appears single; 61% vs. 77% received transforaminal and 31% vs. 23% interlaminar injections  
Provider experience: Not reported | None reported | Fluoroscopic guidance with contrast verification in epidural space | Epidural steroid injection based on MRI findings vs. without MRI |
| Cuckler, 1985       | A vs. B: Age (years): 49 vs. 50  
Duration of symptoms (months): 17.3 vs. 13.8  
Baseline pain: Not reported  
Baseline function: Not reported | A vs. B: Treatments prior to intervention: Not specified  
Treatments following intervention: Not specified  
Previous surgery: 2% (1/42) vs. 7% (2/31)  
Herniated disc: 52% vs. 45%  
Spinal stenosis: 48% vs. 55% | Number of injections: 43% (18/42) vs. 58% (18/31) received second injection with corticosteroid and local anesthetic after 24 hours due to no relief after initial injection  
Number of levels: Single level  
Provider experience: Not reported | None reported | None reported | Epidural injection with local anesthetic |
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
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<tr>
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<tbody>
<tr>
<td><strong>Cohen, 2012b</strong></td>
<td>A vs. B:</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leg pain (0-10 NRS): 6.6 vs. 6.7 at baseline, 3.6 vs. 4.4 at 1 month (p=0.12), 2.7 vs. 3.0 at 3 months (p=0.77)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Back pain (0-10 NRS): 6.1 vs. 6.1 at baseline, 4.0 vs. 4.6 at 1 m (p=0.21), 3.2 vs. 3.5 at 3 m (p=0.81)</td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td>ODI (0-100): 44 vs. 45 at baseline, 35 vs. 35 at 1 month (p=0.98), 30 vs. 31 at 3 months (p=0.79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medication reduction: 48% (26/67) vs. 27% (14/65) at 1 month (p=0.02); 57% (17/67) vs. 56% (14/65) at 3 months (p=0.96)</td>
</tr>
<tr>
<td></td>
<td>Global assessment</td>
<td>Global Perceived Effect positive: 69% (42/67) vs. 55% (36/65) at 1 month (p=0.12), 53% (26/67) vs. 40% (24/65) at 3 months (p=0.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overall success (&gt;=2 point decrease in leg pain plus positive Global Perceived Effect): 41% (24/67) vs. 35% (23/65) at 3 months (p=0.54)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No statistically significant effect of age, sex, type of injection, duration of pain, opioid use, baseline ODI, or baseline pain on likelihood of success</td>
</tr>
<tr>
<td><strong>Cuckler, 1985</strong></td>
<td>A vs. B:</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain improved &gt;=75%: 26% (11/42) vs. 13% (4/31) at mean 20 months, RR 2.40 (95% CI 0.93 to 6.58)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain improved &gt;=75%, herniated disc patients: 26% (6/23) vs. 15% (2/13) at mean 20 months, RR 1.94 (95% CI 0.56 to 7.66)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Surgery: 38% (16/42) vs. 29% (9/31) at mean 20 months, RR 1.50 (95% CI 0.86 to 2.81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery (herniated disk): 43% (10/23) vs. 23% (3/13) at mean 20 months, RR 2.56 (95% CI 1.12 to 7.35)</td>
</tr>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Quality Rating</th>
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<tbody>
<tr>
<td>Cohen, 2012b</td>
<td>3 months</td>
<td>A vs. B: 1.5% (2/132) lost to followup (states 5 patients who did not undergo epidural injections excluded from analysis, but 132 of 132 randomized patients presented in results)</td>
<td>Appears complete</td>
<td>A vs. B: 3 patients had worsening of pain, 1 had unstable angina, and 1 had arrhythmia following epidural steroid injection (group not specified)</td>
<td>John P. Murtha Neuroscience and Pain Institute, International Spinal Intervention Society, the Center for Rehabilitation Sciences Research</td>
<td>Fair</td>
</tr>
<tr>
<td>Cuckler, 1985</td>
<td>13 to 30 months (mean 20.2 vs. 21.5 months)</td>
<td>None</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
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<tbody>
<tr>
<td>Dashfield, 2005</td>
<td>RCT</td>
<td>UK Single center Pain clinic</td>
<td>&gt;18 years of age; sciatica accompanied by neurosensory and motor deficits, with or without back pain; duration 6 to 18 months; imaging findings not required</td>
<td>Previous spinal surgery; coagulopathy; progressive motor neuron disorders; peripheral vascular disease; epidural corticosteroid injection within three months</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 60 (30 vs. 30) Analyzed: 52 (29 vs. 23) at 6 months A: Caudal epidural injection with triamcinolone 40 mg plus 1% lidocaine (10 ml), with fluoroscopic guidance (n=33) B: Epidural injection with 40 mg triamcinolone plus 1% lidocaine (10 ml) and saline (50 to 150 ml), via sacral approach with spinal endoscopic guidance (n=27)</td>
<td></td>
</tr>
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<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
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</thead>
<tbody>
<tr>
<td>Dashfield, 2005</td>
<td>A vs. B: Age (mean): 48 vs. 45 years Male: 51% vs. 37% Duration of symptoms (months): 9.4 vs. 10.1 Baseline pain (0 -10): 6.6 vs. 7.2 Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space for caudal epidural injection, Spinal endoscopic guidance</td>
<td>Epidural injection with steroid, with spinal endoscopic guidance</td>
</tr>
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<td><strong>Dashfield, 2005</strong></td>
<td>A vs. B:</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
</tr>
<tr>
<td>Pain (mean, 0-10): 6.6 vs. 7.2 at baseline; 5.7 vs. 6.7 at 6 weeks; 5.4 vs. 6.4 at 3 months; 5.2 vs. 6.0 at 6 months</td>
<td></td>
</tr>
<tr>
<td>Short-form McGill Pain Questionnaire, sensory subscale (scale not reported): 14.8 vs. 15.5 at baseline; 13.9 vs. 16.0 at 6 weeks; 13.1 vs. 16.4 at 3 months; 12.5 vs. 16.0 at 6 months</td>
<td></td>
</tr>
<tr>
<td>Short-form McGill Pain Questionnaire affective subscale (scale not reported): 4.2 vs. 5.9 at baseline; 4.7 vs. 4.9 at 6 weeks; 4.6 vs. 6.6 at 3 months; 4.2 vs. 5.9 at 6 months</td>
<td></td>
</tr>
<tr>
<td>Present Pain Intensity (0-10): 2.8 vs. 3.5 at baseline; 2.3 vs. 2.6 at 6 weeks; 2.1 vs. 3.1 at 3 months; 2.0 vs. 2.5 at 6 months</td>
<td></td>
</tr>
<tr>
<td><strong>Other outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>HAD-anxiety (0-21): 10.9 vs. 103 at baseline; 9.3 vs. 10.0 at 6 weeks; 8.4 vs. 9.6 at 3 months; 7.8 vs. 8.7 at 6 months</td>
<td></td>
</tr>
<tr>
<td>HAD-depression (0-21): 8.4 vs. 9.0 at baseline; 8.2 vs. 8.0 at 6 weeks; 7.7 vs. 8.0 at 3 months; 7.0 vs. 7.9 at 6 months</td>
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<tbody>
<tr>
<td>Dashfield, 2005</td>
<td>6 months</td>
<td>A vs. B: 12% (4/33) vs. 15% (4/27) at 6 months</td>
<td>3 patients randomized to epiduroscopy crossed over to caudal injection and analyzed as treated</td>
<td>A vs. B: Post-procedural back discomfort: More frequent in spinal endoscopy group</td>
<td>Defense Secondary Care Agency</td>
<td>Fair</td>
</tr>
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</table>
| Datta, 2011  | RCT          | India Single center Pain clinic | 20-70 years of age; BMI 18-30 kg/m²; recurrent episodes of sciatica >4 weeks but <1 year with failure of ≥6 weeks conservative therapy; CT evidence of herniated disc at level correlating with symptoms and clinical findings; RDQ score >20 | Requiring surgery, structural spinal deformities; symptoms from causes other than herniated disc; spinal injection in last year; prior low back surgery, chemonucleolysis or nucleotomy; pregnant; allergy to corticosteroids; use of tricyclic antidepressants or lithium | Approached: Not reported Eligible: Not reported Randomized: 207 (50 vs. 52 vs. 50 vs. 55) Analyzed: 163 (39 vs. 40 vs. 42 vs. 42) at 12 weeks | A: Caudal epidural injection with 80 mg methylprednisolone plus 0.125% bupivacaine (10-15 ml) (n=50)  
B: Caudal epidural injection with 80 mg triamcinolone plus 0.125% bupivacaine (10-15 ml) (n=52)  
C: Caudal epidural injection with 15 mg dexamethasone plus 0.125% bupivacaine (10-15 ml) (n=50)  
D: Caudal epidural injection with 0.125% bupivacaine (10-15 ml) (n=55) |
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<tr>
<td>Datta, 2011</td>
<td>A vs. B vs. C vs. D: Age (mean): 40 vs. 39 vs. 42 vs. 43 years Male: 92% vs. 94% vs. 90% vs. 91% Duration of leg pain (weeks): 16 vs. 17 vs. 16 vs. 16 Baseline pain (0-10 VAS): 7.5 vs. 7.4 vs. 7.3 vs. 7.2 Baseline RDQ (0-24): 21 vs. 22 vs. 21 vs. 22</td>
<td>A vs. B vs. C vs. D: Treatments prior to intervention: 51 vs. 49 vs. 47 vs. 48 diclofenac tablets/week Treatments following intervention: Analgesics other than diclofenac prohibited; no injections during followup Single disc: 82% vs. 86% vs. 88% vs. 86% Two or more discs: 18% vs. 14% vs. 12% vs. 14% L3-L4: 82% vs. 73% vs. 81% vs. 73% L4-L5: 78% vs. 75% vs. 80% vs. 64% L5-S1: 12% vs. 13% vs. 10% vs. 16%</td>
<td>Number and frequency of injections: Up to 3 injections over 1 year Number of levels: Caudal Provider experience: Not reported</td>
<td>None reported</td>
<td>Head-to-head comparison of various corticosteroids and epidural injection with local anesthetic</td>
</tr>
</tbody>
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<td>Datta, 2011</td>
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</tr>
<tr>
<td></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Pain (0-10 VAS): 7.4 vs. 7.4 vs. 7.3 vs. 7.2 at baseline; 6.3 vs. 6.3 vs. 6.4 vs. 6.8 at 3 weeks; 4.9 vs. 4.8 vs. 5.2 vs. 6.2 at 12 weeks</td>
</tr>
<tr>
<td></td>
<td>Complete pain relief (complete, incomplete but satisfactory, unsatisfactory):</td>
</tr>
<tr>
<td></td>
<td>at 12 weeks:</td>
</tr>
<tr>
<td></td>
<td>A vs. B: 43% (17/39) vs. (18/42), RR 1.45 (95% CI 0.86 to 2.60)</td>
</tr>
<tr>
<td></td>
<td>A vs. C: 43% (17/39) vs. 38% (15/40), RR 1.16 (95% CI 0.68 to 1.99)</td>
</tr>
<tr>
<td></td>
<td>A vs. D: 43% (17/39) vs. 26% (11/42), RR 1.66 (95% CI 0.89 to 3.10)</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td>RDQ improved &gt;5 points (percent improvement, 0-24):</td>
</tr>
<tr>
<td></td>
<td>at 3 weeks, 41% (16/39) vs. 40% (17/42) vs. 35% (14/40) vs. 38% (16/42):</td>
</tr>
<tr>
<td></td>
<td>A vs. B: (16/39) vs. 40% (17/42), RR 1.66 (95% CI 0.60 to 1.71)</td>
</tr>
<tr>
<td></td>
<td>A vs. C: 41% (16/39) vs. 35% (14/40), RR 1.17 (95% CI 0.67 to 2.06)</td>
</tr>
<tr>
<td></td>
<td>A vs. D: (16/39) vs. 38% (16/42), RR 1.17 (95% CI 0.63 to 1.84)</td>
</tr>
<tr>
<td></td>
<td>at 12 weeks: 69% (27/39) vs. 71% (30/42) vs. 62% (25/40) vs. 24% (10/42):</td>
</tr>
<tr>
<td></td>
<td>A vs. B: 69% (27/39) vs. 71% (30/42), RR 0.97 (95% CI 0.73 to 1.29)</td>
</tr>
<tr>
<td></td>
<td>A vs. C: 69% (27/39) vs. 62% (25/40), RR 1.11 (95% CI 0.81 to 1.52)</td>
</tr>
<tr>
<td></td>
<td>A vs. D: 69% (27/39) vs. 24% (10/42): RR, 2.91(95% CI 1.63 to 5.19)</td>
</tr>
<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td>Use of diclofenac (tablets/day): 3.8 vs. 3.3 vs. 4.0 vs. 4.8 at 3 weeks; 18 vs. 17 vs. 18 vs. 26 at 12 weeks</td>
</tr>
<tr>
<td></td>
<td>Use of physiotherapy: 25% (9/39) vs. 17% (7/42) vs. 30% (12/40) vs 45% (19/42) at 6 weeks; 15% (6/39) vs. 12% (5/42) vs. 25% (10/40) vs 38% (16/42) from 6 weeks to 3 months</td>
</tr>
<tr>
<td></td>
<td>Sensory deficits: 13% (5/39) vs. 21% (9/42) vs. 28% (11/40) vs. 48% (20/42) at 3 months</td>
</tr>
<tr>
<td></td>
<td>Underwent surgery: 6.0% (3/50) vs. 7.7% (4/52) vs. 6.0% (3/50) vs. 16% (9/55) at 3 months</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>Datta, 2011</td>
<td>3 months</td>
<td>A vs. B vs. C vs. D: 22% (11/50) vs. 23% (12/52) vs. 16% (8/50) vs. 24% (13/55) lost to followup or had laminectomy and excluded at 3 months.</td>
<td>Appears complete</td>
<td>A vs. B vs. C vs. D: Local pain &gt;24 h: 21% (8/39) vs. 17% (7/42) vs. 10% (4/40) vs. 7.1% (3/42) Headache: 38% (15/39) vs. 38% (16/42) vs. 22% (9/40) vs. 31% (31/42) Tinnitus: 2.6% (1/39) vs. 9.5% (4/42) vs. 2.5% (1/40) vs. 7.1% (3/42) Nausea: 15% (6/39) vs. 17% (7/42) vs. 20% (8/40) vs. 17% (7/42) Weight gain: 0% (0/39) vs. 2.4% (1/42) vs. 0% (0/40) vs. 0% (0/42)</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
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<td>----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Dilke, 1973</td>
<td>RCT</td>
<td>UK</td>
<td>Unilateral sciatica with painful limitation of sciatic or femoral nerve stretch; sciatic scoliosis, appropriate neurologic deficit; duration not specified; imaging findings not required</td>
<td>Diagnostic uncertainty; bilateral manifestations; prior lumbar spine surgery; medical conditions affecting rehabilitation; doubt about the technical success of an injection</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 100 Analyzed: 82 at 3 months</td>
<td>A: Interlaminar epidural injection with 80 mg methylprednisolone in saline (10 ml) B: Interspinous ligament injection with saline (1 ml)</td>
</tr>
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<tr>
<td>Dilke, 1973</td>
<td>A vs. B: Age (mean): 39 vs. 42 years Male: 53% vs. 58% Duration of symptoms &gt;4 weeks: 90% vs. 90% Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Mefenamic acid; diazepam; bed rest; graded rehabilitation with hydrotherapy; postural exercise; and spinal mobilizing exercise Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean not reported, second injection permitted after 1 week if no improvement Number of levels: Single level Provider experience: Not reported</td>
<td>None reported</td>
<td>Soft tissue injection with saline</td>
</tr>
</tbody>
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<tr>
<td>Dilke, 1973</td>
<td>A vs. B: Pain</td>
<td>Pain clearly relieved during admission (clearly relieved, clearly not relieved, or intermediate): 31% (16/51) vs. 8% (4/43), RR 3.37 (95% CI 1.21 to 9.33)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain assessment &quot;none&quot; (none, not severe, severe): 36% (16/44) vs. 21% (8/38) at 3 months, RR 1.72 (95% CI 0.83 to 3.58)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain assessment &quot;none&quot; or &quot;not severe&quot;: 91% (40/44) vs. 74% (28/38) at 3 months, RR 1.23 (95% CI 0.10 to 1.52)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full bed rest (days): 8.25 vs. 8.61 (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time to institution of spinal mobility exercises (days): 18.4 vs. 20.4 (NS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time in hospital (days): 25.2 vs. 28.0 (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not resumed work at 3 months: 8.3% (3/36) vs. 40% (14/35), RR 0.21 (95% CI 0.07 to 0.66)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesic consumption &quot;none&quot; (none, less than daily, daily) at 3 months: 50% (19/38) vs. 38% (11/29), RR 1.32 (95% CI 0.75 to 2.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underwent surgery at 3 months: 14% (7/51) vs. 21% (10/48), RR 0.66 (95% CI 0.27 to 1.59)</td>
</tr>
<tr>
<td></td>
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<td>Underwent second injection at 3 months: 31% (16/51) vs. 48% (23/48), RR 0.65 (95% CI 0.40 to 1.08)</td>
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<td></td>
<td></td>
<td>Underwent other conservative treatment at 3 months: 18% (9/51) vs. 29% (14/48), RR 0.61 (95% CI 0.29 to 1.27)</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dilke, 1973</td>
<td>3 months</td>
<td>A vs. B: 18% (18/100) at 3 months</td>
<td>Appears complete</td>
<td>&quot;There were no complications attributable to the injections&quot;</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
</tbody>
</table>

"There were no complications attributable to the injections"
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<th>Author, Year Title</th>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Gerstzen, 2010    | RCT         | USA Multicenter | 18 to 75 years of age; BMI <40; radicular pain score >50 on 0 to 100 VA; epidural corticosteroid injection within 3 weeks to 6 months; normal neurological function; imaging evidence of focal lumbar disc protrusion correlating with clinical symptoms; disc height >50% of normal adjacent discs | Extruded or sequestered disc herniation; sciatica from more than one disc level; axial pain more severe than radicular pain; cauda equina syndrome; progressive neurological deficit; radiological evidence of spondylolisthesis or moderate or severe stenosis at level to be treated; history of previous spinal surgery at or adjacent to level to be treated; spinal fracture; tumor; infection; suspected or planned pregnancy; cardiac pacemaker or defibrillator; spinal cord stimulator; allergy to contrast media or study drugs; severe medical comorbidities; Workman's Compensation or ongoing litigation | Approached: Not reported Eligible: Not reported Randomized: 90 (44 vs. 46) Analyzed: 85 (40 vs. 45) at 2 years, including 12 with missing data | A: Transforaminal epidural injection with corticosteroid, medication type (methylprednisolone acetate, betamethasone, methylprednisolone, triamcinolone acetonide) and dose left to discretion of clinician, with fluoroscopic guidance (n=44)  
B: Plasma disc decompression procedure with Coblation DLR or DLG Spine Wand surgical device, with fluoroscopic guidance (n=46) |
<table>
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<tbody>
<tr>
<td>Gerstzen, 2010</td>
<td>A vs. B: Age (mean): 42 vs. 46 years Male: 52% vs. 47% Duration of symptoms (months): median 24 vs. 12 Baseline leg pain (0-100 VAS): 75 vs. 72 Baseline back pain (0-100 VAS): 53 vs. 44 Baseline ODI (0-100): 43 vs. 42</td>
<td>A vs. B: Treatments prior to intervention: Opioid 55% vs. 47% Treatments following intervention: Not specified Other patient characteristics: Full or part-time employment: 65% vs. 62%</td>
<td>Number and frequency of injections: Up to 2 injections 3 weeks apart; 75% (30/40) underwent 2 epidural injections Number of levels: Single Provider experience: Not reported</td>
<td>Fluoroscopic guidance</td>
<td>Plasma disc decompression</td>
</tr>
</tbody>
</table>
Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<thead>
<tr>
<th>Author, Year</th>
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<tbody>
<tr>
<td>Gerstzen, 2010</td>
<td>A vs. B:</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leg pain (mean change, 0-100 VAS): at 6 weeks -21 vs. -42 (p=0.002), at 3 months -23 vs. -46 (p=0.0001), at 6 months -21 vs. -47 (p=0.0008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leg pain improved &gt;=25 points: at 6 months 21% (8/39) vs. 49% (21/43), RR 0.42 (95% CI 0.21 to 0.83); at 1 year 18% (7/39) vs. 44% (19/43), RR 0.42 (95% CI 0.21 to 0.84); at 2 years 21% (8/39) vs. 42% (18/43), RR 0.49 (95% CI 0.24 to 1.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Back pain (mean change, 0-100 VAS): at 6 weeks 1 vs. -18 (p=0.0005), at 3 months 7 vs. -17 (p=0.0001); at 6 months -0.4 vs. -21 at 6 months (p=0.002)</td>
</tr>
<tr>
<td></td>
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<td>Back pain improved &gt;=12 points: at 6 months 22% (8/36) vs. 49% (19/39), RR 0.46 (95% CI 0.23 to 0.91); at 1 year 11% (4/36) vs. 39% (15/39), RR 0.26 (95% CI 0.11 to 0.79); at 2 years 17% (6/36) vs. 39% (15/39), RR 0.43 (95% CI 0.19 to 1.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ODI (mean change, 0-100): at 6 weeks -5 vs. -13 at 6 weeks (p=0.002); at 3 months -2 vs. -11 (p=0.002); at 6 months -4 vs. -14 (p=0.002)</td>
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<tr>
<td></td>
<td></td>
<td>ODI improved &gt;=13 points: at 6 months 15% (6/40) vs. 32% (14/44), RR 0.47 (95% CI 0.20 to 1.10); at 1 year 10% (4/40) vs. 25% (11/44), RR 0.40 (95% CI 0.14 to 1.16); at 2 years 10% (4/40) vs. 30% (13/44), RR 0.34 (95% CI 0.12 to 0.95)</td>
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<td></td>
<td>SF-36 improved &gt;=5 points: at 6 months 21% (8/39) vs. 37% (16/43), RR 0.55 (95% CI 0.27 to 1.14); at 1 year 13% (5/39) vs. 33% (14/43), RR 0.39 (95% CI 0.16 to 0.99); at 2 years 13% (5/39) vs. 33% (14/43), RR 0.39 (95% CI 0.16 to 0.99)</td>
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<tr>
<td></td>
<td></td>
<td>Other outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient satisfaction &quot;extremely satisfied&quot;: 15% vs. 38%</td>
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<td></td>
<td></td>
<td>Did not undergo secondary procedure: 17% vs. 52%, adjusted HR 2.0 (p=0.025)</td>
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<tr>
<td></td>
<td></td>
<td>Surgery (not including plasma disc decompression): through 2 years: 5% (2/40) vs.11% (5/45), RR 0.45 (95% CI 0.09 to 2.19)</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
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</tr>
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<tbody>
<tr>
<td>Gerstzen, 2010</td>
<td>2 years</td>
<td>A vs. B: 15% (6/40) vs. 13% (6/45) at 2 years; 5 post-randomization exclusions</td>
<td>13 patients in group B received epidural injection, 20 patients in group A received plasma disc decompression</td>
<td>A vs. B: Procedure related adverse events: 18% (7/40) vs. 11% (5/45), RR 1.58 (95% CI 0.54 to 4.57) Injection site pain: 5.0% (2/40) vs. 4.4% (2/45), RR 1.12 (95% CI 0.17 to 7.62) Increased radicular pain: 2.5% (1/40) vs. 11% (5/45), RR 0.22 (95% CI 0.03 to 1.85) Increased weakness: 2.5% (1/40) vs. 0% (0/45), RR 3.37 (95% CI 0.14 to 80) Increased back pain: 2.5% (1/40) vs. 8.9% (4/45), RR 0.28 (95% CI 0.03 to 2.36) Lightheadedness: 0% (0/40) vs. 2.2% (1/45), RR 0.37 (95% CI 0.02 to 8.93) Muscle tightness of spasms: 5.0% (2/40) vs. 2.2% (1/45), RR 2.25 (95% CI 0.21 to 24)</td>
<td>ArthroCare Corp</td>
<td>Fair</td>
</tr>
</tbody>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
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</table>
| Ghahreman, 2010 | RCT | Australia Two centers Neurosurgery clinic | Pain radiating into lower limb with lancinating, burning, stabbing, or electric quality; limitation of straight-leg-raise <30° or < 45° with history of lancinating pain & disc herniation; duration not specified; required imaging correlation | Foraminal stenosis; severe motor deficit; history of substance abuse; previous surgery at affected level; conditions that contraindicated spinal injection (e.g., pregnancy, recent infection, or spinal deformity) | Approached: Not reported Eligible: Not reported Randomized: 150 (28 vs. 37 vs. 27 vs. 28 vs. 30) Analyzed: 150 at 12 months, including 22 with missing data (1 vs. 7 vs. 8 vs. 2 vs. 4) | A: Transforaminal injection with 40 mg/ml triamcinolone (1.75 ml) plus 0.5% bupivacaine (0.75 ml), with fluoroscopic guidance (n=28)  
B: Transforaminal injection of 0.5% bupivacaine (2 ml), with fluoroscopic guidance (n=27)  
C: Transforaminal injection of normal saline (2 ml), with fluoroscopic guidance (n=37)  
D: Intramuscular injection of 40 mg/ml triamcinolone (1.75 ml), with fluoroscopic guidance (n=28)  
E: Intramuscular injection of normal saline (2 ml), with fluoroscopic guidance (n=30) |
| See also Ghahreman, 2011 | | | | | | |
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<th>Author, Year Title</th>
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<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghahreman, 2010</td>
<td>A vs. B vs. C vs. D vs. E:</td>
<td></td>
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<tr>
<td></td>
<td>Age (median): 49 vs. 44 vs. 43 vs. 49 vs. 46 years</td>
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<tr>
<td></td>
<td>Male: 61% vs. 51% vs. 63% vs. 54% vs. 70%</td>
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<td></td>
<td>Duration of symptoms: Mean not reported, range 2 to 560 weeks</td>
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<td></td>
<td>Baseline leg pain (median, 0-10): 7 vs. 7 vs. 7 vs. 7 vs. 8</td>
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<tr>
<td></td>
<td>Baseline Roland Morris score (median, 0-24): 17 vs. 17 vs. 19 vs. 17 vs. 15</td>
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<tr>
<td>See also Ghahreman, 2011</td>
<td>Number and frequency of injections: Single injection</td>
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<tr>
<td></td>
<td>Treatments prior to intervention: Not specified</td>
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<td>Treatments following intervention: Not specified</td>
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<td></td>
<td>Other patient characteristics: Not specified</td>
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<tr>
<td></td>
<td>Number and frequency of injections: Single injection</td>
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<tr>
<td></td>
<td>Number of levels: Appears single</td>
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<td></td>
<td>Provider experience: Not reported</td>
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<tr>
<td></td>
<td>Fluoroscopic guidance with contrast verification of nerve root for transforaminal injections</td>
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<tr>
<td></td>
<td>Transforaminal injection of normal saline</td>
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<td></td>
<td>Transforaminal injection of local anesthetic</td>
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<tr>
<td></td>
<td>Intramuscular injection of corticosteroid</td>
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<tr>
<td></td>
<td>Intramuscular injection of normal saline</td>
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<table>
<thead>
<tr>
<th>Author, Year</th>
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<tbody>
<tr>
<td>Ghahreman, 2010</td>
<td>A vs. B vs. C vs. D vs. E:</td>
<td>Pain (mean, 0-10): at baseline 7.0 vs. 7.4 vs. 6.6 vs. 7.6 vs. 7.0; at 1 month 4.1 vs. 6.7 vs. 5.5 vs. 5.9 vs. 6.0, difference -2.9 vs. -0.7 vs. -1.1 vs. -1.7 vs. -1.0, A vs. C (p=0.07); A vs. B, D, or E (p&lt;0.05); for other comparisons: (p&gt;0.05) Achieved &gt;=50% pain relief: at 1 month 54% (15/28) vs. 74% (2/27) vs. 21% (6/28) vs. 13% (4/30): A vs. B: RR, 7.23 (95% CI 1.82 to 28.67); A vs. C: RR, 2.83 (95% CI 1.33 to 6.00); A vs. D: RR, 2.50 (95% CI 1.14 to 5.50); A vs. E, RR 4.02 (95% CI 1.52 to 10.66): (p&gt;0.05); B vs. C, RR 0.39 95% CI 0.89 to 1.73; B vs. D, RR 0.35 (95% CI 0.08 to 1.57); B vs. E, RR 0.56 (95% CI 0.11 to 2.80): C vs. D, RR 0.88 (95% CI 0.33 to 2.34); C vs. E, RR 1.42 (95% CI 0.46 to 4.39); D vs. E, RR 1.61 (95% CI 0.51 to 5.10); no interaction between duration of symptoms, presence of sensory changes or neurologic signs, location [central or paracentral versus foraminal] or level affected, type of herniation (broad-based bulge, focal protrusion, extrusion, sequestration), dimensions of herniation (thickness, cross-section area of herniation or vertebral canal, ratio area of herniation and spinal canal), or presence of degenerative changes; low grade nerve root compression 75% (30/40) and high grade 26% (8/31), p for difference in estimates &lt;0.0005</td>
</tr>
<tr>
<td>See also Ghahreman, 2011</td>
<td>Function</td>
<td>Patient-specified Functional Outcome Scale (median, 0-12): at 1 month 8 vs. 6 vs. 6 vs. 10 vs. 10 (p&gt;0.05)</td>
</tr>
<tr>
<td>Other outcomes</td>
<td>Underwent surgery at 12 months: 36% (10/28) vs. 26% (7/27) vs. 26% (7/27) vs. 21% (6/28) vs. 30% (9/30): A vs. B, RR 1.38 (95% CI 0.61 to 3.09); A vs. C, RR 1.38 (95% CI 0.61 to 3.09); A vs. D, RR 1.67 95% CI 0.70 to 3.10; A vs. E, RR 1.9 (95% CI 0.57 to 2.49); B vs. C, RR 1.00 (95% CI 0.39 to 2.54); B vs. D, RR 0.96 (95% CI 0.36 to 2.53); B vs. E, RR 0.69 (95% CI 0.29 to 1.62); C vs. D, RR 0.96 (95% CI 0.36 to 2.53); C vs. E, RR 0.69 (95% CI 0.29 to 1.62); D vs. E, RR 0.71 (95% CI 0.29 to 1.75)</td>
<td>Underwent rescue transforaminal injection with steroid at 12 months: 14% (4/28) vs.67% (18/27) vs. 61% (23/38) vs. 64% (18/28) vs.73% (22/30): A vs. B, RR 0.21 (95% CI 0.83 to 0.55); A vs. C, RR 0.24 (95% CI 0.09 to 0.90); A vs. D, RR 0.22 95% CI 0.09 to 0.57; A vs. E, RR 0.19 (95% CI 0.07 to 0.50); B vs. C, RR 1.10 (95% CI 0.76 to 1.60); B vs. D, RR 1.04 (95% CI 0.71 to 1.52); B vs. E, RR 0.91 (95% CI 0.65 to 1.28); C vs. D, RR 0.94 (95% CI 0.65 to1.37); C vs. E, RR 0.83 (95% CI 0.59 to 1.62); D vs. E, RR 0.83 (95% CI 0.59 to 1.12)</td>
</tr>
<tr>
<td>No differences in health care utilization</td>
<td>No effect of chronicity on response to treatment</td>
<td></td>
</tr>
</tbody>
</table>
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<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghahreman, 2010</td>
<td>12 months</td>
<td>A vs. B vs. C vs. D vs. E: 3.6% (1/28) vs. 26% (7/27) vs. 22% (8/37) vs. 7.1% (2/28) vs. 13% (14/30) at 12 months</td>
<td>Appears complete</td>
<td>&quot;No complications occurred that could be attributed to the treatment&quot; 1 case of bladder incontinence after transforaminal injection of local anesthetic</td>
<td>Not reported</td>
<td>Good</td>
</tr>
<tr>
<td>See also Ghahreman, 2011</td>
<td></td>
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</table>

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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghai, 2014</td>
<td>RCT</td>
<td>India</td>
<td>18 to 65 years, with chronic (&gt;3 months) low back pain and unilateral lumbosacral radicular pain, not responding to medications and physical therapies, pain score &gt;=50 on a 0 to 100 VAS at baseline were eligible; MRI was performed for correlation with symptoms</td>
<td>Clinically significant or unstable medical or psychiatric illness, previous surgery on the lumbar spine, facet joint arthropathy, spinal canal stenosis, unstable neurological deficits, or cauda equine syndrome. prior lumbar epidural steroid injection, corticosteroids or anesthetics allergy, taking anticoagulants or bleeding diathesis, taking systemic corticosteroids, pregnant or lactating women</td>
<td>Approached: 124 Eligible: Not reported Randomized: 62 (32 vs. 30) Analyzed: 62 (32 vs. 30)</td>
<td>A. Parasagittal epidural injection with 80 mg methylprednisolone (2 ml) plus normal saline (2 ml) B. Transforaminal epidural injection with 80 mg methylprednisolone (2 ml) plus normal saline (2 ml), with fluoroscopic guidance</td>
</tr>
<tr>
<td>Ghai, 2013</td>
<td>RCT</td>
<td>India</td>
<td>Low back pain with unilateral lumbosacral radicular pain for at least 3 months (MRI performed in all patients)</td>
<td>Somatic referred pain</td>
<td>Approached: 40 Eligible: Not reported Randomized: 37 (19 vs. 18) Analyzed: 37 at 6 months</td>
<td>A: Parasagittal interlaminar injection with 80 mg methylprednisolone (2 ml) plus normal saline (2 ml), with fluoroscopic guidance B: Midline interlaminar injection with 80 mg methylprednisolone (2 ml) plus normal saline (2 ml), with fluoroscopic guidance</td>
</tr>
</tbody>
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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghai, 2014</td>
<td>A vs. B: Age (mean): 43 vs. 46 years Male: 53% vs. 63% Duration of symptoms (months): 25 vs. 30 Baseline pain (0-100 VAS): 73 vs. 74 Modified ODI (0 to 100): 31 vs. 29</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 58 vs. 60 injections (p = 0.72), mean 1.84 vs. 1.92 procedures per year Number of levels: Appears to be single Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative epidural steroid injection methods</td>
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<tr>
<td>Ghai, 2013</td>
<td>A vs. B: Age (mean): 41 vs. 42 years Male: 68% vs. 50% Duration of symptoms (months): 13 vs. 14 Baseline pain (0-100 VAS): 69 vs. 71 Modified ODI (0 to 100): 42 vs. 49</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean 1.53 vs. 2.28 over 6 months (up to 3 injections at least 15 days apart if pain relief &lt;50%) Number of levels: Not reported, levels could differ on subsequent injections Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative epidural steroid injection methods</td>
<td></td>
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| Ghai, 2014         | A vs. B:  

**Pain**  
- Pain score (mean, VAS 0-100, estimated from graph): at baseline, 73 vs. 73 (p=0.56); at 15 days, 38 vs. 45 (p=0.63); at 1 month, 36 vs. 39 (p=0.61); at 2 months, 36 vs. 36 (p=0.59); at 3 months, 35 vs. 35 (p=0.64); at 6 months, 34 vs. 34 (p=0.56); at 9 months, 33 vs. 33 (p=0.23); at 12 months, 33 vs. 31 (p=0.79)  
- ≥50% pain relief from baseline using VAS: at 15 days, 65.6% vs. 50% (p=0.3); at 1 month, 72% vs. 63% (p=0.59); at 2 months, 69% vs. 73% (p=0.78); at 3 months, 78% vs. 77% (p=1.0); at 6 months, 75% vs. 77% (p=1.0); at 9 months, 78% vs. 73% (p=0.77); at 12 months, 69% vs. 77% (p=0.57)  

**Function**  
- Modified ODI (estimated from graph): at baseline, 32 vs. 29 (p=0.18); at 15 days, 21 vs. 20 (p=0.29); at 1 month, 19 vs. 18 (p=0.38); at 2 months, 19 vs. 17 (p=0.38); at 3 months, 20 vs. 18 (p=0.60); at 6 months, 19 vs. 17 (p=0.36); at 9 months, 18 vs. 17 (p=0.52); at 12 months, 18 vs. 17 (p=0.45)  
- Other outcomes:  
  - Patient satisfaction: Patient Global Impression of Change Scale (7-point scale where 1-3 = improved, 4 = no change, 5-7 = worse since study start):  
    - % improved at 3 months, 78% (25/32) vs/ 77% (23/30); at 6 months, 75% (24/32) vs. 80% (24/30); at 9 months, 78% (25/32) vs. 77% (23/30); at 12 months, 78% (25/32) vs. 80% (24/30) (p>0.05 for all)  

| Ghai, 2013         | A vs. B:  

**Pain**  
- Pain score (mean, VAS 0-100, estimated from graph): at baseline, 69 vs. 71; at 15 days, 29 vs. 49; at 1 month, 28 vs. 50; at 3 months, 30 vs. 48; at 6 months, 31 vs. 51, (p<0.05 at all time points)  
- 50% pain relief: at 15 days 79%(15/19) vs. 39% (7/18) RR, 2.03 (95 % CI 1.09 to 3.78); at 1 month 79% (15/19) vs. 39% (7/18) RR 2.03 (95 % CI 1.09 to 3.78); at 3 months 79% (15/19) vs. 39% (7/18) RR, 2.03 (95 % CI 1.09 to 3.78); at 6 months 68% (13/19) vs.17% (3/18), RR 4.1 (95% CI 1.4 to 12)  

