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Canadian Agency for Drugs and Technologies in Health

**Facet Joint Injection as a Diagnostic and Therapeutic Tool
for Spinal Pain: A Review of Clinical and Cost Effectiveness**

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March 2007

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Canadian Agency for
Drugs and Technologies
in Health

HTA

HEALTH TECHNOLOGY INQUIRY SERVICE (HTIS)

Health technology assessment (HTA) agencies face the challenge of providing quality assessments of medical technologies in a timely manner to support decision making. Ideally, all important deliberations would be supported by comprehensive health technology assessment reports, but the urgency of some decisions often requires a more immediate response.

The Health Technology Inquiry Service (HTIS) provides Canadian health care decision makers with health technology assessment information, based on the best available evidence, in a quick and efficient manner. Inquiries related to the assessment of health care technologies (drugs, devices, diagnostic tests, and surgical procedures) are accepted by the service. Information provided by the HTIS is tailored to meet the needs of decision makers, taking into account the urgency, importance, and potential impact of the request.

Consultations with the requestor of this HTIS assessment indicated that a review of the literature would be beneficial. The research question and selection criteria were developed in consultation with the requestor. The literature search was carried out by an information specialist using a standardized search strategy. The review of evidence was conducted by one external HTIS reviewer. The draft report was internally reviewed and externally peer-reviewed by two or more peer reviewers. All comments were reviewed internally to ensure they were addressed appropriately.

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ABBREVIATIONS

ANCOVA	analysis of covariance
ANOVA	analysis of variance
FJ	facet joint
FJI	facet joint injection
hrs	hours
LBP	lower back pain
MPQ	McGill Pain questionnaire
mth(s)	months
PPI	present pain intensity
RCT	randomized controlled trials
SPECT	single photon emission computed tomography
SS	statistically significant
VAS	visual analogue scale

Title: Facet joint injection as a diagnostic and therapeutic tool for spinal pain: a review of clinical and cost effectiveness

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1 CONTEXT AND POLICY ISSUES

Facet joints (FJs) are located on the back of the spine on both sides of the vertebrae where they overlap with neighbouring vertebrae. FJs provide stability and mobility, allowing the spine to bend and twist. Each FJ is composed of two cartilage-covered surfaces of adjacent vertebrae, which are separated by synovial fluid, a lubricant and nourisher of the cartilage, and enclosed in a sac-like capsule.¹

FJs have been implicated as a putative source of pain in 15% to 45% of patients with chronic (≥ 3 months duration) low back pain (LBP), 42% to 48% of patients with chronic thoracic pain, and 54% to 67% of patients with chronic neck pain.^{2,3} The lifetime prevalence of spinal pain has been reported as 54% to 80%. Chronic persistent LBP and neck pain are experienced by up to 60% of patients, ≥ 5 years after the initial episode.³

In the absence of disc herniation and neurological deficit, medical imaging, neurophysiological testing, and a comprehensive physical examination with a psychological component can identify the cause of LBP in 15% of patients.³ Because there are no objective criteria, FJ injections (FJIs) with anesthetics are used to diagnose pain of perceived FJ origin.^{4,5} A spinal needle is advanced toward the FJ using fluoroscopic or CT guidance, and a small amount of contrast material is injected to ensure proper needle placement. Then, anesthetics (often lidocaine or bupivacaine), or anesthetics and steroids are injected, depending on whether the procedure is diagnostic or therapeutic. The local anesthetic has effect for a few hours, and it may be two to three days before the steroid starts producing pain relief. Although the injection takes a few minutes, the procedure takes about

30 to 60 minutes because of post-procedure patient monitoring. Patients are advised to take it easy the day of the procedure, but can usually return to their daily activities, as pain allows, the day after.⁶

Because the prognosis for attacks of spinal pain is favourable, such invasive procedures as FJIs are not generally used in the early stages of an episode. For example, up to 90% of acute back attacks that present for health care settle sufficiently to stop health care and return to work within six weeks.⁷ This report focuses on patients with chronic symptoms presenting for health care. In general, acute symptoms are defined as those lasting < 3 months and chronic symptoms as those lasting > 3 months.⁸ Unless stated otherwise, FJI refers to an intra-articular injection.

2 RESEARCH QUESTIONS

- 1) What is the evidence regarding the clinical efficacy and safety of FJIs as a diagnostic and therapeutic tool for spinal pain?
- 2) What is the evidence regarding the cost-effectiveness of FJIs for spinal pain?
- 3) Where in Canada are FJIs publicly funded?

