Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Ackerman, 2008	RCT	USA Single center Pain clinic	18 to 55 years of age; nonradicular low back pain, SPECT positive for lumbar facet joint involvement; excluded patients with normal MRI imaging	Not required	Required (SPECT, excluded if MRI normal)	<6 months (mean 7.6 weeks)
Carette, 1991	RCT	Canada Single center Pain clinic	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)	Single intraarticular facet joint block (≥50% pain relief)	Not required	≥6 months (median 18-24 months)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
Ackerman, 2008	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	Approached: Not reported Eligible: Not reported Randomized: 46 (23 vs. 23) Analyzed: 46 at 12 w	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	Treatment prior to intervention: Not reported Treatments following intervention: Not reported Other patient characteristics: Not reported
Carette, 1991	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.	Approached: Not reported; 190 underwent diagnostic facet joint block Eligible:108 Randomized: 101 (51 vs. 50) Analyzed: 95 (48 vs. 47) at 6 m	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	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

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
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

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Ackerman, 2008	A vs. B Pain (0-10 NRS): 7.8 vs. 8.1 at baseline, 3.2 vs. 5.4 at 12 w (p<0.05) 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) ODI (0-100): 31 vs. 34 at baseline, 12 vs. 23 at 12 w (p<0.05)
Carette, 1991	A vs. B <u>Pain</u> Pain (0-10 VAS): 4.5 vs. 4.7 at 1 m, 4.0 vs. 5.0 at 6 m (p<0.05) McGill pain questionnaire, pain rating index (scale NR): 19.0 vs. 22.8 at 1 m (p>0.05); 17.1 vs. 21.6 at 6 m (p>0.05) McGill pain questionnaire, present pain intensity (0 to 5): 2.3 vs. 2.6 at 1 m (p>0.05); 2.1 vs. 2.9 at 6 m (p>0.05) <u>Function</u> Sickness Impact Profile, overall (0-100): 9.3 vs. 9.8 at 1 m (p>0.05), 7.8 vs. 10.8 at 6 m (p>0.05) Sickness Impact Profile, physical dimension (0-100): 5.2 vs. 6.3 at 1 m (p>0.05), 4.3 vs. 7.9 at 6 m (p<0.05) Sickness Impact Profile, psychosocial dimension: 8.2 vs. 9.0 at 1 m (p>0.05); 7.7 vs. 9.0 at 6 m (p>0.05) Bed rest in past 2 weeks (days): 0.3 vs. 0.1 at 1 m (p>0.05), 0.2 vs. 0.4 at 6 m (p>0.05) Complete restriction in main activity in past 2 weeks (days): 3.2 vs. 2.2 at 1 m (p>0.05); 1.3 vs. 2.9 at 6 m (p>0.05) <u>Global Assessment</u> Overall effect (7 category scale), "very marked" or "marked improvement": 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)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
Ackerman, 2008	12 weeks	0% at 12 w	Appears complete	Not reported	Fair	Not reported
Carette, 1991	6 months	A vs. B 5.9% (3/51) vs. 6.0% (3/50) at 6 m	No patient in saline injection group received methylprednisolone injection	"No adverse events reported, other than transient local pain at the injection sites."	Fair	Not reported

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Civelek, 2012	RCT	Turkey Number of centers not reported Neurosurgery clinic	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)	Facet joint injection group: Not required Facet denervation group: Facet joint block, methods not reported (% pain relief NR)	Unclear	19 months (mean)
Fuchs, 2005	RCT	Germany Single center Pain clinic	Low back pain for at least 3 months; radiologic evidence of facet joint osteoarthritis with osteophyte formation (Kellgreen grade 2/3); facet joint block not required	Not required	Required (CT)	>3 months
Galiano, 2007	RCT	Germany Single center Neurosurgery and radiology clinic	Chronic low back pain > 6 months; CT or MRI imaging of lumbar spine (findings not specified); >18 years of age	Not required	Required (CT or MRI)	>6 months