**Function**  
- ODI (mean, 0-100, estimated from graph): at baseline, 42 vs. 49; at 15 days, 27 vs. 40; at 1 month, 27 vs. 41; at 3 months, 30 vs. 42; at 6 months, 30 vs. 43, (p<0.05 at all time points)
<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghai, 2014</td>
<td>12 months, but 3 month followup is primary outcome</td>
<td>None reported</td>
<td>Appears complete</td>
<td>No patient reported any swelling, redness, or persisting pain at the injection site.</td>
<td>None</td>
<td>Good</td>
</tr>
<tr>
<td>Ghai, 2013</td>
<td>6 months</td>
<td>None reported</td>
<td>Appears complete</td>
<td>None reported</td>
<td>None</td>
<td>Fair</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Gharibo, 2011      | RCT          | US Single center Pain clinic | Low back pain radiating to one lower extremity for >1 month and <1 year, due to disc disease; failed analgesic and nonpharmacologic therapy; imaging correlation on CT or MRI; unable to tolerate physical therapy; no benefit from physical therapy | Lumbar spine surgery or epidural steroid injections within 6 months; multilevel degenerative spine disease; unstable spine; spondylololhesis > grade 1; spondylolysis, cauda equina syndrome; arachnoiditis, progressive neurologic deficit; central spinal canal stenosis; active cancer diagnosis; history of substance abuse; current psychiatric co-morbidity; pregnant; contrast, steroid, or local anesthetic allergy; ongoing medical legal or workman’s compensation | Approached: 80 Eligible: 46 Randomized: 42 (21 vs. 21) Analyzed: 38 (20 vs. 18) at 10-16 days (including 3 missing data) | A: Transforaminal epidural injection with 40 mg triamcinolone diacetate (1 ml) plus 0.25% bupivacaine (1 ml) at two levels, with fluoroscopic guidance  
B: Interlaminar epidural injection with 80 mg triamcinolone diacetate (2 ml) plus 0.25% bupivacaine (2 ml), with fluoroscopic guidance |
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gharibo, 2011</td>
<td>A vs. B: Age (mean): 48 vs. 51 years Male: 55% vs. 72% Duration of symptoms: Not reported Baseline pain (0-10): 6.4 vs. 7.0 Baseline ODI (0-50): 38 vs. 38</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 1/20 vs. 3/18 underwent two procedures Number of levels: Two levels (transforaminal) vs. single level (interlaminar) Provider experience: Single provider with over 10 years experience</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative epidural steroid injection methods</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
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<tr>
<th>Author, Year Title</th>
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<tbody>
<tr>
<td>Gharibo, 2011</td>
<td>A vs. B:</td>
</tr>
<tr>
<td></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Pain (mean, 0-10 NRS): 6.4 vs. 7.0 at baseline, 1.7 vs. 3.9 at 10-16 days (p&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td>ODI (mean, 0-50): 38 vs. 38 at baseline, 22 vs. 13 at 10-16 days (p&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td>Depression (scale not reported): 4.1 vs. 4.4 at baseline, 1.7 vs. 2.2 at 10-16 days (p&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td>Walking distance (blocks): 8.9 vs. 8.1 at baseline, 11.8 vs. 10.6 at 10-16 days (p&lt;0.05 base on 1-sided test)</td>
</tr>
</tbody>
</table>
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gharibo, 2011</td>
<td>10-16 days</td>
<td>A vs. B: 4.8% (1/21) vs. 10% (2/21) at 10-16 days</td>
<td>2 crossovers in interlaminar injection group after 2 failed injections; one patient excluded for receiving epidural steroid injection outside of protocol</td>
<td>Not reported</td>
<td>None</td>
<td>Fair</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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</thead>
</table>
| Habib, 2013       | RCT          | Israel Single center Hospital | Patients >18 years, low back pain due to radiculopathy of at least one month's duration that did not respond to physical therapy or nonsteroidal anti-inflammatory drugs (if not contraindicated); imaging findings not required | Having had an epidural corticosteroid, systemic, intra-articular, and/or intramuscular injection; nasal spray, eye drops, or inhalation of steroid compounds during the previous three months; evidence of acute illness (inflammatory or noninflammatory); inflammatory back pain; uncontrolled hypertension; uncontrolled diabetes; anticoagulant treatment; bleeding tendency; allergy to corticosteroids; and/or pregnancy | Approached: Not reported Eligible: 50 Randomized: 42 (21 vs. 21) Analyzed: 35 at 4 w | A: Epidural injection with 80 mg methylprednisolone acetate, approach and other details not provided (n=21)  
B: Epidural injection with 40 mg methylprednisolone acetate, approach and other details not provided (n=21) |
| Helliwell, 1985   | RCT          | UK Single center Rheumatology clinic | Low back pain for >2 months with pain in the sciatic or femoral nerve distribution accompanied by dural tension signs or a neurological deficit consistent with lumbar root compression; radiograph of lumbar spine before randomization | Diagnostic uncertainty; pregnant; prior lumbar spine surgery or the development of progressive neurologic impairment | Approached: Not reported Eligible: Not reported Randomized: 39 (20 vs. 19) Analyzed: 39 at 3 months | A: Interlaminar epidural injection with 80 mg methylprednisolone in saline (10 ml) (n=20)  
B: Interspinous ligament injection with saline (5 ml) (n=19) |
<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habib, 2013</td>
<td>A vs. B: Age (mean): 53 vs. 51 Male: 62% vs. 76% Duration of back pain: 2.9 vs. 3.4 years Baseline VAS (0-100): 80 vs. 78</td>
<td>A vs. B: Treatments prior to intervention: Previous back surgery 1 vs 0; Previous epidural injection 4 vs. 2 Treatments following intervention: Not specified Other patient characteristics: Serum cortisol level at baseline 11.1 vs. 13.6 ng/mL</td>
<td>Number and frequency of injections: 1 Number of levels: 1-2 Provider experience: Experienced anesthesiologist</td>
<td>Not reported</td>
<td>Epidural injection with different doses of corticosteroid</td>
</tr>
<tr>
<td>Helliwell, 1985</td>
<td>A vs. B: Age (mean): 45 vs. 47 years Male: 25% vs. 20% Duration of symptoms (months): 8.5 vs. 13 Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single Number of levels: Single Provider experience: Not reported</td>
<td>Not reported</td>
<td>Soft tissue injection with saline</td>
</tr>
</tbody>
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</thead>
<tbody>
<tr>
<td>Habib, 2013</td>
<td>A vs. B: Pain</td>
<td>≥30% improvement in 0-100 VAS: 62% (13/21) vs. 47% (9/19) at w 1 (p=0.362); 56% (10/18) vs. 35% (7/20) (p=0.210) at w 3, 39% (7/18) vs. 6% (1/17) at w 4 (p=0.049)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Serum cortisol levels and number of patients with secondary adrenal insufficiency (serum corticol &lt;18 ng/ml 30 minutes after ACTH stimulation test): 86% (18/21) vs. 53% (10/19) at w 1 (p=0.024), 22% (4/18) vs. 15% (3/20) at w 3 (p=0.87), 17% (3/18) vs. 12% (2/17) at w 4 (p=0.72)</td>
</tr>
<tr>
<td>Helliwell, 1985</td>
<td>A vs. B: Pain</td>
<td>Pain, mean change from baseline (0-10 VAS, estimated from figure): at 1 month -2.6 vs. -0.7; at 3 months -2.7 vs. -0.3 (p&lt;0.01 at both time points)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Analgesic consumption decreased by ≥50%: at 3 months 64% (7/11) vs. 40% (4/10), RR 1.6 (95% CI 0.69 to 4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overall outcome &quot;definite improvement&quot; (vs. no improvement): at 3 months 70% 14/20 vs. 26% (5/19) RR, 2.7 (95% CI 1.3 to 6.2)</td>
</tr>
<tr>
<td>Author, Year Title</td>
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</tr>
<tr>
<td>-------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Habib, 2013</td>
<td>4 weeks</td>
<td>A vs. B: 14% (3/21) vs. 19% (4/21)</td>
</tr>
<tr>
<td>Heliwell, 1985</td>
<td>3 months</td>
<td>Not reported</td>
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</table>
| Iversen, 2011 | RCT          | Norway          | Unilateral lumbar radiculopathy >12 weeks with leg pain below the knee; leg pain worse than back pain; age 20 to 60 years; MRI or CT performed in all patients | Cauda equina syndrome; severe paresis; severe pain; prior spinal injection or surgery; deformity; pregnancy; breast feeding; warfarin therapy; treatment with non-steroidal anti-inflammatory drugs; body mass index >30; poorly controlled psychiatric conditions with possible secondary gain, or severe comorbidity; severe intraspinal pathology | Approached: 461 Eligible: 133 Enrolled: 116 (37 vs. 39 vs. 40) Analyzed: 116 (37 vs. 39 vs. 40) at 52 weeks (including 4 missing data) | A: Caudal epidural injection with 40 mg triamcinolone in 0.9% saline (29 ml), with ultrasound guidance (n=37)  
B: Caudal epidural injection with 0.9% saline (30 ml), with ultrasound guidance (n=39)  
C: Subcutaneous injection superficial to the sacral hiatus and outside spinal canal with 0.9% saline (2 ml), with ultrasound guidance (n=40) |
| Jeong, 2007  | RCT          | Korea           | Lumbosacral radiculopathy; imaging (CT or MRI) documentation of nerve root compression with subarticular or paracentral disk herniation or central canal and/or lateral recess stenosis, based on consensus of 3 radiologists; duration of symptoms not specified | Not reported | Approached: Not reported Eligible: Not reported Randomized: 239 (127 vs. 112) Analyzed: 222 (116 vs. 106) at mid-term (>6 m) followup | A: Ganglionic transforaminal epidural injection with 40 mg triamcinolone acetonide (1 ml) plus 0.5% bupivacaine (0.5 cc), with fluoroscopic guidance (n=127)  
B: Preganglionic transforaminal epidural injection with 40 mg triamcinolone acetonide (1 ml) and 0.5% bupivacaine (0.5 cc), with fluoroscopic guidance (n=112) |
<table>
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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iversen, 2011</td>
<td>A vs. B vs. C: Age (mean): 40 vs. 43 vs. 43 years Male: 54% vs. 62% vs. 60% Duration of leg pain (weeks): 42 vs. 57 vs. 27 Baseline back pain (0-100 VAS): 47 vs. 50 vs. 46 Baseline leg pain (0-100 VAS): 50 vs. 54 vs. 48 Baseline ODI (0-50): 32 vs. 31 vs. 26</td>
<td>A vs. B vs. C: Treatments prior to intervention: Use of morphine: 24% vs. 18% vs. 15% Treatments following intervention: Not reported Other patient characteristics: Physically demanding work: 57% vs. 46% vs. 47% Received sickness benefit: 68% vs. 67% vs. 55% Fear Avoidance Beliefs Questionnaire (FABQ) work: 24 vs. 25 vs. 22 FABQ physical activity: 12 vs. 14 vs. 13</td>
<td>Number and frequency of injections: 2 injections within 2 weeks on all patients unless pain recovered prior to 2nd injection Number of levels: Not reported Provider experience: &quot;Experienced&quot; anesthesiologist</td>
<td>Ultrasound used to identify sacral hiatus</td>
<td>Caudal epidural injection with saline Soft tissue injection with saline</td>
</tr>
<tr>
<td>Jeong, 2007</td>
<td>A vs. B: Age (mean): 50 vs. 49 years Male: 40% vs. 48% Spinal stenosis: 18% vs. 20% Herniated disc: 82% vs. 80% Duration of symptoms &lt;6 months: 64% vs. 56% Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: 2-5 years</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of alternative transformaminal epidural steroid injection techniques</td>
</tr>
</tbody>
</table>
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<td><strong>Iversen, 2011</strong></td>
<td>A vs. B vs. C:</td>
</tr>
<tr>
<td><strong>Title</strong></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Leg pain: at 6 weeks 3.2 (-9.1 to 16); at 12 weeks 2.5 (-9.6 to 15); at 52 weeks 3.1 (-9.6 to 16)</td>
</tr>
<tr>
<td></td>
<td>Low back pain: at 6 weeks -5.0 (-17 to 6.7); at 12 weeks -7.8 (-19 to 3.8); at 52 weeks -2.0 (-14 to 10)</td>
</tr>
<tr>
<td></td>
<td>EuroQol: at 6 weeks -0.02 (-0.13 to 0.09); at 12 weeks -0.05 (-0.17 to 0.06); at 52 weeks -0.01 (-0.12 to 0.11)</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>A vs. C:</td>
</tr>
<tr>
<td></td>
<td>ODI: (mean difference, 0-50) A vs B: at 6 weeks; -0.5 (-6.3 to 5.4); at 12 weeks; 1.4 (-4.5 to 7.2); at 52 weeks; -1.9 (-8.0 to 4.3); A vs. C: at 6 weeks; -2.9 (-9.7 to 3.0); at 12 weeks; 4.0 (-1.9 to 9.9); at 52 weeks; 1.9 (-4.2 to 8.0)</td>
</tr>
<tr>
<td></td>
<td>EuroQol: (mean difference, -0.594 to 1) A vs. B: at 6 weeks; -0.02 (-0.13 to 0.09); at 12 weeks; -0.05 (-0.17 to 0.06); at 52 weeks; -0.01 (-0.12 to 0.11). A vs. C: at 6 weeks; -0.05 (-0.16 to 0.06); at 12 weeks; -0.12 (-0.23 to -0.00); at 52 weeks; -0.05 (-0.17 to 0.06)</td>
</tr>
<tr>
<td><strong>Other outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Morphine use at 6 weeks: 8.1% (3/37) vs. 17% (6/35) vs. 11% (4/37): A vs. B RR 0.47 (95% CI 0.13 to 1.74); A vs. C RR 0.75 (95% CI 0.18 to 3.12); B vs. C RR 1.59 (95 % CI 0.49 to 5.15)</td>
<td></td>
</tr>
<tr>
<td>Receiving sickness benefit at 52 weeks: 32% (11) vs. 30% (10) vs. 22% (7) (p=0.69)</td>
<td></td>
</tr>
<tr>
<td>Underwent back surgery: 2.7% (1/37) vs. 15% (6/39) vs. 20% (8/40) (p=0.07): A vs. B, RR 1.72 (95% CI 0.72 to 4.12); A vs. C, RR 1.33 (95% CI 0.61 to 2.88); B vs. C, RR 0.77 (95% CI 0.29 vs. 2.01)</td>
<td></td>
</tr>
</tbody>
</table>

| Jeong, 2007 | A vs. B: |
| **Pain** | Overall results excellent (4 category scale poor, fair, good, excellent): 47% (56/127) vs. 73% (82/112) at 1 month, RR 0.60 (95% CI 0.48 to 0.75); 34% (39/116) vs. 37% (39/106) at mid-term (> 6 month) follow-up, RR 0.91 (95% CI 0.64 to 1.31) |
| Overall results good or excellent: at 1 month 71% (90/127) vs. 88% (99/112), RR 0.80 (95% CI 0.70 to 0.91); at mid-term follow-up 67% (78/116) vs. 60% (64/106), RR 1.11 (95% CI 0.91 to 1.36) |
| Age, sex, duration of symptoms, cause of radiculopathy were not statistically significant predictors for effectiveness of injection at 1 month or mid-term follow-up |
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</tr>
</thead>
<tbody>
<tr>
<td>Iversen, 2011</td>
<td>52 weeks</td>
<td>A vs. B: 0% (0/37) vs. 5.1% (2/39) vs. 5.0% (2/40) at 52 weeks</td>
<td>5 patients did not receive allocated intervention (1 vs. 3 vs. 1), 7 discontinued intervention (2 vs. 4 vs. 1); no crossovers</td>
<td>6 had local pain with injection</td>
<td>North Norway Regional Health Authority and Health Region Nord-Trondelag, Norway</td>
<td>Good</td>
</tr>
<tr>
<td>Jeong, 2007</td>
<td>Mean 373 days (range 216-547) post-injection</td>
<td>A vs. B: 7% (17/239) at midterm followup</td>
<td>Appears complete</td>
<td>None reported</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
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</table>
| Kang, 2011        | RCT          | South Korea     | Signs and symptoms consistent with nerve root entrapment at neural foramen; radicular leg pain; positive straight leg raise; at least single level disc herniation on MRI correlating with symptoms; age 18 to 60 years; duration not specified | Spinal stenosis; allergic reaction to local anesthetics or corticosteroids; contraindications to epidural steroid injections; epidural steroid injection within 6 months; previous lumbar spine surgery; unstable neurological deficits; cauda equina syndrome | Approached: Not reported Eligible: Not reported Randomized: 160 (40 vs. 40 vs. 40) Analyzed: 160 at 2 weeks | A: Transforaminal epidural injection with 40 mg triamcinolone plus 1% lidocaine (total 3 ml), with fluoroscopic guidance (n=40)  
B: Transforaminal epidural injection with 20 mg triamcinolone plus 1% lidocaine (total 3 ml), with fluoroscopic guidance (n=40)  
C: Transforaminal epidural injection with 10 mg triamcinolone plus 1% lidocaine (total 3 ml), with fluoroscopic guidance (n=40)  
D: Transforaminal epidural injection with 5 mg triamcinolone plus 1% lidocaine (total 3 ml), with fluoroscopic guidance (n=40) |
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<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kang, 2011</td>
<td>A vs. B vs. C vs D: Age (mean): 47 vs. 53 vs. 52 vs. 53 years Male: 40% vs. 42% vs. 38% vs. 35% Duration of symptoms (days): 37 vs. 33 vs. 42 vs. 33 Baseline pain: 7.3 vs. 7.2 vs. 7.0 vs. 7.0 Baseline function: Not reported</td>
<td>A vs. B vs. C vs. D: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 2 injections 1 weeks apart Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of alternative corticosteroid doses</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Title</td>
<td>Results</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Kang, 2011</td>
<td>A vs. B vs. C vs. D: Pain</td>
<td>Pain (0-10 VAS): at baseline 7.3 vs. 7.2 vs. 7.0 vs. 7.0; at 1 week 3.8 vs. 3.9 vs. 4.3 vs. 5.4; at 2 weeks 3.2 vs. 3.3 vs. 3.4 vs. 3.9; (p&gt;0.05) Pain relief (&gt;=67% improvement in VAS pain): at 1 week 75% (30/40) vs. 70% (28/40) vs. 65% (26/40) vs. 45% (18/40); A vs. B, RR 1.07 (95% CI 0.88 to 1.40); A vs. C, RR 1.15 (95% CI 0.86 to 1.54); A vs. D, RR 1.67 (95% CI 1.13 to 2.46); B vs. C RR, 1.08 (95% CI 0.79 to 1.47); B vs. D, RR 1.56 (95% CI 1.04 to 2.32); C vs. D, RR 1.44 (95% CI 0.96 to 2.18) (p&lt;0.05 for A, B, or C vs. D); at 2 weeks 85% (34/40) vs. 80% (32/40) vs. 75% (30/40) vs. 68% (27/40); A vs. B, RR 1.06 (95% CI 0.87 to 1.30); A vs. C, RR 1.13 (95% CI 0.91 to 1.41); A vs. D, RR 1.26 (95% CI 0.98 to 1.62); B vs. C, RR 1.07 (95% CI 0.84 to 1.35); B vs. D, RR 1.19 (95% CI 0.91 to 1.54); C vs. D, RR 1.11 (95% CI 0.84 to 1.49)</td>
<td></td>
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</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kang, 2011</td>
<td>2 weeks</td>
<td>None reported</td>
<td>Appears complete</td>
<td>Facial flushing (n=2) and itching (n=1); groups not reported</td>
<td>No funding received</td>
<td>Fair</td>
</tr>
</tbody>
</table>
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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</table>
| Karppinen, 2001   | RCT          | Finland         | Unilateral back pain radiating dermatomally below knee; duration 3 to 28 weeks; leg pain intensity at least equal to back pain intensity; MRI scans at baseline (findings for inclusion not specified) | Prior back surgery; application for early retirement; clinical depression; anticoagulation treatment; unstable diabetes; epidural injection in past 3 months; pregnant; allergy to study drugs; rare causes of sciatica such as synovial cysts; nondegenerative spondylolisthesis | Approached: 277 Eligible: 171 Randomized: 163 Analyzed: 158 (78 vs. 80) at 12 months | A: Transforaminal (periradicular) injection with 2-3 cc of methylprednisolone 40 mg/cc plus bupivacaine 5 mg/cc, with fluoroscopic guidance (n=78)  
B: Transforaminal (periradicular) injection with isotonic (0.9%) saline (2-3 cc), with fluoroscopic guidance |
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tbody>
<tr>
<td>Karppinen, 2001</td>
<td>A vs. B: Age (mean): 44 vs. 44 years Male: 64% vs. 58% Duration of symptoms (months): 2.4 vs. 2.6 Baseline leg pain (0 to 100 VAS): 71 vs. 75 Baseline back pain (0 to 100 VAS): 53 vs. 60 Baseline ODI (0-100): 43 vs. 44</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Back school instructions by physiotherapist at 2 weeks; pain medication and physiotherapy for persisting sciatic pain; referral to neurosurgeon for severe sciatic pain and disability Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Experienced radiologist</td>
<td>Fluoroscopic guidance with contrast verification of nerve root site</td>
<td>Transforaminal epidural injection with saline</td>
</tr>
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<tr>
<td>Karppinen, 2001</td>
<td>A vs. B: <em>(difference ANCOVA adjusted for level of symptomatic disc and days on sick leave)</em></td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td>Leg pain (0-100 VAS): 71 vs. 75 at baseline; 39 vs. 54 at 2 w, difference -12 (95% CI -23.4 to 1.6); 37 vs. 44 at 4 w, difference -2.3 (95% CI -13.4 to 8.7); 31 vs. 34 at 3 m, difference 0.5 (95% CI -11 to 12); 31 vs. 22 at 6 m, difference 16 (95% CI 5.6 to 27); 24 vs. 24 at 12 m, difference 5.3 (-5.0 to 16); by MRI subgroups: bulges no differences at any time point; contained herniation difference -24 (95% CI -8 to -41) at 2 w; -19 (95% CI -36 to -3) at 4 w; -1.4 (95% CI -23 to 20) at 3 m; 22 (95% CI 5 to 40) at 6 m; 0.3 (95% CI -16 to 16) at 1 y Back pain (0-100 VAS): 53 vs. 60 at baseline; 26 vs. 36 at 2 w, difference -5.8 (95% CI -17 to 5.1); 27 vs. 31 at 4 w, difference 6.1 (95% CI -5.0 to 17); 26 vs. 23 at 3 m, difference 12 (95% CI 1.0 to 24); 23 vs. 20 at 6 m, difference 14 (95% CI 2.4 to 25); 19 vs. 19 at 12 m, difference 8.4 (95% CI -2.1 to 19); extrusions no differences except at 6 m, difference 17 (95% CI 1 to 32); disc level L3-L4/L4-L5 -25 difference -25 (95% CI -40 to -10) at 2w, -50 (95% CI -35 to 5) at 4 w, no differences at other time points &gt;75% improvement in leg pain (only reported for some subgroups): contained herniations: 35% (9/26) vs. 9% (2/23) at 2 w (p=0.04), otherwise no differences; extrusions: No differences at any time point; disc level L3-L4/L4-L5: 68% (21/36) vs. 31% (16/51) at 4 w (p=0.02), otherwise no differences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td>ODI (0-100): 43 vs. 44 at baseline; 29 vs. 34 at 2 w, difference -5.1 (95% CI -10 to 0.3); 27 vs. 29 at 4 w, difference -1.5 (95% CI -7.3 to 4.4); 23 vs. 23 at 3 m, difference 1.3 (95% CI -6.1 to 8.6); 19 vs. 16 at 6 m, difference 5.9 (95% CI -0.7 to 12); 16 vs. 16 at 12 m, difference 0.4 (95% CI -6.2 to 7.0); by MRI subgroups: bulges no differences at any time point; contained herniation difference -8.0 (-16 to 0.3) at 2 w, -2.7 (95% CI -10 to 5) at 4 w, 2.3 (95% CI -9 to 13) at 3 m, 14 (95% CI 3 to 24) at 6 m, 12 (95% CI -9 to 12) at 1 y; extrusion no differences at any time point; disc level L3-L4 or L4-L5 -9.6 (95% CI -17 to -2) at 2 w, no differences at other time points</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Sick leave (days/month): 8.9 vs.10 at 4 w, difference -0.5 (95% CI -3.9 to 4.9); 7.3 vs. 7.4 at 3 m, difference -0.2 (95% CI -4.4 to 3.9); 3.6 vs. 4.9 at 6 m, difference 1.7 (95% CI 1.7 to 5.1); 1.9 vs. 1.2 at 12 m, difference -0.6 (95% CI -2.4 to 1.2) Therapy visits: 0.4 vs. 1.9 at 4 w, difference 1.7 (95% CI -0.5 to 3.9); 3.7 vs. 5.9 at 12 m, difference 1.7 (95% CI -2.9 to 6.3) Underwent surgery: 22% (18/80) vs. 19% (15/80) at 12 m, RR 1.2 (95% CI 0.65 to 2.21); contained herniation subgroup 20% vs. 42% (p=0.10), extrusion subgroup 32% vs. 13% (p=0.05)</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Duration of Followup</td>
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<tr>
<td>--------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Karppinen, 2001</td>
<td>1 year</td>
<td>A vs. B: 2/80 (2.5%) vs. 0/80 (0%); 3 other exclusions because neurogram findings were not typical</td>
</tr>
<tr>
<td>See also Karpinnen, 2001</td>
<td></td>
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</tr>
</tbody>
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# Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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| Kennedy, 2014 | RCT          | USA     | Two centers Rehabilitation or spine surgery clinic | Unilateral radicular pain with pain intensity ≥4 on 0-10 scale; <6 months duration; MRI single level below L3 corresponding with symptoms; appropriate for surgery if injection failed | Back pain greater than leg pain; nonradicular pain; unclear diagnosis; more than one potential pain generator on MRI; lumbar stenosis; prior surgery; prior spine injection; conditions increasing injection risk (bleeding tendencies, workers compensation, pregnancy, litigation) | Approached: Not reported Eligible: 81 Randomized: 78 (41 vs. 37) Analyzed: Unclear at 6 months | A: Transforaminal epidural injection with 15 mg dexamethasone (1.5 ml) plus 1% lidocaine (2 ml), with fluoroscopic guidance  
B: Transforaminal epidural injection with 60 mg triamcinolone (1.5 ml) plus 1% lidocaine (2 ml), with fluoroscopic guidance |
| Kim, 2011    | RCT          | USA     | Single center Pain clinic | Lumbar radicular symptoms below the knee corresponding to MRI findings; ≥18 year of age; pain ≥6 months; failed medication and physical therapy | Litigation; history of psychopathology; Beck Depression Inventory <15; history of substance abuse; contraindications to intra-axial procedures | Approached: Not reported Eligible: Not reported Randomized: 61 (31 vs. 30) Analyzed: 60 (30 vs. 30) | A: Interlaminar epidural injection with 15 mg dexamethasone phosphate, 0.25% bupivacaine (2 ml), and saline (total 10 ml), with fluoroscopic guidance (n=30)  
B: Interlaminar epidural injection with 80 mg methylprednisolone acetate, 0.25% bupivacaine (2 ml), and saline (total 10 ml), with fluoroscopic guidance (n=30) |
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<tbody>
<tr>
<td>Kennedy, 2014 A vs. B:</td>
<td>Age (mean): 36 vs. 36 years Male: 66% vs. 65% Duration of symptoms (weeks): 10 vs. 8.6 Baseline pain (0-10): 6.3 vs. 6.5 Baseline ODI (0-100): 46 vs. 42</td>
<td>A vs. B: Treatments prior to intervention: No differences between groups; no formal treatment program prior to intervention Treatments following intervention: Not specified L4/L5: 15% vs. 14% L5/S1: 56% vs. 54% S1/S2: 29% vs. 32% Disc extrusion: 27% vs. 46%</td>
<td>Number and frequency of injections: Up to 3 injections over 6 months; 54% vs. 62% received 1 injection, 29% vs. 32% 2 injections, 17% vs. 2.7% 3 injections Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of alternative corticosteroids</td>
</tr>
<tr>
<td>Kim, 2011 A vs. B:</td>
<td>Age (mean): 66 vs. 64 years Male: 13% vs. 20% Duration of symptoms: Not reported Baseline pain (0-100 VAS): 78 vs. 77 Baseline function: Not reported</td>
<td>A vs. B: Treatment prior to intervention: Not specified Treatments following intervention: not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Two injections, within 1-2 months Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative corticosteroids</td>
</tr>
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</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tbody>
<tr>
<td><strong>Kennedy, 2014</strong></td>
<td>A vs. B:</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (mean 3 day average NRS, 0-10): 7.0 vs. 6.9 at baseline 4.1 vs. 4.1 at 7-14 days; 1.6 vs. 1.8 at 3 months; 1.4 vs. 1.2 at 6 months&lt;br&gt;Pain improved &gt;50%: 32% (13/41) vs. 43% (16/37) at 7-14 days, RR 0.73 (95% CI 0.41 to 1.31); 73% (30/41) vs. 73% (27/37) at 3 months, RR 1.0 (95% CI 0.77 to 1.31); 73% (30/41) vs. 76% (28/37) at 6 months, RR 0.97 (95% CI 0.75 to 1.25)&lt;br&gt;<strong>Function</strong>&lt;br&gt;ODI improved &gt;51%: 27% (11/41) vs. 35% (13/37) at 7-14 days, RR 0.60 (95% CI 0.30 to 1.92); 68% (28/41) vs. 68% (30/37) at 3 months, RR 0.84 (95% CI 0.65 to 1.09); 71% (27/41) vs. 65% (24/37) at 6 months, RR 1.07 (95% CI 0.78 to 1.46)&lt;br&gt;<strong>Other outcomes</strong>&lt;br&gt;Underwent surgery: 15% (6/41) vs. 19% (7/37) at 6 months, RR 0.77 (95% CI 0.29 to 2.09)</td>
</tr>
<tr>
<td><strong>Kim, 2011</strong></td>
<td>A vs. B:</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (0-100 VAS): 78 vs. 77 at baseline, 61 vs. 54 at 1-2 months; percent change from baseline -20% vs. -27% (p=0.37)&lt;br&gt;Decrease in pain: 90% (27/30) vs. 87% (26/30), RR 1.04 (95% CI 0.86 to 1.25)&lt;br&gt;<strong>Other outcomes</strong>&lt;br&gt;Pain medication use, emergency room visits for pain, new treatment for pain: No differences, data not provided</td>
</tr>
</tbody>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kennedy, 2014</td>
<td>6 months after last injection</td>
<td>Unclear</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>International Spine Intervention Society</td>
<td>Fair</td>
</tr>
</tbody>
</table>
| Kim, 2011          | 1-2 months (mean 41 vs. 51 days) | A vs. B: 3.2% (1/31) excluded from analysis from dexamethasone group | Appears complete | "No complications were reported including new neurological symptoms or new areas of pain."
1 patient excluded for inadvertant dexamethasone injection intrathecally; no complications seen | Not reported | Fair |
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
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</table>
| Klenerman, 1984    | RCT          | UK              | Unilateral sciatica with or without objective neurological signs; no previous treatment in a hospital for backs; symptoms ≤6 months | Not reported | Approached: Not reported Eligible: Not reported Randomized: 74 Analyzed: 63 (19 vs. 16 vs. 16 vs. 12) at 2 months | A: Epidural injection with 80 mg methylprednisolone plus normal saline (20 ml total) (n=19)  
B: Epidural injection with 0.25% bupivacaine (20 ml) (n=16)  
C: Epidural injection with normal saline (20 ml) (n=16)  
D: Interspinous ligament needling without injection (n=12) |
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<th>Imaging Guidance</th>
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</tr>
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<tbody>
<tr>
<td>Klenerman, 1984</td>
<td></td>
<td>A vs. B vs. C vs. D: Age: Not reported Male: Not reported Duration of symptoms: Not reported (≤6 months by inclusion criteria) Baseline pain (0-100 VAS): 48 vs. 53 vs. 65 vs. 65 Baseline function: Not reported</td>
<td>A vs. B vs. C vs. D: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
</tr>
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<td>Klenerman, 1984</td>
<td>A vs. B vs. C vs. D:</td>
</tr>
<tr>
<td></td>
<td>Pain (0-100 VAS, estimated from graph): at baseline 48 vs. 53 vs. 65 vs. 65; at 2 weeks 30 vs. 39 vs. 39 vs. 53; at 2 months 25 vs. 19 vs. 20 vs. 25</td>
</tr>
<tr>
<td></td>
<td>Global assessment</td>
</tr>
<tr>
<td></td>
<td>&quot;Improved&quot; or &quot;cured&quot; (failed, improved, cured) at 2 months: 79% (15/19) vs. 69% (11/16) vs. 69% (10/12); A vs. B: RR 0.19 (95% CI 0.77 to 1.72); A vs. C: RR 1.15 (95% CI 0.66 to 1.60); A vs. D: RR 0.95 (95% CI 0.67 to 1.34); B vs. C: RR 1.00 (95% CI 0.77 to 1.72); B vs. D: RR 0.83 (95% CI 0.54 to 1.25); C vs. D: RR 0.83 (95% CI 0.54 to 1.25)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
</tr>
<tr>
<td></td>
<td>Underwent surgery: 0% (0/19) vs. 12% (2/16) vs. 0% (0/16) vs. 0% (0/12); A vs. B: RR 0.17 (95% CI 0.00 to 3.30); A vs. C: RR 0.85 (95% CI 0.02 to 40.60); A vs. D: RR 0.65 (95% CI 0.01 to 30.77); B vs. C: RR 5.00 (95% CI 0.26 to 96.59); B vs. D: RR 3.83 (95% CI 0.20 to 73.00); C vs. D: RR 0.76 (95% CI 0.02 to 36.04)</td>
</tr>
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<tr>
<td>Klenerman, 1984</td>
<td>2 months</td>
<td>A vs. B vs. C vs. D: 15% (11/74) excluded from analysis, including 1 lost to followup</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Fair</td>
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<tbody>
<tr>
<td>Koh, 2013</td>
<td>RCT</td>
<td>Korea Single center Pain clinic</td>
<td>Age ≥20 years, chronic lumbosacral radiculopathy secondary to spinal stenosis lasting ≥12 weeks, dominant leg pain with less severe back pain, unilateral leg pain with symptoms restricted to 1-level of dermatome, and previous failure of conservative management including physiotherapy, exercise therapy, analgesic medication, and acupuncture; MRI findings of lateral canal spinal stenosis (including lateral recess and foraminal spinal stenosis)</td>
<td>Unbearable pain &gt;9 on the NRS, pain &lt;4 NRS, acute back or leg pain, patients who had developed signs of progressive motor weakness or neurologic deficits, patients with a history of prior spinal surgery, allergies to steroids or contrast dyes, coagulopathy, injection of steroids or hyaluronic acids within the previous 12 weeks, systemic infections, injection site infections, unstable medical or psychiatric condition; bilateral radiculopathy, spondylolisthesis, multilevel spinal stenosis, and radiographic confirmed severe central canal stenosis</td>
<td>Approached: 259 Eligible: 86 Randomized: 68 (34 vs. 34) Analyzed: 53 (27 vs. 53) at 3 m, 25 (13 vs. 12) at 6 m</td>
<td>A: Transforaminal epidural steroid injection with 20 mg triamcinolone acetonide plus 2 mL 10% hypertonic saline (sodium chloride solution) (n=27) B: Transforaminal epidural steroid injection with 20 mg triamcinolone acetonide plus 2 mL 0.9% normal saline (n=26)</td>
</tr>
</tbody>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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</tr>
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<tbody>
<tr>
<td>Koh, 2013</td>
<td>A vs. B: Age (mean): 66 vs. 63.7 years Male: 30% vs. 27% Duration of symptoms (months): 18.3 vs. 22.3 Baseline NRS (0-10): 7.26 vs. 6.60 Baseline ODI (1-100): 42.6 vs. 37.5</td>
<td>A vs. B Treatments prior to intervention: Prior epidural steroid injections 2.41 vs. 2.35 Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Not reported Provider experience: Anesthesiologist with 10 year career in pain medicine</td>
<td>Fluoroscopic guidance</td>
<td>Transforaminal epidural injection with saline</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year</th>
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</thead>
<tbody>
<tr>
<td>Koh, 2013</td>
<td>A vs. B</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRS (0-10): At baseline 7.26 vs. 6.60. Difference at 1 month -3.13 vs. -2.56 (p=0.25), at 2 months -3.22 vs. -1.94 (p=0.02), at 3 months -2.93 vs. -1.52 (p=0.01), at 4 months -2.78 vs. -1.50 (p=0.05), at 6 months -2.15 vs. -0.58 (p=0.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GPE mean values (1-7 Likert scale where 7=best ever and 1=worst ever). Difference at 1 month 5.82 vs. 5.65 (p=0.24), at 3 months 5.41 vs. 4.73 (p=0.02), at 6 months 4.59 vs. 4.22 (p=0.40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ODI, Korean version (0-100). At baseline 42.6 vs. 37.5. Difference at 1 month -13.22 vs. -10.08 (p=0.56), at 2 months -13.81 vs. -10.31 (p=0.45), at 3 months -12.70 vs. -8.08 (p=0.34), at 4 months -12.22 vs. -6.90 (p=0.41), at 6 months -6.85 vs. -3.83 (p=0.34)</td>
</tr>
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### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koh, 2013</td>
<td>6 months</td>
<td>A vs. B</td>
<td>Appears complete</td>
<td>1 withdrawal due to severe burning in the hypertonic saline group that resolved within 2 hours; no other reports of serious complications during injection and no other withdrawals due to adverse effects</td>
<td>None</td>
<td>Fair</td>
</tr>
</tbody>
</table>