3 METHODS

Published literature was obtained by a multi-file search of the BIOSIS Previews[®], EMBASE[®], MEDLINE[®], and PREMEDLINE[®] databases on the OVID[®] search system. This search was systematically updated, and results incorporated on a weekly basis to August 15, 2006. The Cochrane Library 2006, Issue 2, was searched, and results updated to Issue 3. Language and publication date limits were not applied. Filters were applied to limit the retrieval to systematic reviews, clinical studies, and economic studies. We searched the Health Economic Evaluations Database (HEED) (Aug 2006) for economic literature.

Grey literature was identified through searching the web sites of health technology assessment (HTA) and related agencies and their databases.

The Google™ search engine was used to search for information on the Internet, including conference literature. Searches were supplemented by manual searches of the bibliographies and abstracts of selected publications.

4 FINDINGS

4.1 HTAs

One HTA produced by the Danish Institute of Health Technology Assessment was identified.⁸ The report concluded that there was limited scientific evidence on the clinical effect of FJIs for acute or chronic low back trouble. The cost of the FJI procedure was considered to be high because it is delivered in an ambulatory setting with imaging guidance. The report suggests that FJI cannot be recommended as treatment, but may have utility in certain situations for diagnostic purposes. The report did not indicate in which diagnostic situations FJIs would be most appropriate.

4.2 Practice guidelines

Several practice guidelines on the appropriate use of FJIs were available.^{3,9,10} A European guideline indicated that while there is no evidence for the effectiveness of FJIs with steroids in patients with chronic non-specific LBP, FJIs may prove to be effective when investigated in high-quality randomized controlled trials (RCTs).⁹ The American College of Radiology recommends that FJIs are useful for patients with multi-level disease, diagnosed by any imaging modality, to identify the level(s) that are producing symptoms.¹⁰ The American Society of International Pain Physicians provided more detailed guidelines about the diagnostic and therapeutic use of FJIs.³ In the diagnostic phase, they stated that a patient may receive two procedures at intervals of no sooner than one week or preferably two weeks. In the therapeutic phase (after the diagnostic phase is completed), the suggested frequency would be ≥ 2 months between injections, provided that $\geq 50\%$ relief is obtained for six weeks. If the intervention is applied to different regions, it

was suggested that therapeutic frequency remain at two months for each region, and as long as safety is not compromised, that all regions be treated at the same time. Otherwise, the regions could be treated at intervals of no sooner than one week or preferably two weeks. In the therapeutic phase, the procedure should be repeated only as medically necessary with a suggested limit of six times for local anesthetic and steroid blocks during one year per region. Medical necessity criteria included non-responsiveness to less invasive treatments, moderate to severe pain and disability, responsiveness to previous interventions with improvement in physical and functional status to justify repeating the procedure, and repeating the intervention only upon return of pain and deterioration in functional status. The American Society of International Pain Physicians stated that under unusual circumstances with a recurrent injury or cervicogenic headache, procedures may be repeated at intervals of six weeks after stabilization in the treatment phase.

4.3 Systematic reviews and meta-analyses

Diagnostic Utility of FJIs: No clinical history, physical examination, medical imaging, or biopsy test can identify the FJ as the source of pain.^{2,3,11,12} Hence, positive responses to local anesthetic blocks of the FJ or its nerve supply (medial branches of the dorsal rami of the relevant spinal nerves) can be used to identify the FJ as the source of pain.^{2,3,11,12} False positive rates range from 27% to 63% for the cervical spine, 55% to 58% for the thoracic spine, and 17% to 47% for the lumbar spine^{2,3} of patients experiencing >3 months of spinal pain that is sufficiently severe to warrant further investigation or referral to a pain-spine specialist, and recalcitrant to conservative management. Because single injections have a high false positive rate, patients should undergo placebo-controlled or comparative-controlled procedures^{2,11} at intervals of no less than one week or preferably two weeks.³ In placebo-controlled procedures, as many as three injections may be required. The first uses a local anesthetic agent, and if a positive response is obtained, the patient is subsequently subjected to

two further injections including a second different local anesthetic and a saline placebo. Significant pain relief or the ability to perform prior painful movements when exposed to a local anesthetic and no significant improvement when exposed to the placebo confirm the diagnosis. In comparative controlled procedures, patients obtaining significant pain relief from a local anesthetic receive a second different local anesthetic with a different duration of action. Significant pain relief, consistent with the duration of action of the local anesthetic, or the ability to perform prior painful movements after the second injection confirm the diagnosis. Because of ethical and financial considerations, the latter method is generally used because placebo-controlled procedures may require up to three injections, with one injection exposing the patient to radiation and potential side effects without providing therapeutic relief.