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
Civelek, 2012	Radicular pain; neurogenic claudication; neurologic deficits; acute or uncontrolled medical illness; history of adverse reaction to local anesthetics; pregnant or lactating	Approached: Not reported Eligible: Not reported Randomized: 100 (50 vs. 50) Analyzed: 100 at 1 y	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	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
Fuchs, 2005	Hypersensitivity or contraindication to study medications; contraindication to intraarticular treatment; anticoagulation, radicular pain, or other specific conditions on clinical examination or CT scan	Approached: Not reported Eligible: Not reported Randomized: 60 (30 vs. 30) Analyzed: 59 (30 vs. 29)	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	A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported
Galiano, 2007	Local or systemic infection; allergy to steroids or anesthetics; uncorrectable coagulopathy; pregnancy	Approached: Not reported Eligible: Not reported Randomized: 40 (20 vs. 20) Analyzed: Not reported	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	A vs. B: Treatments prior to intervention: Lumbar surgery (35% vs. 35%) Treatments following intervention: Not specified Other patient characteristics: Not reported

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
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 join 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)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Civelek, 2012	A vs. B <u>Pain</u> 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<0.01 at all time points except baseline) Pain improved >50%: 80% vs. 100% at 1 m, 68% vs. 90% at 6 m, 62% vs. 88% at 12 m <u>Other Outcomes</u> NASS patient satisfaction questionnaire (1-4): 1.3 vs. 1.3 at 1 m (p>0.05), 1.7 vs. 1.4 at 6 m (p>0.05), 2.0 vs. 1.5 at 12 m (p=0.04) NASS score 1 or 2: 88% vs. 100% at 1 m, 75% vs. 90% at 6 m, 66% vs. 88% at 12 m EQ-5D (scale, 5-15): 15 vs. 14 at baseline, 6.0 vs. 5.6 at 1 m, 7.2 vs. 6.5 at 6 m, 8.0 vs. 6.7 at 12 m (p>0.05 at all time points) EQ-5D <9: 89% vs. 98% at 1 m, 75% vs. 92% at 6 m, 69% vs. 90% at 12 m
Fuchs, 2005	A vs. B <u>Pain</u> Pain (0-100 VAS): 69 vs. 69 at baseline, 30 vs. 41 at 1 m, 33 vs 38 at 6 m (p>0.05) <u>Function</u> Roland Morris (0-24): 12 vs. 12 at baseline, 7.2 vs. 8.4 at 1 m, 8.3 vs. 7.1 at 6 m (p>0.05) ODI (0-50): 18 vs. 21 at baseline, 12 vs. 14 at 1 m, 13 vs. 13 at 6 m (p>0.05) Low Back Outcome Score (0-75): 33 vs. 32 at baseline, 44 vs. 43 at 1 m, 44 vs. 46 at 6 m (p>0.05) <u>Other Outcomes</u> SF-36: "Similar improvement" between groups on all subscales
Galiano, 2007	A vs. B <u>Pain</u> Pain (0-100 VAS, data estimated from graph): 46 vs. 38 at 6 w (p<0.01)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
Civelek, 2012	12 months	0% at 12 m	Appears complete	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)	Fair	Not reported
Fuchs, 2005	6 months	A vs. B 0% (0/30) vs. 3.3% (1/29) at 6 m	Appears complete	"No significant adverse events"	Fair	Not reported
Galiano, 2007	6 weeks	Not reported	Appears complete (4 ultrasound patients received CT guidance after ultrasound could not provide adequate resolution)	Fluid retention with edema: 1 (group not reported)	Fair	Not reported

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Lakemeier, 2013	RCT	Germany Single center Orthopedic clinic	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	Single intraarticular facet joint block (≥50% pain relief)	Required (MRI)	>24 months
Lilius, 1989	RCT	Finland Single center Clinic setting unclear	Back pain >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)	Not required	Not required	>3 months

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
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

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
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 in15 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

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Lakemeier, 2013	A vs. B Pain 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) Function 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) ODI (0-100): 39 vs. 41 at baseline, 33 vs. 28 at 6 m, improvement 5.7 vs. 13 (p=0.46) Other Outcomes Analgesic intake: "No measurable differences," data not provided
Lilius, 1989	A vs. B vs. C Pain 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) Function Disability score: Data not reported (p=0.99 for A vs. B, p=0.89 for A + B vs. C) Return to work: No difference between groups (data not reported)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
Lakemeier, 2013	6 months	A vs. B 10.3% (3/29) vs. 3.7% (1/27) at 6 m	10% (3/29) vs. 3.7% (1/27) did not undergo allocated procedure or underwent additional procedure (nucleotomy)	"No major adverse events reported"	Good	No funding
Lilius, 1989	3 months	A vs. B 3.6% (1/28) vs. 0% (0/39) vs. 4.8% (2/42)	Appears complete	Not reported by intervention group; unspecified "side effects" reported in 7/106 overall	Poor	None