At 4 months 32% (11/34) vs. 41% (14/34), at 6 months 62% (21/34) vs. 65% (22/34)
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<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
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</table>
| Kolsi, 2000        | RCT          | France          | 18 to 75 years of age; sciatica (L5 or S1) or femoral neuralgia (L4) with pain radiating at least to knee; positive straight leg raise or crossed straight leg raise; duration ≥15 days; baseline pain >5 on 0-10 scale; impingement of disc on nerve root by CT or MRI | Cauda equina syndrome; motor strength ≤2 on 0 to 5 scale; history of disc surgery or chemonucleolysis; epidural corticosteroid injection within 1 week; bleeding disorder or anticoagulant therapy; pregnant or breast-feeding; current infection; psychiatric disorders | Approached: Not reported Eligible: Not reported Randomized: 30 (17 vs. 13) Analyzed: 30 at 4 weeks | A: Transformaminal nerve root injection with 3.75 mg cortivazol (1.5 ml) plus 0.10 g lidocaine (2 ml), with fluoroscopic guidance (n=17)  
B: Interlaminar epidural injection with 3.75 mg cortivazol (1.5 ml) plus 0.10 g lidocaine (2 ml), with fluoroscopic guidance (n=13) |
| Kraemer, 1997, study 1 | RCT          | Germany         | Inpatients with intractable unilateral sciatica extending below knee with paresthesia; positive SLR test; limited trunk movement and aggravation of pain by certain movements and coughing; disk protrusion with nerve root compression seen on MRI and/or CT; duration not specified | Presence of other concomitant disease like osteoporosis or diabetes; contraindications to steroids | Approached: Not reported Eligible: Not reported Randomized: 133 (47 vs. 40 vs. 46) Analyzed: 133 (includes patients with missing data, number unclear) | A: Epidural perineural injection via oblique interlaminar approach with 10 mg triamcinolone + local anesthetic (1 ml, drug not specified) (n=47)  
B: Interlaminar epidural steroid injection using conventional technique (medications and doses not reported) (n=40)  
C: Paravertebral local anesthetic injection (medications and doses not reported) (n=46) |
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
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<tbody>
<tr>
<td>Kolsi, 2000</td>
<td>A vs. B: Age (mean): 45 vs. 40 years Male: 41% vs. 38% Duration of symptoms (months): 3.7 vs. 4.4 Baseline leg pain (0-10 VAS): 7.0 vs. 6.3 Baseline back pain (0-10 VAS): 3.9 vs. 4.2 Baseline RDQ (French version) (0-24): 16 vs. 15</td>
<td>A vs. B: Treatment prior to intervention: Not specified Treatments following intervention: Not specified L5: 6/17 vs. 5/13 S1: 10/17 vs. 8/13 Intra- or extraforaminal nerve root impingement: 1/17 vs. 2/13 Midline herniation: 5/17 vs. 3/13 Herniation on side of pain: 11/17 vs. 7/13 Work-related injury: 24% (4/17) vs. 15% (2/13)</td>
<td>Number and frequency of injections: Number of injections not reported; open-label transforaminal nerve root steroid injection performed if &lt;50% pain score decrease after first injection Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of transforaminal vs. interlaminar steroid injection</td>
</tr>
<tr>
<td>Kraemer, 1997, study 1</td>
<td>A vs. B vs. C: Age (mean): Not reported Male: Not reported Duration of symptoms: Not reported Baseline pain: Not reported (Age, sex, duration of symptoms, baseline pain not reported by treatment group though reports no statistically significant difference) Function: Not reported</td>
<td>A vs. B vs. C: Treatments prior to intervention: Physiotherapy; back school; and dynamic flexion orthosis Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection given three times in one week Number of levels: Single level Provider experience: Not reported</td>
<td>Not used routinely</td>
<td>Interlaminar epidural steroid injection (unclear if local anesthetic used) Soft tissue injection with local anesthetic</td>
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<tr>
<td><strong>Kolsi, 2000</strong> A vs. B:</td>
<td>Pain</td>
</tr>
<tr>
<td>Radicular pain (0-10 VAS, estimated from graph): at 2 weeks 7.0 vs. 6.3 at baseline, 2.6 vs. 1.6; at 4 weeks 2.0 vs. 1.5</td>
<td></td>
</tr>
<tr>
<td>Radicular pain, percent improvement from baseline (estimated from graph): at 1 week 78% vs. 73%; at 4 weeks 70% vs. 78%</td>
<td></td>
</tr>
<tr>
<td>Back pain (0-10 VAS, estimated from graph): at baseline 3.9 vs. 4.2; at 2 weeks 1.5 vs. 2.4; at 4 weeks 1.6 vs. 2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td></td>
</tr>
<tr>
<td>RDQ (French version, 0-24): at 4 weeks 16 vs.16 at baseline, 10 vs. 7.6</td>
<td></td>
</tr>
<tr>
<td><strong>Other outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Underwent surgery: at 8 months 18% (3/17) vs. 23% (3/13) RR 0.76 (95% CI 0.18 vs. 3.20)</td>
<td></td>
</tr>
</tbody>
</table>

<p>| <strong>Kraemer, 1997, study 1</strong> A vs. B vs. C: | Pain |
| (Based on modified MacNab criteria; p-values not reported) | |
| Modified MacNab criteria “good” (leg &lt;10%, back pain &lt;20%, return to work, sports as before; some results estimated from graph): 68% (32/47) vs. 53% (21/40) vs. 26% (12/46) at 3 months: A vs. B: 68% (32/47) vs. 53% (21/40), RR 1.30 (95% CI 0.91 to 1.85); A vs. C: 68% (32/47) vs. 26% (12/46), RR 2.61 (95% CI 1.55 to 4.41); B vs. C: 53% (21/40) vs. 26% (12/46), RR 2.02 (95% CI 1.14 to 3.55) |
| <strong>Other outcomes</strong> | |
| Surgery: 8.5% (4/47) vs. 18% (7/40) vs. 13% (6/46) at 3 months; A vs. B: (4/47) vs. 18% (7/40), RR 0.49 (5% CI 0.15 to 1.54); A vs. C: 8.5% (4/47) vs. 13% (6/46), RR 0.65 (95% CI 0.20 to 2.16); B vs. C: 18% (7/40) vs. 13% (6/46), RR 1.34 (95% CI 0.51 to 3.54) |</p>
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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolsi, 2000</td>
<td>4 weeks for pain, function; mean 8 months for surgery</td>
<td>None reported</td>
<td>Appears complete</td>
<td>A vs. B: 1 case of acute hypertension in group A</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Kraemer, 1997, study 1</td>
<td>3 months</td>
<td>Not reported by study or treatment arm; eight patients withdrew across two trials</td>
<td>Appears complete</td>
<td>No serious adverse events reported in any group. Headache: 1.9% (including group A in trial 2) vs. 3.6% vs. &lt;1%</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Kraemer, 1997, study 2 | Study 2: A "prospective double-blind study," not described as randomized | Germany Single center University hospital setting, departments of Orthopaedic Surgery and Radiology | Inpatients with intractable unilateral sciatica extending below knee with paresthesia; positive SLR test; limited trunk movement and aggravation of pain by certain movements and coughing; disk protrusion with nerve root compression seen on MRI and/or CT; duration not specified | Presence of other concomitant disease like osteoporosis or diabetes; contraindications to steroids | Approached: Not reported Eligible: Not reported Randomized: 49 (24 vs. 25) Analyzed: 49 (includes patients with missing data, number unclear) | A: Epidural perineural injection via oblique interlaminar approach with 10 mg triamcinolone plus saline (volume not reported) (n=24)  
B: Epidural perineural injection via oblique interlaminar approach with saline alone plus intramuscular injection with 10 mg triamcinolone (n=25) |
| Laiq, 2009 | RCT | Pakistan Single Center Setting unclear | Lumbar radicular pain (including low back and unilateral or bilateral leg pain); VAS pain score ≥6/10 for >2 weeks; single lumbar intervertebral disc herniation on recent MRI corresponding to clinical symptoms | Previous lumbar epidural steroid injections; previous lumbar spine surgery; unstable neurological deficits; cauda equina syndrome; radiologically proven facet syndrome; known contraindications for epidural steroid injections; infection; bleeding tendency or malignancy | Approached: Not reported Eligible: Not reported Randomized: 52 (26 vs. 26) Analyzed: 50 (25 vs. 25) | A: Interlaminar epidural injection with 80 mg methylprednisolone plus 2% Xylocaine (3 ml), preceded by 2% lidocaine (3 ml) (n=26)  
B: Ibuprofen 400 mg tid x 1 m, tramadol SR 100 mg QD x 2 m, tizanidine 2 mg bid x 3 m, famotidine 40 mg throughout treatment, bed rest and limited activity x 1 m with gradual increase to waling 2-3 h/day, heavy lifting and strenuous exercise not permitted for 3-6 m (n=25) |
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Author, Year</th>
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<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kraemer, 1997, study 2</td>
<td>A vs. B: Age (mean): Not reported, Male: Not reported, Duration of symptoms: Not reported, Baseline pain: Not reported (Age, sex, duration of symptoms, baseline pain not reported by treatment group though reports no statistically significant difference), Function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Physiotherapy, back school, and dynamic flexion orthosis, Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection given three times in one week; epidural perineural injection with corticosteroid performed if patients did not improve, Number of levels: Single level, Provider experience: Not reported</td>
<td>Not used routinely</td>
<td>Epidural perineural injection via oblique interlaminar approach with saline plus soft tissue injection with corticosteroid</td>
</tr>
<tr>
<td>Laiq, 2009</td>
<td>A vs. B: Age (mean): 40 vs. 41 years, Male: 68% vs. 60%, Duration of symptoms: Not reported, Baseline pain: Not reported, Baseline function: Not reported</td>
<td>A vs. B: Treatment prior to intervention: Not reported, Treatments following intervention: Not reported, Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Appears to be single injection, Number of levels: Appears to be single level, Provider experience: &quot;Expert&quot; (no other details provided)</td>
<td>Not reported</td>
<td>Non-injection therapy</td>
</tr>
</tbody>
</table>
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<tbody>
<tr>
<td><strong>Kraemer, 1997, study 2</strong></td>
<td>A vs. B:</td>
<td>Pain Modified MacNab criteria &quot;good&quot; (leg &lt;10%, back pain &lt;20%, return to work, sports as before; estimated from graph): at 3 months 54% (13/24) vs. 40% (10/25), RR 1.35 (95% CI 0.74 to 2.48)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Surgery: at 3 months 4% (1/24) vs. 4% (1/25), RR 1.04 (95% CI 0.07 to 15.73)</td>
</tr>
<tr>
<td><strong>Laiq, 2009</strong></td>
<td>A vs. B:</td>
<td>Pain (0-10 VAS): 2 vs. 4 at 2 weeks, (p&lt;0.0001); 2 vs. 4.5 at 1 month, (p&lt;0.0001); 4.5 vs. 5.0 at 3 months, (p=0.19); 6 vs. 6.5 at 6 months, (p=0.21) Pain score &gt;=6 (0-10 VAS): 16% (4/25) vs. 24% (6/25), RR 0.67 (95% CI 0.22 to 2.1) Patient satisfaction with improvement in pain: at 2 weeks 80% (20/25) vs. 52% (13/25), RR 1.54 (95% CI 1.01 to 2.35) (p=0.38); at 1 month 76% (19/25) vs. 48% (12/25), RR 1.59 (95% CI 1.00 to 2.52) (p=0.36); at 3 months 52% (13/25) vs. 56% (14/25), RR 0.93 (95% CI 0.56 to 1.55) (p=1.0); at 6 months 68% (17/25) vs. 64% (16/25), RR 106 (95% CI 0.71 to 1.58) (p = 1.0)</td>
</tr>
<tr>
<td>Author, Year, Title</td>
<td>Duration of Followup</td>
<td>Loss to Followup</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Kraemer, 1997, study 2</td>
<td>3 months</td>
<td>Not reported by study or treatment arm; eight patients withdrew overall across two trials</td>
</tr>
<tr>
<td>Laiq, 2009</td>
<td>6 months</td>
<td>A vs. B: 3.8% (1/26) vs. 3.8% (1/26)</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
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</tr>
</tbody>
</table>
| Manchikanti, 2014                                                               | RCT          | US              | ≥ 18 years of age; disc herniation or radiculitis; function-limiting low back and lower extremity pain for ≥6 months; imaging findings not specified                                                                 | Previous lumbar surgery; radiculitis secondary to spinal stenosis without disc herniation; uncontrollable or unstable opioid use; uncontrolled psychiatric disorder or acute/chronic medical illness; pregnant or lactating; patients with history, potential for adverse reaction to study medications | Approached: 162 Eligible: 140 Randomized: 120 (60 vs. 60) Analyzed: 120 at 2 years, including 19 (10 vs. 9) with missing data | A: Interlaminar epidural injection with 6 mg betamethasone (1 ml) plus 0.5% lidocaine (5 ml), with fluoroscopic guidance (n=60)  
B: Interlaminar epidural injection with 0.5% lidocaine (6 ml), with fluoroscopic guidance (n=60) |
| Manchikanti, 2013                                                               |              |                 |                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |                                                                                                                                                                                                 |                                                                                                                                                                                                 |
| Manchikanti, 2010                                                               |              |                 |                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |                                                                                                                                                                                                 |                                                                                                                                                                                                 |
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<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
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</tr>
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<tbody>
<tr>
<td>Manchikanti, 2014</td>
<td>A vs. B: Age (mean): 41 vs. 49 years Male: 62% vs. 38% Duration of symptoms (months): 133 vs. 135 Baseline pain (0 to 10 NRS): 8.0 vs. 8.2 Baseline ODI (0-50): 30 vs. 30</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified L4/5: 13% vs. 3.3% L5/S1: 87% vs. 95% Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean 6.1 vs. 5.3 over 2 years, frequency not specified Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Interlaminar epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Manchikanti, 2013</td>
<td></td>
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<tr>
<td>Manchikanti, 2010</td>
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<td>Manchikanti, 2014</td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td>Manchikanti, 2013</td>
<td>Pain scores (0-10): at baseline 8.0 vs. 8.2; at 3 months 3.5 vs. 3.9; at 6 months 3.5 vs. 4.1; at 12 months 3.4 vs. 4.0; at 24 months 3.7 vs. 4.1 (p&gt;0.05 at all time points) Pain relief &gt;=50%: at 3 months 88% (53/60) vs. 78% (47/60), RR 1.13 (95% CI 0.96 to 1.33); at 6 months 88% (53/60) vs. 70% (42/60), RR 1.26 (95% CI 1.04 to 1.53); at 12 months 85% (51/60) vs. 72% (43/60), RR 1.19 (95% CI 0.98 to 1.44); at 24 months 70% (42/60) vs. 63% (38/60), RR 1.11 (95% CI 0.86 to 1.42)</td>
</tr>
<tr>
<td>Manchikanti, 2010</td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td>ODI (0-50): at baseline 30 vs. 30, at 3 months 14 vs. 16; at 6 months 14 vs. 16; at 12 months 13 vs. 16; at 24 months 14 vs. 16 (p&gt;0.05 at all time points) ODI improved &gt;=50%: at 3 months 82% (49/60) vs. 73% (44/60), RR 1.11 (95% CI 0.92 to 1.35); at 6 months 87% (52/60) vs. 63% (38/60), RR 1.37 (95% CI 1.10 to 1.70); at 12 months 87% (52/60) vs. 68% (41/60), RR 1.27 (95% CI 1.04 to 1.55); at 24 months 73% (44/60 ) vs. 63% (38/60), RR 1.16 (95% CI 0.91 to 1.48)</td>
</tr>
<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td>Opioid use (mg MED/day): at baseline 47 vs. 50; at 3 months 42 vs. 34; at 6 months 36 vs. 37; at 12 months 36 vs. 37; at 24 months 37 vs. 36 (p&gt;0.05 at all time points)</td>
</tr>
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<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2014</td>
<td>24 months</td>
<td>A vs. B: 17% (10/60) vs. 15% (9/60) at 24 months</td>
<td>Appears complete</td>
<td>One dural puncture (treatment group not reported); no other major adverse events</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
<tr>
<td>Manchikanti, 2013</td>
<td></td>
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<td></td>
<td></td>
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<tr>
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</thead>
<tbody>
<tr>
<td>Manchikanti, 2012 Manchikanti, 2011 Manchikanti, 2008</td>
<td>RCT</td>
<td>US</td>
<td>Demonstrated disc herniation with radiculitis; &gt;18 years of age; function-limiting low back and lower extremity pain for &gt;6 months; imaging findings not specified</td>
<td>Previous lumbar surgery; radiculitis secondary to spinal stenosis or without disc herniation; uncontrollable or unstable opioid use; uncontrolled psychiatric disorders; uncontrolled medical illness; any conditions that could interfere with the interpretation of the outcome assessments; pregnant or lactating; history or potential for adverse reactions to local anesthetics or steroids</td>
<td>Approached: 178 Eligible: 132 Randomized: 120 (60 vs. 60) Analyzed: 120 (60 vs. 60) at 24 months, including 24 (12 vs. 12) with missing data</td>
<td>A: Caudal epidural injection with 6 mg betamethasone or 40 mg methylprednisolone plus 0.5% lidocaine (9 ml), with fluoroscopic guidance (n=60) B: Caudal epidural injection with 0.5% lidocaine (10 ml), with fluoroscopic guidance (n=60)</td>
</tr>
<tr>
<td>Matthews, 1987</td>
<td>RCT</td>
<td>UK</td>
<td>18 to 60 years of age; onset of most within 3 months; low back pain with asymmetrical restriction of lumbar spine movement; positive straight leg raise test and/or femoral nerve stretch test positive; radicular pain and uniradicular neurologic deficit; radiographs performed (imaging findings not specified)</td>
<td>Abnormalities or complicating problems after screening examination and investigations</td>
<td>Approached: 895 for 4 different trials (1 trial evaluated epidural injection) Eligible: Not reported Randomized: 57 (23 vs. 24) in trial of epidural injection Analyzed: 57 (23 vs. 34) at up to 12 months, including 3 (2 vs. 1) with missing data</td>
<td>A: Caudal epidural injection with 80 mg methylprednisolone (2 ml) and 0.125% bupivacaine (20 ml) (n=23) B: Soft tissue injection at sacral hiatus or tender point with lignocaine (2 ml, concentration not reported) (n=34)</td>
</tr>
</tbody>
</table>
# Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B:</td>
<td>Age (mean): 43 vs. 49 years Male: 38% vs. 32% Duration of pain (months): 81 vs. 93 Baseline pain (0-10 NRS): 7.8 vs. 8.1 Baseline ODI (0 to 50): 28 vs. 29</td>
<td>A vs. B: Treatments prior to intervention: Not reported Treatments following intervention: Not reported Herniation level L3/4: 5% vs. 8% L4/L5: 70% vs. 67% L5/S1: 50% vs. 58% Other patient characteristics: Not reported</td>
<td>Number of injections: Mean 5.3 over 5.5 years, frequency not specified</td>
<td>5</td>
<td>Caudal Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Caudal epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Manchikanti, 2011</td>
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<tr>
<td>Manchikanti, 2008</td>
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<tr>
<td>Matthews, 1987</td>
<td>A vs. B:</td>
<td>Age (median): 38 vs. 41 years Male: 83% vs. 71% Duration of symptoms (median, weeks): 4 vs. 4 weeks Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Acetaminophen as needed, opioid available on request; offered spinal corset and given instruction in 'posture' and 'back care' Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Injection repeated every 2 weeks, up to 3 times as needed</td>
<td>1</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Soft tissue injection with local anesthetic</td>
</tr>
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</table>