Therapeutic effect of FJIs: Nelemans *et al.*⁴ systematically reviewed RCTs examining the efficacy of FJIs for benign LBP lasting >1 month. Three eligible studies were identified,¹³⁻¹⁵ one of which was considered to be well designed. The results of this study were statistically non-significant. Nelemans *et al.*⁴ suggest that although FJIs do not seem to be effective, only one good quality study was identified, and thus, conclusions must be drawn with prudence. In their meta-analysis, Nelemans *et al.*⁴ concluded that, in general, few side effects were reported by studies on injection therapy with anesthetics or steroids. This meta-analysis was published in The Cochrane Library but is withdrawn because it is almost 10 years old. It is being updated by Bart Staal¹⁶ who estimated completion in September or October 2006 with subsequent review by the Cochrane back review group before publication.

In a review of Cochrane systematic reviews and the COST B13 European Guidelines for the Management of Acute and Chronic Non-Specific Low Back Pain⁹ by Van Tulder *et al.*,⁵ the conclusions of Nelemans *et al.*⁴ were reinforced, as no additional RCTs had been executed.

The most recent reviews by Boswell *et al.*^{3,12} qualitatively examined the effectiveness of FJIs in patients with chronic spinal pain for ≥ 3 months. Study inclusion criteria included satisfaction of minimum study quality criteria, evaluation of outcomes for ≥ 3 months, and documented existence of spinal pain of facet origin using controlled diagnostic FJ, nerve blocks, or single blocks. Two RCTs^{13,17} and five prospective or retrospective observational studies¹⁸⁻²² met the inclusion criteria. This review concluded that there was moderate evidence for short-term (<6 weeks) and limited evidence for long-term (≥ 6 weeks) improvement in managing LBP, and that the evidence was negative in managing neck pain.³

Cost-effectiveness of FJIs: No studies evaluating the cost-effectiveness of FJIs were identified.

Safety of FJIs: The most common complications of FJIs are related to needle placement and drug administration. Potential complications include hemorrhage; dural puncture; spinal cord trauma; infection; intra-arterial or intravenous injection; chemical meningitis; neural trauma; paralysis; pneumothorax; radiation exposure; facet capsule rupture; hematoma; steroid side effects; and epidural, subdural, or subarachnoid spread.³ Risks may be higher in the cervical spine given the proximity of the spinal cord.¹² Quantitative data regarding the incidence or prevalence of complications are lacking.¹²

4.4 Randomized controlled trials

Eight RCTs examining the efficacy of FJIs were identified (Appendix 1 Table 1).

FJIs versus placebo: Two RCTs compared FJIs using anesthetic or steroid with saline placebo.^{13,14} Carette *et al.*¹³ compared steroid FJIs with placebo FJIs in chronic LBP patients who had responded positively to an initial FJI using anesthetic. No statistically significant differences between groups were noted at one or three months in any of the outcomes (self-reported improvement, pain, functional status,

and finger to floor distance), and there was little change between one and three months. At three months, improvement was reported in 36% and 28% of those receiving steroids and placebo respectively. Although a statistically significant difference in favour of steroids was noted at six months, it was discredited by inconsistent improvement over time and concurrent interventions in the group receiving steroids. Lilius *et al.*¹⁴ compared three treatments in chronic LBP patients: steroid and anesthetic FJIs, peri-capsular steroid and anesthetic FJIs, and saline FJIs. Although statistically significant improvements were seen in return to work, pain, and disability, there were no differences noted among the three groups. At three months, 31% of patients reported improvement in or disappearance of symptoms, and 27% said they were slightly better.

These RCTs have been criticized. First, neither used appropriate diagnostic techniques to identify patients with pain of FJ origin. Carette *et al.*¹³ used one diagnostic injection to determine study eligibility, but the false-positive rate of such an approach can be substantial. Lilius *et al.*¹⁴ have been criticized for their broad inclusion criteria, such as including patients with previous disc surgery, and large injection volumes (8 mL). A lumbar FJ can accommodate 1 mL to 2 mL of fluid. Thus, the use of excessive volume may have caused extra-capsular leakage and the anesthetizing of adjacent pain-sensitive structures.²³

FJIs with steroids versus local

anesthetic: One small but methodologically rigorous study used comparative controlled FJ medial nerve branch blocks to diagnostically confirm chronic neck pain of FJ origin before randomly assigning patients to steroid or anesthetic FJIs.¹⁷ The median time to return to 50% of the pre-injection pain level was three days in the steroid group and 3½ days in the local anesthetic group. Only 14.3% and 25% of the steroid and local anesthetic group respectively, had at least one month of >50% pain relief. The limitation with this study is generalizability. All patients had neck pain attributed to a motor vehicle accident. Hence,

the responses of other chronic neck pain populations are unknown.