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Manchikanti, 2010 Manchikanti, 2008	RCT	USA Single center Pain clinic	History of chronic function-limiting low back pain for >6 months; >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	Two medial branch blocks (≥80% pain relief)	Not required	>6 months (mean 108 months)
Manchikanti, 2001	RCT	USA Single center Pain clinic	Low back pain for >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	Two facet joint blocks (% pain relief NR)	Not required	> 6 months (mean 21 months)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
Manchikanti, 2010 Manchikanti, 2008	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	Approached: 144 (152 in 2008 report) Eligible: 128 Randomized: 120 (60 vs. 60) Analyzed: 120 (including 24 patients with missing data) at 24 m	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	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
Manchikanti, 2001	<18 or >90 years, neurological deficits, response to conservative treatment, previous nerve block	Approached: 212 Eligible: 84 Randomized: 84 (42 vs. 42) Analyzed: 73 (41 vs. 32) at 2.5 y	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	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%

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
Manchikanti, 2010 Manchikanti, 2008	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, 2001	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

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Manchikanti, 2010 Manchikanti, 2008	A vs. B <u>Pain</u> 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>0.05 at all time points) Pain relief >=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 <u>Function</u> 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>0.05 at all time points) ODI improved >=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 <u>Other Outcomes</u> 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)
Manchikanti, 2001	A vs. B <u>Pain</u> Pain (0-10 NRS): 7.7 vs. 7.6 at baseline, 3.3 vs. 3.5 post-treatment (duration unclear) (p>0.05) Pain relief >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 >12 m <u>Function</u> Functional status: (scale not reported) 3.7 vs. 3.6 at baseline, 5.7 vs. 5.3 post-treatment (duration unclear) (P>0.05) <u>Other Outcomes</u> Use of schedule II opioids: 15% (6/41) vs. 19% (6/32) post-treatment (duration unclear) Physical health (scale not reported): 5.1 vs. 4.7 at baseline, 7.1 vs. 6.7 post-treatment (duration unclear) (p>0.05) Mental health (scale not reported): 4.7 vs. 4.2 at baseline; 6.7 vs. 6.3 post-treatment (duration unclear) (p>0.05) Depression (criteria not reported): 73% (30/41) vs. 81% (26/32) (baseline); 58% (24/41) vs. 72% (23/32) (follow-up unclear) (p>0.05) 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>0.05) Somatization disorder (criteria not reported): 56% (23/41) vs. 41% (13/32) (baseline); 32% (13/41) vs. 18% (9/32) (p<0.05) Symptom magnification (criteria not reported): 34% (14/41) vs. 28% (9/32) (baseline); 22% (9/41) vs. 19% (6/32) (p>0.05)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
Manchikanti, 2010 Manchikanti, 2008	24 months	A vs. B 20.0% (12/60 vs. 20.0% (12/60) at 24 m	4/60 vs. 5/60 unblinded prematurely due to lack of treatment response	"No adverse events reported"	Fair	No funding
Manchikanti, 2001	Unclear (up to 2.5 years)	A vs B 2.3% (1/42) vs. 23.8% (10/42) at 2.5y	Appears complete	"None of the various types of complications...were observed"	Poor	Not reported

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Marks, 1992	RCT	Australia Single center Pain clinic	Lumbar or lumbarsacral pain and referred pain in an extra-spinal region; pain present most of the time for >6 months; unresponsive to non-narcotic analgesics and physical therapy; pain aggravated by sustained postures; imaging not specified	Not required	Not required	>6 months (median 8.5 years)
Nash, 1990	RCT	UK Single center Pain clinic	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)	Not required	Not required	Not reported
Pneumaticos, 2006	RCT	USA Single center Orthopedic and radiology clinic	Presumed facet joint pain with nonradicular low back pain; symptoms present >6 months; low back pain with extension of lumbar spine; imaging evidence of facet joint abnormalities; response to facet joint block not required	Not required	Required (imaging method not specified)	>6 months