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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B: Pain</td>
<td>Pain (mean NRS, 0 to 10): at baseline 7.8 vs. 8.1; at 3 months 3.4 vs. 4.1; at 6 months 3.5 vs. 3.9; at 12 months 3.5 vs. 4.1; at 24 months 3.6 vs. 4.2: (p=0.80 for group difference) Pain improved &gt;=50% from baseline: at 3 months 80% (48/60) vs. 77% (46/60); at 6 months 82% (49/60) vs. 77% (46/60); at 12 months 77% (46/60) vs. 70% (42/60); at 24 months 68% (41/60) vs. 63% (38/60)</td>
</tr>
<tr>
<td>Manchikanti, 2011</td>
<td></td>
<td>Function: ODI (0 to 50): at baseline 28 vs. 29; at 3 months 14 vs. 16; at 6 months 14 vs. 16; at 12 months 13 vs. 16; at 24 months 14 vs. 16: (p=0.71 for group difference) ODI improved &gt;=50% from baseline: at 3 months 73% (44/60 ) vs. 62% (37/60); at 6 months 73% (44/60) vs. 72% (43/60), RR 1.02 (95% CI 0.82 vs. 1.28); at 12 months 72% (43/60) vs. 67% (40/60), RR 108 (95% CI 0.85 to 1.37); at 24 months 70% (42/60) vs. 60% (36/60), RR 1.08 (95% Cl 0.82 to 1.43)</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td></td>
<td>Other outcomes: Opioid use (mg MED/day): at baseline 45 vs. 52; at 3 months 30 vs. 33; at 6 months 31 vs. 33; at 12 months 31 vs. 33; at 24 months 31 vs. 33: (p=0.75 for group difference) Success (pain improved &gt;=50% and ODI improved &gt;=50%): at 6 months 73% (44/60) vs. 72% (43/60); at 12 months 72% (43/60) vs. 67% (40/60); at 24 months 65% (39/60) vs. 60% (36/60)</td>
</tr>
<tr>
<td>Matthews, 1987</td>
<td>A vs. B: Pain</td>
<td>Pain score (6 point NRS): at 1 month 67% (14/21) vs. 56% (18/32), RR 1.67 (95% CI 1.23 to 2.28) (p&gt;0.05); No further pain: at 1 year 39% (9/23) vs. 41% (14/34), RR 0.95 (95% CI 0.49 to 1.8)</td>
</tr>
<tr>
<td></td>
<td>Other outcomes</td>
<td>Spinal surgery: 4% (1/23) vs. 0% (0/34), RR 4.38 (95% CI 0.19 to 102.94)</td>
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<th>Quality Rating</th>
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<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>24 months</td>
<td>A vs. B: 20% (12/60) vs. 20% (12/60) at 24 months</td>
<td>Appears complete</td>
<td>No major adverse events</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Manchikanti, 2011</td>
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<tr>
<td>Matthews, 1987</td>
<td>Up to 1 year</td>
<td>A vs. B: 8.7% (2/23) vs. 2.9% (1/34) at 1 year</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Department of Health and Social Security (UK) and St. Thomas’ Hospital, London</td>
<td>Fair</td>
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<tbody>
<tr>
<td>McCahon, 2011</td>
<td>RCT with crossover design</td>
<td>UK Single center Anesthesiology clinic</td>
<td>Back and leg pain of any cause; ≥2 epidural steroid injections in the last 12 months; ODI score &gt;20%; back or leg VAS &gt;30 mm</td>
<td>Anticoagulant therapy; bleeding diathesis; sepsis</td>
<td>Approached: 83 Eligible: 78 Randomized: 38 (19 vs. 19) Analyzed: 33 at 12 weeks following crossover intervention</td>
<td>A: Caudal epidural injection with 80 mg methylprednisolone acetate (2 ml), 0.25% levobupivacaine (10 ml), and saline (8 ml) (n=19) B: Caudal epidural injection with 40 mg methylprednisolone acetate (1 ml), 0.25% levobupivacaine (10 ml), and saline (9 ml) (n=19)</td>
</tr>
<tr>
<td>Murakibhavi, 2011</td>
<td>RCT</td>
<td>India Single center Orthopedic clinic</td>
<td>≥18 years of age; low back pain with unilateral or bilateral sciatica for ≥3 months; not responding to rest and analgesics; MRI showed lumbar disc disease (disc degeneration or herniation)</td>
<td>History of surgery; severe motor weakness; rapidly progressive neurological deficit; cauda equina syndrome; neurogenic claudication; local infection at injection site; steroid use in last 3 weeks; allergy to steroids; bleeding diathesis; pregnant; uncontrolled hypertension; uncontrolled diabetes</td>
<td>Approached: 189 Eligible: 189 Randomized: 102 (52 vs. 50) Analyzed: 100 (50 vs. 50) at 6 months</td>
<td>A: Caudal epidural injection with 80 mg triamcinolone acetate (2 ml), 2% lidocaine (2 ml), and normal saline (20 ml), with fluoroscopic guidance B: Conservative treatment (tizanidine 6-12 mg/d, diclofenac 50-100 mg/d, amitriptyline 10-50 mg qhs, bilateral skin traction, physiotherapy including TENS, short-wave diathermy, back extension exercises)</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Subject Characteristics</td>
<td>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</td>
<td>Number and Frequency of Injections Number of Levels Provider Experience</td>
<td>Imaging Guidance</td>
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<tr>
<td>McCahon, 2011</td>
<td>A vs. B: Age (mean): 56 years Male: 39% Duration of pain (years): 19 Baseline leg pain (0-100 VAS): 57 vs. 54 Baseline back pain (0-100 VAS): 67 vs. 66 Baseline ODI (0-100): 55 vs. 54</td>
<td>A vs. B: Treatments prior to intervention: ≥2 epidural injections in last 12 months (median 3 prior injections in last 12 months) Treatment following intervention: Not reported Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Appears to be single Number of levels: Caudal Provider experience: Not reported</td>
<td>None</td>
<td>Head-to-head comparison of different corticosteroid doses</td>
<td></td>
</tr>
<tr>
<td>Murakibhavi, 2011</td>
<td>A vs. B: Age (mean): 45 years (overall) Male: 66% (overall) Race: Not reported Duration of symptoms (months): 21 (overall) Baseline pain (0-10 VAS): 8.1 vs. 8.1 Baseline ODI (0-100): 36 vs. 36</td>
<td>A vs. B: Treatment prior to intervention: 98% rest/analgesics; 78% traction; 76% lumbar belt; 76% physiotherapy; 18% epidural injection Treatments following intervention: Not specified MRI findings: 60% disc degeneration; 26% disc bulge; 14% disc herniation</td>
<td>Number and frequency of injections: Repeat injection permitted after 2-3 weeks if &lt;20% improvement in VAS pain; 12% received repeat injection Number of levels: Caudal injection Provider experience: Not reported</td>
<td>Fluoroscopic guidance without contrast verification</td>
<td>Conservative therapy</td>
<td></td>
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## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<td>McCahon, 2011</td>
<td><strong>A vs. B:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong></td>
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<tr>
<td></td>
<td>Change in ODI from baseline (0-100, estimated from graph): -7 vs. -7 at 4 weeks; 0.5 vs. -3 at 8 weeks; 1 vs. 0 at 12 weeks</td>
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<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
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<tr>
<td></td>
<td>Analgesic use: No difference between groups</td>
</tr>
<tr>
<td>Murakibhavi, 2011</td>
<td><strong>A vs. B:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Pain (0-10 VAS): 8.1 vs. 8.1 at baseline; 2.7 vs. 6.1 at 6 months</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td>ODI (0-100): 36 vs. 36 at baseline; 12 vs. 25 at 6 months</td>
</tr>
<tr>
<td></td>
<td>Beck Depression Inventory (0-63): 18 vs. 19 at baseline; 8.6 vs. 13 at 6 months</td>
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<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td>Complete pain relief (complete, partial, no relief): 92% (46/50) vs. 32% (16/50) at 3 weeks, RR 2.88 (95 % CI 1.90 to 4.34); 86% (43/50) vs. 24% (12/50) at 6 months, RR 3.58 (95% CI 2.16 to 5.94)</td>
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<tr>
<td>McCahon, 2011</td>
<td>12 weeks</td>
<td>A vs. B: 13% (5/38) withdrew, did not maintain ODI booklet, or did not return diary</td>
<td>Appears complete</td>
<td>&quot;No adverse events reported&quot;</td>
<td>No external funding</td>
<td>Fair</td>
</tr>
<tr>
<td>Murakibhavi, 2011</td>
<td>6 months</td>
<td>Not reported</td>
<td>3.8% (2/52) excluded in group A due to hypotension during procedure</td>
<td>A vs. B: Dural puncture: 0% (0/50) Headache: 18% (9/50) Hypotension during procedure: 24% (12/50) Bleeding during procedure: 4% (2/50)</td>
<td>NIH/NIAMS and University of Washington (through gift from Synthes Spine)</td>
<td>Poor</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
<td>Inclusion Criteria</td>
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<tr>
<td>Owlia, 2007</td>
<td>RCT</td>
<td>Iran</td>
<td>Lumbar radicular pain for &gt;2 weeks; MRI showing disc herniation with or without canal stenosis; refractory pain despite NSAIDs; opioids, and physical therapy for &gt;2 weeks</td>
<td>Prior back surgery; radiologically proven facet syndrome; signs or symptoms of infection; bleeding tendency; or malignancy</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 84 (43 vs. 41) Analyzed: 84 at 3 months</td>
<td>A: Interlaminar epidural injection with 80 mg methylprednisolone acetate (8-10 ml) plus 2% lidocaine (2-4 ml), with fluoroscopic guidance (n=43) B: Interlaminar epidural injection with 40 mg methylprednisolone acetate (8-10 ml) plus 2% lidocaine (2-4 ml), with fluoroscopic guidance (n=41)</td>
</tr>
<tr>
<td>Park, 2010</td>
<td>RCT</td>
<td>South Korea</td>
<td>18 to 80 years of age, lumbar radicular pain; MRI showing nerve root compromise; duration not specified</td>
<td>Chronic use of oral steroids; oral, peripheral, or epidural steroid use in past 3 months; temperature &gt;100.4 F; pregnant; cognitive impairment; use of aspirin, Plavix, Coumadin, or heparin in last 2 weeks; history of bleeding disorders; history of lumbar surgery</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 106 (53 vs. 53) Analyzed: 106 at 4 weeks</td>
<td>A: Transforaminal injection with 7.5 mg dexamethasone plus 1% lidocaine (1 ml), with fluoroscopic guidance (n=53) B: Transforaminal injection with 40 mg triamcinolone acetonide plus 1% lidocaine (1 ml), with fluoroscopic guidance (n=53)</td>
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<tr>
<td>Owlia, 2007</td>
<td>A vs. B: Age (mean): 38 vs. 36 years Male: 51% vs. 66% Duration of symptoms (weeks): 12 vs. 9 Baseline pain: Not reported Limitation in daily activities: 28% vs. 49%</td>
<td>A vs. B: Treatments prior to intervention: NSAIDS, opioids, and physical therapy for &gt;2 weeks Treatments following intervention: Rehabilitative management for 2 weeks Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Head-to-head comparison of alternative corticosteroid doses</td>
</tr>
<tr>
<td>Park, 2010</td>
<td>A vs. B: Age (mean): 56 vs. 62 years Male: 49% vs. 45% Duration of symptoms: Not reported Baseline pain (0-10 VAS): 7.5 vs. 8.3 Baseline ODI (0-100): 52 vs. 58</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified L4: 21% vs. 17% L5: 47% vs. 55% S1: 32% vs. 25%</td>
<td>Number and frequency of injections: Appears to be single injection Number of levels: Appears to be single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of alternative corticosteroids</td>
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<td>Owlia, 2007</td>
<td>A vs. B: Pain Improvement in pain (not defined): at 2 weeks, 70% (30/43) vs. 61% (25/41), RR 1.14 (95% CI 0.84 to 1.57); at 1 month, 74% (32/43) vs. 76% (31/41), RR 0.98 (95% CI 0.77 to 1.25); at 3 months, 65% (28/43) vs. 51% (21/41), RR 1.27 (95% CI 0.88 to 1.84)</td>
<td></td>
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<tr>
<td>Park, 2010</td>
<td>A vs. B: Pain Pain (0-10 VAS): 7.4 vs. 8.3 at baseline, 4.1 vs. 2.4 at 1 month (p&lt;0.0005) McGill Pain Questionnaire summary score (0-45): 15 vs. 13 at baseline, 13 vs. 20 at 1 month (p&gt;0.05) Function ODI (0-100): 52 vs. 58 at baseline, 45 vs. 59 at 1 month (p&gt;0.05)</td>
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<tr>
<td>Owlia, 2007</td>
<td>3 months</td>
<td>None reported</td>
<td>Appears complete</td>
<td>A vs. B: Major complications: None Hyperglycemia: 4.6% (2/43) vs. 0% (0/41) Flushing: 14% (6/43) vs. 2.4% (1/41) Post-injection flare: 4.6% (2/43) vs. 7.3% (3/41) CSF hypotension: 2.3% (1/43) vs. 7.3% (3/41)</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
<tr>
<td>Park, 2010</td>
<td>1 month</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Wooridul Institute</td>
<td>Fair</td>
</tr>
<tr>
<td>Author, Year Title</td>
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<td>Exclusion Criteria</td>
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| Park, 2013        | RCT          | Korea Single center Pain clinic | Back pain with pain radiating to leg; duration not specified; imaging confirmation not required | Systemic inflammatory disease; anticoagulant; uncontrolled diabetes; allergic reaction to lidocaine or contrast media; suspected or diagnosed infection; poor general health; skin defects in the injection area; psychiatric problems preventing the completion of a questionnaire; injections within 3 months; pain-relieving anti-inflammatory medication other than acetaminophen; undergoing physical therapy during the study period that might impact treatment effects; cauda equina syndrome; additional peripheral injections; surgery | Approached: 156 Eligible: 144 Randomized: 120 (60 vs. 60) Analyzed: 110 (55 vs. 55) at 12 weeks | A: Caudal epidural injection with 10 mg dexamethasone (2 ml) plus 0.5% lidocaine (13 ml) and 5 ml of iodinated contrast, with Doppler ultrasound and fluoroscopy guidance  
B: Caudal epidural injection with 10mg dexamethasone (2 ml) plus 0.5% lidocaine (13 ml) with 5 ml of iodinated contrast, with fluoroscopic guidance |
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<tr>
<td>Park, 2013</td>
<td>A vs. B: Age (mean): 57 vs. 58 years Male: 29% vs. 44% Duration of symptoms (months): 6.6 vs. 7.0 Baseline pain (0-10 NRS): 6.4 vs. 6.4 Baseline ODI (0-100): 51 vs. 52</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Herniated lumbar disc: 42% vs. 34% Spinal stenosis: 58% vs. 66% Target root L4: 36% vs. 36% Target root L5: 44% vs. 44% Target root S1: 9.1% vs. 20%</td>
<td>Number and frequency of injections: 51% vs. 53% received 2 injections within 2 week interval; 2nd injection performed if &lt;50% reduction in pain NRS after 1st injection Number of levels: Caudal Provider experience: Not reported</td>
<td>Doppler ultrasound with contrast verification in epidural space, also fluoroscopic confirmation vs. fluoroscopy with contrast verification in epidural space (without ultrasound)</td>
<td>Head-to-head comparison of alternative imaging guidance methods</td>
</tr>
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<td>Park, 2013 A vs. B:</td>
<td>Pain (0-10 NRS): 6.4 vs. 6.4 at baseline; 3.1 vs. 3.2 at 2 weeks; 2.5 vs. 2.6 at 12 weeks, (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td>Function ODI (0-100): 51 vs. 52 at baseline; 33 vs. 31 at 2 weeks; 29 vs. 29 at 12 weeks, (p&gt;0.05)</td>
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<td>Global assessment Pain score improvement &gt;50% and ODI improvement &gt;40%: at 2 weeks 87% (48/55) vs. 89% (49/55), RR 0.98 (95% CI 0.85 to 1.12); at 12 weeks 76% (42/55) vs. 74% (41/55), RR 1.02 (95% CI 0.83 to 1.27)</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Duration of Followup</td>
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<tr>
<td>--------------------</td>
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</tr>
<tr>
<td>Park, 2013</td>
<td>12 weeks</td>
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### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
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| Rados, 2011  | RCT          | Croatia         | Unilateral lumbosacral radicular leg pain greater than back pain; duration <1 year; unresponsive to ≥6 weeks of conservative management; pain score ≥5; underwent MRI and EMG | Motor or bowel/bladder impairment; lumbar canal stenosis on MRI or x-ray that could explain symptoms; pregnant; allergic to steroids; bleeding history; infections; on anticoagulants; neurological deficits secondary to spine pathology; previous lumbar spinal surgery; previous caudal or lumbar epidural steroid injection; history of opioid abuse or currently on long acting opioids | Approached: Not reported Eligible: Not reported Randomized: 70 (35 vs. 35) Analyzed: 64 (32 vs. 32) at 24 weeks | A: Transforaminal epidural injection with 40 mg methylprednisolone plus 0.5% lidocaine (3 ml), with fluoroscopic guidance  
B: Interlaminar epidural injection with 80 mg methylprednisolone plus 0.5% lidocaine (8 ml), with fluoroscopic guidance |
| Ridley, 1988 | RCT          | UK              | Clinical history consistent with sciatic nerve root compression with numbness or paresthesia or objective neurologic deficit | Prior epidural injection; spinal surgery | Approached: Not reported Eligible: Not reported Randomized: 39 Analyzed: 35 (19 vs. 15) at 2 weeks | A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) and saline (10 ml) (n=19)  
B: Interspinous ligament injection with saline (2 ml) (n=16) |
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<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rados, 2011</td>
<td>A vs. B: Age (mean): 49 vs. 49 years Male: 62% vs. 66% Duration of symptoms: Not reported (&lt;1 year and &gt;6 weeks by inclusion criteria) Baseline pain (0-10 VAS): 6.7 vs. 7.4 Baseline ODI (0-100): 53 vs. 52</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: tramadol 50 mg 1-2 T po q 6 h prn L4-5: 43% vs. 41% L5-S1: 57% vs. 59% Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 3 injections at 2 week intervals Number of levels: Single level Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Head-to-head comparison of transforaminal vs. interlaminar steroid injection</td>
</tr>
<tr>
<td>Ridley, 1988</td>
<td>A vs. B: Age (mean): 40 vs. 39 years Male: 42% vs. 44% Duration of symptoms &gt;6 months: 47% vs. 56% Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection repeated after 1 week if no improvement Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>Non-epidural saline injection</td>
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<tr>
<td>Rados, 2011</td>
<td>A vs. B: Pain</td>
<td>Pain (0-10 VAS, estimated from graph): at baseline 6.7 vs. 7.4; at 2 weeks, 5.0 vs. 5.0; at 4 weeks, 4.2 vs. 4.0; 12 weeks, 3.8 vs. 4.0 Pain improved &gt;=2 (0-10 VAS): 84% (27/32) vs. 75% (24/32); RR, 1.13 (95% CI 0.88 to 1.44) Pain improved &gt;50%: 63% (20/32) vs. 53% (17/32) at 24 weeks: RR, 1.18 (95% CI 0.77 to 1.79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td>Ridley, 1988</td>
<td>A vs. B: Pain</td>
<td>Rest pain, improvement from baseline (median, 0-10 VAS): at 2 weeks 46% vs. 0%, (p&lt;0.01) Walking pain, improvement from baseline (median, 0-10 VAS): at 2 weeks 69% vs. 0%, (p&lt;0.01)</td>
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<tr>
<td>Rados, 2011</td>
<td>24 weeks</td>
<td>A vs. B: 8.6% (3/5) vs. 8.6% (3/35) at 6 months (excluded because they did not undergo 3 injections)</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>No external funding</td>
<td>Fair</td>
</tr>
<tr>
<td>Ridley, 1988</td>
<td>2 weeks</td>
<td>A vs. B: 5% (2/39) at 2 weeks</td>
<td>14 crossovers in placebo group; timing unclear</td>
<td>None reported</td>
<td>Not reported</td>
<td>Fair</td>
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<tr>
<td>Riew, 2000</td>
<td>RCT</td>
<td>USA Single center Spine surgery clinic</td>
<td>&gt;21 years of age; degenerative lumbar radicular pain with disc herniation or spinal stenosis confirmed by MRI or CT; completed course of nonoperative management (NSAID, PT, activity modification) for at least 6 weeks without adequate benefit, unless in intractable pain despite maximum NSAID plus opioid; surgery considered appropriate</td>
<td>Acute trauma; cauda equina syndrome; progressive neurological deficit; motor deficit; pathologic or infectious etiology; not an operative candidate; Workers' Compensation claim; history of an adverse reaction to corticosteroids or local anesthetics; lack of a radiographically detectable abnormality; more than two radiographically abnormal and symptomatic levels on either side; absence of substantial radicular pain as the presenting symptom</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 55 (28 vs. 27) Analyzed: 55 at 13-28 months, 55 at &gt;5 years, including 8 (8 vs. 0) with missing data</td>
<td>A: Transforaminal nerve root injection with 6 mg betamethasone (1 ml) plus 0.25% bupivacaine (1 ml), with fluoroscopic guidance (n=28) B: Transforaminal nerve root injection with 0.25% bupivacaine (1 ml), with fluoroscopic guidance (n=27)</td>
</tr>
<tr>
<td>Riew, 2006</td>
<td>RCT</td>
<td>USA Single center Spine surgery clinic</td>
<td>&gt;21 years of age; degenerative lumbar radicular pain with disc herniation or spinal stenosis confirmed by MRI or CT; completed course of nonoperative management (NSAID, PT, activity modification) for at least 6 weeks without adequate benefit, unless in intractable pain despite maximum NSAID plus opioid; surgery considered appropriate</td>
<td>Acute trauma; cauda equina syndrome; progressive neurological deficit; motor deficit; pathologic or infectious etiology; not an operative candidate; Workers' Compensation claim; history of an adverse reaction to corticosteroids or local anesthetics; lack of a radiographically detectable abnormality; more than two radiographically abnormal and symptomatic levels on either side; absence of substantial radicular pain as the presenting symptom</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 55 (28 vs. 27) Analyzed: 55 at 13-28 months, 55 at &gt;5 years, including 8 (8 vs. 0) with missing data</td>
<td>A: Transforaminal nerve root injection with 6 mg betamethasone (1 ml) plus 0.25% bupivacaine (1 ml), with fluoroscopic guidance (n=28) B: Transforaminal nerve root injection with 0.25% bupivacaine (1 ml), with fluoroscopic guidance (n=27)</td>
</tr>
<tr>
<td>Rogers 1992</td>
<td>RCT</td>
<td>UK Single center Pain clinic</td>
<td>Clinical diagnosis of sciatica with positive straight leg raise at less than 60 degrees; duration and imaging findings not specified</td>
<td>Not reported</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 30 (15 vs. 15) Analyzed: 30 Lost to followup: Not reported</td>
<td>A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) plus 2% lignocaine (14 ml) plus saline (4 ml) (n=15) B: Interlaminar epidural injection with 2% lignocaine (14 ml) + saline (6 ml) (n=15)</td>
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<th>Imaging Guidance</th>
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<tbody>
<tr>
<td>Riew, 2000 Riew, 2006</td>
<td>A vs. B: Age: Not reported (states no difference) Male: 49% overall (states no difference) Duration of symptoms: Not reported Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: NSAIDs; PT; and activity modification for ≥6 weeks; +/- opioid Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection with 4 additional injections during followup period-19 had &gt;1; frequency not specified (range 6 days to 10.5 months) Number of levels: One or two (determined by surgeon based on patient's history) Provider experience: Radiologists experienced in the injection technique</td>
<td>Fluoroscopic guidance with contrast verification of nerve root site</td>
<td>Transforaminal nerve root injection with local anesthetic</td>
</tr>
<tr>
<td>Rogers 1992</td>
<td>A vs. B: Age (mean): 42 vs. 41 years Male: 47% vs. 47% Duration of symptoms (months): 23 vs. 25 Baseline pain &quot;severe&quot; or &quot;very severe&quot;: 87% vs. 67% Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Prior surgery: 1/15 vs. 0/15 Prior epidural injection: 4/15 vs. 2/15 Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>Interlaminar epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Author, Year</td>
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<tr>
<td><strong>Riew, 2000</strong></td>
<td>A vs. B:</td>
<td>Other outcomes</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Underwent surgery: 29% (8/28) vs. 67% (18/27) at 13 to 28 months, RR 0.43 (95% CI 0.22 to 0.82); 39% (11/28) vs. 70% (19/27) at &gt;=5 years, RR 0.56 (95% CI 0.33 to 0.94) (assuming none lost to follow-up had surgery); 68% (19/28) vs. 70% (19/27), RR 0.96 (95% CI 0.66 to 1.4) (assuming all lost to follow-up had surgery)</td>
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<tr>
<td><strong>Riew, 2006</strong></td>
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<tr>
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<td>A vs. B:</td>
<td>Pain</td>
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<tr>
<td></td>
<td></td>
<td>Pain &quot;none&quot; (none, mild, moderate, severe): 20% (3/15) vs. 6.7% (1/15), RR 3.0 (95% CI 0.35 to 26)</td>
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<td>Pain &quot;none&quot; or &quot;mild&quot;: 47% (7/15) vs. 20% (3/15), RR 2.33 (95% CI 0.74 to 7.35)</td>
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<td></td>
<td></td>
<td>Function</td>
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<tr>
<td></td>
<td></td>
<td>Full ability to work: 53% (8/15) vs. 33% (5/15), RR 1.6 (95% CI 0.68 to 3.80)</td>
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<td>Other outcomes</td>
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<tr>
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<td></td>
<td>Reduced analgesic intake: 53% (8/15) vs. 40% (6/15, RR 1.33 (95% CI 0.61 to 2.9)</td>
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<td>Subsequent surgery: 27% (4/15) vs. 27% (4/15), RR 1.0 (95% CI 0.31 to 3.28)</td>
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</tr>
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<tbody>
<tr>
<td>Riew, 2000</td>
<td>Mean 23 months, range 13 to 28 months for initial followup; ≥5 years for second followup</td>
<td>A vs. B: None at 13 to 28 months; 29% (8/28) vs. 0% (0/27) at ≥5 years</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Barnes-Jewish Christian Health System's Innovations in Health Care Grant and Washington University School of Medicine</td>
<td>Fair</td>
</tr>
<tr>
<td>Riew, 2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rogers 1992</td>
<td>1 month for all outcomes except subsequent surgery, which was evaluated at 20-21 months</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Poor</td>
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<td>Sayegh, 2009</td>
<td>RCT</td>
<td>Greece</td>
<td>Low back pain for ≥ 1 month with or without unilateral or bilateral sciatica; failure to respond to conservative measures; disc degeneration or herniation on MRI</td>
<td>Cauda equina or spinal stenosis; psychosomatic diseases or any other pathology</td>
<td>Approached: Not reported Eligible: 191 Randomized: 183 (93 vs. 90) Analyzed: 151 (81 vs. 70) at 1 year</td>
<td>A: Caudal epidural injection with betamethasone (2 mg/dL betamethasone dipropionate + 5 mg/dL betamethasone phosphate) (1 ml) + 2% Xylocaine (12 ml) (n=93) B: Caudal epidural injection with 2% Xylocaine (12 ml) + water for injection (8 ml) (n=90)</td>
</tr>
<tr>
<td>Snoek, 1977</td>
<td>RCT</td>
<td>Norway</td>
<td>Radiating pain in the distribution of the sciatic or femoral nerve; neurologic deficit that correlated with compression of L4, L5, or S1 nerve root; myelographic findings at the appropriate level and side; duration not specified</td>
<td>Acute severe motor paresis; cauda equina syndrome; intolerable pain; previous lumbar spine surgery; contraindications to corticosteroids; doubts about myelography findings</td>
<td>Approached: &gt;200 Eligible: Not reported Randomized: 51 (27 vs. 24) Analyzed: Unclear</td>
<td>A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) (n=27) B: Interlaminar epidural injection with saline (2 ml) (n=24)</td>
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<td>Sayegh, 2009</td>
<td>A vs. B: Age (mean): 51 vs. 48 years Male: 65% vs. 70% Duration of symptoms (days): 53 vs. 51 Baseline pain: Not reported Baseline ODI (0-100): 39 vs. 39</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Acetaminophen allowed during first 4 weeks of study, but not NSAIDs Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 51/183 (28%) received 2nd injection 1-2 weeks after 1st for failure to improve Number of levels: Caudal injection Provider experience: Not reported</td>
<td>No fluoroscopic guidance</td>
<td>Caudal epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Snoek, 1977</td>
<td>A vs. B: Age (mean): 44 vs. 46 years Male: 48% vs. 54% Duration of symptoms (weeks): 12 vs. 11 Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>Interlaminar epidural injection with saline</td>
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| Sayegh, 2009       | A vs. B:  
Function  
ODI (scale NR): 39 vs. 39 at baseline (p=0.75); 13 vs. 6.2 at 1 week (p<0.0005); 12 vs. 9.6 at 1 month (p<0.0005); 5.8 vs. 14 at 6 months (p<0.0005); 4.9 vs. 13 at 1 year (p<0.0005)  
Other outcomes  
Surgery (overall): 16% (13/83) vs. 22% (19/85) at 1 month, RR 0.70 (95% CI 0.37 to 1.3)  
Surgery (disc herniation group): 17% (7/42) vs. 24% (8/33) at 1 month, RR 0.69 (95% CI 0.28 to 1.70) |
| Snoek, 1977        | A vs. B:  
Other outcomes  
Subsequent surgery: 52% (14/27) vs. 58% (14/24), RR 0.89 (95% CI 0.54 to 1.5) |
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<tr>
<td>Sayegh, 2009</td>
<td>1 year</td>
<td>A vs. B: 13% (12/93) vs. 22% (20/90) at 1 year</td>
<td>Appears complete</td>
<td>A vs. B: Transient lower extremity numbness: 13% (12/93) vs. 8.9% (8/90) &quot;No patient reported any major immediate or late complications&quot;</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Snoek, 1977</td>
<td>Mean not reported; range 8-20 months after injection</td>
<td>Not reported</td>
<td>Unclear</td>
<td>A few patients who felt increased pain of sciatic distribution</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
<tr>
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<tr>
<td>Tafazal, 2009; Ng, 2005</td>
<td>RCT</td>
<td>UK Single center Spine clinic</td>
<td>Unilateral leg pain with intensity comparable to back pain intensity; MRI diagnosis of lumbar disc herniation or foraminal stenosis; ≥ 6 weeks of failed conservative treatment</td>
<td>Acute back trauma; cauda equina syndrome; active local skin infection; previous back operation; periradicular infiltration during previous 12 months; epidural injection in last 3 months; pregnant; allergy to treatment agents; anticoagulation treatment</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 150 (74 vs. 76) Analyzed: 124 (65 vs. 59) at 3 months</td>
<td>A: Transforaminal periradicular injection with 40 mg methylprednisolone plus 0.25% bupivacaine (2 ml), with fluoroscopic guidance (n=74) B: Transforaminal periradicular injection with 0.25% bupivacaine (2 ml), with fluoroscopic guidance (n=76)</td>
</tr>
<tr>
<td>Tauheed, 2014</td>
<td>RCT</td>
<td>India Single center Pain clinic</td>
<td>Ages 18-55 years, weight between 40-70 kg, ASA grade I or II, suffering from sciatica due to disc herniation, and symptomatic for ≥6 weeks; 1 or 2 level disc herniation at L3-L4, L4-L5, L5-S1 on MRI</td>
<td>Large HNP with severe central or foraminal stenosis on MRI, progressive neurologic deficits, cauda-equina syndrome, blood coagulation disorder, valvular heart diseases, hypotension, emotional instability, known history of allergy to local anesthetics, corticosteroids or clonidine or received prior epidural steroid injection or lumbar surgery</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 180 (60 vs. 60 vs. 60) Analyzed: 177 (60 vs. 58 vs. 59) at 12 w</td>
<td>A: Transforaminal sleeve root injection with 60 mg methylprednisolone (n=60) B: Transforaminal sleeve root injection with 60 mg methylprednisolone plus 0.5 mcg/kg clonidine (n=60) C: Transforaminal sleeve root injection with 60 mg methylprednisolone plus 1 mcg/kg clonidine (n=60)</td>
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<tr>
<td>Tafazal, 2009; Ng, 2005</td>
<td>A vs. B: Age (mean): 52 vs. 51 years Male: 60% vs. 54% Duration of symptoms (months): 20 vs. 18 months Baseline leg pain (0-100 VAS): 73 vs. 76 Baseline back pain (0-100 VAS): 44 vs. 48 Baseline ODI (0-100): 43 vs. 47</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 13% vs. 15% received subsequent injections, mean number not reported, frequency not specified Number of levels: Single level Provider experience: Senior surgeon</td>
<td>Fluoroscopy with contrast verification</td>
<td>Transforaminal periradicular injection with local anesthetic</td>
</tr>
<tr>
<td>Tauheed, 2014</td>
<td>A vs. B vs. C: Age (mean): 39 vs. 42 vs. 41 Male: 63% vs. 72% vs. 67% Duration of pain: 128 vs. 130 vs. 127 days</td>
<td>A vs. B vs. C: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Two levels, depending upon the level of disc herniation Provider experience: Not reported</td>
<td>Fluoroscopic guidance</td>
<td>Transforaminal epidural injection with clonidine</td>
</tr>
</tbody>
</table>
Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tafazal, 2009; Ng, 2005</td>
<td>A vs. B:</td>
</tr>
<tr>
<td></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Leg pain, change from baseline (mean, 0-100 VAS): 26 vs. 19 at 6 weeks, 24 vs. 23 at 12 weeks (p=0.74)</td>
</tr>
<tr>
<td></td>
<td>Back pain, change from baseline (mean, 0-100 VAS): 9.8 vs. 6.4 at 6 weeks, 6.9 vs. 9.9 at 12 weeks (p=0.57)</td>
</tr>
<tr>
<td></td>
<td>Leg pain improved &gt;=20 points (0-100 VAS) (from Ng): at 12 weeks 42% (18/43) vs. 48% (20/43): RR, 0.90 (95% CI 0.56 to 1.50)</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td>ODI, change from baseline (mean, 0-100 VAS): 9.3 vs. 11 at 12 weeks (p=0.69)</td>
</tr>
<tr>
<td></td>
<td>Low Back Outcome Score, change from baseline (mean, 0-75): 8.8 vs. 8.5 at 6 weeks, 9.1 vs. 9.4 at 12 weeks (p=0.93)</td>
</tr>
<tr>
<td></td>
<td>ODI improved ≥ 10% (from Ng): at 12 weeks 35% (15/43) vs. 55% (24/43); RR 0.63 (95% CI 0.38 to 1.0)</td>
</tr>
<tr>
<td></td>
<td>Change in walking distance from baseline (yards) (from Ng): at 6 weeks 89 vs. 220 (0.12); 200 vs. 240 at 12 weeks (p=0.72)</td>
</tr>
<tr>
<td></td>
<td><strong>Global assessment</strong></td>
</tr>
<tr>
<td></td>
<td>Satisfaction excellent or good (from Ng): at 12 weeks 45% (18/40) vs. 49% (20/40) RR, 0.92 (95% CI 0.58 to 1.5)</td>
</tr>
<tr>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td>Subsequent peri-radicular injection: 13% (8/64) vs. 15% (10/65) at 1 year, RR 0.81 (95% CI 0.34 to 1.93)</td>
</tr>
<tr>
<td></td>
<td>Surgery a 12 weeks (from Ng): 2.5% (1/40) vs. 0% (0/41); RR, 3.07 (95% CI 0.13 to 73.28) (4 of 5 patients who withdrew at 6 weeks also had surgery, not reported by treatment arm)</td>
</tr>
<tr>
<td></td>
<td>Surgery at 1 year: 14% (9/64) vs. 22% (14/65)), RR 0.65 (95% CI 0.30 to 1.40)</td>
</tr>
<tr>
<td>Tauheed, 2014</td>
<td>A vs. B vs. C:</td>
</tr>
<tr>
<td></td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td>Global pain score (VAS, 0-100): At baseline 7.83 vs. 7.60 vs. 7.72, at 1 week 5.41 vs. 4.62 vs. 4.41, at 2 weeks 3.97 vs. 3.61 vs. 2.02, at 4 weeks 4.37, 3.91 vs. 2.23, at 6 weeks 4.46 vs. 4.11 vs. 2.41, and 12 weeks 4.66 vs. 4.24 vs. 2.65 (p &gt;0.05 at all followup)</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tafazal, 2009; Ng, 2005</td>
<td>12 weeks (pain and function); 1 year (need for surgery or additional interventions)</td>
<td>A vs. B: 14% (21/150)</td>
<td>Appears complete</td>
<td>2 deaths; not stratified by treatment group</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Tauheed, 2014</td>
<td>12 weeks</td>
<td>A vs. B vs. C: 0 vs. 1 vs. 0</td>
<td>Appears complete</td>
<td>No serious adverse events or complication rates reported in any group</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Thomas, 2003       | RCT         | France Single center Rheumatology clinic | >18 years of age; radicular pain <3 months; disc herniation of L4-L5 or L5-S1 confirmed by CT or MRI; radicular pain intensity >30 on 0 to 100 VAS | Epidural corticosteroid injection within 1 month; history of spinal surgery; motor or sphincter dysfunction requiring emergency surgery; iodine allergy; anticoagulant intake; depression; employment disruption >6 months; occupational injury | Approached: Not reported Eligible: Not reported Randomized: 31 (15 vs. 16) Analyzed: 22 (10 vs. 12) at 6 months | A: Transforaminal injection with 5 mg dexamethasone acetate (2 ml), with fluoroscopic guidance (n=15)  
B: Interlaminar epidural injection with 5 mg dexamethasone acetate (2 ml), with fluoroscopic guidance (n=16) |
| Valat, 2003        | RCT         | France Single center Rheumatology clinic | First or recurrent episode of sciatica (pain in one leg, radiation below knee, at least one nerve root compression, sign); duration 15 to 180 days; pain >30 on 0-100 mm VAS | Requiring surgery; structural spinal deformities; symptoms from causes other than herniated disc; spinal injection in past month; prior low back surgery; chemonucleolysis; or nucleotomy; pregnant; allergy to corticosteroid; treated with tricyclic antidepressant or lithium; out of work >1 year; worker’s compensation | Approached: Not reported Eligible: Not reported Randomized: 85 (43 vs. 42) Analyzed: 63 (33 vs. 30) at 35 days | A: Interlaminar epidural injection with 50 mg prednisolone acetate (2 ml) (n=43)  
B: Interlaminar epidural injection with saline (2 ml) (n=42) |
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas, 2003 A vs. B:</td>
<td>Age (mean): 50 vs. 51 years Male: 53% vs. 31%</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Rest and physical therapy (not otherwise specified) Lateral (vs. posterior) herniation: 33% vs. 25% Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level (L4-5) Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification of nerve root (transforaminal) or epidural space (interlaminar)</td>
<td>Head-to-head comparison of different approaches for epidural injections</td>
</tr>
<tr>
<td>Valat, 2003 A vs. B:</td>
<td>Age (mean): 44 vs. 38 years Male: 60% vs. 62%</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 3 injections at 2 day intervals Number of levels: Single level Provider experience: Not reported</td>
<td>None reported</td>
<td>Interlaminar epidural injection with saline</td>
</tr>
</tbody>
</table>
# Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

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<tr>
<td><strong>Thomas, 2003</strong></td>
<td>A vs. B:</td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leg pain (0-100 VAS): 74 vs. 72 at baseline; at 1 month 17 vs. 31 (p=0.04); at 6 months 22 vs. 44 (p=0.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RDQ (0-24): 12 vs. 14 at baseline; at 1 month, 7.9 vs. 9.6 (p&gt;0.05); at 6 months, 5.3 vs. 10 (p=0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Daily Activities: 84 vs. 84 at baseline; at 1 month 52 vs. 59 (p&gt;0.05); at 6 months, 46 vs. 69 (p=0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Work and Leisure Activities: at baseline 99 vs. 96, (p&gt;0.05); at 6 months, 37 vs. 60 (p=0.02)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Anxiety-Depression: at baseline 50 vs. 64; at 1 month 36 vs. 40, (p&gt;0.05); at 6 months 34 vs. 55, (p=0.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Sociability: at baseline 47 vs. 54; at 1 month 33 vs. 32, (p&gt;0.05); at 6 months 30 vs. 44, (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery at 6 months:33% (5/15) vs. 25% (4/16), RR, 1.33 (95% CI 0.44 to 4.05)</td>
</tr>
<tr>
<td><strong>Valat, 2003</strong></td>
<td>A vs. B:</td>
<td><strong>Pain</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain (0-100 VAS): 58 vs. 58 at baseline; 28 vs. 40 at day 20, difference -11 (95% CI -23 to 1.3); 22 vs. 25 at day 35, difference -5.1 (95% CI -19 to 8.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Success</strong> (recovery or marked improvement on four category scale and not requiring NSAID): 51% (22/43) vs. 36% (15/42), RR 1.43 (95% CI (p=0.15) at day 20; 49% (21/43) vs. 48% (20/42) at day 35, RR 1.03 (95% CI 0.66 to 1.59)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RDQ (0-24): 15.1 vs. 14.2 at baseline; 10.9 vs. 11.7 at day 20, difference -1.8 (95% CI -4.6 to 1.0); 8.5 vs. 9.1 at day 35, difference -2.1 (95% CI -5.0 to 0.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Daily Activities: 66 vs. 69 at baseline; 41 vs. 49 at day 20, difference -3 (95% CI -18 to 5.7), 31 vs. 40 at day 35, difference -5.7 (95% CI -18 to 7.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Work and Leisure Activities: at baseline 73 vs. 78; 50 vs. 62 at day 20, difference -7.2 (95% CI -21 to 6.2); 41 vs. 47 at day 35, difference -7.3 (95% CI -22 to 7.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Anxiety-Depression: 29 vs. 34 at baseline; 21 vs. 30 at day 20, difference -3.2 (95% CI -16 to 9.8); 16 vs. 26 at day 35, difference -5.3 (95% CI -19 to 8.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dallas Sociability: 29 vs. 25 at baseline; 18 vs. 20 at day 20, difference -10 (95% CI -20 to -0.9); 14 vs. 20 at day 35, difference -12 (95% CI -22 to -2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Other outcomes</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery: 2.3% (1/43) vs. 4.7% (2/42), RR 0.49 (95% CI 0.05 to 5.19)</td>
</tr>
</tbody>
</table>
## Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
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<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas, 2003</td>
<td>6 months</td>
<td>A vs. B: None; 9 patients who underwent surgery excluded from 6 month analysis</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>Valat, 2003</td>
<td>35 days</td>
<td>A vs. B: 23% (10/43) vs. 29% (12/42) at 35 days</td>
<td>Appears complete</td>
<td>A vs. B: Headache: 9.3% (2/43) vs. 5% (2/40)</td>
<td>Ministry of Health</td>
<td>Fair</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
<td>Inclusion Criteria</td>
<td>Exclusion Criteria</td>
<td>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</td>
<td>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</td>
</tr>
<tr>
<td>--------------------</td>
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<td>---------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Wilson-MacDonald, 2005 | RCT          | UK Single center Surgery clinic | Lumbosacral nerve root pain >6 weeks of sufficient intensity to warrant surgery; MRI showing disc prolapse and/or spinal stenosis | Not a surgical candidate; cauda equina syndrome; deteriorating neurological function | Approached: Not reported Eligible: Not reported Randomized: 93 (44 vs. 48) Analyzed: 72 (36 vs. 36) at 3 months | A: Interlaminar epidural steroid injection with 80 mg methylprednisolone (2 ml) plus 40 mg 0.5% bupivacaine (8 ml) (n=44)  
B: Intramuscular/interspinous ligament injection with 80 mg methylprednisolone (2 ml) plus 40 mg 0.5% bupivacaine (8 ml) (n=48) |
| el Zahaar, 1991 | RCT          | Egypt Single center Surgery clinic | Acute unilateral sciatica with neurological findings or neurogenic claudication without specific neurologic deficits; failure to improve with at least 2 weeks of conservative therapy; findings on MRI or CT consistent with clinical presentation | Surgery for similar symptoms or within 6 months | Approached: Not reported Eligible: Not reported Randomized: 63 (37 vs. 26) Analyzed: Unclear | A: Caudal epidural injection with hydrocortisone (5 ml), 4% Carbocaine (4 ml), and saline (21 ml) (n=37)  
B: Caudal epidural injection with 4% Carbocaine (4 ml) plus saline (26 cc) (n=26) |
<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Number of Levels</th>
<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilson-MacDonald, 2005</td>
<td>A vs. B: Age (mean): 49 vs. 49 years Male: 40% (entire cohort) Herniated disc: 52% vs. 40% Spinal stenosis: 41% vs. 29% Both: 7% vs. 31% Duration of symptoms: Not reported (&gt;6 weeks for all) Baseline pain: Not reported Baseline ODI (0-100): 44 vs. 40</td>
<td>A vs. B: Treatment prior to intervention: 16% (7/44) vs. 19% (9/48) previous epidural injection, chemonucleolysis, or surgery Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 16% (7/44) vs. 19% (9/48) received a second epidural following the 6 week visit Number of levels: Appears to be single Provider experience: Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Nonepidural injection with corticosteroid plus local anesthetic</td>
<td></td>
</tr>
<tr>
<td>el Zahaar, 1991</td>
<td>A vs. B: Age (mean): 46 vs. 49 years Male: 54% vs. 65% Duration of symptoms (months): 17 vs. 14 Herniated disc: 51% vs. 54% Spinal stenosis: 49% vs. 46% Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B: Treatment prior to intervention: Not specified Treatment following intervention: Advised to take aspirin; no physical therapy or exercise program Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Caudal epidural injection with local anesthetic</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix E1. Epidural Steroid Injections for Radiculopathy and Herniated Disc

<table>
<thead>
<tr>
<th>Author, Year</th>
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</tr>
</thead>
</table>
| Wilson-MacDonald, 2005 | A vs. B:  
Pain  
Pain relief: Favored intervention A (p<0.004), data not provided  
Other outcomes  
Underwent surgery: 41% (18/44) vs. 31% (15/48) at >=2 years, RR: 1.31 (95% CI 0.76 to 2.27) |
| el Zahaar, 1991 | A vs. B:  
Other outcomes  
Treatment success (>75% improvement in pre-injection symptoms and no spinal surgery): 49% (18/37) vs. 50% (13/26) at 13-36 months, RR 0.97 (95% CI 0.59 to 1.62); 58% (11/19) vs. 64% (9/14) in patients with herniated disc, RR 0.90 (95% CI 0.52 to 1.56)  
Subsequent surgery: 13/37 (35%) vs. 10/26 (38%) at 13-36 months, RR 0.91 (95% CI 0.47 to 1.76); 26% (5/19) vs. 21% (3/14) in patients with herniated disc, RR 1.23 (95% CI 0.35 to 4.30) |
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<th>Author, Year Title</th>
<th>Duration of Followup</th>
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<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilson-MacDonald, 2005</td>
<td>At least 2 years</td>
<td>Unclear</td>
<td>19% (9/19) in nonepidural injection group received epidural corticosteroid injection due to continued symptoms</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
<tr>
<td>el Zahaar, 1991</td>
<td>Mean 20 to 21 months</td>
<td>Unclear</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
</tbody>
</table>

ACS=acute coronary syndrome; BMI=body mass index; cc=cubic centimeters; CI=confidence interval; CT=computed tomography; DLG=poly(DL-lactide-co-glycolide); DLR=digital luminescence radiography; EMG=electromyography; ER=emergency room; ESI=epidural steroid injection; F=female; FABQ=Fear-Avoidance Beliefs Questionnaire; FL=fetal length; gD=growth and development; h=hours; HAD=healthcare alternatives development; IL=interlaminar; L=angular momentum; m=months; MED=minimal effective dose; MIL=midline interlaminar; MRI=magnetic resonance imaging; NIAMS=National Institute of Arthritis and Musculoskeletal and Skin Diseases; NIH=National Institutes of Health; NR=no results; OR=not reported; NRS=numeric rating scale; NS=not significant; NSAID=nonsteroidal antiinflammatory drug; ODI=Oswestry Disability Index; PIL=pre illness level; PLC=pityriasis lichenoides chronica; PT=physical therapy; RCT=randomized controlled trial; RDQ=Roland Disability Questionnaire; RR=relative risk; S=Diabetes; SF-36=Short Form (36) Health Survey; SLR=straight leg raise; SR=systematic review; TENS=Toxic Epidermal Necrosis Syndrome; TFESI=transformational epidural steroid injection; tid=three times daily; VA=Veteran's Affairs; VAS=visual analogue scale; w=week; y=year.

Please see Appendix C. Included Studies for full study references.
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, 2012</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>Degenerative lumbar spinal stenosis with painful lower limb neurogenic claudication and hypertrophic ligamentum flavum; with MRI or CT correlation; &gt;18 years of age; failed conservative therapy; ODI &gt;20; able to walk &gt;10 feet unaided; duration not specified</td>
<td>Prior surgery at the intended treatment level, previous epidural steroids, recent spinal fractures, disabling back or leg pain from causes other than lumbar spinal stenosis, fixed spondylolisthesis &gt; grade 1, disk protrusion or osteophyte formation, excessive facet hypertrophy, bleeding disorders, current use of anticoagulants, ASA or NSAID within 5 days, pregnant or breastfeeding, unable to lie prone, on Workman’s Compensation or considering litigation</td>
</tr>
<tr>
<td>Cuckler, 1985</td>
<td>RCT</td>
<td>USA &gt;1 center Type of clinics not reported</td>
<td>Acute unilateral sciatica; well defined, discrete neurological findings or neurogenic claudication; failure to improved with at least two weeks of noninvasive therapy; duration of symptoms not specified; imaging findings not required</td>
<td>Lumbar surgery for similar symptoms or any lumbar surgery within 6 months</td>
</tr>
</tbody>
</table>
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Subject Characteristics</th>
</tr>
</thead>
</table>
| Brown, 2012  | Approached: 50 eligibility: 46 randomized: 38 (17 vs. 21) analyzed: 38 at 6 weeks            | A: Interlaminar epidural steroid injection with 80 mg triamcinolone acetate (40 mg in diabetic patients) plus NS (6 ml), with fluoroscopic guidance (n=17)  
B: Minimally invasive lumbar decompression (mild) procedure using device to access the interlaminar space and remove portions of the lamina and ligamentum flavum, with fluoroscopic guidance (n=21) | Age (mean): 74 vs. 79 years  
Male: 62% vs. 47%  
Duration of medical management >6 months: 76% vs. 62%  
Baseline pain: Not reported  
Baseline function: Not reported |
| Cuckler, 1985| Approached: Not reported eligible: Not reported randomized: 37 (23 vs. 14) analyzed: 37 at 20-22 months | A: Interlaminar epidural injection with 80 mg methylprednisolone (2 ml) and 1% procaine (5 ml) (n=23)  
B: Interlaminar epidural injection with saline (2 ml) and 1% procaine (5 ml) (n=14) | Age (years): 49 vs. 50  
Male: 48% vs. 55%  
Duration of symptoms (months): 17.3 vs. 13.8  
Baseline pain: Not reported  
Baseline function: Not reported |
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, 2012</td>
<td></td>
<td>Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of treatments: One treatment up to 6 weeks, then patient unblinded and given option of additional treatments, including nonallocated treatment Number of levels: 7/17 epidural steroid vs. 7/21 had one level treated Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Noninjection intervention</td>
</tr>
<tr>
<td>Cuckler, 1985</td>
<td></td>
<td>Treatments prior to intervention: Not specified Treatments following intervention: Not specified Previous surgery: 2% (1/42) vs 7% (2/31), RR 0.38 (95% CI 0.04 to 4.05) Herniated disc: 52% vs 45% Spinal stenosis: 48% vs. 55&quot;</td>
<td>Number of injections: 43% (18/42) vs. 58% (18/31), RR 0.82 (95% CI 0.48 to 1.39) received second injection with corticosteroid and local anesthetic after 24 h due to no relief after initial injection Number of levels: Single level Provider experience: Not reported</td>
<td>Interlaminar epidural injection with corticosteroid and local anesthetic</td>
<td>Interlaminar or transforaminal epidural injection with local anesthetic</td>
</tr>
</tbody>
</table>
# Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year Title</th>
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<tbody>
<tr>
<td>Brown, 2012</td>
<td>A vs. B</td>
</tr>
<tr>
<td></td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td>&gt;=2 point improvement in VAS pain (0-10): 35% (6/17) vs. 76% (16/21) at 2 weeks, RR 0.46 (95% CI 0.23 to 0.92)</td>
</tr>
<tr>
<td></td>
<td>Pain (mean, 0-10 VAS): 6.4 vs. 6.4 at baseline, 6.3 vs. 3.8 at 6 weeks</td>
</tr>
<tr>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>Oswestry Disability Index: 40 vs. 39 at baseline, 35 vs. 27 at 6 weeks</td>
</tr>
<tr>
<td></td>
<td>Other Outcomes</td>
</tr>
<tr>
<td></td>
<td>Zurich Claudication Questionnaire patient satisfaction (mean, 1-6): 2.8 vs. 2.2 at 6 weeks, patient satisfaction &lt;=2.5: 41% (7/17) vs. 59% (12/21) at 6 weeks, RR 0.72 (95% CI 0.36 to 1.74)</td>
</tr>
<tr>
<td>Cuckler, 1985</td>
<td>A vs B (spinal stenosis subgroup)</td>
</tr>
<tr>
<td></td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td>Pain improved &gt;=75%: 22% (5/23) vs. 14% (2/14) at mean 20 months, RR 1.52 (95% CI 0.34 to 6.81)</td>
</tr>
<tr>
<td></td>
<td>Other Outcomes</td>
</tr>
<tr>
<td></td>
<td>Surgery: 26% (6/23) vs. 29% (4/14) at mean 20 months, RR 0.91 (95% CI 0.31 to 2.68)</td>
</tr>
</tbody>
</table>
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Brown, 2012        | 6 weeks              | None reported    | No crossover prior to 6 weeks | Mortality: None  
*No major procedure-related or device-related complications reported in either treatment group* | Vertos Medical | Fair |          |
| Cuckler, 1985      | 13 to 30 months (mean 20.2 vs. 21.5 months) | None reported | Appears complete | Not reported | Not reported | Fair |          |
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<tr>
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<tbody>
<tr>
<td>Friedly, 2014</td>
<td>RCT</td>
<td>USA Multicenter</td>
<td>≥50 years of age; central lumbar spinal stenosis on MRI or CT; average pain rating &gt; 4 on 0 to 10 scale; pain in lower back, buttock, or on standing, walking, or spinal extension in the past week; worse pain in the buttock, leg or both than in the back; score ≥ 7 on RDQ; duration not specified</td>
<td>Spondylolysis requiring surgery, history of lumbar surgery or epidural injections within past 6 months</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</td>
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<td>-------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Friedly, 2014</td>
<td>Approached: 2224&lt;br&gt;Eligible: 422&lt;br&gt;Randomized: 400 (200 vs. 200)&lt;br&gt;Analized: 386 (193 vs. 193) at 6 weeks</td>
<td>A: Interlaminar (n=143) or transforaminal (n=57) injection with 1 to 3 ml triamcinolone (60 to 120 mg), betamethasone (6 to 12 mg), dexamethasone (8 to 10 mg), or methylprednisolone (60 to 120 mg) plus 0.25% to 1% lidocaine (3 ml), with fluoroscopic guidance (n=200)&lt;br&gt;B: Interlaminar (n=139) or transforaminal (n=61) injection with 0.25% to 1% lidocaine, with fluoroscopic guidance (2 to 6 ml) (n=200)</td>
<td>Age (mean): 68 vs. 68 years&lt;br&gt;Male: 42% vs. 48%&lt;br&gt;Nonwhite: 32% vs. 30%&lt;br&gt;Duration of symptoms: &lt;3 months 12% to 20%; 3 to &lt;12 months 25% to 28%; 1 to 5 years 29.5 to 31.2%; &gt;5 years 21.1 to 33.5%&lt;br&gt;Baseline leg pain (0-10 NS): 7.2 vs. 7.2&lt;br&gt;Baseline RDQ (0-24): 16 vs. 16</td>
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<tr>
<td>Friedly, 2014</td>
<td>Treatments prior to intervention: Not specified&lt;br&gt;Treatments following intervention: Not specified&lt;br&gt;Employed full-time or part-time: 28% vs. 36%&lt;br&gt;Smoker: 12% vs. 16%&lt;br&gt;Diabetes on insulin: 8.0% vs. 7.5%&lt;br&gt;Expectation of pain relief (0-10): 7.7 vs. 7.8</td>
<td>Number of injections: Up to two injections in 1st six weeks&lt;br&gt;Number of levels: Multilevel and bilateral injections allowed (numbers not reported)&lt;br&gt;Provider experience: Board-certified anesthesiologists, physiatrist, and radiologists with expertise in epidural injections, trained to administer injections in standardized manner</td>
<td>Fluoroscopy</td>
<td>Interlaminar or transforaminal epidural injection with local anesthetic</td>
</tr>
</tbody>
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<td>A vs. B</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
</tr>
<tr>
<td>Leg pain improved &gt;=30%: 49.2% (96/193) vs. 49.7% at 6 weeks (96/193), RR 1.0 (95% CI 0.82 to 1.22)</td>
<td></td>
</tr>
<tr>
<td>Leg pain improved &gt;=50%: 38.3% (74/193) vs. 38.3% (74/193) at 6 weeks, RR 1.0 (95% CI 0.78 to 1.29)</td>
<td></td>
</tr>
<tr>
<td>Leg pain (0-10): 7.2 vs. 7.2 at baseline; 4.4 vs. 5.0 at 3 weeks, difference -0.6 (95% CI -1.2 to -0.10); 4.4 vs. 4.6 at 6 weeks, 95% CI -0.2 (95% CI -0.8 to 0.4)</td>
<td></td>
</tr>
<tr>
<td>BPI, SSSQ symptoms and physical function, EQ-5D, GAD-7: No differences</td>
<td></td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td></td>
</tr>
<tr>
<td>RDQ (0-24): 16 vs. 16 at baseline; 12 vs. 13 at 3 weeks, difference -1.8 (95% CI -2.8 to -0.9); 12 vs. 12 at 6 weeks, difference -1.0 (95% CI -2.1 to 0.1)</td>
<td></td>
</tr>
<tr>
<td>RDQ improved &gt;=30%: 37.3% (72/193) vs. 31.6% (61/193) at 6 weeks, RR 1.18 (95% CI 0.90 to 1.56)</td>
<td></td>
</tr>
<tr>
<td>RDQ improved &gt;=50%: 23.8% (46/193) vs. 20.2% (39/193) at 6 weeks RR 1.14 (95% CI 0.78 to 1.69)</td>
<td></td>
</tr>
<tr>
<td><strong>Other Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>PHQ-8: More improvement in group A (p=0.007)</td>
<td></td>
</tr>
<tr>
<td>SSQ satisfaction &quot;very&quot; or &quot;somewhat&quot; satisfied: 67% (129/193) vs. 54% (104/191), RR 1.23 (95% CI 1.04 to 1.45)</td>
<td></td>
</tr>
</tbody>
</table>