FJIs versus FJ medial nerve branch

blocks: Two studies compared FJIs with FJ medial nerve branch blocks for LBP, which was unconfirmed as arising from the FJ.^{15,24} Nash²⁴ compared steroid and anesthetic FJIs with medial branch nerve blocks using local anesthetics. Based on reviewer-performed statistical tests, no significant differences between groups were noted in pain, work status, or analgesic consumption at one month post-intervention. This study was of poor methodological quality for several reasons: diagnostic procedures were not performed to identify appropriate patients before randomization; allocation of every other patient could be predicted; no statistical tests were performed by the author; and 16.4% of the patients were lost to follow-up.

In a more methodologically rigorous study, Marks *et al.*¹⁵ compared FJIs with FJ nerve blocks using the same steroid and anesthetic injectant. Although a statistically significant greater proportion of those allocated to FJIs received at least some pain relief at one month post-intervention (57.1% versus 34.1%), no statistically significant differences were found at three months (39.0% versus 28.6%). Two of 83 (2.4%) patients had complete pain relief at three months. Marks *et al.*¹⁵ concluded that FJIs are diagnostic and cannot be considered worthwhile treatment for chronic back pain. If the diagnostic validity of the injections is accepted, it is essential that definitive management, such as a facet treatment or a rehabilitation program, be rapidly available for the responders to take advantage of the brief window of relief from their pain.¹⁵

FJIs with sodium hyaluronate versus

steroids: Despite the absence of a proven effect of steroids relative to placebo, Fuchs *et al.*²⁵ compared sodium hyaluronate FJIs with triamcinolone acetonide FJIs in the treatment of chronic LBP unconfirmed as arising from the FJ. Sodium hyaluronate was used by the researchers because it has been shown to improve the viscoelastic properties of defective synovial

fluid and has anti-inflammatory effects. Although both groups reported pain relief and improved function during the six months of follow-up, no statistically significant differences were noted between the two groups over time.

FJIs plus exercise versus exercise alone:

One small purported RCT examined whether the FJIs of anesthetics and steroids in addition to exercise were superior to exercise alone for chronic work-related LBP patients demonstrating lumbar rigidity.²⁶ Five to seven weeks after pre-treatment measures, statistically significant differences in favour of FJI plus exercise were noted with respect to range of motion. There were no statistically significant differences with respect to pain and disability. There were several limitations. First, patients were allocated to a treatment group based on the date of their visit, suggesting that allocation was predictable rather than random. Second, the groups were not comparable at baseline. Because the FJI plus exercise group demonstrated greater rigidity of the lumbar spine at baseline, they may have had greater potential for improvement in range of motion relative to the exercise-only group. Finally, 17% of the FJI plus exercise group had significant pain reduction post-FJI, suggesting that FJI therapy was inappropriate for this population. Hence, the efficacy of FJIs plus exercise relative to exercise alone in a population diagnosed with FJ pain by controlled diagnostic blocks is unknown.

FJIs plus bone scintigraphy versus FJIs alone:

Pneumaticos *et al.*²⁷ demonstrated positive impacts on short-term pain relief and costs of FJIs with the use of bone scintigraphy with single photon emission computed tomography (SPECT). SPECT detects bone areas with increased osteoblastic activity, synovial changes caused by inflammation or hyperemia, and degenerative changes. By using SPECT to identify appropriate patients and target injections, Pneumaticos *et al.*²⁷ demonstrated >50% reduction in the number of FJIs and a statistically significant greater change in pain scores at one and three months relative to patients with negative scans or no scans. They estimated that the addition of SPECT would reduce the costs of one treatment session for 100

Medicare patients from US\$225,678 to US\$188,887 for a savings of US\$36,791. This cost estimate assumed that approximately 48% of patients would be SPECT positive and subsequently receive an average of four FJIs in the treatment session. The cost savings are likely to be greater than those estimated, because the SPECT-positive patients are likely to receive a lower number of injections than patients treated without SPECT.

Factors affecting diagnostic utility of FJIs:

A small randomized double-blind placebo-controlled trial demonstrated that injection of local anesthetic in soft tissue while advancing the needle to the FJ or medial branch nerve significantly increases the proportion of patients with at least 75% reduction of pain compared with patients receiving saline during needle advancement.²⁸ The authors concluded that if an injection into the musculature overlying a lumbar FJ is performed with a local anesthetic, a false-positive result with respect to a diagnostic FJI may occur.