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
Marks, 1992	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	Approached: Not reported Eligible: Not reported Randomized: 86 (42 vs. 44) Analyzed: 86 at 3 m, including 3 (1 vs. 2) with missing data	A vs. B: Age: Not reported Male: Not reported Duration of symptoms: Not reported Baseline pain "severe" or "very severe": 61% vs. 59% Baseline function: Not reported	A vs. B: Treatments prior to intervention: Spinal surgery 11.9% vs. 11.3% Treatments following interventions: Not specified Other patient characteristics: Not reported
Nash, 1990	Not specified	Approached: Not reported Eligible: Not reported Randomized: 67 (33 vs. 34) Analyzed: 56 (30 vs. 26) at 1 m	A vs. B: Age: Not reported Male: Not reported Duration of symptoms: Not reported Baseline pain "severe" or "very severe": 61% vs. 59% Baseline function: Not reported	A vs. B: Treatments prior to intervention: Not specified Treatments following interventions: Not specified Other patient characteristics: Not reported
Pneumaticos, 2006	Prior spinal surgery or facet joint injection, other spinal abnormalities, unable to tolerate SPECT, pregnant	Approached: Not reported Eligible: 47 Randomized: 47 (31 vs. 16) Analyzed: 46 (31 vs. 15) at 6 m	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	A vs. B: Treatments prior to intervention: Not specified Treatments following intervention: Not specified Other patient characteristics: Not reported

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
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 join 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

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Marks, 1992	A vs. B <u>Pain</u> 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 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
Nash, 1990	A vs. B <u>Pain</u> Pain moderate to very severe (nil to very severe): 83% (25/30) vs. 85% (22/26) at 1 m <u>Function</u> Functional status full (nil, limited, full): 57% (17/30) vs. 58% (15/26) at 1 m <u>Other Outcomes</u> Drug intake decreased: 30% (9/30) vs. 38% (10/26) at 1 m
Pneumaticos, 2006	A vs. B <u>Pain</u> 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 AAOS pain score improved >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

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
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

Author, Year Title	Study Design	Country Setting	Inclusion Criteria	Facet Joint Block (percent pain relief) Requirements	Imaging Requirements for Patient Selection	Duration of Symptoms at Enrollment
Ribeiro, 2013	RCT	Brazil Single center University outpatient clinic	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	Not required	Required (lumbar radiograph)	4.3 years (mean, minimum 3 months)

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Exclusion Criteria	Number of Treatment and Control Subjects (number approached, number eligible, number enrolled)	Subject Age, Sex, Diagnosis, Duration of Pain, Severity of Pain	Other Patient Characteristics (expectations of treatment benefit, confidence in clinician, worker's compensation status, ongoing litigation, smoking status, other treatments received)
Ribeiro, 2013	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	Approached: 82 Eligible: 69 Randomized: 60 (31 vs. 29) Analyzed: 60 (31 vs. 29) at 6 m	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)	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%

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Type of Intervention (experimental & control groups, dose, duration of treatment)	Number and Frequency of Injections, Number of Levels, Provider Experience	Imaging Guidance	Type of Comparator
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

Author, Year Title	Results (acute and subacute, or chronic, or mixed)
Ribeiro, 2013	A vs. B Pain 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=0.54) 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) 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) Global Improvement (5-point Likert scale, options were "much worse, a little worse, unchanged, a little better, or much better), percentage of patients who were "much better": 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) Quality of life SF-36 Physical Functioning: p=0.21 between the groups over time (data NR) SF-36 Role Physical: p=0.023 between the groups over time (favors group A) (data NR) SF-36 Body Pain: p=0.15 between the groups over time (data NR) SF-36 General Health: p=0.52 between the groups over time (data NR) SF-36 Vitality: p=0.45 between the groups over time (data NR) SF-36 Social Functioning: p=0.16 between the groups over time (data NR) SF-36 Role Emotional: p=0.35 between the groups over time (data NR) SF-36 Mental Health: p=0.68 between the groups over time (data NR) 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) 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) 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.

Appendix E5. Epidural Steroid Injections for Facet Joint Pain

Author, Year Title	Duration of Followup	Loss to Followup	Compliance to Treatment	Adverse Events and Withdrawals due to Adverse Events	Quality Rating	Sponsor
Ribeiro, 2013	6 months	A vs. B 6.5% (2/31) vs. 6.9% (2/29) at 6 months (but all 60 patients included in the intention to treat analysis)	Appears that all patients received injection as randomized.	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 "No significant differences were found between the groups regarding the number of adverse [local and systemic] events." 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	Good	Grant funding (from Fundacao de Amparo a Pesquisa do Estado de Sao Paulo)

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.