| Interlaminar Pain |         |
| Leg pain (0-10): 7.3 vs. 7.4 at baseline; 4.1 vs. 5.0 at 3 weeks, difference -0.9 (95% CI -1.5 to -0.3); 4.2 vs. 4.5 at 6 weeks, difference -0.3 (95% CI -1.0 to 0.4) |

| Function |
| RDQ (0-24): 17 vs. 16 at baseline; 11 vs. 13 at 3 weeks, difference -2.5 (95% CI -3.7 to -1.3); 12 vs. 13 at 6 weeks, difference -1.4 (95% CI -2.8 to -0.1) |

| Transforaminal Pain |         |
| Leg pain (0-10): 7.0 vs. 7.0 at baseline; 5.0 vs. 5.1 at 3 weeks, difference 0.0 (95% CI -0.9 to 0.9 ); 4.9 vs. 4.9 at 6 weeks, difference 0.1 (95% CI -0.9 to 1.0) |
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<tr>
<th>Author, Year</th>
<th>Duration of Followup</th>
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<th>Compliance to Treatment</th>
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<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Friedly, 2014 | 6 weeks              | 3.5% (7/200) vs. 3% (7/200) at 6 weeks | Appears complete | A vs. B  
At least 1 adverse event: 22% (43/200 vs. 16% (31/200), RR 1.39 (95% CI 0.91 to 2.11)  
Adverse event rate, interlaminar approach: 0.22 (32/143) vs. 0.10 (14/139), RR 2.22 (95% CI 1.24 to 3.98)  
Adverse event rate, transforaminal approach: 0.46 (26/57) vs. 0.33 (20/61), RR 1.39 (95% CI 0.88 to 2.20)  
Excessive pain: 2.5% (5/200) vs. 3.5% (7/200), RR 0.71 (95% CI 0.23 to 2.21)  
Headache: 4% (8/200) vs. 1.5% (3/200), RR 2.67 (95% CI 0.72 to 9.91)  
Fever and/or infection: 5% (10/200) vs. 1.0% (2/200), RR 5.0 (95% CI 1.11 to 22.53)  
Dizziness/lightheadedness: 2% (4/200) vs. 2% (4/200), RR 1.0 (95% CI 0.25 to 3.94)  
Dural puncture: 0.5% (1/200) vs. 0.5% (1/200), RR 10. (95% CI 0.6 to 15.88)  
Serious adverse event: 2.5% (5/200) vs. 2.0% (4/200), RR 1.25 (95% CI 0.34 to 4.59) | Agency for Healthcare Research and Quality | Good |
### Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<tr>
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<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fukusaki, 1998</td>
<td>RCT</td>
<td>Japan Single center Pain clinic</td>
<td>Pseudoclaudication and diagnosed by an orthopedist as having lumbar degenerative spinal canal stenosis with imaging correlation; duration not specified</td>
<td>Not reported</td>
</tr>
<tr>
<td>Huda, 2010</td>
<td>RCT</td>
<td>India Single center Orthopedics clinic</td>
<td>Clinical signs and symptoms of lumbar canal stenosis, refractory pain after full dose NSAIDs or physical therapy for &gt;2 weeks; imaging findings not specified</td>
<td>Prior back surgery, back or leg pain due to other causes, pregnant, breast feeding, serious medical comorbidities</td>
</tr>
</tbody>
</table>
# Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Subject Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fukusaki, 1998</td>
<td>Approached: Not reported</td>
<td>A: Interlaminar epidural injection with 40 mg methylprednisolone and 1% mepivacaine (8 ml)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eligible: Not reported</td>
<td>B: Interlaminar epidural injection with 1% mepivacaine (8 ml)</td>
<td>Mean age (years): 72 vs. 69 vs. 70</td>
</tr>
<tr>
<td></td>
<td>Randomized: 53 (19 vs. 18 vs. 16)</td>
<td>C: Interlaminar epidural injection with normal saline (8 ml)</td>
<td>Male: 68% vs. 72% vs. 75%</td>
</tr>
<tr>
<td></td>
<td>Analyzed: 53 at 3 months</td>
<td></td>
<td>Duration of symptoms: Not reported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline pain: Not reported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline function: Not reported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Walking distance (m): 9 vs. 11 vs. 10</td>
</tr>
<tr>
<td>Huda, 2010</td>
<td>Approached: Not reported</td>
<td>A: Caudal epidural injection with 80 mg methylprednisolone (2 ml) plus 0.125% bupivacaine (5 ml) and normal saline (13 ml) (n=35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eligible: Not reported</td>
<td>B: Caudal epidural injection with 80 mg triamcinolone acetate (80 mg) plus 0.125% bupivacaine (5 ml) and normal saline (13 ml) (n=35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Randomized: 70 (35 vs. 35)</td>
<td></td>
<td>Age (mean): 45 vs. 42 years</td>
</tr>
<tr>
<td></td>
<td>Analyzed: 70</td>
<td></td>
<td>Male: 54% vs. 66%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Duration of symptoms (months): 18 vs. 17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline pain (0-10 VAS): 6.4 vs. 6.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline function: Not reported</td>
</tr>
</tbody>
</table>

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### Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<tr>
<th>Author, Year Title</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
</table>
| Fukusaki, 1998    | Treatments prior to intervention: Not specified  
Treatments following intervention: Not specified  
Other patient characteristics: Not reported | Number and frequency of injections: 2 injections in first week  
Number of levels: Not specified (L3/4 or L4/5 interspace)  
Provider experience: "Experienced anesthesiologist" | No use of imaging guidance reported | Epidural local anesthetic  
Epidural saline |
| Huda, 2010        | Treatments prior to intervention: Not specified  
Treatments following intervention: Not specified  
Baseline claudication distance (m) 170 vs. 163 | Number and frequency of injections: 2 injections with 2nd injection after 2 weeks  
Number of levels: Caudal  
Provider experience: Not reported | Not reported | Head-to-head comparison of different corticosteroids |
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year Title</th>
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</tr>
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</table>
| **Fukusaki, 1998** | A vs. B vs. C  
Function  
Walking distance: 87 vs. 92 vs. 23 at 1 week, 26 vs. 28 vs. 18 at 1 month, 10 vs. 13 vs. 11 at 3 months (p<0.05 for A and B vs. C at week 1 only)  
Good or excellent results (walk >20 meters): 63% (12/19) vs. 56% (10/18) vs. 12% (2/16) at 1 week: A vs. B, RR 1.14 (95% CI 0.66 to 1.94); A vs C, RR 5.05 (95% CI 1.32 to 19.31); B vs. C, RR 4.44 (95% CI 1.14 to 17.33); 16% (3/19) vs. 17% (3/18) vs. 6.3% (1/16) at 1 month:  
A vs. B, RR 0.94 (95% CI 0.22 to 4.10); A vs. C, RR 2.53 (95% CI 0.29 to 21.98); B vs. C RR 2.67 (95% CI 0.30 to 23.14); 5.6% (1/19) vs. 6.3% (1/16) at 3 months: A vs. B, RR 0.95 (95% CI 0.06 to 14.03); A vs. C RR 0.84 (95% CI 0.06 to 12.41); B vs. C, RR 0.89 (95% CI 0.06 to 13.07) |
| **Huda, 2010** | A vs. B  
Pain  
Pain (0-10 VAS): 6.3 vs. 6.4 at baseline; 5.6 vs. 5.4 at 1 month; 4.9 vs. 4.7 at 3 months; 3.6 vs. 4.8 at 6 months (p values not reported and SD's not provided)  
Pain score improved >2 points on 0-10 VAS: 94% (33/35) vs. 86% (30/35) at 1 month, RR 1.10 (95% CI 0.94 to 1.30); 30/35 (86%) vs. 26/35 (74%) at 3 months, RR 1.15 (95% CI 0.91 to 1.46); 28/35 (80%) vs. 21/35 (60%) at 6 months, RR 1.33 (95% CI 0.97 to 1.83)  
Function  
Claudication distance (m): 163 vs. 170 at baseline; 467 vs. 280 at 1 month; 587 vs. 312 at 3 months; 637 vs. 350 at 6 months (p-values not reported) |
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</tr>
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<tbody>
<tr>
<td>Fukusaki, 1998</td>
<td>3 months</td>
<td>Unclear</td>
<td>Appears complete</td>
<td>&quot;No incidence of dural puncture, hypotension, or subarachnoid injection in any group.&quot;</td>
<td>Not reported</td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td>Huda, 2010</td>
<td>6 months</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>&quot;No serious complications like epidural abscess, infection, or hematoma…during the study period of 12 months&quot;</td>
<td>Not reported</td>
<td>Fair</td>
<td></td>
</tr>
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<tr>
<td>Koc, 2009</td>
<td>RCT</td>
<td>Turkey Single center Clinic setting unclear</td>
<td>Lumbar spinal stenosis based on medical history; physical and neurologic exam and MRI; duration not specified</td>
<td>Coronary artery or peripheral artery disease; spinal surgery; recent vertebral fracture; progression neurologic deficit; cauda equina syndrome</td>
</tr>
<tr>
<td>Manchikanti, 2009</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>≥ 50 yrs of age; evidence of lumbar spinal stenosis with radicular pain; chronic (≥ 6 months) function-limiting low back and lower extremity pain; failed fluoroscopically directed epidural injections; failed to improve substantially with conservative management; imaging findings not specified</td>
<td>Previous lumbar surgery; central spinal stenosis without radicular pain; uncontrollable or unstable opioid use; uncontrolled psychiatric disorder or acute/chronic medical illness; pregnant or lactating; history or potential for adverse reaction to study medications</td>
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<tr>
<td>Koc, 2009</td>
<td>Approached: Unclear\nEligible: Unclear\nRandomized: 33 (10 vs. 13 vs. 10)\nAnalyzed: 29 (10 vs. 10 vs. 9) at 6 months</td>
<td>A: Interlaminar epidural injection with 60 mg triamcinolone acetonide (1.5 ml), 15 mg 0.5% bupivacaine (3 ml), and 0.9% NS (5.5 ml), with fluoroscopic guidance\nB: Physical therapy 5 days/week for 2 weeks, including ultrasound for 10 minutes, hot pack for 20 minutes, and TENS for 20 minutes\nC: No injection or physical therapy</td>
<td>Age (mean): 61 vs. 63 vs. 53 years\nMale: 80% vs. 50% vs. 89%\nDuration of pain (years): 5.0 vs. 5.7 vs. 5.7\nBaseline pain (0-100 VAS): 56 vs. 54 vs. 59\nBaseline Roland Morris Disability Index (estimated from graph): 18 vs. 19 vs. 15</td>
</tr>
<tr>
<td>Manchikanti, 2009</td>
<td>Approached: 116\nEligible: 106\nRandomized: 82 (not reported by group)\nAnalyzed: 50 (25 vs. 25) at 12 months, including 8 patients (8 vs. 0) missing data (preliminary analysis)</td>
<td>A: Caudal epidural injection with 6 mg betamethasone, normal saline (6 mL), and 2% lidocaine (5 ml), with fluoroscopic guidance\nB: Epidural adhesiolysis with fluoroscopic guidance, followed by injection of 6 mg betamethasone, 10% sodium chloride (6 ml), and 2% lidocaine (5 ml), with fluoroscopic and lumbar epidurogram guidance</td>
<td>Age (mean): 62 vs. 61 years\nMale: 44% vs. 40%\nDuration of pain (months): 114 vs. 164\nBaseline pain (0-10 NRS): 8.0 vs. 7.8\nFunctional status: Not reported</td>
</tr>
</tbody>
</table>
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Number of Levels</th>
<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koc, 2009</td>
<td></td>
<td>Treatments prior to intervention: Training to perform home-based therapeutic exercise program and oral diclofenac sodium 75 mg bid x 2 weeks Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level Provider experience: Not reported</td>
<td></td>
<td></td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Physical therapy without injection No injection or physical therapy</td>
</tr>
<tr>
<td>Manchikanti, 2009</td>
<td></td>
<td>Treatments prior to intervention: Epidural injection with fluoroscopic guidance Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: 1.8 vs. 3.5 per year, frequency not reported Number of levels: Caudal approach Provider experience: Not reported</td>
<td></td>
<td></td>
<td>Fluoroscopy with lumbar epidurogram</td>
<td>Epidural adhesiolysis with corticosteroid and local anesthetic</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Title</td>
<td>Results</td>
<td></td>
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<tr>
<td>Koc, 2009</td>
<td>A vs. B vs. C</td>
<td><strong>Pain</strong>&lt;br&gt;Pain intensity (mean VAS, 0 to 100; estimated from graph): 53 vs. 55 vs. 58 at baseline; 20 vs. 31 vs. 47 at 2 weeks; 21 vs. 32 vs. 56 at 1 month; 23 vs. 24 vs. 38 at 3 months; 26 vs. 22 vs. 33 at 6 months</td>
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<td><strong>Function</strong>&lt;br&gt;Roland Morris Disability Index (mean, 0-24; estimated from graph): 18 vs. 19 vs. 15 at baseline; 8 vs. 12 vs. 12 at 2 weeks; 13 vs. 14 vs. 11 at 1 month; 11 vs. 11 vs. 10 at 3 months; 13 vs. 12 vs. 9 at 6 months&lt;br&gt;Nottingham Health Profile (NHP), pain (median, 0-100): 56 vs. 54 vs. 59 at baseline; 7.3 vs. 19 vs. 33 at 2 weeks; 36 vs. 31 vs. 20 at 1 month, 20 vs. 18 vs. 28 at 3 months; 23 vs. 23 vs. 20 at 6 months&lt;br&gt;NHP, physical mobility (median, 0-100): 42 vs. 42 vs. 42 at baseline; 22 vs. 31 vs. 31 at 2 weeks; 32 vs. 37 vs. 20 at 1 month; 31 vs. 32 vs. 31 at 3 months; 31 vs. 37 vs. 20 at 6 months&lt;br&gt;NHP, energy (median, 0 to 100): 100 vs. 88 vs. 63 at baseline; 61 vs. 30 vs. 63 at 2 weeks; 100 vs. 24 vs. 61 at 1 month; 62 vs. 30 vs. 100 at 3 months; 82 vs. 49 vs. 63 at 6 months, (p&gt;0.05 at all time points)&lt;br&gt;NHP, sleep (median, 0 to 100): 58 vs. 56 vs. 56 at baseline; 26 vs. 32 vs. 12 at 2 weeks; 45 vs. 12 vs. 12 at 1 month; 14 vs. 12 vs. 29 at 3 months; 26 vs. 12 vs. 29 at 6 months, (p&gt;0.05 at all time points)&lt;br&gt;NHP, social isolation (median, 0 to 100): 42 vs. 29 vs. 0 at baseline; 22 vs. 18 vs. 0 at 2 weeks; 22 vs. 19 vs. 0 at 1 months; 32 vs. 11 vs. 0 at 3 months; 32 vs. 0 vs. 0 at 6 months, (p&gt;0.05 at all time points)</td>
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</tr>
<tr>
<td>Manchikanti, 2009</td>
<td>A vs. B</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (mean NRS, 0 to 10): 8.0 vs. 7.8 at baseline (p=0.47); 5.4 vs. 3.6 at 3 months, (p&lt;0.0005); 6.0 vs. 3.8 at 6 months, (p&lt;0.0005); 6.2 vs. 3.9 at 12 months&lt;br&gt;Pain relief &gt;=50% from baseline: 28% (7/25) vs. 80% (20/25) at 3 months, RR 0.35 (95% CI 0.18 to 0.67); 12% (3/25) vs. 80% (20/25) at 6 months, RR 0.15 (95% CI 0.50 to 0.44); 4% (1/25) vs. 76% (19/25) at 12 months RR 0.05 (95% CI 0.00 to 0.36)</td>
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<td><strong>Function</strong>&lt;br&gt;ODI (0 to 50): 30 vs. 31 at baseline (p=0.80), 23 vs. 16 at 3 months, (p&lt;0.0005), 25 vs. 16 at 6 months, (p&lt;0.0005), 25 vs. 16 at 12 months, (p&lt;0.0005)&lt;br&gt;ODI improved &gt;=40% from baseline: 24% (6/25) vs. 80% (20/25) at 3 months, RR 0.30 (95% CI 0.14 to 0.62); 8% (2/25) vs. 76% (19/25) at 6 months RR 0.11 (95% CI 0.03 to 0.41); 0% (0/25) vs. 80% (20/25) at 12 months RR 0.02 (95% CI 0.00 to 0.38)</td>
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## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koc, 2009</td>
<td>6 months</td>
<td>0% (0/10) vs. 23% (3/13) vs. 10% (1/10) at 6 months, RR 0.18 (95% CI 0.01 to 3.16)</td>
<td>Appears complete</td>
<td>2 withdrawals due to adverse events, group not described</td>
<td>None</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Manchikanti, 2009</td>
<td>12 months</td>
<td>32% (8/25) vs. 0% (0/25) at 12 months</td>
<td>Unclear; 18/25 patients in caudal epidural injection group unblinded early and received additional interventions</td>
<td>Subarachnoid placement of catheter: 0% (0/25) vs. 4% (1/25), RR 0.33 (5% CI 0.01 to 7.81)</td>
<td>None reported</td>
<td>Poor</td>
<td>All of the patients failed the control treatment prior to enrollment, preliminary analysis</td>
</tr>
</tbody>
</table>
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>&gt;30 years of age, chronic function-limiting low back pain and lower extremity pain of at least 6 on a scale of 0-10 for &gt;6 months; diagnosis of central spinal stenosis with radicular pain; failure to improve with conservative management; imaging findings not specified</td>
<td>Spinal stenosis without radicular pain; foraminal stenosis without central stenosis; uncontrolled psychiatric disorders; a history of lumbar surgery; uncontrollable or unstable opioid use; pregnant or lactating women; uncontrolled medical illness (either acute or chronic); patients with a history or potential for adverse reaction(s) to local anesthetics or steroids</td>
</tr>
<tr>
<td>Manchikanti 2012</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>Spinal stenosis with radicular pain, ≥30 years of age; history of function-limiting low back pain and lower extremity pain &gt;6 on a scale of 0-10 for &gt;6 months; failed to improve with conservative management; imaging findings not specified</td>
<td>History of lumbar surgery, spinal stenosis without radicular pain; uncontrollable or unstable opioid use; uncontrolled psychiatric disorders; uncontrolled medical illness, pregnant or lactating; patients with a history or potential for adverse reaction to study medications</td>
</tr>
<tr>
<td>Manchikanti 2012</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2008</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
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## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<tr>
<th>Author, Year Title</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Subject Characteristics</th>
</tr>
</thead>
</table>
| Manchikanti, 2012  | Approached: 164  
Eligible: 138  
Randomized: 120  
 Analyzed: 60 (30 vs. 30) at 12 months, including 6 (3 vs. 30) with missing data (preliminary analysis) | A: Interlaminar epidural injection with betamethasone (1 ml, dose not specified) plus 0.5% lidocaine (5 ml), with fluoroscopic guidance  
B: Interlaminar epidural injection with 0.5% lidocaine (6 ml), with fluoroscopic guidance | Age (mean): 50 vs. 54 years  
Male: 63% vs. 40%  
Duration of pain (months): 121 vs. 138  
Baseline pain (0 to 10 NRS): 8.1 vs. 8.1  
Baseline ODI (0 to 50): 29 vs. 31 |
| Manchikanti 2012  | Approached: 140  
Eligible: 112  
Randomized: 100 (50 vs. 50)  
 Analyzed: 100 (50 vs. 50) at 24 months, including 29 (14 vs.15) with missing data | A: Caudal epidural injection with betamethasone 6 mg (1 ml) plus lidocaine 0.5% (9 ml) with fluoroscopic guidance  
B: Caudal epidural injection with lidocaine 0.5% (10 ml) with fluoroscopic guidance | Age (mean): 56 vs. 57 years  
Male: 50% vs. 32%  
Race: Not reported  
Duration of pain (months): 105 vs. 94  
Baseline pain (NRS 0 to 10): 7.6 vs. 7.9  
Baseline ODI (0 to 50): 28 vs. 40 |
### Appendix E2. Epidural Steroid Injections for Spinal Stenosis

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<th>Author, Year Title</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>Treatments prior to intervention: Not specified Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Mean 3.5 vs. 3.6 per year, Frequency not specified Number of levels: Appears to be single Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Interlaminar epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Manchikanti 2012</td>
<td>Treatments prior to intervention: Not specified Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Mean 3.8 vs. 4.2 over 2 years, Frequency not specified Number of levels: Caudal Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
<td>Caudal epidural local anesthetic</td>
</tr>
</tbody>
</table>
## Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
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<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain (mean NRS, 0 to 10): 8.1 vs. 8.1 at baseline, (p=0.90); 4.1 vs. 3.7 at 3 months, (p=0.37); 4.2 vs. 3.8 at 6 months, (p=0.38); 4.2 vs. 4.0 at 12 months, (p=0.67)</td>
</tr>
<tr>
<td></td>
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<td>Pain relief &gt;=50% from baseline: 77% (23/30) vs. 77% (23/30) at 3 months, RR 1.0 (95% CI 0.76 to 1.32); 73% (22/30) vs. 73% (22/30) at 6 months, RR 1.0 (95% CI 0.74 to 1.36); 63% (19/30) vs. 70% (21/30) at 12 months, RR 0.90 (95% CI 0.63 to 1.30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ODI (0 to 50): 29 vs. 31 at baseline, (p=0.18); 16 vs.15 at 3 months, (p=0.73); 15 vs.16 at 6 months, (p=0.92); 16 vs.16 at 12 months, (p=0.84)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ODI improved &gt;=50% from baseline: 63% (19/30) vs. 80% (24/30) at 3 months, RR 0.79 (95% CI 0.57 to 1.10); 67% (20/30) vs. 67% (20/30) at 6 months, RR 1.0 (95% CI 0.70 to 1.43); 60% (18/30) vs. 70% (21/30) at 12 months, RR 0.86 (95% CI 0.59 to 1.25)</td>
</tr>
<tr>
<td>Manchikanti 2012</td>
<td>A vs. B</td>
<td>Pain</td>
</tr>
<tr>
<td>Manchikanti 2012</td>
<td>A vs. B</td>
<td>Pain</td>
</tr>
<tr>
<td>Manchikanti 2008</td>
<td>A vs. B</td>
<td>Pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain (mean NRS, 0 to 10): 7.6 vs. 7.9 at baseline; 4.1 vs. 4.1 at 3 months; 4.2 vs. 4.1 at 6 months; 4.3 vs. 4.4 at 12 months; 4.7 vs. 4.6 at 24 months, (p=0.80 for group difference)</td>
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<tr>
<td></td>
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<td>Pain relief &gt;=50% from baseline: 62% (31/50) vs. 66% (33/50) at 3 months, RR 0.94 (95% CI 0.70 to 1.26); 56% (28/50) vs. 58% (29/50) at 6 months, RR 0.97 (95% CI 0.63 to 1.45); 46% (23/50) vs. 48% (24/50) at 12 months, RR 0.97 (95% CI 0.63 to 1.45); 44% (22/50) vs. 42% (21/50) at 24 months, RR 1.05 (95% CI 0.67 to 1.65)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
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<tr>
<td></td>
<td></td>
<td>ODI (0 to 50): 28 vs. 30 at baseline; 17 vs. 17 at 3 months; 7 vs.17 at 6 months; 17 vs.18 at 12 months; 17 vs.18 at 24 months, (p=0.60 for group difference)</td>
</tr>
<tr>
<td></td>
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<td>ODI improved &gt;=50% from baseline: 49% (24/50) vs. 58% (29/50) at 3 months, RR 0.83 (95% CI 0.57 to 1.20); 50% (25/50) vs. 54% (27/50) at 6 months, RR 0.93 (95% CI 0.64 to 1.35); 50% (25/50) vs. 50% (25/50) at 12 months, RR 1.0 (95% CI 0.68 to 1.48); 46% (23/50) vs. 42% (21/50) at 24 months, RR 1.10 (95% CI 0.70 to 1.71)</td>
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<tr>
<td></td>
<td></td>
<td>Global Assessment</td>
</tr>
<tr>
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<td>Success (pain improved &gt;=50% and ODI improved &gt;=50%): 48% (24/50) vs. 58% (29/50) at 3 months; 50% (25/50) vs. 54% (25/50) at 6 months; 46% (23/50) vs. 44% (22/50) at 12 months; 44% (22/50) vs. 38% (19/50) at 24 months</td>
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<tr>
<td></td>
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<td>Other Outcomes</td>
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<tr>
<td></td>
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<td>Opioid use (mg MED/day): 49 vs. 46 at baseline; 33 vs. 33 at 3 months; 34 vs. 34 at 6 months; 33 vs. 36 at 12 months; 32 vs. 36 at 24 months, (p&gt;0.05 at all time points)</td>
</tr>
</tbody>
</table>
### Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>12 months</td>
<td>10% (3/30) vs. 10% (3/30) at 12 months, RR 1.0 (95% CI 0.22 to 4.56)</td>
<td>Appears complete</td>
<td>3 subarachnoid punctures (not reported by group)</td>
<td>None reported</td>
<td>Fair</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>Manchikanti 2012&lt;br&gt;Manchikanti 2012&lt;br&gt;Manchikanti 2008</td>
<td>24 months</td>
<td>28% (14/50) vs. 30% (15/50) at 24 months, RR 0.93 (95% CI 0.51 to 1.72)</td>
<td>Appears complete</td>
<td>&quot;No major adverse events&quot;</td>
<td>None reported</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
<td>Inclusion Criteria</td>
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<tr>
<td>Nam, 2011</td>
<td>RCT</td>
<td>South Korea</td>
<td>≥50 years of age; pain increased with lumbar extension and decreased with lumbar flexion; pain radiating below knee; thoracolumbar scoliosis greater than 10 degrees, visible on x-rays; spinal stenosis on CT or MRI; duration not specified</td>
<td>Systemic inflammatory disease or diabetes; on anticoagulants; prior side effects from lidocaine or contrast dye; suspected infectious disease; steroid injection within 3 months; degenerative spondylolisthesis, osteoporosis, or compression fracture; surgical treatment of thoracolumbar region or cancer metastasis to thoracolumbar site or with spinal deformity caused by metabolic disease</td>
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</tr>
<tr>
<td>Ohtori, 2012</td>
<td>RCT</td>
<td>Japan</td>
<td>Low back and leg pain &gt;1 month, lumbar spinal stenosis (central stenosis, lateral recess, or foraminal stenosis) on x-ray and MRI and physical examination</td>
<td>Monoradiculopathy, cauda equina syndrome, polyradiculopathy</td>
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<tr>
<td>el Zahaar, 1991</td>
<td>RCT</td>
<td>Egypt</td>
<td>Acute unilateral sciatica with neurological findings or neurogenic claudication without specific neurologic deficits; failure to improve with at least 2 weeks of conservative therapy; findings on MRI or CT consistent with clinical presentation</td>
<td>Surgery for similar symptoms or within 6 months</td>
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</tbody>
</table>
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<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Subject Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nam, 2011</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 48 Analyzed: 36 (17 vs. 19) at 12 weeks</td>
<td>A: Transforaminal epidural injection with 20 mg triamcinolone (0.5 ml) plus 0.5% lidocaine (1.5 ml), with fluoroscopic guidance (n=17) B: Transforaminal epidural injection with 0.5% lidocaine (2 ml), with fluoroscopic guidance (n=19)</td>
<td>Age (mean): 75 vs. 71 years Male: 24% vs. 26% Duration of symptoms (months): 7.7 vs. 6.7 Baseline pain (0-10 VAS): 7.3 vs. 7.4 Baseline ODI (0-100): 63 vs. 63</td>
</tr>
<tr>
<td>Ohtori, 2012</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 80 (40 vs. 40) Analyzed: Not reported</td>
<td>A: Transforaminal epidural injection with 3.3 mg dexamethasone plus 1% lidocaine (2 ml), with fluoroscopic guidance (n=40) B: Transforaminal epidural injection with 10 mg etanercept plus 1% lidocaine (2 ml), with fluoroscopic guidance (n=40)</td>
<td>Age (mean): 67 vs. 65 years Male: 45% vs. 55% Race: Not reported Duration of symptoms (months): 2.3 vs. 2.5 Baseline pain (0-10 VAS): 7.5 vs. 7.9 Baseline ODI (0-100): 40 vs. 38</td>
</tr>
<tr>
<td>el Zahaar, 1991</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 30 (18 vs. 12) Analyzed: 30</td>
<td>A: Caudal epidural injection with hydrocortisone (5 ml), 4% Carbocaine (4 ml), and saline (21 ml) (n=18) B: Caudal epidural injection with 4% Carbocaine (4 ml) plus saline (26 cc) (n=12)</td>
<td>Age (mean): 46 vs. 49 years Male: 54% vs. 65% Duration of symptoms (months): 17 vs. 14 Herniated disc: 51% vs. 54% Spinal stenosis: 49% vs. 46% Baseline pain: Not reported Baseline function: Not reported</td>
</tr>
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<th>Imaging Guidance</th>
<th>Type of Comparison</th>
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<tr>
<td>Nam, 2011</td>
<td>Treatments prior to intervention: Not specified&lt;br&gt;Treatments following intervention: Physical therapy not allowed&lt;br&gt;Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 2nd injection after 3 weeks for partial improvement (53% vs. 47% received 2 injections)&lt;br&gt;Number of levels: Single level (L5-S1 35% vs. 42%; L4-L5 41% vs. 37%)&lt;br&gt;Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification</td>
<td>Transforaminal epidural injection with local anesthetic</td>
</tr>
<tr>
<td>Ohtori, 2012</td>
<td>Treatment prior to intervention: Not specified (85% vs. 88% used meloxicam)&lt;br&gt;Treatments following intervention: Not reported&lt;br&gt;Spondylosis on x-ray: 60% vs. 65%&lt;br&gt;Spondylolisthesis on x-ray: 40% vs. 35%&lt;br&gt;Central stenosis on MRI: 70% vs. 78%&lt;br&gt;Foraminal stenosis on MRI: 15% vs. 10%&lt;br&gt; L4: 18% vs. 12%&lt;br&gt; L5: 60% vs. 60^&lt;br&gt; S1: 22% vs. 28%</td>
<td>Number of injections: Single injection&lt;br&gt;Number of levels: Single level&lt;br&gt;Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification of nerve</td>
<td>Transforaminal epidural injection with etanercept</td>
</tr>
<tr>
<td>el Zahaar, 1991</td>
<td>Treatment prior to intervention: Not specified&lt;br&gt;Treatment following intervention: Advised to take aspirin, no physical therapy or exercise program&lt;br&gt;Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection&lt;br&gt;Number of levels: Single level&lt;br&gt;Provider experience: Not reported</td>
<td>Not reported</td>
<td>Caudal epidural injection with local anesthetic</td>
</tr>
</tbody>
</table>
# Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nam, 2011</strong></td>
<td>A vs. B</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (mean, 0-10 VAS): 7.3 vs. 7.4 at baseline; 3.4 vs. 4.0 at 2 weeks; 3.5 vs. 4.4 at 1 month; 3.8 vs. 4.7 at 3 months (p&lt;0.05 at 2 weeks, 1 month, and 3 months)&lt;br&gt;&lt;br&gt;<strong>Function</strong>&lt;br&gt;ODI (mean, 0-100): 63 vs. 63 at baseline; 42 vs. 44 at 2 weeks; 39 vs. 46 at 1 month; 37 vs. 49 at 3 months (p&lt;0.05 at 2 weeks; 1 month; and 3 months)&lt;br&gt;&lt;br&gt;<strong>Global Assessment</strong>&lt;br&gt;Success (pain improved &gt;40%, ODI improved &gt;20%, patient satisfaction good or excellent): 76% (13/17) vs. 42% (8/19), RR 1.82 (95% CI 1.0 to 3.27)&lt;br&gt;In multiple regression, sex, age, BMI, duration, and radiographic findings not associated with likelihood of success</td>
</tr>
<tr>
<td><strong>Ohtori, 2012</strong></td>
<td>A vs. B</td>
<td><strong>Pain</strong>&lt;br&gt;Leg pain (0-10 VAS): 7.5 vs. 7.9 at baseline, 5.2 vs. 3.5 at 1 m (p=0.026)&lt;br&gt;Leg numbness (0-10 VAS): 6.0 vs. 6.9 at baseline, 4.9 vs. 4.8 at 1 m (p&gt;0.05)&lt;br&gt;&lt;br&gt;<strong>Function</strong>&lt;br&gt;ODI (0-100): 40 vs. 38 at baseline, 30 vs. 28 at 1 m (p&gt;0.05)</td>
</tr>
<tr>
<td><strong>el Zahaar, 1991</strong></td>
<td>A vs. B (spinal stenosis subgroup)</td>
<td><strong>Global Assessment</strong>&lt;br&gt;Treatment success (&gt;75% improvement in pre-injection symptoms and no spinal surgery): 38% (7/18) vs. 33% (4/12) at 13-36 months; RR 1.17 (95% CI 0.43 to 3.13)&lt;br&gt;&lt;br&gt;<strong>Other Outcomes</strong>&lt;br&gt;Subsequent surgery: 44% (8/18) vs. 58% (7/12) at 13-36 months, RR 0.68 (95% CI 0.33 to 1.40)</td>
</tr>
</tbody>
</table>
# Appendix E2. Epidural Steroid Injections for Spinal Stenosis