Safety of FJIs: Four RCTs provided information regarding side effects.^{13-15,17} Barnsley *et al.*¹⁷ reported transient facial flushing in two of 41 (4.9%) patients and temporary exacerbation of usual pain when the analgesic wore off (number affected not stated). Marks *et al.*¹⁵ reported the following for the FJI treatment group (n=42): all patients found the infiltration painful and unpleasant, four (9.5%) had transient headaches, one (2.4%) had transient paresthesia of one leg below the knee, one (2.4%) had transient nausea, and nine (21.4%) had worsening of pain immediately after infiltration. Carette *et al.*¹³ reported transient local pain at the injection site (number not stated), and Lilius *et al.*¹⁴ reported side effects in seven of 106 (6.6%) patients, but no details were provided. These RCTs suggest that serious adverse effects are rare. Despite an inability to quantify the rate, serious complications such as paraspinal abscess, epidural abscess, and septic arthritis have been reported.²⁹ According to the most detailed reporting by Marks *et al.*,¹⁵ a substantial proportion of patients experience minor transient adverse effects.

4.5 Observational Studies

Nine observational studies examining the efficacy of FJIs were identified (Appendix 1 Table 2). All can be considered to be case studies because of the lack of a comparison group.³⁰ Such studies compromise the ability to draw causal inferences between the treatment and the outcome. The treatment may appear to work, but other factors may be responsible such as placebo effect, spontaneous recovery, or a co-intervention unknown to the investigator. According to Bogduk,³¹ such studies are a basis for conjecture requiring proper investigation.

FJIs alone: Seven observational studies^{18-22,32,33} examined the impact of FJIs with steroids or combined local anesthetics and steroids on LBP. Within two weeks of injection, the proportion of patients experiencing at least some pain relief ranged from 53.7% to 78.0%.^{19,20,22,32} This dropped to 23.1% to 62.0% at three months.^{19,32} Although Carette *et al.*¹³ and Lilius *et al.*¹⁴ reported similar results at three months follow-up, these RCTs did not prove that FJIs were superior to placebo. Furthermore, limitations make these observational study results difficult to interpret. First, inclusion criteria were often poorly defined,^{18,21,33} and exclusion criteria were inconsistent. Some studies included patients with radiculopathy,¹⁸ previous lumbar surgery,²⁰⁻²² and acute LBP.^{21,22} Second, the method of targeting FJIs varied from injecting the same joints in all patients,^{20,33} to targeting sites that were tender on palpation,^{18,22} to using clinical and radiological findings.^{19,32} Third, only one study addressed the potential of co-interventions.³² Fourth, authors reported that the FJ capsule ruptured on injection,^{18,22} suggesting a lack of localized treatment. Last, there were variable lengths of follow-up,^{21,33} significant losses to follow-up,^{20,21} and the subjective nature of the outcomes.^{19-22,33}

FJIs plus exercise: Mayer *et al.*³⁴ examined the effect of steroid and anesthetic FJIs in 39 chronic LBP patients receiving workers' compensation and demonstrating segmental rigidity of at least one level in the lumbar spine. Although statistically significant improvements

in pain, disability, and range of motion were demonstrated over time, these patients also did stretching and strengthening, and received education and counselling, making the impact of the FJI difficult to discern. A more recent RCT by Mayer *et al.*²⁶ did not prove that the addition of FJIs was beneficial with respect to pain and function, compared to the results seen with an exercise program alone.

FJIs plus bone scintigraphy: A small prospective study by Dolan *et al.*³⁵ reinforced the findings of a recent small RCT²⁷ with respect to the usefulness of SPECT in targeting FJIs in chronic LBP patients. Patients with steroid and anesthetic FJIs directed to joints demonstrating increased uptake on SPECT had statistically significant lower pain scores at one and three months post-injection compared to those patients with negative SPECT who received their injections at tender joints. At six months, a statistically significant greater proportion of SPECT-positive patients had stopped analgesics (42% versus 14%). Dolan *et al.*³⁵ found that sites of tenderness and x-ray changes had little relationship to increased uptake on SPECT, calling into question the clinical methods used to identify the joints that were causing pain.

Safety of FJIs: Two^{20,21} of the nine observational studies addressed side effects. The authors reported no important complications. A multi-centre, prospective, observational study of 132 contrast-enhanced, fluoroscopically guided lumbar FJIs documented an incidence of 6.1% for intravascular uptake. The potential problems associated with intravascular injection include anesthetic toxicity (seizures, cardiac arrest, burning pain) and anaphylactic reactions from corticosteroids.³⁶

4.6 Funding of FJI in Canada

Representatives from each of the provinces and territories were asked whether FJIs were funded by their jurisdiction. All but three provinces and two territories responded (Appendix 1 Table 3). The method of billing for FJIs is inconsistent among the jurisdictions. While some jurisdictions have billing codes for FJIs, funding may be limited by the health professional who is

administering the injection. Often, nerve block or facet block injection codes are used. Other general joint injection codes are also used.

5 CONCLUSIONS AND IMPLICATIONS FOR RESEARCH AND POLICY

Ideally, all health care practices should be evidence-based. Because FJIs are costly, invasive procedures with associated risks and x-ray exposure, the importance of this requisite is magnified. According to the RCTs completed to date, FJIs with local anesthetics or steroids have not been proven to be superior to placebo for the treatment of chronic LBP. Steroid FJIs have not been proven to be superior to local anesthetic FJIs in the treatment of chronic neck pain secondary to a motor vehicle accident. The studies are limited. The most common limitation was the lack of appropriate diagnostic procedures to identify patients with pain of FJ origin. Only Barnsley *et al.*¹⁷ executed comparative-controlled FJ medial nerve branch blocks to identify an appropriate patient group before randomization. Future RCTs should:^{4,5,23}

- execute appropriate diagnostic procedures to identify patients with pain of FJ origin before randomization
- include adequate sample sizes based on a priori sample size calculations
- use a standardized treatment, with information about any concurrent treatment clearly stated
- establish the efficacy of FJIs relative to placebo before comparing medications with each other
- have an adequate follow-up duration of at least 12 months to ascertain long-term effects
- acknowledge basic study quality criteria such as concealment of allocation, baseline comparability of groups, blinding, documentation of loss to follow-up, and intention to treat analysis
- include economic evaluations to provide needed information about the costs of observed effects relative to alternative interventions.

Although FJIs have not been proven to be efficacious for the treatment of chronic LBP or chronic neck pain secondary to a motor vehicle accident, placebo- or comparative-controlled FJIs or medial nerve branch blocks are the standard for diagnosing pain of FJ origin. Unequivocally effective treatments with long-term impacts remain elusive. In the meantime, guidelines have been developed for more judicious therapeutic use of FJIs on a case by case basis.³

It has been recommended that FJIs be used to facilitate other forms of active conservative treatment, such as physical exercise, rather than as a stand-alone pain treatment.^{1,32} Although Mayer *et al.*²⁶ did not find FJIs with local anesthetics and steroids to be an effective addition to exercise alone, the study groups did not consist of patients with confirmed pain of FJ origin.

Using bone scintigraphy with SPECT to identify appropriate patients and target FJIs may offer a less burdensome and more cost-effective approach to management. More research is needed to evaluate this technology.

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APPENDIX 1: TABLES

Table 1: Randomized controlled trials involving FJIs

Study	Methods	Participants	Interventions	Main Outcomes	Findings (including side effects)
Pneumáticos <i>et al.</i> ²⁷	RCT, groups comparable at baseline, ANOVA	enrolled consecutive patients referred for FJI; LBP >6 mths and FJ syndrome diagnosis; LBP with lumbar extension; imaging evidence of facet joint abnormalities but not other abnormalities; no leg pain, spinal surgery, previous FJI, or pregnancy	patients randomized in a 2:1 ratio to receive bone scintigraphy with SPECT and FJI (n=31) versus FJI alone (n=16); SPECT used to identify appropriate injection sites among +SPECT patients (n=15); referring physician's recommended injection sites used for those with -SPECT (n=16) or not receiving SPECT (n=16); each injection consisted of 2.5 mL local anesthetic (0.5% bupivacaine hydrochloride) and 0.5 mL steroid (betamethasone sodium phosphate and betamethasone acetate injectable suspension with concentration of 6 mg/mL); approximately half administered intra-articularly and remainder after slight withdrawal	changes in pain at 1, 3, and 6 mths post-FJI relative to baseline; pain measured using American Academy of Orthopaedic Surgeons' MODEMS Lumbar Spine Baseline and Follow-up Survey; cost of SPECT+FJI versus FJI	2 patients not receiving SPECT lost to follow-up at 6 mths; in patients with +SPECT, number of FJIs reduced from 60 to 27; patients with +SPECT had SS greater changes in pain scores compared to patients with -SPECT or no SPECT at 1 and 3 mths; at 1 mth, 20 of 47 (43%) patients had positive change (>17 units) with respect to pain (+SPECT 86.7%, -SPECT 12.5%, no SPECT 31.2%); at 3 mths, 19 of 47 (40%) patients had positive change (>17 units) with respect to pain (+SPECT 80.0%, -SPECT 12.5%, no SPECT 31.2%); at 6 mths, 17 of 45 (38%) patients had positive change (>17 units) with respect to pain (+SPECT 53.3%, -SPECT 25.0%, no SPECT 35.7%); average cost per FJI procedure US\$2,257 (assuming 4 joints injected); average cost per SPECT US\$797; cost savings of using SPECT on 100 patients US\$36,791
Fuchs <i>et al.</i> ²⁵	RCT; blinded outcome evaluation; intent to treat analysis; groups comparable at baseline; t-tests and Mann-Whitney tests	chronic (≥3 mths) non-radicular LBP; radiologic confirmation of facet joint osteoarthritis of Kellgren grade 2/3; good general and nutritive condition	both groups had bilateral FJI at L3/L4, L4/L5, and L5/S1 over 3 treatment sessions (1 for each level) separated by 1 week; group 1 (n=30): FJI 1 mL triamcinolone acetonide (10 mg); group 2 (n=29):	outcomes measured at each treatment session, 3 mths, and 6 mths after last treatment session: pain on VAS; Roland Morris Questionnaire for functional limitation;	no SS differences noted between 2 groups over time; decrease in pain by 6 mths was 51.7% versus 45.1% in groups 1 and 2 respectively; improvement in Roland Morris Questionnaire by 6 mths was 33.4% versus 43.2% in groups 1 and 2 respectively; improvement in