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nam, 2011</td>
<td>3 months</td>
<td>12 patients excluded from analysis for various reasons; 13 others excluded after &quot;enrollment&quot; (unclear if randomized)</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Inje University</td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td>Ohtori, 2012</td>
<td>1 month</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>No cases of infection, hematoma, spinal nerve injury, or other complications reported</td>
<td>No funding received</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>el Zahaar, 1991</td>
<td>Mean 20 to 21 months</td>
<td>Unclear</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Poor</td>
<td></td>
</tr>
</tbody>
</table>

ASA = aspirin; CI = confidence interval; CT = CT=computed tomography; MRI = magnetic resonance imaging; NSAID = nonsteroidal antiinflammatory drug, ODI = Oswestry Disability Index; RCT = randomized controlled trial; RDQ = Roland Disability Questionnaire; RR = relative risk; VAS = visual analogue scale

Please see Appendix C. Included Studies for full study references.
# Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Lee, 2009          | RCT          | South Korea Single center Physical medicine clinic | Axial back pain without radiation for >3 months, due to herniated intervertebral disc or spinal stenosis | Unilateral or bilateral leg pain, arterial vascular disease, lumbar epidural steroid injection in last 2 months, prior lumbar spine surgery, presence of neurological deficits | Not reported; Randomized: 202; Analyzed: 192 (116 vs. 76) at 2 weeks to 4 months | A: Transforaminal epidural injection with 20 mg triamcinolone acetonide (0.5 ml) with lidocaine 0.5% (4 ml) with fluoroscopic guidance (n=116)  
B: Interlaminar epidural injection with 40 mg triamcinolone acetonide (1 ml) with lidocaine 0.5% (8 ml) with fluoroscopic guidance (n=76) |
| Manchikanti, 2012  | RCT          | USA Single center Pain clinic | No evidence of disc herniation and negative controlled local anesthetic blocks for facet or sacroiliac joint pain; ≥18 years of age; history of chronic function-limiting low back pain for >6 months; failure to improve with conservative management; imaging findings not specified | Facet joint pain; previous lumbar surgery; uncontrolled or unstable opioid use; uncontrolled psychiatric disorders; uncontrolled medical illness, either acute or chronic; pregnant or lactating; history or potential for an adverse reaction or reactions to study medications | Approached: 147; Eligible: 133; Randomized: 120 (60 vs. 60); Analyzed: 120 (60 vs. 60) at 24 months, including 22 (10 vs. 12) lost to followup | A: Caudal epidural with 6 mg betamethasone or 40 mg methylprednisolone (1 ml) with lidocaine 0.5% (9 ml) with fluoroscopic guidance (n=60)  
B: Caudal epidural with lidocaine 0.5% (10 ml) with fluoroscopic guidance (n=60) |
## Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee, 2009</td>
<td>A vs. B: Age (mean): 42 vs. 42 in herniated disc group, 62 vs. 62 years in spinal stenosis group Male: 61% vs. 50% in herniated disc group, 35% vs. 26% in spinal stenosis group Duration of pain: 4.5 vs. 3.7 m in herniated disc group, 14 vs. 16 months in spinal stenosis group Baseline pain (0-10 NRS): 6.5 vs. 6.8 in herniated disc group, 6.6 vs. 6.6 in spinal stenosis group Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: 52% herniated disc, 58% spinal stenosis (analyzed separately)</td>
<td>Number of injections: Mean not reported, maximum of three interlaminar injections at minimum 2 week intervals, maximum number of transforaminal injections not reported (injection performed bilaterally) Number of levels: Appears to be single Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
</tr>
<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B: Age (mean): 44 vs. 48 years Male: 37% vs. 22% Duration of pain (months): 92 vs. 100 Baseline pain (0 to 10 NRS): 7.9 vs. 8.0 Baseline ODI (0 to 50): 28 vs. 28</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Mean 5.5 vs. 4.5 over 2 years, frequency not specified Number of levels: Caudal Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
</tr>
<tr>
<td>Also Manchikanti 2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2008</td>
<td></td>
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</tr>
</tbody>
</table>
# Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Type of Comparison</th>
<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lee, 2009</strong></td>
<td>Transforaminal versus interlaminar epidural injection with corticosteroid plus local anesthetic</td>
<td>Herniated disc group</td>
<td>Roland pain score (0 to 5): 3.34 vs. 3.25 at baseline, 1.55 vs. 1.53 at 2 w, 1.57 vs. 1.59 at 2 m, 1.66 vs. 1.72 at 4 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pain score improved ≥2 points (0-10 pain NRS): 68% (40/59) vs. 65% (22/34) at 2 w, RR 1.05 (95% 0.77 to 1.42); 75% (44/59) vs. 65% (22/34) at 2 m, RR 1.15 (95% CI 0.86 to 1.54); 66% (39/59) vs. 50% (17/34) at 4 m, RR 1.32 (95% CI 0.90 to 1.94)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spinal stenosis group</td>
</tr>
<tr>
<td><strong>Manchikanti, 2012</strong></td>
<td>Caudal epidural injection with local anesthetic</td>
<td>A vs. B</td>
<td>Pain (mean NRS, 0 to 10): 7.9 vs. 8.0 at baseline, 3.6 vs. 4.2 at 3 months, 3.7 vs. 4.1 at 6 months, 3.8 vs. 4.3 at 12 months, 4.0 vs. 4.4 at 24 months (p=0.52 for group difference)</td>
</tr>
<tr>
<td><strong>Also Manchikanti 2011</strong></td>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td><strong>Manchikanti 2008</strong></td>
<td></td>
<td></td>
<td>Other Outcomes</td>
</tr>
</tbody>
</table>
### Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee, 2009</td>
<td>4 months</td>
<td>10/192 at 2 weeks to 4 months</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Wooridul Spine Foundation</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Manchikanti, 2012</td>
<td>24 months</td>
<td>A vs. B: 17% (10/60) vs. 20% (12/60) at 24 months</td>
<td>Appears complete</td>
<td>&quot;None of the patients reported significant adverse events&quot;</td>
<td>None reported</td>
<td>Fair</td>
<td>Primary ITT analysis based on baseline data or last followup for patients lost to followup</td>
</tr>
<tr>
<td>Also Manchikanti 2011</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Manchikanti 2008</td>
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## Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2013</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>Lumbar axial or discogenic pain; age ≥18 years; function-limiting low back pain for &gt;6 months; failure to improve with conservative management; imaging findings not specified</td>
<td>Lumbar facet joint or sacroiliac joint pain based on controlled, comparative local anesthetic blocks; previous lumbar surgery; uncontrolled or unstable opioid use; uncontrolled psychiatric disorders; uncontrolled medical illness; pregnant or lactating; history or potential for adverse reactions to study medications</td>
<td>Approached: 164 Eligible: 134 Randomized: 120 (60 vs. 60) Analyzed: 120 (60 vs. 60) at 24 months, including 13 (9 vs. 4) with missing data</td>
<td>A: Interlaminar epidural injection with 6 mg betamethasone (1 ml) and lidocaine 0.5% (5 ml) with fluoroscopic guidance (n=60) B: Interlaminar epidural injection with lidocaine 0.5% (6 ml) with fluoroscopic guidance (n=60)</td>
</tr>
<tr>
<td>Also Manchikanti 2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2010</td>
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</table>
### Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2013</td>
<td>A vs. B: Age (mean): 43 vs. 41 years Male: 40% vs. 23% Race: Not reported Duration of pain (months): 129 vs. 104 Baseline pain (NRS 0 to 10): 7.7 vs. 8.0 Baseline ODI (0 to 50): 29 vs. 31</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Mean 3.8 vs. 3.7 per year, frequency not specified Number of levels: Caudal Provider experience: Not reported</td>
<td>Fluoroscopy with contrast verification in epidural space</td>
</tr>
<tr>
<td>Also Manchikanti 2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2010</td>
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</tbody>
</table>
## Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Type of Comparison</th>
<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2013</td>
<td>Interlaminar epidural steroid injection with local anesthetic</td>
<td>Pain (mean NRS, 0 to 10): 7.7 vs. 8.0 at baseline, 3.5 vs. 3.6 at 3 months, 3.6 vs. 3.9 at 6 months, 3.7 vs. 3.7 at 12 months, 3.6 vs. 3.9 at 24 months (p=0.38 for group difference) &lt;br&gt; Pain relief &gt;=50% from baseline: 80% (48/60) vs. 68% (41/60) at 3 months, 80% (48/60) vs. 68% (41/60) at 6 months, 72% (43/60) vs. 63% (38/60) at 12 months, 65% (39/60) vs. 57% (34/60) at 24 months</td>
</tr>
<tr>
<td>Also Manchikanti 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2010</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix E3. Epidural Steroid Injections for Nonradicular Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2013</td>
<td>24 months</td>
<td>A vs. B: 27% (16/60) vs. 17% (10/60) at 24 months</td>
<td>Appears complete</td>
<td>4 subarachnoid punctures without headache and one case of nerve root irritation, not reported by group</td>
<td>None reported</td>
<td>Fair</td>
<td>Primary ITT analysis based on baseline data or last followup for patients lost to followup</td>
</tr>
<tr>
<td>Also Manchikanti 2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti 2010</td>
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<td></td>
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</tr>
</tbody>
</table>

E=electronic; ITT=intention-to-treat; m=month; MED=minimal effective dose; n=number; NCS=Nerve Conduction Study; NRS=Numerical Rating Scale; ODI=Oswestry Disability Index; p=p value; RCT=randomized controlled trial; SI=sacroiliac

Please see Appendix C. Included Studies for full study references.
### Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Devulder, 1999    | RCT         | Belgium Single center Pain clinic | 20-70 years of age; persistent pain following spinal surgery for disc herniation; EMG showing chronic nerve pathology without acute irritation; pronounced nerve fibrosis on epidurogram and MRI (considered primary source of pain and neurophysiological abnormalities); 1-2 pathologic nerve roots; duration not specified | Lumbar instability; recurrent lumbar disc herniation; spinal stenosis | Approached: Not reported Eligible: Not reported Randomized: 60 (20 vs. 20 vs. 20) Analyzed: 60 | A: Transforaminal epidural injection to nerve root sleeve with 40 mg methylprednisolone, 0.5% bupivacaine (1 ml) (total 2 ml) (n=20)  
B: Transforaminal epidural injection to nerve root sleeve with 40 mg methylprednisolone, 1,500 U hyaluronidase, and 0.5% bupivacaine (1 ml) (total 2 ml) (n=20)  
C: Transforaminal epidural injection to nerve root sleeve with 1,500 U hyaluronidase and 0.5% bupivacaine (1 ml), with fluoroscopic guidance (total 2 ml) (n=20) |
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Number of Levels</th>
<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devulder, 1999</td>
<td>A vs. B vs. C: Age (mean): 48 vs. 47 vs. 44 years Male: 50% vs. 40% vs. 30% Race: Not reported Duration of symptoms: Not reported Baseline pain: Not reported Baseline function: Not reported</td>
<td>A vs. B vs. C: Treatments prior to intervention: Surgery for disc herniation Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number of injections: Two injections 1 week apart Number of levels: Appears to be single level</td>
<td></td>
<td></td>
<td>Fluoroscopic guidance with contrast verification in nerve root sleeve</td>
<td>Transforaminal epidural injection with corticosteroid, hyaluronic acid, and local anesthetic or hyaluronic acid and local anesthetic</td>
</tr>
</tbody>
</table>
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Results (acute and sub-acute, or chronic, or mixed)</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devulder, 1999</td>
<td>A vs. B vs. C</td>
<td>Pain Pain improved &gt;50%: 40% (8/20) vs. 35% (7/20) vs. 35% (7/20) at 1 month (p=0.71), 40% (8/20) vs. 25% (5/20) vs. 25% (5/20) at 3 months (p=0.69), 35% (7/20) vs. 20% (4/20) vs. 25% (5/20) at 6 months (p=0.66)</td>
<td>6 months</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
</tbody>
</table>
### Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Title</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Manchikanti, 2012 | RCT        | United States Single center Pain clinic | >18 years of age; lumbar surgery ≥6 months prior; function-limiting low back pain for >6 months with or without lower extremity pain; no evidence of facet joint pain; failed to improve substantially with conservative management; imaging findings not specified | >400 mg morphine equivalents/day; uncontrolled psychiatric disorder or acute/chronic medical illness; pregnant or lactating; history or potential for adverse reaction to study medications | Approached: 242 Eligible: 214 Randomized:180 Analyzed: 120 (60 vs. 60) at 12 months in preliminary analysis, including 35 (33 vs. 2) with missing data | A: Caudal epidural injection with 6 mg betamethasone, 2% lidocaine (5 ml), normal saline (6 ml), with fluoroscopic guidance (n=60)  
B: Caudal epidural adhesiolysis with 6 mg betamethasone, 2% lidocaine (5 ml), and hypertonic (10%) saline (6 ml) (n=60) |
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections</th>
<th>Number of Levels</th>
<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B: Age (mean): 52 vs. 52 years Male: 42% vs. 42% Duration of symptoms (months): 186 vs. 196 Baseline pain (0-10 NRS): 7.9 vs. 8.1 Baseline ODI (0-50): 29 vs. 31</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Mean 2.2 vs. 3.5 per year; adhesiolysis performed after 3 months</td>
<td>1</td>
<td>Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Caudal adhesiolysis</td>
</tr>
</tbody>
</table>
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Results (acute and sub-acute, or chronic, or mixed)</th>
<th>Duration of Followup</th>
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<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2012</td>
<td>A vs. B Pain: Pain scores (0-10): 7.9 vs. 8.1 at baseline (p=0.22), 4.9 vs. 3.4 at 3 months (p&lt;0.0005), 5.8 vs. 3.7 at 6 months (p&lt;0.0005), 6.1 vs. 4.0 at 12 months (p&lt;0.0005), 6.2 vs. 3.6 at 24 months Pain relief &gt;50%: 35% (21/60) vs. 90% (54/60) at 3 months; 18% (11/60) vs. 85% (51/60) at 6 months; 12% (7/60) vs. 73% (44/60) at 12 months</td>
<td>24 months</td>
<td>A vs. B: 62% (43/60) vs. 3% (2/60) were unblinded and did not complete trial at 1 year; 87% (52/60) and 10% (6/60) at 2 years</td>
<td>Complete</td>
<td>&quot;No adverse events noted&quot;</td>
<td>Not reported</td>
<td>Poor</td>
</tr>
<tr>
<td>Function ODI (0-50): 29 vs. 31 at baseline (p=0.001), 20 vs. 15 at 3 months (p&lt;0.0005), 22 vs. 15 at 6 months (p&lt;0.0005), 23 vs. 16 at 12 months (p&lt;0.0005), 23 vs. 14 at 24 months ODI improved &gt;40%: 37% (22/60) vs. 92% (55/60) at 3 months; 25% (15/60) vs. 88% (53/60) at 6 months; 13% (8/60) vs. 77% (46/60) at 12 months</td>
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<tr>
<td>Global Assessment Success (pain relief &gt;=50% and ODI improved &gt;=50%): 23% (14/60) vs. 78% (47/60) at 3 months, 7% (4/60) vs. 73% (44/60) at 6 months, 5% (3/60) vs. 70% (42/60) at 12 months, 5% (3/60) vs. 82% (49/60) at 24 months</td>
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<tr>
<td>Other Outcomes Opioid intake (mg MED/day): 41 vs. 64 at baseline (p=0.001), 42 vs. 42 at 3 months (p=0.67), 47 vs. 49 at 6 months (p=0.71), 40 vs. 41 at 12 months (p=0.72)</td>
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Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

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<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
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<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Meadeb, 2001        | RCT         | France Multicenter Rheumatology clinic | 18 to 75 years of age; postoperative sciatica with or without low back pain; duration not specified; imaging findings not required though nerve root compression by residual disc tissue or lumbar spinal stenosis or of a nondegenerative disease on CT or MRI included as an exclusion criterion | Clotting disorders; skin lesion at injection site; hypersensitivity to iodine | Approached: Not reported Eligible: Not reported Randomized: 58 Analyzed: 47 (16 vs.16 vs. 15) at 120 days | A: Caudal epidural injection with 125 mg prednisolone acetate, with fluoroscopic guidance (n=16)  
B: Forceful caudal epidural injection with saline (20 ml), with fluoroscopic guidance (n=16)  
C: Forceful caudal epidural injection with saline (20 ml) plus 125 mg prednisolone acetate, with fluoroscopic guidance (n=15) |
| Rahimzadeh, 2014    | RCT         | Iran Single center Pain clinic | Patients ages 20-75 years old suffering from persistent (>6 months) back pain following laminectomy for spinal canal stenosis and/or discectomy for herniated nucleus pulposus documented by MRI (Failed back surgery syndrome defined as pain and or disability following laminectomy with or without sensory-motor neurological deficits or any form of urinary or bowel incontinence for at least 6 months) | Sacroiliac joint disease, facet joint arthritis, severe cardiopulmonary disease, uncontrolled diabetes, morbid obesity, addiction, infection, and coagulation disorders that prohibited lumbar epidural injections | Approached: 33 Eligible: Not reported Randomized: 25 Analyzed: 25 | A. Transforaminal lumbar epidural injection of bupivacaine 5 mg (1 mL) + triamcinolone 40 mg (1 mL) + saline solution 10% (2 mL) + hyaluronidase 1500 IU reconstituted in 1 mL distilled water (n=12)  
B. Transforaminal lumbar epidural injection of bupivacaine 5 mg (1 mL) + triamcinolone 40 mg (1 mL) + saline solution 10% (2 mL) + 1 mL distilled water (n=13) |
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadeb, 2001</td>
<td>A vs. B vs. C: Age (mean): 43 vs. 47 vs. 45 years Male: 44% vs. 50% vs. 27% Duration of symptoms (months): 31 vs. 35 vs. 20 Baseline pain (0-100 VAS): 55 vs. 70 vs. 60 Dallas ADL (0-100: 66 vs. 71 vs. 61)</td>
<td>A vs. B vs. C: Treatments prior to intervention: Discectomy, time since surgery 38 vs. 43 vs. 34 months; prior epidural steroid injection 12/15 vs. 12/15 vs. 12/14 Treatment following intervention: Not specified Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: Single injection Number of levels: Single level (caudal) Provider experience: Not reported</td>
<td>Fluoroscopic guidance with contrast verification in epidural space</td>
<td>Forceful caudal injection with saline or saline plus corticosteroid</td>
</tr>
<tr>
<td>Rahimzadeh, 2014</td>
<td>A vs. B: Age (mean): 46 vs. 48 years Male: 58% vs. 54% Duration of symptoms (months): 7 vs. 8 Baseline pain (0-10 VAS): 3.1 vs. 3.4</td>
<td>A vs. B Treatments prior to intervention: Laminectomy for spinal canal stenosis and/or discectomy for herniated nucleus pulposus Treatment following intervention: Not reported Other patient characteristics: Not reported</td>
<td>Number and frequency of injections: 1 Number of levels: Not reported Provider experience: Interventional pain specialist</td>
<td>Fluoroscopic guidance</td>
<td>Epidural injection with hyaluronidase</td>
</tr>
</tbody>
</table>
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

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<th>Author, Year</th>
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<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadeb, 2001</td>
<td>A vs. B vs. C</td>
<td>Pain (mean, 0-100 VAS): 55 vs. 70 vs. 60 at baseline; 48 vs. 66 vs. 58 at 30 days; 53 vs. 62 vs. 52 at 60 days; 45 vs. 60 vs. 58 at 120 days</td>
<td>120 days</td>
<td>A vs. B vs. C: 18.9%(11/58) excluded due to incomplete evaluation at baseline or failure to respond to injections</td>
<td>Appears complete</td>
<td>A vs. B vs. C: Pain induced by injection: 76% vs. 73% vs. 70%</td>
<td>French Society for Rheumatology</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function (acute and sub-acute, or chronic, or mixed)</td>
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<td>Dallas ADL (mean, 0-100 VAS): 66 vs. 71 vs. 61 at baseline; 58 vs. 69 vs. 62 at 30 days; 60 vs. 68 vs. 60 at 60 days; 58 vs. 67 vs. 65 at 120 days</td>
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<tr>
<td>Rahimzadeh, 2014</td>
<td>A vs. B</td>
<td>Pain (median IQR, 0-10): 0 vs. 0 at baseline, 1 vs. 1 at week 1, 1 vs. 1.5 at week 2, 1.5 vs. 2.5 at week 4 (p&lt;0.001 at week 4)</td>
<td>4 weeks</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>A vs. B Experienced any adverse event (specifically monitored for development of inadvertent subarachnoid injection, prolonged sensory-motor block, long-term weakness of the limbs, epidural hematoma, infection, bladder dysfunction, and arachnoiditis): 0% vs. 0%</td>
<td>No external funding</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% patients with &gt;50% decrease in numerical rating of pain score (NRS): 100% (12/12) vs. 100% (13/13) at baseline, 92% (11/12) vs. 77% (10/13) at week 1, 92% (11/12) vs. 54% (7/13) at week 2, 83% (10/12) vs. 46% (6/13) at week 4</td>
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</tbody>
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## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
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<th>Inclusion Criteria</th>
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<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental and control groups, dose, duration of treatment)</th>
</tr>
</thead>
</table>
| Rocco, 1989        | RCT          | USA Single center Pain clinic | Prior laminectomy, still symptomatic; duration not specified; imaging findings not specified | Not reported       | Approached: Not reported Eligible: Not reported Randomized: 24 Analyzed: 22 (8 vs. 7 vs. 7) at 6 months | A: Epidural injection with 75 mg triamcinolone diacetate (1.9 ml) plus 5% lidocaine (2 ml) and normal saline (8 ml) (n=8)  
B: Epidural injection with 8 mg morphine (8 ml) plus 5% lidocaine (2 ml) (n=7)  
C: Epidural injection with 75 mg triamcinolone diacetate (1.9 ml) and 8 mg morphine (8 ml) plus 5% lidocaine (2 ml) (n=7) |
### Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)</th>
<th>Number and Frequency of Injections Number of Levels Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocco, 1989</td>
<td>A vs. B vs. C:</td>
<td>A vs. B vs. C: Treatments prior to intervention: Laminectomies 2.1 vs. 2.4 vs. 2.1; epidural steroid 4 vs. 4 vs. 4 Treatments following intervention: Not specified Other patient characteristics: Primary diagnosis epiduroarachnoiditis: 75% vs. 71% vs. 71%</td>
<td>Number and frequency of injections: Up to 3 injections at 1 month intervals; 62% vs. 67% vs. 86% received 3 blocks Number of levels: Not specified Provider experience: Not reported</td>
<td>Not reported</td>
<td>Epidural injection with morphine or morphine plus corticosteroid</td>
</tr>
</tbody>
</table>
## Appendix E4. Epidural Steroid Injections for Post-Surgery Syndrome

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<tr>
<th>Author, Year</th>
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<th>Duration of Followup</th>
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<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocco, 1989</td>
<td>A vs. B vs. C</td>
<td>Pain</td>
<td>6 months</td>
<td>A vs. B vs. C: 8.3% (2/24) lost to followup or inadvertent subarachnoid injection (1)</td>
<td>Appears complete</td>
<td>A vs. B vs. C: Required naloxone: 0% vs. 0% vs. 43% (3/7) Urinary retention: 0% (0/8) vs. 14% (1/7) vs. 71% (5/7) Nausea and vomiting: 12% (1/8) vs. 71% (5/7) vs. 57% (4/7) Pruritus: 12% (1/8) vs. 57% (4/7) vs. 57% (4/7)</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
</tbody>
</table>

ADL=Activities of Daily Living; AE=adverse event; CT=computerized tomography; d=day; EMG=electromyogram; m=month; MED=minimal effective dose; MRI=magnetic resonance imaging; n=number; NRS=numerical rating scale; ODI=Oswestry Disability Index; p=p value; RCT=randomized controlled trial; VAS=visual analog scale

Please see Appendix C. Included Studies for full study references.
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Facet Joint Block (percent pain relief) Requirements</th>
<th>Imaging Requirements for Patient Selection</th>
<th>Duration of Symptoms at Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackerman, 2008</td>
<td>RCT</td>
<td>USA</td>
<td>18 to 55 years of age; nonradicular low back pain, SPECT positive for lumbar facet joint involvement; excluded patients with normal MRI imaging</td>
<td>Not required</td>
<td>Required (SPECT, excluded if MRI normal)</td>
<td>&lt;6 months (mean 7.6 weeks)</td>
</tr>
<tr>
<td>Carette, 1991</td>
<td>RCT</td>
<td>Canada</td>
<td>18 to 65 years of age; first or recurrent episode of low back pain, buttock pain, or both for ≥6 months; pain present on day of enrollment; normal neurological exam; at least 50% reduction in pain following uncontrolled facet joint block at L4-L5 and/or L5-S1 followed by return of pain by 2 weeks after block (imaging findings not required)</td>
<td>Single intraarticular facet joint block (≥50% pain relief)</td>
<td>Not required</td>
<td>≥6 months (median 18-24 months)</td>
</tr>
</tbody>
</table>
### Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
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<tr>
<th>Author, Year</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackerman, 2008</td>
<td>Allergy to study drugs, radicular symptoms, pregnant, steroid exposure within 4 weeks, workman’s compensation or motor vehicle accident, anticoagulant therapy, lumbar disc herniation, spinal stenosis, lumbar compression fracture, positive bleeding history, pain longer than 6 months, schedule II opioid use</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 46 (23 vs. 23) Analyzed: 46 at 12 w</td>
<td>A vs. B: Age (mean): 41 vs. 38 years Male: 52% vs. 61% Duration of pain: Not reported by group, mean 7.6 w overall Baseline pain (0-10 NRS): 7.8 vs. 8.1 Baseline function (0-100 ODI): 31 vs. 34</td>
<td>Treatment prior to intervention: Not reported Treatments following intervention: Not reported Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Carette, 1991</td>
<td>Nonmechanical low back pain (e.g., tumor, infection, or spondylitis); previous injections into the facet joints or low back surgery; pregnant; known allergy to local anesthetic or radiologic contrast agents; blood coagulation disorder.</td>
<td>Approached: Not reported; 190 underwent diagnostic facet joint block Eligible: 108 Randomized: 101 (51 vs. 50) Analyzed: 95 (48 vs. 47) at 6 m</td>
<td>A vs. B: Age (mean): 42 vs. 43 years Male: 51% vs. 58% Duration of pain (median, months): 18 versus 24 Baseline pain (0-10 VAS): 6.3 vs. 6.2 Baseline Sickness Impact Profile (0 to 100): 11 vs. 13</td>
<td>A vs. B: Treatments prior to intervention: Restricted to acetaminophen Treatments following intervention: Physicians asked to limit concurrent treatments to acetaminophen; 11 vs. 6 patients received other treatments (antidepressant, physical therapy, additional injection) through 6 months Other patient characteristics: Not reported</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Number and Frequency of Injections, Number of Levels, Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparator</th>
</tr>
</thead>
</table>
| Ackerman, 2008 | A: Intra-articular facet joint injection with 8 mg triamcinolone (0.2 ml) and 1% lidocaine (0.5 ml), with fluoroscopic guidance  
B: Medial branch block with at medial branches of doral rami with 8 mg triamcinolone (0.2 ml) and 1% lidocaine (0.5 ml), with fluoroscopic guidance | Number and frequency of injections: Injections appeared to be performed once  
Number of levels: 5 levels bilaterally  
Provider experience: Physician fellowship trained and board certified in anesthesiology and pain medicine | Fluoroscopic guidance | Intra-articular versus medial branch corticosteroid injection |
| Carette, 1991  | A: Intra-articular facet joint injection with 20 mg methylprednisolone acetate (1 ml) plus isotonic saline (1 ml), with fluoroscopic guidance  
B: Intra-articular facet joint injection with isotonic saline (2 ml), with fluoroscopic guidance | Number and frequency of injections: Mean 3.6 vs. 3.6 injections, frequency not specified  
Number of levels: 2 vs. 2 (L4/L5 and L5/S1), bilateral 80% vs. 79% | Fluoroscopic guidance | Intraarticular injection of saline |
# Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year Title</th>
<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
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<tbody>
<tr>
<td>Ackerman, 2008</td>
<td>A vs. B&lt;br&gt;Pain (0-10 NRS): 7.8 vs. 8.1 at baseline, 3.2 vs. 5.4 at 12 w (p&lt;0.05)&lt;br&gt;Pain relief ≥50% (0-10 NRS): 61% (14/23) vs. 26% (6/23) at 12 w, RR 2.33 (95% CI 1.09 to 5.00)&lt;br&gt;ODI (0-100): 31 vs. 34 at baseline, 12 vs. 23 at 12 w (p&lt;0.05)</td>
</tr>
<tr>
<td>Carette, 1991</td>
<td>A vs. B&lt;br&gt;Pain&lt;br&gt;Pain (0-10 VAS): 4.5 vs. 4.7 at 1 m, 4.0 vs. 5.0 at 6 m (p&lt;0.05)&lt;br&gt;McGill pain questionnaire, pain rating index (scale NR): 19.0 vs. 22.8 at 1 m (p&gt;0.05); 17.1 vs. 21.6 at 6 m (p&gt;0.05)&lt;br&gt;McGill pain questionnaire, present pain intensity (0 to 5): 2.3 vs. 2.6 at 1 m (p&gt;0.05); 2.1 vs. 2.9 at 6 m (p&gt;0.05)&lt;br&gt;Function&lt;br&gt;Sickness Impact Profile, overall (0-100): 9.3 vs. 9.8 at 1 m (p&gt;0.05), 7.8 vs. 10.8 at 6 m (p&gt;0.05)&lt;br&gt;Sickness Impact Profile, physical dimension (0-100): 5.2 vs. 6.3 at 1 m (p&gt;0.05), 4.3 vs. 7.9 at 6 m (p&lt;0.05)&lt;br&gt;Sickness Impact Profile, psychosocial dimension: 8.2 vs. 9.0 at 1 m (p&gt;0.05); 7.7 vs. 9.0 at 6 m (p&gt;0.05)&lt;br&gt;Bed rest in past 2 weeks (days): 0.3 vs. 0.1 at 1 m (p&gt;0.05), 0.2 vs. 0.4 at 6 m (p&gt;0.05)&lt;br&gt;Complete restriction in main activity in past 2 weeks (days): 3.2 vs. 2.2 at 1 m (p&lt;0.05); 1.3 vs. 2.9 at 6 m (p&gt;0.05)&lt;br&gt;Global Assessment&lt;br&gt;Overall effect (7 category scale), &quot;very marked&quot; or &quot;marked improvement&quot;: 42% (20/48) vs. 33% (16/48) at 1 m (p=0.53), 46% (22/48) vs. 15% (7/47) at 6 m (p=0.002)</td>
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## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawals due to Adverse Events</th>
<th>Quality Rating</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackerman, 2008</td>
<td>12 weeks</td>
<td>0% at 12 w</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Fair</td>
<td>Not reported</td>
</tr>
<tr>
<td>Carette, 1991</td>
<td>6 months</td>
<td>A vs. B 5.9% (3/51) vs. 6.0% (3/50) at 6 m</td>
<td>No patient in saline injection group received methylprednisolone injection</td>
<td>&quot;No adverse events reported, other than transient local pain at the injection sites.&quot;</td>
<td>Fair</td>
<td>Not reported</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Study Design</td>
<td>Country Setting</td>
<td>Inclusion Criteria</td>
<td>Facet Joint Block (percent pain relief) Requirements</td>
<td>Imaging Requirements for Patient Selection</td>
<td>Duration of Symptoms at Enrollment</td>
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</tr>
<tr>
<td>Civelek, 2012</td>
<td>RCT</td>
<td>Turkey</td>
<td>Chronic and debilitating low back pain thought due to lumbar facet syndrome, not responding to conservative treatment for up to 6 weeks (mean duration 19 months), pain relief after facet joint injection for radiofrequency denervation patients (methods of facet joint block not reported, facet joint block not reported as required for facet joint injection patients, imaging findings of facet joint arthritis described but not clearly required)</td>
<td>Facet joint injection group: Not required</td>
<td>Unclear</td>
<td>19 months (mean)</td>
</tr>
<tr>
<td>Fuchs, 2005</td>
<td>RCT</td>
<td>Germany</td>
<td>Low back pain for at least 3 months; radiologic evidence of facet joint osteoarthritis with osteophyte formation (Kellgren grade 2/3); facet joint block not required</td>
<td>Not required</td>
<td>Required (CT)</td>
<td>&gt;3 months</td>
</tr>
<tr>
<td>Galiano, 2007</td>
<td>RCT</td>
<td>Germany</td>
<td>Chronic low back pain &gt; 6 months; CT or MRI imaging of lumbar spine (findings not specified); &gt;18 years of age</td>
<td>Not required</td>
<td>Required (CT or MRI)</td>
<td>&gt;6 months</td>
</tr>
</tbody>
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# Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year</th>
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<th>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civelek, 2012</td>
<td>Radicular pain; neurogenic claudication; neurologic deficits; acute or uncontrolled medical illness; history of adverse reaction to local anesthetics; pregnant or lactating</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 100 (50 vs. 50) Analyzed: 100 at 1 y</td>
<td>A vs. B: Age (mean): 56 vs. 52 years Male: 29% vs. 30% Duration of symptoms (mean months): 19 vs. 19 Baseline pain score (0-10 NRS): 8.5 vs. 8.2 Baseline EQ-5D (5-15): 14 vs. 15</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Spine rehabilitation program for 4-6 weeks in patients who responded favorably to procedure at 1 week, surgery or physical therapy offered to patients who did not respond at 1 week Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Fuchs, 2005</td>
<td>Hypersensitivity or contraindication to study medications; contraindication to intraarticular treatment; anticoagulation, radicular pain, or other specific conditions on clinical examination or CT scan</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 60 (30 vs. 30) Analyzed: 59 (30 vs. 29)</td>
<td>A vs. B: Age (mean): 66 vs. 65 years Male: 20% vs. 40% Duration of symptoms: Not reported (minimum 3 mos.) Baseline pain score (0-100 VAS): 69 vs. 69 Baseline RDQ (0-24): 12 vs. 12</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Galiano, 2007</td>
<td>Local or systemic infection; allergy to steroids or anesthetics; uncorrectable coagulopathy; pregnancy</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 40 (20 vs. 20) Analyzed: Not reported</td>
<td>A vs. B: Age (mean): 49 vs. 49 years Male: 35% vs. 70% Duration of symptoms: Not reported (minimum 6 m) Baseline pain score (0-10 VAS): 71 vs. 73 Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Lumbar surgery (35% vs. 35%) Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</td>
<td>Number and Frequency of Injections, Number of Levels, Provider Experience</td>
<td>Imaging Guidance</td>
<td>Type of Comparator</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------</td>
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</tr>
</tbody>
</table>
| Civelek, 2012     | A: Extra-articular facet joint injection to site of medial branch of the dorsal spinal ramus with 40 mg methylprednisolone (1 ml) and 1% lidocaine (8 ml), with fluoroscopic guidance  
B: Radiofrequency facet denervation at medial branch of the dorsal spinal ramus performed at 80°C for 120 s, with fluoroscopic guidance and electrostimulation confirmation | Number and frequency of injections:  
Appears to be one  
Number of levels  
1-level: 54% vs. 52%  
2-level: 26% vs. 28%  
3-level: 16% vs. 16%  
4-level: 4% vs. 4%  
Provider experience: 2 providers with 5+ years experience | A: Fluoroscopic guidance  
B: Fluoroscopic guidance with electrostimulation confirmation | Radiofrequency denervation |
| Fuchs, 2005       | A: Intraarticular facet joint injection with 10 mg triamcinolone acetonide (1 ml), with CT fluoroscopic guidance  
B: Intraarticular facet joint injection with 10 mg sodium hyaluronate (1 ml), with CT fluoroscopic guidance | Number and frequency of injections: 3 injections performed at different levels at weekly intervals  
Number of levels: 3 over 3 weeks (bilateral)  
Provider experience: Not reported | CT fluoroscopic guidance | Intraarticular facet joint injection of hyaluronic acid |
| Galiano, 2007     | A: CT-guided intraarticular facet joint injection with 4 mg betamethasone (1 ml), 1% lidocaine (1 ml), and 0.5% bupivacaine hydrochloride (1 ml)  
B: Ultrasound-guided intraarticular facet joint injection with 4 mg betamethasone (1 ml), 1% lidocaine (1 ml), and 0.5% bupivacaine hydrochloride (1 ml) | Number and frequency of injections:  
Single injection  
Number of levels: Single level  
Provider experience: Not reported | A: CT guidance (contrast verification not reported)  
B: Ultrasound guidance (contrast verification not reported) | Type of guidance (CT vs. ultrasound) |
<table>
<thead>
<tr>
<th>Author, Year</th>
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<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
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<tbody>
<tr>
<td>Civelek, 2012</td>
<td>A vs. B</td>
<td>Pain (0-10 VNS): 8.5 vs. 8.2 at baseline, 3.4 vs. 2.2 at 1 m, 4.4 VS. 2.5 at 6 m, 4.9 vs. 2.6 at 12 m (p&lt;0.01 at all time points except baseline) Pain improved &gt;50%: 80% vs. 100% at 1 m, 68% vs. 90% at 6 m, 62% vs. 88% at 12 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other Outcomes</td>
</tr>
<tr>
<td>Fuchs, 2005</td>
<td>A vs. B</td>
<td>Pain (0-100 VAS): 69 vs. 69 at baseline, 30 vs. 41 at 1 m, 33 vs 38 at 6 m (p&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other Outcomes</td>
</tr>
<tr>
<td>Galiano, 2007</td>
<td>A vs. B</td>
<td>Pain (0-100 VAS, data estimated from graph): 46 vs. 38 at 6 w (p&lt;0.01)</td>
</tr>
</tbody>
</table>
### Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawals due to Adverse Events</th>
<th>Quality Rating</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civelek, 2012</td>
<td>12 months</td>
<td>0% at 12 m</td>
<td>Appears complete</td>
<td>A vs. B Infection: 0% vs. 0% New motor deficit: 0% vs. 0% New sensory deficit: 0% vs. 0% Increase in severity of low back pain: 0% vs. 4% (resolved within 6-8 weeks)</td>
<td>Fair</td>
<td>Not reported</td>
</tr>
<tr>
<td>Fuchs, 2005</td>
<td>6 months</td>
<td>A vs. B 0% (0/30) vs. 3.3% (1/29) at 6 m</td>
<td>Appears complete</td>
<td>&quot;No significant adverse events&quot;</td>
<td>Fair</td>
<td>Not reported</td>
</tr>
<tr>
<td>Galiano, 2007</td>
<td>6 weeks</td>
<td>Not reported</td>
<td>Appears complete (4 ultrasound patients received CT guidance after ultrasound could not provide adequate resolution)</td>
<td>Fluid retention with edema: 1 (group not reported)</td>
<td>Fair</td>
<td>Not reported</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year</th>
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<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Facet Joint Block Requirements</th>
<th>Imaging Requirements for Patient Selection</th>
<th>Duration of Symptoms at Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakemeier, 2013</td>
<td>RCT</td>
<td>Germany Single center Orthopedic clinic</td>
<td>Lumbar facet joint-related low back pain for at least 24 months; ≥18 years of age; pain reduction ≥50% with uncontrolled intraarticular facet joint block; lumbar facet joint osteoarthritis and hypertrophy in the L3/L4-L5/S1 segments on MRI</td>
<td>Single intraarticular facet joint block (≥50% pain relief)</td>
<td>Required (MRI)</td>
<td>&gt;24 months</td>
</tr>
<tr>
<td>Lilius, 1989</td>
<td>RCT</td>
<td>Finland Single center Clinic setting unclear</td>
<td>Back pain &gt;3 months, localized to one side with tenderness and local muscle spasm over the facet joints; negative straight leg raise (response to facet joint block and imaging findings not required)</td>
<td>Not required</td>
<td>Not required</td>
<td>&gt;3 months</td>
</tr>
</tbody>
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## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year</th>
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<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
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</table>
| Lakemeier, 2013 |       | History of osteoporosis or malignancies; allergies to local anesthetics; pregnant or lactating; lumbar spinal stenosis or spinal instability; vertebral fractures; symptomatic radiculopathies; uncontrolled psychiatric disorders, uncontrolled medical illness; history of adverse reactions to corticosteroids. | Approached: 89  
Eligible: 69  
Randomized: 56 (29 vs. 27)  
Analyzed: 52 (26 vs. 26) at 6 m | A vs. B:  
Age (mean): 56 vs. 58 years  
Male: 62% vs. 65%  
Duration of symptoms: Not reported (≥24 months required for inclusion)  
Baseline pain score (0-10 VAS): 7.0 vs. 6.6  
Baseline ODI (0-100): 39 vs. 41 | A vs. B:  
Treatments prior to intervention: Not specified  
Treatments following intervention: Not specified  
Other patient characteristics: Not reported |
| Lilius, 1989 |       | Not described | Approached: Not reported  
Eligible: Not reported  
Randomized: 109 (28 vs. 39 vs. 42)  
Analyzed: 104 at 3 m | A vs. B vs. C:  
Age (mean): 44 years overall  
Male: 44% overall  
Duration of symptoms: Not reported  
Baseline pain (0 to 100 VAS): 49 overall  
Baseline function: Not reported  
“No important differences between groups for age, sex, duration of symptoms, previous operations”; data not reported by group | A vs. B vs. C:  
Treatments prior to intervention: Not reported  
Treatments following intervention: Not reported  
Other patient characteristics: Not reported |
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<th>Author, Year</th>
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<th>Number and Frequency of Injections, Number of Levels, Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparator</th>
</tr>
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</table>
| Lakemeier, 2013 | A: Intraarticular facet injection with betamethasone 3 mg (1 ml) plus 0.5% bupivacaine (0.5 ml), with fluoroscopic guidance; sham denervation (electrodes not connected to generator)  
B: Radiofrequency denervation of facet joint: 0.5% bupivacaine (1ml), radiofrequency applied to site of the dorsal ramus medial branch of the target facet joint at 80°C for 90 seconds, with fluoroscopic guidance and electrostimulation confirmation | Number and frequency of injections: Unclear  
Number of levels: Unclear  
Provider experience: “Experienced spinal surgeon” | A: Fluoroscopic guidance with contrast verification in facet joint  
B: Fluoroscopic guidance to site of the dorsal ramus medial branch of the relevant lumbar facet joint, confirmed with electrostimulation | Radiofrequency denervation |
| Lilius, 1989 | A: Intraarticular facet joint injection with 80 mg methylprednisolone acetate (2 ml) plus 30 mg bupivacaine (6 ml), with fluoroscopic guidance  
B: Extra-articular (pericapsular) facet joint injection with 80 mg of methylprednisolone (2 ml) + 30 mg bupivacaine (6 ml), with fluoroscopic guidance  
C: Intra-articular facet join injection with 8 ml saline, with fluoroscopic guidance | Number and frequency of injections: Appears to be single injection  
Number of levels: Unilateral, 2 levels per patient (L3/4 and L4/5 in 15 patients and L4/5 and L5/S1 in 94 patients) (Provider experience: Not reported) | Fluoroscopic guidance | Pericapsular injection of steroid + local anesthetic  
Intraarticular injection of saline |
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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</tr>
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<tr>
<td>Lakemeier, 2013</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (0-10 VAS): 7.0 vs. 6.6 at baseline, 5.4 vs. 4.7 at 6 m; improvement 1.6 vs. 1.9 (p=0.35)&lt;br&gt;<strong>Function</strong>&lt;br&gt;Roland Morris Disability Questionnaire (0-24): 1.32 vs. 12.8 at baseline, 9.0 vs. 9.1 at 6 m; improvement 4.2 vs. 3.7 (p=0.51)&lt;br&gt;ODI (0-100): 39 vs. 41 at baseline, 33 vs. 28 at 6 m, improvement 5.7 vs. 13 (p=0.46)&lt;br&gt;<strong>Other Outcomes</strong>&lt;br&gt;Analgesic intake: &quot;No measurable differences,&quot; data not provided</td>
</tr>
<tr>
<td>Lilius, 1989</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (VAS, 0-100, estimated from graph): 45 vs. 52 vs. 52 at baseline, 31 vs. 35 vs. 41 at 2 w, 40 vs. 40 vs. 42 at 6 w, 44 vs. 42 vs. 43 at 3 m (p=0.33 vs. A vs. B, p=0.72 for A + B vs. C)&lt;br&gt;<strong>Function</strong>&lt;br&gt;Disability score: Data not reported (p=0.99 for A vs. B, p=0.89 for A + B vs. C)&lt;br&gt;Return to work: No difference between groups (data not reported)</td>
</tr>
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## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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</tr>
</thead>
<tbody>
<tr>
<td>Lakemeier, 2013</td>
<td>6 months</td>
<td>A vs. B 10.3% (3/29) vs. 3.7% (1/27) at 6 m</td>
<td>10% (3/29) vs. 3.7% (1/27) did not undergo allocated procedure or underwent additional procedure (nucleotomy)</td>
<td>&quot;No major adverse events reported&quot;</td>
<td>Good</td>
<td>No funding</td>
</tr>
<tr>
<td>Lilius, 1989</td>
<td>3 months</td>
<td>A vs. B 3.6% (1/28) vs. 0% (0/39) vs. 4.8% (2/42)</td>
<td>Appears complete</td>
<td>Not reported by intervention group; unspecified &quot;side effects&quot; reported in 7/106 overall</td>
<td>Poor</td>
<td>None</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<tr>
<th>Author, Year Title</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Facet Joint Block (percent pain relief) Requirements</th>
<th>Imaging Requirements for Patient Selection</th>
<th>Duration of Symptoms at Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2010</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>History of chronic function-limiting low back pain for &gt;6 months; &gt;18 years of age; positive results on controlled diagnostic lumbar facet joint nerve blocks (≥80% concordant pain relief and ability to perform previously painful movements); Imaging findings not required</td>
<td>Two medial branch blocks (≥80% pain relief)</td>
<td>Not required</td>
<td>&gt;6 months (mean 108 months)</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>Low back pain for &gt;6 months with or without lower extremity pain; positive response to comparative facet joint blocks (criteria for positive response not reported); imaging findings not required</td>
<td>Two facet joint blocks (% pain relief NR)</td>
<td>Not required</td>
<td>&gt; 6 months (mean 21 months)</td>
</tr>
<tr>
<td>Manchikanti, 2001</td>
<td>RCT</td>
<td>USA Single center Pain clinic</td>
<td>Low back pain for &gt;6 months with or without lower extremity pain; positive response to comparative facet joint blocks (criteria for positive response not reported); imaging findings not required</td>
<td>Two medial branch blocks (≥80% pain relief)</td>
<td>Not required</td>
<td>&gt;6 months (mean 21 months)</td>
</tr>
</tbody>
</table>