Table 1: Randomized controlled trials involving FJIs

Study	Methods	Participants	Interventions	Main Outcomes	Findings (including side effects)
			FJI 1 mL sodium hyaluronate (10 mg) (Ostenil mini; TRB Chemedica, Haar, Germany)	Oswestry Disability Questionnaire; Low Back Outcome Score for physical function; German version of Short Form 36; primary end point was pain	Oswestry Disability Questionnaire by 6 mths was 29.5% versus 39.1% in groups 1 and 2 respectively; improvement in Low Back Outcome Score at 6 mths was 34.8% versus 43.9% in groups 1 and 2 respectively; Short Form 36 data shown graphically, but demonstrated improvements in physical functioning, pain, emotional functioning for both groups
Mayer <i>et al.</i> ²⁶	described as RCT but patients allocated to treatment group based on date of initial visit; outcome evaluators blinded; baseline comparisons indicated that group 1 had higher proportion of surgical patients and higher number of rigid levels; chi-square, independent, and paired t-tests	all diagnosed with chronic work-related lumbar spinal disorder; mean age 43 to 46 years; mean length of disability 12.4 to 15.6 mths; lumbar surgery not exclusion criterion; all had diagnosis of lumbar degenerative disc disease; no cases of spondylolisthesis or significant central or foraminal stenosis; all had lumbar rigidity affecting 1 to 3 levels, as measured by standardized observation of lumbar spine during lateral bending; excluded those without insurance authorization for treatment and those	group 1 (n=36): FJI bilaterally into lumbar levels affected by rigidity followed by exercise program; FJI consisted of 1 mL lidocaine (2%), 1 mL bupivacaine (0.5%), and 1 mL depot corticosteroid injected intra-articularly with residual injected over posterior facet capsule; group 2 (n=34): exercise program	performed pre and post treatment: pain using VAS; Million VAS disability score; inclinometric range of motion of three most caudal (non-surgically fused) levels (primary outcome); post treatment measures occurred about 5 to 7 weeks after pre-treatment measures; group 1 had post injection pain monitored to ascertain if facet syndrome existed: 80% reduction of pre-injection pain at 1 and 2 hours post-injection considered to be diagnostic	no dropouts; 5 of 29 (17.2%) patients in group 1 met diagnosis of facet syndrome; greater proportion of group 1 patients improved on all range of motion measures (SS); per cent improvement in group 1 patients SS greater than group 2 on all range of motion measures; no SS differences noted for proportion of patients experiencing pain relief (53% versus 50%, groups 1 and 2, respectively) or decrease in disability (72% versus 68%, groups 1 and 2 respectively)