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## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<th>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2010</td>
<td></td>
<td>Radicular pain, lumbar spine surgery within 3 months, uncontrolled major depression or psychiatric disorders, heavy opioid usage (300 mg MED/day), acute or uncontrolled medical illness, pregnant or lactating, unable to be positioned in the prone position, history of adverse reactions to study medications</td>
<td>Approached: 144 (152 in 2008 report) Eligible: 128 Randomized: 120 (60 vs. 60) Analyzed: 120 (including 24 patients with missing data) at 24 m</td>
<td>A vs. B: Age (mean): 46 vs. 48 years Male: 45% vs. 35% Duration of symptoms (months): 108 vs. 108 Baseline pain (0-10 NRS): 7.9 vs. 8.2 Baseline ODI (0-50): 26 vs. 27</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Prior lumbar surgery: 13% vs. 20% Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td></td>
<td>&lt;18 or &gt;90 years, neurological deficits, response to conservative treatment, previous nerve block</td>
<td>Approached: 212 Eligible: 84 Randomized: 84 (42 vs. 42) Analyzed: 73 (41 vs. 32) at 2.5 y</td>
<td>A vs. B: Age (mean): 47 vs. 46 years Male: 44% vs. 36% Duration of symptoms (years): 1.7 vs. 1.8 Baseline pain (0-10 NRS): 7.7 vs. 7.6 Functional status (scale not reported): 3.7 vs. 3.6</td>
<td>A vs. B: Treatments prior to intervention: Prior laminectomy 17% vs. 31% Treatments following intervention: Not reported Occupational: 12% vs. 16% Depression: 73% vs. 81% Generalized anxiety disorder: 76% vs. 72% Somatization disorder: 56% vs. 41% Disabled: 47% vs. 34%</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<th>Author, Year Title</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Number and Frequency of Injections, Number of Levels, Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparator</th>
</tr>
</thead>
</table>
| Manchikanti, 2010  | A: Extra-articular facet joint injection with 0.5-1.5 ml solution of 0.15 mg/ml betamethasone and 0.25% bupivacaine or bupivacaine plus Sarapin in equal amounts, with fluoroscopic guidance  
B: Extra-articular facet joint injection with 0.5-1.5 ml solution of 0.25% bupivacaine or bupivacaine and Sarapin in equal amounts, with fluoroscopic guidance | Number and frequency of injections: 6.1 vs. 5.6 over 2 years (allowed for patients with initial >50% pain relief with subsequent deterioration in pain relief to <50%, timing not reported)  
Number of levels: Unclear (blocks performed on minimum of 2 nerves)  
Provider experience: Not reported | Fluoroscopic guidance | Facet joint nerve block with local anesthetic and Sarapin |
| Manchikanti, 2008  | A: Extra-articular facet joint injection of the medial branch of the medial branch block with 0.5-1 ml of 1 mg/ml methylprednisolone and 0.5% lidocaine or 0.25% bupivacaine plus equal volume of Sarapin, with fluoroscopic guidance  
B: Extra-articular facet joint injection of the medial branch of the medial branch block with 0.5-1 ml of 0.5% lidocaine or 0.25% bupivacaine plus equal volume of Sarapin, with fluoroscopic guidance | Number and frequency of procedures: Mean 7.3 vs. 6.6 over 2.5 years, frequency not specified  
Number of levels: 4 per patient (L1/2 to L4/5) (bilateral for bilateral pain and ipsilateral for unilateral pain)  
Provider experience: Not reported | Fluoroscopic guidance | Extra-articular facet joint injection with local anesthetic and Sarapin |
### Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<td>Manchikanti, 2010</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (mean NRS, 0 to 10): 7.9 vs. 8.2 at baseline, 3.5 vs. 3.8 at 3 m, 3.3 vs. 3.6 at 6 m, 3.5 vs. 3.7 at 12 m, 3.2 vs. 3.5 at 24 m (p&gt;0.05 at all time points)&lt;br&gt;Pain relief &gt;=50% from baseline: 82% (49/60) vs. 83% (50/60) at 3 m, 93% (56/60) vs. 83% (50/60) at 6 m, 85% (51/60) vs. 82% (49/60) at 12 m, 90% (54/60) vs. 85% (51/60) at 24 m</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong>&lt;br&gt;ODI (0 to 50): 26 vs. 27 at baseline, 14 vs. 13 at 3 m, 12 vs. 13 at 6 m, 12 vs. 12 at 12 m, 11 vs. 12 at 24 m (p&gt;0.05 at all time points)&lt;br&gt;ODI improved &gt;=40% from baseline: 72% (43/60) vs. 82% (49/60) at 3 m, 78% (47/60) vs. 83% (50/60) at 6 m, 78% (47/60) vs. 85% (51/60) at 12 m, 88% (53/60) vs. 87% (52/60) at 24 m</td>
</tr>
<tr>
<td></td>
<td><strong>Other Outcomes</strong>&lt;br&gt;Opioid use (mg MED/day): 37 vs. 31 at baseline (p=0.29), 33 vs. 29 at 12 m (p=0.41), 30 vs. 27 at 24 m (p=0.55)</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td><strong>Pain</strong>&lt;br&gt;Pain (0-10 NRS): 7.7 vs. 7.6 at baseline, 3.3 vs. 3.5 post-treatment (duration unclear) (p&gt;0.05)&lt;br&gt;Pain relief &gt;=50%: 100% (41/41) vs. 100% (32/32) at 3 m, 88% (36/41) vs. 75% (24/32) at 6 m, 17% (7/41) vs. 25% (8/32) at 1 y, 5% (2/41) vs. 16% (5/32) at &gt;12 m</td>
</tr>
<tr>
<td></td>
<td><strong>Function</strong>&lt;br&gt;Functional status: (scale not reported) 3.7 vs. 3.6 at baseline, 5.7 vs. 5.3 post-treatment (duration unclear) (P&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td><strong>Other Outcomes</strong>&lt;br&gt;Use of schedule II opioids: 15% (6/41) vs. 19% (6/32) post-treatment (duration unclear)&lt;br&gt;Physical health (scale not reported): 5.1 vs. 4.7 at baseline, 7.1 vs. 6.7 post-treatment (duration unclear) (p&gt;0.05)&lt;br&gt;Mental health (scale not reported): 4.7 vs. 4.2 at baseline, 6.7 vs. 6.3 post-treatment (duration unclear) (p&gt;0.05)&lt;br&gt;Depression (criteria not reported): 73% (30/41) vs. 81% (26/32) (baseline); 58% (24/41) vs. 72% (23/32) (follow-up unclear) (p&gt;0.05)&lt;br&gt;Generalized anxiety disorder (criteria not reported): 76% (31/41) vs. 72% (23/32) (baseline); 61% (25/41) vs. 63% (20/32) (follow-up unclear) (p&gt;0.05)&lt;br&gt;Somatization disorder (criteria not reported): 56% (23/41) vs. 41% (13/32) (baseline); 32% (13/41) vs. 18% (9/32) (p&lt;0.05)&lt;br&gt;Symptom magnification (criteria not reported): 34% (14/41) vs. 28% (9/32) (baseline); 22% (9/41) vs. 19% (6/32) (p&gt;0.05)</td>
</tr>
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## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

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<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchikanti, 2010</td>
<td>24 months</td>
<td>A vs. B</td>
<td>4/60 vs. 5/60 unblinded prematurely due to lack of treatment response</td>
<td>&quot;No adverse events reported&quot;</td>
<td>Fair</td>
<td>No funding</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td></td>
<td>20.0% (12/60 vs. 20.0% (12/60) at 24 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manchikanti, 2001</td>
<td>Unclear (up to 2.5 years)</td>
<td>A vs B</td>
<td>Appears complete</td>
<td>&quot;None of the various types of complications...were observed&quot;</td>
<td>Poor</td>
<td>Not reported</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Facet Joint Block (percent pain relief) Requirements</th>
<th>Imaging Requirements for Patient Selection</th>
<th>Duration of Symptoms at Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks, 1992</td>
<td>RCT</td>
<td>Australia</td>
<td>Lumbar or lumbarsacral pain and referred pain in an extra-spinal region; pain present most of the time for &gt;6 months; unresponsive to non-narcotic analgesics and physical therapy; pain aggravated by sustained postures; imaging not specified</td>
<td>Not required</td>
<td>Not required</td>
<td>&gt;6 months (median 8.5 years)</td>
</tr>
<tr>
<td>Nash, 1990</td>
<td>RCT</td>
<td>UK</td>
<td>Primary low back pain; diffuse lesser intensity pain over the buttocks and posterolateral thigh and occasional radiation to the calf aggravated by sustained positions such as sitting, lying, or standing (diagnostic blocks not performed and no imaging findings required)</td>
<td>Not required</td>
<td>Not required</td>
<td>Not reported</td>
</tr>
<tr>
<td>Pneumaticos, 2006</td>
<td>RCT</td>
<td>USA</td>
<td>Presumed facet joint pain with nonradicular low back pain; symptoms present &gt;6 months; low back pain with extension of lumbar spine; imaging evidence of facet joint abnormalities; response to facet joint block not required</td>
<td>Not required</td>
<td>Required (imaging method not specified)</td>
<td>&gt;6 months</td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks, 1992</td>
<td>Precise radicular pattern of motor or sensory changes in either lower limb (ignoring changes in tendon reflexes); straight leg raising limited to less than 60 degrees by lower limb pain; evidence of progressive spinal disorder of nondegenerative origin; gross psychological distress</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 86 (42 vs. 44) Analyzed: 86 at 3 m, including 3 (1 vs. 2) with missing data</td>
<td>A vs. B: Age: Not reported Male: Not reported Duration of symptoms: Not reported Baseline pain &quot;severe&quot; or &quot;very severe&quot;: 61% vs. 59% Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Spinal surgery 11.9% vs. 11.3% Treatments following interventions: Not specified Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Nash, 1990</td>
<td>Not specified</td>
<td>Approached: Not reported Eligible: Not reported Randomized: 67 (33 vs. 34) Analyzed: 56 (30 vs. 26) at 1 m</td>
<td>A vs. B: Age: Not reported Male: Not reported Duration of symptoms: Not reported Baseline pain &quot;severe&quot; or &quot;very severe&quot;: 61% vs. 59% Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following interventions: Not specified Other patient characteristics: Not reported</td>
</tr>
<tr>
<td>Pneumaticos, 2006</td>
<td>Prior spinal surgery or facet joint injection, other spinal abnormalities, unable to tolerate SPECT, pregnant</td>
<td>Approached: Not reported Eligible: 47 Randomized: 47 (31 vs. 16) Analyzed: 46 (31 vs. 15) at 6 m</td>
<td>A vs. B: Age (mean): 43 vs. 44 years Male: 48% vs. 50% Duration of symptoms: Not reported (minimum 6 months) Baseline AAOS pain score (0 to 100): 46 across groups (NS for between-group difference, data not reported) Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
</tr>
</tbody>
</table>
### Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Number and Frequency of Injections, Number of Levels, Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparator</th>
</tr>
</thead>
</table>
| Marks, 1992  | A: Intraarticular facet joint injection with 20 mg methylprednisolone acetate (0.5 ml) and 1% lignocaine (1.0 to 1.5 ml), with fluoroscopic guidance  
B: Extra-articular facet joint injection at medial articular branch of posterior primary ramus with 20 mg methylprednisolone acetate (0.5 ml) and 1% lignocaine (1.0 to 1.5 ml), with fluoroscopic guidance | Number and frequency of injections: Not reported  
Number of levels: Not reported  
Provider experience: Not reported | Fluoroscopic guidance, contrast verification not reported | Extra-articular facet joint injection with corticosteroid and local anesthetic |
| Nash, 1990   | A: Intraarticular facet joint injection with 20 mg methylprednisolone and 2% lignocaine (1 ml) and 0.5% bupivacaine (1 ml), with fluoroscopic guidance  
B: Extra-articular facet joint injection at medial branch of posterior ramus with 2% lignocaine (1 ml) and 0.5% bupivacaine (1 ml), with fluoroscopic guidance | Number and frequency of injections: Not reported  
Number of levels: Not reported (extra-articular injections performed at target level and level above)  
Provider experience: Not reported | A: Fluoroscopic guidance with intraarticular contrast confirmation  
B: Fluoroscopic guidance with contrast confirmation at site | Extra-articular facet joint injection with local anesthetic |
| Pneumaticos, 2006 | A: Intra-articular and extra-articular facet joint injection with 3 mg betamethasone (0.5 ml) and 0.5% bupivacaine (2.5 ml) (half within joint and half around posterior facet capsule), guided by single photon electronic computed tomography (at positive sites when present or at levels specified by referring physician if no positive sites on SPECT), with fluoroscopic guidance  
B: Intra-articular and extra-articular facet joint injection with 3 mg betamethasone (0.5 ml) and 0.5% bupivacaine (2.5 ml) (half within joint and half around posterior facet capsule), at levels specified by referring physician, with fluoroscopic guidance | Number and frequency of injections: Not reported  
Number of levels: Mean 4 joints/patient (not reported by treatment group)  
Provider experience: 2 providers with 7 and 10 years of experience | Fluoroscopic guidance | Comparison of SPECT vs. no SPECT to guide site of facet joint injections |
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks, 1992</td>
<td>Pain: Pain response excellent (none, slight, good, excellent): 7.1% (3/42) vs. 0% (0/44) at 1 m, 4.8% (2/42) vs. 0% (0/44) at 3 m</td>
</tr>
<tr>
<td></td>
<td>Pain response good or excellent: 36% (15/42) vs. 20% (9/44) at 1 m; 22% (9/42) vs. 14% (6/44) at 3 m</td>
</tr>
<tr>
<td>Nash, 1990</td>
<td>Pain: Pain moderate to very severe (nil to very severe): 83% (25/30) vs. 85% (22/26) at 1 m</td>
</tr>
<tr>
<td></td>
<td>Function: Functional status full (nil, limited, full): 57% (17/30) vs. 58% (15/26) at 1 m</td>
</tr>
<tr>
<td></td>
<td>Other Outcomes: Drug intake decreased: 30% (9/30) vs. 38% (10/26) at 1 m</td>
</tr>
<tr>
<td>Pneumaticos, 2006</td>
<td>Pain: AAOS pain score, change from baseline (0-100, estimated from graph): 20 vs. 12 at 1 m, 23 vs. 15 at 3 m, 16 vs. 11 at 6 m</td>
</tr>
<tr>
<td></td>
<td>AAOS pain score improved &gt;17 points: 48% (15/31) vs. 45% (5/16) at 1 m, 45% (14/31) vs. 45% (5/16) at 3 m, 39% (12/31) vs. 36% (5/14) at 6 m</td>
</tr>
</tbody>
</table>
# Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawals due to Adverse Events</th>
<th>Quality Rating</th>
<th>Sponsor</th>
</tr>
</thead>
</table>
| Marks, 1992         | 3 months             | 2.4% (1/42) vs. 4.8% (2/44) at 3 m | Appears complete | A vs. B:
"Serious complications": 0% (0/42) vs. 0% (0/44)
Headache: 9.5% (4/42) vs. 6.8% (3/44)
Paraesthesia of one leg below knee without motor signs: 2.4% (1/42) vs. 2.3% (1/44)
Nausea: 2.4% (1/42) vs. 2.3% (1/44)
Worsening of pain (1 month): 21.4% (9/42) vs. 29.5% (13/44) | Fair | Not reported |
| Nash, 1990          | 1 month              | A vs. B 9.1% (3/33) vs. 24% (8/34) at 1 m | Not reported | A vs. B
Dermatomal analgesia (periprocedural): 0% vs. 0%
Motor weakness (periprocedural): 0% vs. 0% | Poor | Not reported |
| Pneumaticos, 2006   | 6 months             | A vs. B 0% (0/31) vs. 2/15 (13%) at 6 months | Appears complete | Not reported | Fair | Roderick Duncan MacDonald Research Fund of St Luke's Episcopal Hospital and Institute of Orthopedic Research and Education |
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Facet Joint Block (percent pain relief) Requirements</th>
<th>Imaging Requirements for Patient Selection</th>
<th>Duration of Symptoms at Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribeiro, 2013</td>
<td>RCT</td>
<td>Brazil Single center University outpatient clinic</td>
<td>18 to 80 years of age; continuous or intermittent low back pain for 3 months or longer; baseline pain intensity between 4 to 8 (on a 10-point VAS scale); diagnosis of facet joint syndrome based on the following criteria: local paraspinal tenderness (with or without radiation to the groin or thigh); pain on hyperextension, rotation or lateral bending; absence of neurological deficit; findings of degenerative facet disease (osteophyte and bone sclerosis) on lumbar spine radiograph</td>
<td>Not required</td>
<td>Required (lumbar radiograph)</td>
<td>4.3 years (mean, minimum 3 months)</td>
</tr>
<tr>
<td>Author, Year Title</td>
<td>Exclusion Criteria</td>
<td>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</td>
<td>Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain</td>
<td>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
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<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribeiro, 2013</td>
<td>Known diagnosis of low back pain of an origin other than the facet joints; prior spine surgery; uncontrolled diabetes, systemic arterial hypertension, or glaucoma; diabetes with insulin use; fibromyalgia; changes in medications used for low back pain during the previous 2 months; allergy to the contrast medium; pregnancy or suspected pregnancy; current involvement in litigation</td>
<td>Approached: 82 Eligible: 69 Randomized: 60 (31 vs. 29) Analyzed: 60 (31 vs. 29) at 6 m</td>
<td>A vs. B: Age (mean): 63 vs. 64 years Male: 19% vs. 17% Duration of pain (mean, months): 50 vs. 53 Baseline pain (0-10 VAS): 7.0 vs. 6.8 (p=0.8) Baseline pain on extension (0-10 VAS): 6.8 vs. 6.5 (p=0.53) Baseline RDQ (0-24): 15 vs. 16 (p=0.31)</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Patients to remain at rest for 48 hours, take acetaminophen as needed (maximum 750 mg 4x daily) or diclofenac tablets as needed (maximum 50 mg 3x daily), no other medications should be taken or nonpharmacological therapy was to be taken for back pain Other patient characteristics: Diabetes: 13% vs. 17%, systemic arterial hypertension: 20% vs. 21%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Number and Frequency of Injections, Number of Levels, Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparator</th>
</tr>
</thead>
</table>
| Ribeiro, 2013      | A: Intra-articular facet joint injection with 20 mg triamcinolone hexacetonide (1 ml) and lidocaine (dose not reported, 1 ml), with fluoroscopic guidance  
B: Intramuscular injections in the lumbar paravertebral musculature with 20 mg triamcinolone hexacetonide (1 ml) and lidocaine (dose not reported, 1 ml) | Number and frequency of injections: Appeared to be administered once  
Number of levels: 6 injections performed bilaterally at L3 to S1, each level injected bilaterally  
Injections performed by a rheumatologist with experience in minimally invasive procedures | Fluoroscopic guidance | Intramuscular injection |
Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Results (acute and subacute, or chronic, or mixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribeiro, 2013</td>
<td>A vs. B</td>
<td>Pain (0-10 VAS): 7.0 vs. 6.8 at baseline (p=0.54), 4.0 vs. 4.0 at 1 week (p=0.92), 4.0 vs. 3.6 at 1 m (p=0.92), 4.7 vs. 6.1 at 3 m (p=0.06), 5.3 vs. 5.8 at 6 m (p=0.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain on extension (0-10 VAS): 6.8 vs. 6.5 at baseline (p=0.53), 3.6 vs. 4.4 at 1 week (p=0.30), 4.0 vs. 5.1 at 1 m (p=0.17), 5.1 vs. 6.4 at 3 m (p=0.10), 5.3 vs. 6.1 at 6 m (p=0.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function RDQ (0-24): 15 vs. 16.4 at baseline (p=0.31), 11.5 vs. 13.4 at 1 week (p=0.24), 10.2 vs. 12.2 at 1 m (p=0.21), 10.6 vs. 14.7 at 3 m (p=0.01), 10.9 vs. 13.4 at 6 m (p=0.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global Improvement (5-point Likert scale, options were &quot;much worse, a little worse, unchanged, a little better, or much better&quot;), percentage of patients who were &quot;much better&quot;: 58% vs. 31% at 1 week (intergroup p=0.029), 55% vs. 52% at 1 m (p=0.4), 55% vs. 45% at 3 m (p=0.82), 48% vs. 24% at 6 m (p=0.26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality of life SF-36 Physical Functioning: p=0.21 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Role Physical: p=0.023 between the groups over time (favors group A) (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Body Pain: p=0.15 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 General Health: p=0.52 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Vitality: p=0.45 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Social Functioning: p=0.16 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Role Emotional: p=0.35 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SF-36 Mental Health: p=0.68 between the groups over time (data NR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medication usage Acetaminophen daily intake (unit of measurement not reported): 5.2 vs. 3.7 at 1 week (p=0.34), 6.0 vs. 9.4 at 1 m (p=0.40), 19.5 vs. 19.7 at 3 m (p=0.98), 26.4 vs. 28.8 at 6 m (p=0.83)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diclofenac daily intake (unit of measurement not reported): 1.5 vs. 1.4 at 1 week (p=0.98), 4.3 vs. 5.4 at 1 m (p=0.72), 3.1 vs. 10.4 at 3 m (p=0.06), 5.9 vs. 14.9 at 6 m (p=0.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No differences between groups in terms of the number of patients between groups who used other treatments, including pharmacological treatments, physical therapy, and spine surgery.</td>
</tr>
</tbody>
</table>
### Appendix E5. Epidural Steroid Injections for Facet Joint Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Title</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawals due to Adverse Events</th>
<th>Quality Rating</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribeiro, 2013</td>
<td></td>
<td>6 months</td>
<td>A vs. B</td>
<td>Appears that all patients received injection as randomized.</td>
<td>Gastrointestinal bleeding (considered serious) and endoscopic surgery: 0% (0/31) vs. 3% (1/29) between 3 and 6 m Spinal arthrodesis for aggravation of back pain after a fall: 3% (1/31) vs. 0% (0/29) (after 1 m visit) Death (cause not reported): 3% (1/31) vs. 0% (0/29) between 3 and 6 m &quot;No significant differences were found between the groups regarding the number of adverse [local and systemic] events.&quot; Events included: Postprocedure pain: 9 patients total Cutaneous hypochromia: 1 patient total Increased blood glucose: 5 patients total Vaginal bleeding: 3 patients total Dizziness: 3 patients total Nausea: 3 patients total</td>
<td>Good</td>
<td>Grant funding (from Fundacao de Amparo a Pesquisa do Estado de Sao Paulo)</td>
</tr>
</tbody>
</table>

AAOS = American Academy of Orthopedic Surgeons; CI = confidence interval; CT=computed tomography; EQ-5D = EuroQoL five-level version; MED = minimal effective dose; MRI = magnetic resonance imaging; NASS = North American Spine Society; NR = not reported; NRS = numeric rating scale; ODI = Oswestry Disability Index; RCT = randomized controlled trial; SPECT = single photon electronic computed tomography; VAS = visual analogue scale

Please see Appendix C. Included Studies for full study references.
## Appendix E6. Epidural Steroid Injections for Sacroiliac Pain

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Design</th>
<th>Country Setting</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)</th>
<th>Type of Intervention (experimental &amp; control groups, dose, duration of treatment)</th>
<th>Subject Characteristics</th>
<th>Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker’s compensation status, ongoing litigation, smoking status, other treatments received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luukkainen, 2002</td>
<td>RCT</td>
<td>Finland Single center Rheumatology clinic</td>
<td>18-70 years of age; pain &gt;3 months in sacroiliac joint region; positive results on one of the following: Gaenslen's test, Patrick's test, thigh flexion test; no signs of infection or neoplasm; no radiological signs of sacroiliitis; no signs of spondyloarthopathy; imaging findings not specified</td>
<td>Not reported</td>
<td>Approach: Not reported Eligible: Not reported Randomized: 24 (13 vs. 11) Analyzed: 24</td>
<td>A: Periartricular sacroiliac joint injection with 60 mg methylprednisolone (1.5 ml) and 20 mg/ml lidocaine (1.5 ml) (n=13) B: Periartricular sacroiliac joint injection with 20 mg/ml lidocaine (1.5 ml) (n=11)</td>
<td>A vs. B: Age (mean): 50 vs. 49 years Male: 23% vs. 36% Race: Not reported Duration of symptoms (years): 5.4 vs. 4.4 Baseline pain (median, 0-100 VAS): 53 vs. 53 Baseline function: Not reported</td>
<td>A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported</td>
</tr>
</tbody>
</table>
## Appendix E6. Epidural Steroid Injections for Sacroiliac Pain

<table>
<thead>
<tr>
<th>Author, Year Title</th>
<th>Number and Frequency of Injections</th>
<th>Number of Levels</th>
<th>Provider Experience</th>
<th>Imaging Guidance</th>
<th>Type of Comparison</th>
<th>Results</th>
<th>Duration of Followup</th>
<th>Loss to Followup</th>
<th>Compliance to Treatment</th>
<th>Adverse Events and Withdrawal due to Adverse Events</th>
<th>Sponsor</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luukkainen, 2002</td>
<td>Number of injections: Single injection</td>
<td>Number of levels: Sacroiliac</td>
<td>S Equinac Provider experience: Not reported</td>
<td>No use of imaging guidance reported</td>
<td>Periarticular sacroiliac joint injection with local anesthetic</td>
<td>A vs. B: Pain Improvement in pain (median, 0-100 VAS): -40 vs. -13 at 1 m (p=0.046)</td>
<td>1 month</td>
<td>Not reported</td>
<td>Appears complete</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Fair</td>
</tr>
</tbody>
</table>

m=month; RCT=randomized controlled trial; SIJ=sacroiliac joint; VAS=visual analogue scale

Please see Appendix C. Included Studies for full study references.
### Appendix F1. Quality Assessment of Epidural Steroid Injections for Radicular Pain and Herniated Disc

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackerman, 2007</td>
<td>Yes</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
</tr>
<tr>
<td>Ahadian, 2011</td>
<td>Yes</td>
<td>Unclear</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Arden, 2005/ Price, 2005</td>
<td>Yes</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No/Unclear</td>
</tr>
<tr>
<td>Aronsohn, 2010</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
<td>No</td>
</tr>
<tr>
<td>Becker, 2007</td>
<td>Yes</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Beliveau, 1971</td>
<td>No</td>
<td>No</td>
<td>Unclear</td>
<td>Yes</td>
<td>Unclear</td>
<td>Unclear</td>
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<tr>
<td>Breivik, 1976</td>
<td>Yes</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
</tr>
<tr>
<td>Buchner, 2000</td>
<td>Unclear</td>
<td>Unclear</td>
<td>No</td>
<td>Yes</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Burgher, 2011</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bush, 1991</td>
<td>Unclear</td>
<td>Unclear</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
</tr>
<tr>
<td>Buttermann, 2004</td>
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Appendix F1. Quality Assessment of Epidural Steroid Injections for Radicular Pain and Herniated Disc

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Appendix F1. Quality Assessment of Epidural Steroid Injections for Radicular Pain and Herniated Disc

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Please see Appendix C. Included Studies for full study references.
### Appendix F2. Quality Assessment of Epidural Steroid injections for Spinal Stenosis

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### Appendix F2. Quality Assessment of Epidural Steroid injections for Spinal Stenosis

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Please see Appendix C. Included Studies for full study references.
## Appendix F3. Quality Assessment of Epidural Steroid Injections for Nonradicular Pain

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Please see Appendix C. Included Studies for full study references.
## Appendix F4. Epidural Steroid Injections for Postsurgery Pain

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Please see Appendix C. Included Studies for full study references.
## Appendix F5. Quality Rating of Facet Joint Steroid Injections

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### Appendix F5. Quality Rating of Facet Joint Steroid Injections

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<td>Unclear</td>
<td>Fair</td>
</tr>
<tr>
<td>Manchikanti, 2008</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Poor</td>
</tr>
<tr>
<td>Manchikanti, 2001</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Poor</td>
</tr>
<tr>
<td>Marks, 1992</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Fair</td>
</tr>
<tr>
<td>Nash, 1990</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td>Pneumaticos, 2006</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Ribeiro, 2013</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Good</td>
</tr>
</tbody>
</table>

Please see Appendix C. Included Studies for full study references.
### Appendix F6. Quality Rating of Epidural Steroid Injections for Sacroiliac Pain

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Randomization Adequate?</th>
<th>Allocation Concealment Adequate?</th>
<th>Groups Similar at Baseline?</th>
<th>Eligibility Criteria Specified?</th>
<th>Outcome Assessors Masked?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luukkainen, 2002</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Appendix F6. Quality Rating of Epidural Steroid Injections for Sacroiliac Pain

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Care Provider Masked (injection/postinjection)</th>
<th>Patient Masked?</th>
<th>Attrition and Withdrawals Reported?</th>
<th>Attrition Acceptable and Comparable?</th>
<th>Analyze People in the Groups in Which They Were Randomized?</th>
<th>Primary Outcome Specified and Reported?</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luukkainen, 2002</td>
<td>Unclear</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
<td>Yes</td>
<td>No</td>
<td>Fair</td>
</tr>
</tbody>
</table>

Please see Appendix C. Included Studies for full study references.
### Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
<th>Risk of bias</th>
<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key Question 1. In patients with low back pain, what is the effectiveness of epidural corticosteroid injections, facet joint corticosteroid injections, medial branch blocks, and sacroiliac joint corticosteroid injections versus epidural nonsteroid injection, nonepidural injection, no injection, surgery or non-surgical therapies on outcomes related to pain, function and quality of life?</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Epidural injections for radiculopathy</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Epidural corticosteroid injections versus placebo interventions</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean improvement in pain, immediate-term</td>
<td>6 trials N=701</td>
<td>Moderate</td>
<td>No serious inconsistency</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>Epidural corticosteroid injections associated with greater improvement versus placebo interventions (6 trials, WMD -7.55 on 0 to 100 scale, 95% CI -11.4 to -3.74, I²=30%)</td>
</tr>
<tr>
<td>Mean improvement in pain, short-term</td>
<td>14 trials N=1537</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>No difference (14 trials, WMD -3.94, 95% CI -9.11 to 1.24, I²=82%)</td>
</tr>
<tr>
<td>Mean improvement in pain, intermediate-term</td>
<td>4 trials N=436</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (4 trials, WMD 0.07, 95% CI -8.41 to 8.26, I²=82%)</td>
</tr>
<tr>
<td>Mean improvement in pain, long-term</td>
<td>6 trials N=767</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (6 trials, WMD -0.86, 95% CI -3.78 to 2.06, I²=0%)</td>
</tr>
<tr>
<td>Successful pain outcome, short-term</td>
<td>8 trials N=897</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>No difference (8 trials, RR 1.21, 95% CI 0.98 to 1.49, I²=67%)</td>
</tr>
<tr>
<td>Successful pain outcome, intermediate-term</td>
<td>3 trials N=298</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>No difference (3 trials, RR 1.12, 95% CI 0.93 to 1.36, I²=41%)</td>
</tr>
<tr>
<td>Successful pain outcome, long-term</td>
<td>4 trials N=504</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (4 trials, RR 1.10, 95% CI 0.94 to 1.28, I²=0%)</td>
</tr>
<tr>
<td>Mean improvement in function, immediate-term</td>
<td>4 trials N=464</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference, based on all trials (4 trials, SMD -0.75, 95% CI -1.62 to 0.11, I²=94%). Excluding an outlier trial eliminated statistical heterogeneity and resulted in a statistically significant effect favoring epidural corticosteroid injections (3 trials, SMD -0.33, 95% CI -0.56 to -0.09, I²=0%)</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
<th>Risk of bias</th>
<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean improvement in function, short-term</td>
<td>11 trials N=1226</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (11 trials, SMD -0.03, 95% CI -0.20 to 0.15, I²=53%)</td>
</tr>
<tr>
<td>Mean improvement in function, intermediate-term</td>
<td>5 trials N=619</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (5 trials, SMD -0.30, 95% CI -0.74 to 0.15, I²=86%)</td>
</tr>
<tr>
<td>Mean improvement in function, long-term</td>
<td>8 trials N=950</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>No difference (7 trials, SMD -0.23, 95% CI -0.55 to 0.10, I²=82%)</td>
</tr>
<tr>
<td>Successful functional outcome, short-term</td>
<td>6 trials N=873</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (6 trials, RR 1.01, 95% CI 0.74 to 1.38, I²=76%)</td>
</tr>
<tr>
<td>Successful functional outcome, intermediate-term</td>
<td>2 trials N=240</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 1.18, 95% CI 0.89 to 1.57, I²=71%)</td>
</tr>
<tr>
<td>Successful functional outcome, long-term</td>
<td>3 trials N=468</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>No difference (3 trials, RR 1.15, 95% CI 0.97 to 1.35, I²=0%)</td>
</tr>
<tr>
<td>Risk of surgery, short-term</td>
<td>5 trials N=845</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Epidural corticosteroid injections were associated with lower risk versus placebo interventions (8 trials, RR 0.62, 95% CI 0.41 to 0.92, I²=0%), but the estimate was no longer statistically significant after exclusion of poor-quality trials (5 trials, RR 0.69, 95% CI 0.42 to 1.13, I²=0%)</td>
</tr>
<tr>
<td>Risk of surgery, intermediate-term</td>
<td>1 trial N=36</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, RR 0.56, 95% CI 0.12 to 2.68)</td>
</tr>
<tr>
<td>Risk of surgery, long-term</td>
<td>14 trials N=1208</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (14 trials, RR 0.97, 95% CI 0.75 to 1.25, I²=23%)</td>
</tr>
<tr>
<td>Successful composite outcome, short-term</td>
<td>9 trials N=604</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (9 trials, RR 1.13, 95% CI 0.98 to 1.32, I²=3.5%)</td>
</tr>
<tr>
<td>Successful composite outcome, intermediate-term</td>
<td>1 trial N=58</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, RR 0.71, 95% CI 0.34 to 1.48)</td>
</tr>
<tr>
<td>Successful composite outcome, long-term</td>
<td>2 trials N=153</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, 1.04, 95% CI 0.81 to 1.34, I²=0%)</td>
</tr>
</tbody>
</table>

**Epidural corticosteroid injections versus other interventions**

| Pain, function, surgery | 2 trials N=150 | High | Inconsistent | Direct | Imprecise | Insufficient | There was insufficient evidence from two trials to determine effects of epidural corticosteroid injections versus discectomy, due to methodological shortcomings in the trials |
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
<th>Risk of bias</th>
<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain function, surgery</td>
<td>1 trial N=90</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found epidural corticosteroid injections associated with lower likelihood than minimally invasive lumbar decompression of achieving ≥25 point improvement in leg pain (RR 0.49, 95% CI 0.24 to 1.0), ≥13 point improvement in ODI (RR 0.34, 95% CI 0.34 to 0.95), and ≥5 point improvement in SF-36 (RR 0.34, 95% CI 0.12 to 0.95) through 2 years. There was no difference in risk of undergoing surgery (RR 0.45, 95% CI 0.09 to 2.19)</td>
</tr>
<tr>
<td>Pain, function, surgery</td>
<td>1 trial N=26</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from one small, fair-quality trial to determine effects of epidural corticosteroid injections versus epidural clonidine injection</td>
</tr>
<tr>
<td>Pain, function, analgesic use</td>
<td>1 trial N=132</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found transforaminal epidural corticosteroid injection superior to etanercept on the ODI at 1 month (difference -16 on 0 to 100 scale, 95% CI -26.0 to -6.27). There were no differences on other outcomes, including pain and analgesic use</td>
</tr>
<tr>
<td>Pain, function</td>
<td>1 trial N=72</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no differences between epidural corticosteroid versus autologous conditioned serum administered via the oblique interlaminar approach in improvement in pain or ODI scores after 22 weeks</td>
</tr>
<tr>
<td>Pain, function, surgery</td>
<td>2 trials N=151</td>
<td>High</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from two trials to determine effects of epidural corticosteroid injections versus non-surgical, non-interventional therapies due to methodological shortcomings in the trials and differences in the non-surgical, non-interventional therapies evaluated</td>
</tr>
<tr>
<td>Pain, function</td>
<td>1 trial N=53</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found transforaminal epidural corticosteroid injection with corticosteroid plus hypertonic saline associated with greater decrease in pain intensity through 4 months than a corticosteroid injection alone (difference from baseline -2.78 vs. -1.50 on 0 to 10 NRS, ( p=0.05 )), though the effect was smaller and no longer statistically significant at 6 months. There were no differences in global...</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design</th>
<th>Risk of bias</th>
<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain, function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>assessment or the ODI</td>
</tr>
<tr>
<td></td>
<td>1 trial</td>
<td>Moderate</td>
<td>Cannot</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no difference between transforaminal epidural injection with corticosteroid versus corticosteroid plus low-dose clonidine in pain scores through 12 weeks in patients with subacute low back pain</td>
</tr>
<tr>
<td></td>
<td>N=177</td>
<td></td>
<td>determine (1 trial)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Epidural injections for spinal stenosis</td>
<td>Epidural corticosteroid injections versus placebo interventions</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean improvement in pain, immediate-term</td>
<td>1 trial</td>
<td>Moderate</td>
<td>Cannot</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Epidural corticosteroid injection was superior to placebo at intermediate-term (1 trial, WMD -22.0, 95% CI -36.0 to -8.0)</td>
</tr>
<tr>
<td></td>
<td>N=29</td>
<td></td>
<td>determine (1 trial)</td>
<td></td>
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<tr>
<td>Mean improvement in pain, short-term</td>
<td>5 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (5 trials, WMD 0.62, 95% CI -2.87 to 4.11, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=615</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean improvement in pain, intermediate-term</td>
<td>3 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, WMD 3.73, 95% CI -0.81 to 8.26, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=179</td>
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</tr>
<tr>
<td>Mean improvement in pain, long-term</td>
<td>1 trial</td>
<td>Moderate</td>
<td>Cannot</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, mean difference 4.00, 95% CI -2.87 to 10.9)</td>
</tr>
<tr>
<td></td>
<td>N=100</td>
<td></td>
<td>determine (1 trial)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful pain outcome, short-term</td>
<td>3 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, RR 0.98, 95% CI 0.84 to 1.15, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=546</td>
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<td></td>
</tr>
<tr>
<td>Successful pain outcome, intermediate-term</td>
<td>2 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 0.98, 95% CI 0.78 to 1.24, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=160</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Successful pain outcome, long-term</td>
<td>3 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, RR 0.97, 95% CI 0.74 to 1.28, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=197</td>
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</tr>
<tr>
<td>Mean improvement in function, immediate-term</td>
<td>2 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, SMD -0.32, 95% CI -0.85 to 0.22, I2=0%)</td>
</tr>
<tr>
<td></td>
<td>N=55</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mean improvement in function, short-term</td>
<td>5 trials</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>No difference (5 trials, SMD -0.03, 95% CI -0.31 to 0.26, I2=60%)</td>
</tr>
<tr>
<td></td>
<td>N=615</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
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<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean improvement in function, intermediate-term</td>
<td>3 trials N=179</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, WMD 2.81, 95% CI -0.44 to 6.06, I²=0%)</td>
</tr>
<tr>
<td>Mean improvement in function, long-term</td>
<td>2 trials N=160</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, WMD 2.78, 95% CI -1.24 to 6.79, I²=0%)</td>
</tr>
<tr>
<td>Successful functional outcome, short-term</td>
<td>3 trials N=546</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, RR 0.91, 95% CI 0.70 to 1.18, I²=37%)</td>
</tr>
<tr>
<td>Successful functional outcome, intermediate-term</td>
<td>2 trials N=160</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 0.96, 95% CI 0.74 to 1.25, I²=0%)</td>
</tr>
<tr>
<td>Successful functional outcome, long-term</td>
<td>2 trials N=160</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 0.95, 95% CI 0.71 to 1.26, I²=0%)</td>
</tr>
<tr>
<td>Successful composite outcome, short-term</td>
<td>2 trials N=136</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 1.18, 95% CI 0.55 to 2.55, I²=80%)</td>
</tr>
<tr>
<td>Successful composite outcome, intermediate-term</td>
<td>1 trial N=100</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, RR 0.93, 95% CI 0.63 to 1.35)</td>
</tr>
<tr>
<td>Successful composite outcome, long-term</td>
<td>2 trials N=130</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, RR 1.16, 95% CI 0.76 to 1.78, I²=0%)</td>
</tr>
<tr>
<td>Risk of surgery, long-term</td>
<td>1 trial N=30</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, RR 0.76, 95% CI 0.38 to 1.54)</td>
</tr>
</tbody>
</table>

### Epidural corticosteroid injections versus other interventions

| Pain, function | 1 trial N=38 | Moderate | Cannot determine (1 trial) | Direct | Imprecise | Low | One trial found an epidural corticosteroid injection associated with lower likelihood of experiencing ≥2 point improvement in pain at 2 weeks versus the minimally invasive lumbar decompression procedure, but the difference was no longer present at 6 weeks. There was no difference in function |
| Pain, function | 1 trial N=23 | Moderate | Cannot determine (1 trial) | Direct | Imprecise | Low | One trial found no differences between and epidural corticosteroid injection versus intense physical therapy in pain intensity or functional outcomes at 2 weeks through 6 months |
| Pain, function | 1 trial N=80 | Moderate | Cannot determine (1 trial) | Direct | Imprecise | Low | One trial found epidural corticosteroid injection associated with worse leg pain than epidural etanercept injection at 1 month, with no difference in functional outcomes |
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
<th>Risk of bias</th>
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<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain, function</td>
<td>1 trial N=50</td>
<td>High</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from one poor-quality trial to determine effects of epidural corticosteroid injections versus epidural adhesiolysis</td>
</tr>
<tr>
<td>Epidural corticosteroid injections versus placebo interventions for non-radicular low back pain</td>
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</tr>
<tr>
<td>Pain, function, opioid use</td>
<td>2 trials N=240</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials found no differences between epidural corticosteroid injections and epidural local anesthetic injections in pain, function, or opioid use</td>
</tr>
<tr>
<td>Epidural injections for chronic post-surgical pain</td>
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</tr>
<tr>
<td>All outcomes</td>
<td>0 trials</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>Insufficient</td>
<td>No trial compared an epidural injection with corticosteroid versus a placebo intervention</td>
</tr>
<tr>
<td>All outcomes</td>
<td>5 trials N=274</td>
<td>High</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>Evidence from 5 trials was insufficient to determine effects of epidural corticosteroid injections versus other interventions, due to methodological limitations, differences in the comparators evaluated, and small sample sizes</td>
</tr>
<tr>
<td>Facet joint injections</td>
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</tr>
<tr>
<td>Pain, function</td>
<td>2 trials N=171</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials found no clear differences between an intra-articular facet joint injection with corticosteroid versus saline in pain or function at one to three months</td>
</tr>
<tr>
<td>All outcomes</td>
<td>1 trial N=67</td>
<td>High</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>Evidence from one small, poor-quality trial was insufficient to determine effects of an intra-articular corticosteroid facet joint injection versus medial branch local anesthetic injection</td>
</tr>
<tr>
<td>All outcomes</td>
<td>1 trial N=81</td>
<td>High</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>Evidence from one poor-quality trial was insufficient to determine effects of an extra-articular facet joint corticosteroid injection versus intra-articular saline injection</td>
</tr>
</tbody>
</table>
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</tr>
</thead>
<tbody>
<tr>
<td>Pain, function, opioid use</td>
<td>2 trials N=204</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials found no differences between medial branch corticosteroid injection versus medial branch local anesthetic injection in pain, function, or opioid use through 12 to 24 months</td>
</tr>
<tr>
<td>Pain, function, quality of life</td>
<td>1 trial N=60</td>
<td>Low</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no clear differences between an intra-articular facet joint versus an intramuscular corticosteroid injection in pain, function, or quality of life through 6 months</td>
</tr>
<tr>
<td>Pain, function, quality of life</td>
<td>1 trial N=60</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no differences between intra-articular facet injection with triamcinolone acetonide versus hyaluronic acid in pain or function at 1 month or in health-related quality of life at 1 week</td>
</tr>
<tr>
<td>Pain, functional analgesic use</td>
<td>1 trial N=56</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no differences between intra-articular corticosteroid injection plus sham neurotomy versus medial branch radiofrequency facet neurotomy plus local anesthetic injection in pain, function, or analgesic use at six months</td>
</tr>
<tr>
<td>Pain, quality of life</td>
<td>1 trial N=100</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One fair-quality trial found medial branch corticosteroid injection inferior to radiofrequency facet denervation on pain at 1, 6, and 12 months, with no differences in quality of life (1, 6, and 12 months), but results may have been confounded by differential use of diagnostic blocks to select patients for inclusion</td>
</tr>
</tbody>
</table>

**Sacrolilac joint injections**

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
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<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>All outcomes</td>
<td>1 trial N=24</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from one small (n=24) trial to determine effects of periarticular sacroiliac corticosteroid injection versus local anesthetic injection</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Key Question 1a. How does effectiveness vary according to the medication (corticosteroid, local anesthetic) used, the dose or frequency of injections, the number of levels treated, or degree of provider experience?</td>
<td></td>
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<tr>
<td><strong>Epidural injections</strong></td>
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</tr>
<tr>
<td><strong>Epidural corticosteroid injections for radiculopathy</strong></td>
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</tr>
<tr>
<td>Effects of different corticosteroids: all outcomes</td>
<td>4 trials&lt;sup&gt;3&lt;/sup&gt; N=329</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Four trials that directly compared epidural corticosteroid injections for radiculopathy with different corticosteroids found few differences in outcomes including pain and function, but conclusions were limited by differences in the corticosteroids compared, doses, and some inconsistency.</td>
</tr>
<tr>
<td>Effects of different local anesthetics: all outcomes</td>
<td>0 trials&lt;sup&gt;3&lt;/sup&gt;</td>
<td>No direct evidence</td>
<td>No direct evidence</td>
<td>Indirect</td>
<td>No direct evidence</td>
<td>Insufficient</td>
<td>No trial directly compared effects of epidural corticosteroid injections with one local anesthetic versus another</td>
</tr>
<tr>
<td>Effects of corticosteroid dose: all outcomes</td>
<td>6 trials&lt;sup&gt;3&lt;/sup&gt; N=506</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Six trials that directly compared epidural injections for radiculopathy using different corticosteroid doses found no clear differences in outcomes including pain and function</td>
</tr>
<tr>
<td>Effects of number of injections, number of levels injected, or provider experience: all outcomes</td>
<td>2 trials N=334</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Low for number of injections, insufficient for number of levels and provider experience</td>
<td>No trial directly compared the effectiveness of epidural corticosteroid injections based on the number of injections, number of levels injected, or provider experience. Two trials found no association between receipt of more injections and better outcomes</td>
</tr>
</tbody>
</table>
### Appendix G. Strength of Evidence

<table>
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<tr>
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<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epidural corticosteroid injections for spinal stenosis</strong></td>
<td>1 trial N=70</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no clear differences between caudal epidural injection for spinal stenosis with methylprednisolone versus triamcinolone in pain or claudication distance through 6 months, though results favored methylprednisolone</td>
</tr>
<tr>
<td><strong>Facet joint injections</strong></td>
<td>0 trials</td>
<td>No direct evidence</td>
<td>No direct evidence</td>
<td>Indirect</td>
<td>No direct evidence</td>
<td>Insufficient</td>
<td>No trial of facet joint injections directly compared effects of different corticosteroids, different local anesthetics, different doses, different frequency or number of injections, or degree of provider experience. Indirect evidence was too limited to reach reliable conclusions</td>
</tr>
<tr>
<td><strong>Key Question 1b. How does effectiveness vary according to use of imaging guidance or route of administration (e.g., for epidural injections interlaminar, transfominal, caudal for epidural injections and for facet joint injections intra-articular, extra-articular [pericapsular] or medial branch injections)?</strong></td>
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<tr>
<td><strong>Epidural injections</strong></td>
<td>Use of imaging</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Effects of imaging guidance versus no imaging guidance: All outcomes</strong></td>
<td>0 trials</td>
<td>No direct evidence</td>
<td>No direct evidence</td>
<td>Indirect</td>
<td>No direct evidence</td>
<td>Insufficient</td>
<td>No trial directly compared the effectiveness of epidural injections for radiculopathy performed with or without imaging guidance. Indirect evidence was not useful for evaluating effects of imaging guidance on estimates of effects because use of imaging guidance was highly associated with the epidural technique used</td>
</tr>
<tr>
<td>Effects of fluoroscopic plus Doppler versus fluoroscopic imaging guidance: Pain, function</td>
<td>1 trial N=110</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial of caudal epidural corticosteroid injections for radiculopathy found no difference between fluoroscopic plus Doppler guidance versus fluoroscopic guidance alone in pain or ODI scores through 12 weeks</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
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<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects of imaging to guide epidural injection targets: Pain, function, medication use</td>
<td>1 trial N=132</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no difference between use of MRI versus history and physical examination without MRI to guide epidural corticosteroid injection treatment and targets on pain, function, or medication use</td>
</tr>
<tr>
<td><em>Transforaminal versus interlaminar corticosteroid injections</em></td>
<td></td>
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</tr>
<tr>
<td>Mean improvement in pain, immediate-term</td>
<td>5 trials N=227</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (5 trials, WMD -10.1, 95% CI -24.8 to 4.63, I²=83%)</td>
</tr>
<tr>
<td>Mean improvement in pain, short-term</td>
<td>3 trials N=125</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, WMD -1.29, 95% CI -12.6 to 10.1, I²=54%)</td>
</tr>
<tr>
<td>Mean improvement in pain, intermediate-term</td>
<td>2 trials N=95</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (2 trials, WMD -11.3, 95% CI -44.8 to 22.2, I²=87%)</td>
</tr>
<tr>
<td>Mean improvement in function, immediate-term</td>
<td>4 trials N=197</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (4 trials, SMD 0.03, 95% CI -0.48 to 0.53, I²=68%)</td>
</tr>
<tr>
<td>Mean improvement in function, short-term</td>
<td>3 trials N=125</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (3 trials, SMD 0.39, 95% CI -0.36 to 1.13, I²=74%)</td>
</tr>
<tr>
<td>Mean improvement in function, long-term</td>
<td>1 trial N=64</td>
<td>Low</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No difference (1 trial, WMD -2.00, 95% CI -8.77 to 4.77)</td>
</tr>
<tr>
<td>Likelihood of undergoing surgery, intermediate-term</td>
<td>2 trials N=61</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>There were no differences between transforaminal versus interlaminar epidural corticosteroid injections for radiculopathy in risk of undergoing surgery at intermediate-term in two trials (RR 0.76, 95% CI 0.18 to 3.19 and RR 1.33, 95% CI 0.44 to 4.05)</td>
</tr>
</tbody>
</table>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparisons of other approaches</strong></td>
<td></td>
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<tr>
<td><strong>Epidural injections for radiculopathy</strong></td>
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</tr>
<tr>
<td>Caudal versus other approaches: Pain, function, depression</td>
<td>1 trial N=60</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found the transformaminal epidural corticosteroid injections for radiculopathy associated with better pain outcomes than the caudal approach, with no differences in measures of function or depression, but no differences between the interlaminar versus caudal approaches in measures of pain or depression</td>
</tr>
<tr>
<td>Oblique versus standard interlaminar approaches: Successful composite outcome, surgery</td>
<td>1 trial N=87</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no differences between epidural corticosteroid injections for radiculopathy using the oblique interlaminar versus standard interlaminar approaches in likelihood of achieving a successful outcome or undergoing surgery</td>
</tr>
<tr>
<td>Lateral parasagittal versus standard interlaminar approaches: Pain, function</td>
<td>2 trials N=143</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial of epidural corticosteroid injections for radiculopathy found the lateral parasagittal interlaminar approach associated with greater likelihood of achieving &gt;50% pain relief (RR 4.1, 95% CI 1.4 to 12) and greater improvement in pain and function than the standard interlaminar approach through 6 months; a second trial also reported results that favored the lateral parasagittal approach, but differences were smaller and not statistically significant</td>
</tr>
<tr>
<td>Lateral parasagittal versus transformaminal approaches: Pain</td>
<td>2 trials N=119</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials found no differences between epidural corticosteroid injections for radiculopathy using the lateral parasagittal versus transformaminal approaches in pain or function through 6 or 12 months</td>
</tr>
<tr>
<td>Ganglionic versus preganglionic transformaminal injections: Successful composite outcome</td>
<td>1 trial N=239</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found transfornaminal epidural corticosteroid injections for radiculopathy at the ganglionic versus preganglionic approaches associated with a lower likelihood of a successful outcome at 1 month (RR 0.80, 95% CI 0.70 to 0.91), though differences were no longer present after 5 months</td>
</tr>
</tbody>
</table>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Epidural injections for spinal stenosis</strong></td>
<td>1 trial (subgroup analysis) N=400</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>No trial randomized patients with spinal stenosis to different approaches for performing epidural corticosteroid injections. One trial in which epidural corticosteroid injections could be performed by the interlaminar or transforaminal approaches found that interlaminar corticosteroid injections were associated with greater improvement in leg pain and function versus local anesthetic injections at 3 weeks, but there were no differences between transforaminal corticosteroid versus local anesthetic injections</td>
<td></td>
</tr>
<tr>
<td><strong>Facet joint injections</strong></td>
<td>1 trial N=46</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found intra-articular facet joint corticosteroid injection in patients with subacute low back pain selected on the basis of positive facet joint SPECT findings associated with lower pain intensity (3.2 vs. 5.4 on 0 to 10 NRS, p&lt;0.05), greater likelihood of ≥50% pain relief (61% vs. 26%, RR 2.33, 95% CI 1.09 to 5.00), and better ODI score (12 vs. 23, p&lt;0.05), versus medial branch injection at 12 weeks</td>
<td></td>
</tr>
<tr>
<td>Intra-articular versus extra-articular (pericapsular) facet joint corticosteroid injection: All outcomes</td>
<td>1 trial N=67</td>
<td>High</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from one poor-quality trial to determine effectiveness of intra- versus extra-articular (pericapsular) facet joint corticosteroid injections</td>
<td></td>
</tr>
<tr>
<td>Effects of imaging guidance versus no imaging guidance: All outcomes</td>
<td>0 trials</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>Insufficient</td>
<td>No trial directly compared the effectiveness of epidural injections for radiculopathy performed with or without imaging guidance</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
<th>Risk of bias</th>
<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects of CT- versus ultrasound imaging guidance: Pain</td>
<td>1 trial N=40</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no difference between CT- versus ultrasound-guided intra-articular facet joint corticosteroid injections with betamethasone and local anesthetic in pain at 6 weeks</td>
</tr>
<tr>
<td><strong>Key Question 2. In patients with low back pain, what patient characteristics predict responsiveness to injection therapies on outcomes related to pain, function, and quality of life?</strong></td>
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<tr>
<td><em>Epidural injections</em></td>
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</tr>
<tr>
<td>Effects of duration: Pain, function</td>
<td>6 trials N=869</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Precise</td>
<td>Low</td>
<td>Five of six trials of patients with radiculopathy found no association between duration of symptoms and responsiveness to epidural corticosteroid injections</td>
</tr>
<tr>
<td>Effects of age, sex, anxiety/depression, opioid use, baseline function, presence of neurological abnormalities, previous episodes, or work status: Pain, function</td>
<td>6 trials N=869</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Precise</td>
<td>Low</td>
<td>Trials or patients with radiculopathy found no association between age, sex, anxiety/depression, opioid use, baseline function, presence of neurological abnormalities, previous episodes, or work status and responsiveness to epidural corticosteroid injections</td>
</tr>
<tr>
<td>Effects of cause of radicular symptoms: Pain, function</td>
<td>4 trials N=406</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from 4 trials to determine effects of the cause of radicular symptoms on responsiveness to epidural corticosteroid injections for radiculopathy, due to inconsistent results</td>
</tr>
<tr>
<td>Effects of smoking status, body mass index, use of opioid therapies: Pain, function</td>
<td>0 trials No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>Insufficient</td>
<td>No study evaluated the association between smoking status, body mass index, or opioid therapies on responsiveness to epidural corticosteroid injection therapies for radiculopathy</td>
</tr>
<tr>
<td>Effects of pain, function</td>
<td>29 trials used in meta-regression analyses N=2792</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Low</td>
<td>Based on meta-regression analyses of trials of epidural corticosteroid injections versus placebo interventions for radiculopathy, there was no clear association between prior lumbar surgery, requirement for imaging correlation with symptoms, or requirement for presence of herniated disc on imaging and estimates of treatment effect</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
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<tr>
<th>Key Question Outcome</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Effects of race: All outcomes</td>
<td>1 trial N=400</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial of patients with spinal stenosis found no interaction between race and responsiveness to epidural corticosteroid injections</td>
</tr>
<tr>
<td>Effects of pain, patient satisfaction</td>
<td>1 trial N=192</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial of patients with non-radicular low back pain found no differences between transforaminal versus interlaminar epidural corticosteroid injection in pain or a patient satisfaction index in the subgroup of patient with imaging findings of a herniated disc, but in patients with spinal stenosis effects on pain favored the transforaminal approach (1.79 vs. 2.19 on the 0 to 5 Roland pain score, p&lt;0.05; likelihood of improving ≥2 points 51% vs. 31%, RR 1.64, 95% CI 0.98 to 2.76)</td>
</tr>
<tr>
<td>Facet joint injections</td>
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<tr>
<td>Effects of use of SPECT versus no SPECT to identify targets for facet joint injections: Pain</td>
<td>1 trial N=46</td>
<td>Moderate</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>One trial found no difference between use of SPECT bone scans versus no SPECT to identify targets for intra- and extra-articular facet joint corticosteroid injections in pain outcomes through 6 months</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

| Key Question Outcome | Study Design  
<table>
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<tr>
<th></th>
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<tr>
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<td>Number of Studies (N)</td>
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</table>
|                      | Risk of bias  
|                      | Consistency  
|                      | Directness  
|                      | Precision   |
|                      | Strength of Evidence   |
|                      | Conclusion |
| Key Question 3. In randomized trials of low back pain injection therapies, how does effectiveness vary according to the control therapy used (e.g., epidural nonsteroid injection, nonepidural injection, no injection)? | | | | | | |
| **Epidural injections** | | | | | | |
| Effects of type of placebo intervention in patients with radiculopathy: Pain, function | 29 trials included in stratified analyses N=2792 | Moderate | Consistent | Indirect | Imprecise | Low | In trials of epidural corticosteroid injections versus placebo injections for radiculopathy, there were no clear differences in estimates for improvement in pain or function, likelihood of a successful pain or functional outcome, or likelihood of undergoing surgery when trials were stratified according to the type of placebo intervention |
| Effects of type of control intervention in patients with radiculopathy: All outcomes | 11 trials N=896 | Moderate | Consistent | Indirect | Imprecise | Insufficient | Trials of epidural corticosteroid injections versus other interventions were too limited to determine effects on outcome estimates, due to variability in the interventions evaluated, small numbers of trials, and methodological limitations |
| Effects of type of placebo intervention in patients with other back conditions: All outcomes | 20 trials N=1880 | Moderate | Consistent | Indirect | Imprecise | Insufficient | There was insufficient evidence from trials of epidural corticosteroid injections for spinal stenosis, non-radicular back pain, or chronic post-surgical pain, to determine effects of comparators on estimates of effect, due to small numbers of trials for specific comparisons |
## Appendix G. Strength of Evidence

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<tr>
<th>Key Question Outcome</th>
<th>Study Design Number of Studies (N)</th>
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<tbody>
<tr>
<td><strong>Facet joint injections</strong></td>
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</tr>
<tr>
<td>Effects of type of placebo therapy:</td>
<td>8 trials N=589</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from trials facet joint injections to determine effects of comparators on estimates of effect, due to small numbers of trials for specific comparisons</td>
</tr>
<tr>
<td><strong>Key Question 3a. How do response rates vary according to the specific comparator evaluated (e.g., saline epidural, epidural with local anesthetic, nonepidural injection, no injection, surgery, non-surgical therapies)?</strong></td>
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<tr>
<td><strong>Epidural injections for radiculopathy</strong></td>
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</tr>
<tr>
<td>Epidural corticosteroid injections versus placebo interventions (direct comparisons): Pain, function, successful outcome</td>
<td>3 trials N=340</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Three trials found no differences between epidural local anesthetic versus epidural saline injections (3 trials) or soft tissue injections (2 trials) in mean improvements in pain or function or the proportion experiencing pain relief or a successful outcome</td>
</tr>
<tr>
<td>Epidural corticosteroid injections versus placebo interventions (indirect comparisons): Pain function</td>
<td>29 trials included in stratified analyses N=2792</td>
<td>Moderate</td>
<td>Inconsistent</td>
<td>Indirect</td>
<td>Precise</td>
<td>Low</td>
<td>In trials of epidural corticosteroid injections for radiculopathy, improvement in pain was smaller in patients who received epidural local anesthetic injections (3 trials, WMD ‒6.51, 95% CI ‒11.9 to ‒1.16, I²=45%) than epidural saline injections (4 trials, WMD ‒19.8, 95% CI ‒25.1 to ‒14.3, I²=56%) at immediate-term; there were no clear differences at other time points, but analyses were limited by small numbers of trials and statistical heterogeneity</td>
</tr>
<tr>
<td>Epidural corticosteroid injections versus other interventions: Pain, function</td>
<td>11 trials N=896</td>
<td>Moderate</td>
<td>Consistent</td>
<td>Indirect</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>Trials were too limited to determine effects on response rates, due to variability in the interventions evaluated, small numbers of trials, and methodological limitations</td>
</tr>
</tbody>
</table>
## Appendix G. Strength of Evidence

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Key Question 4. What are the harms of epidural corticosteroid, facet joint corticosteroid injections, medial branch blocks, and sacroiliac joint corticosteroid injection compared to epidural nonsteroid injection, nonepidural injection, no injection, surgery, or non-surgical therapies?</td>
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</tr>
<tr>
<td>Harms</td>
<td>29 trials N=2792</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>29 trials of epidural corticosteroid injections versus placebo for radiculopathy reported no serious adverse events and few harms, but methods for assessing harms were not well reported and harms data were sparse. Observational studies were consistent with the trials in showing a low risk of serious adverse events.</td>
<td></td>
</tr>
<tr>
<td>Harms</td>
<td>11 trials N=896</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Moderate</td>
<td>Eleven trials of epidural corticosteroid injections versus other therapies for radiculopathy reported no serious adverse events and few harms</td>
<td></td>
</tr>
<tr>
<td>Harms</td>
<td>2 trials N=120</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials of transforminal versus interlaminar epidural corticosteroid injections for radiculopathy reported no serious adverse events</td>
<td></td>
</tr>
<tr>
<td>Harms</td>
<td>4 trials N=324</td>
<td>High</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from four trials that compared epidural injections for radiculopathy with different corticosteroids to determine effects on harms</td>
<td></td>
</tr>
<tr>
<td>Harms</td>
<td>5 trials N=452</td>
<td>High</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from five trials of epidural corticosteroid injections for radiculopathy that compared different doses to determine effects on harms</td>
<td></td>
</tr>
<tr>
<td>Harms</td>
<td>8 trials N=821</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Precise</td>
<td>Low</td>
<td>Eight trials of epidural corticosteroid injections versus placebo injections for spinal stenosis reported no serious harms and few adverse events, but methods for assessing harms were not well reported and harms data were sparse</td>
<td></td>
</tr>
</tbody>
</table>

### Epidural injections
## Appendix G. Strength of Evidence

<table>
<thead>
<tr>
<th>Key Question Outcome</th>
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<th>Consistency</th>
<th>Directness</th>
<th>Precision</th>
<th>Strength of Evidence</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harms</td>
<td>2 trials N=240</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Two trials of epidural corticosteroid injections for non-radicular back pain reported no serious harms</td>
</tr>
<tr>
<td>Harms</td>
<td>4 trials N=322</td>
<td>High</td>
<td>Inconsistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>There was insufficient evidence from four trials of epidural corticosteroid injections for chronic post-surgical back pain to determine effects on harms</td>
</tr>
<tr>
<td><strong>Facet joint injections</strong></td>
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</tr>
<tr>
<td>Harms</td>
<td>10 trials N=823</td>
<td>High</td>
<td>Consistent</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Low</td>
<td>Ten trials of facet joint corticosteroid injections reported no serious harms and few adverse events, but methods for assessing harms were not well reported and harms data sparse</td>
</tr>
<tr>
<td><strong>Sacroiliac joint injections</strong></td>
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</tr>
<tr>
<td>Harms</td>
<td>1 trial N=24</td>
<td>High</td>
<td>Cannot determine (1 trial)</td>
<td>Direct</td>
<td>Imprecise</td>
<td>Insufficient</td>
<td>Harms were not reported in one small trial of periarticular sacroiliac joint injections</td>
</tr>
</tbody>
</table>

*Study number based on number of trials directly evaluating the comparison of interest

CI=confidence interval; ODI= Oswestry Disability Index; RR=relative risk; SMD=standard mean difference; SPECT= single photon electronic computed tomography; WMD=weighted mean difference

Please see Appendix C. Included Studies for full study references.