Table 1: Randomized controlled trials involving FJIs

Study	Methods	Participants	Interventions	Main Outcomes	Findings (including side effects)
		who would be unwilling to receive FJI			
Barnsley <i>et al.</i> ¹⁷	RCT; double-blind; treatment groups comparable at baseline; t-test, Mann-Whitney U test, survival analysis	neck pain (>3 mths) attributed to motor vehicle accident; >18 years old; pain of FJ origin confirmed by comparative controlled FJ medial nerve branch blocks	patients allowed to continue using analgesic and physical therapy as pre-intervention; FJIs in both groups anesthetized with medial branch blocks using 0.5% bupivacaine so that subsequent intra-articular injections would be painless; group 1 (n=21): FJI with 1 mL betamethasone (5.7 mg); group 2 (n=20): FJI with 1 mL of bupivacaine (0.5%)	primary outcome: time from injection to return of at least 50% of pre-injection pain; other measures pre-intervention and 2 and 12 weeks post intervention: pain using VAS, McGill Pain Questionnaire total word count and score, psychological symptom scores; other measures at 1, 2, 4, 8, 12, 16, and 20 weeks: per cent of pre-injection pain being experienced	no losses to follow-up; median time to return to 50% of pre-injection pain level 3 days in group 1 and 3.5 days in group 2 (not SS); 14 of 21 (66.7%) patients in group 1 and 12 of 20 (60.0%) patients in group 2 had \geq 50% of baseline pain within 1 week of intervention; 3 of 21 (14.3%) patients in group 1 and 5 of 20 (25.0%) patients in group 2 had at least 1 mth of >50% pain relief; only 15 patients in total completed other outcomes before returning to \geq 50% of baseline pain, so results not presented; side effects: transient facial flushing in 2 patients, temporary exacerbation of usual pain when analgesic wore off (number affected not stated)
Marks <i>et al.</i> ¹⁵	RCT; single-blind for outcomes at 30 to 60 min; double-blind for outcomes at 1 and 3 mths; groups comparable pre-intervention; chi-square test	chronic (\geq 6 mths) LBP plus referred pain in extra-spinal location; pain worse with sustained postures; recalcitrant to conservative treatment; patients with previous spinal surgery allowed; exclusion criteria included nerve root signs, straight leg raise limited to <60°, or evidence of	group 1 (n=42): FJI; group 2 (n=44): FJ nerve block; injections consisted of 0.5 mL Depomedrone (20 mg methylprednisolone acetate) followed by 1 mL lignocaine (1%); lumbosacral level received 1.5 mL lignocaine instead of 1 mL	patient pain report at 30 min to 60 min, 1 and 3 mths post-intervention categorized as worsening of pain, no real change or unsure, worthwhile improvement but with some pain remaining, or complete relief of pain	3 losses to follow-up at 3 mths (1 in group 1 and 2 in group 2); SS greater proportion of group 1 received at least some pain relief at 1 mth (57.1% versus 34.1%); no SS differences between groups at 30 to 60 min (64.3% versus 54.5%) or 3 mths (39.0% versus 28.6%); at 3 mths, proportion of patients with complete relief of all pain was 4.8% in group 1 and 0% in group 2; side effects: similar across 2 treatment groups; for FJI, all patients found infiltrations painful and unpleasant, 4 (9.5%) had transient headaches, 1 (2.4%) had

Table 1: Randomized controlled trials involving FJIs

Study	Methods	Participants	Interventions	Main Outcomes	Findings (including side effects)
		progressive spinal disorder			transient paresthesia of one leg below knee, 1 (2.4%) had transient nausea, 9 (21.4%) had worsening of pain immediately after infiltration
Carette <i>et al.</i> ¹³	RCT; stratified by disability compensation status before randomization; placebo-controlled; double-blind; pre-intervention Sickness Impact Profile lower in group 1; intention to treat analysis; chi-square test for proportions; ANCOVA for continuous variables; completed sample size calculation	-age 18 to 65 years; LBP, buttock pain, or both ≥ 6 mths; normal neurological examination, no non-mechanical back pain, previous FJIs, low back surgery, pregnancy, known allergy to local anesthetic or radiologic contrast agents, or blood coagulation disorder; $\geq 50\%$ reduction in pain after FJIs with lidocaine	group 1 (n=49): FJI with 1 mL methylprednisolone acetate (20 mg) mixed with 1 mL isotonic saline; group 2 (n=48): FJI with 2 mL isotonic saline	assessed pre-intervention and at 1, 3, and 6 mths post-intervention: overall effect on 7-point scale ranging from very marked deterioration to very marked improvement; VAS for pain ranging from 0 (no pain) to 10 (very severe pain); McGill pain questionnaire; function status via modified version of Sickness Impact Profile; number of days in past 2 weeks activity limited by back pain; finger to floor distance on maximal forward flexion	-outcomes missing for no more than 2 patients at any follow-up time; over course of follow-up, 11 of 49 (22.4%) group 1 patients and 6 of 48 (12.5%) group 2 patients reported receiving concurrent interventions; no SS difference between groups at 1 and 3 mths on any outcome; little change between outcomes at 1 and 3 mths; at 1 mth, very marked or marked improvement reported in 42% and 33% of groups 1 and 2 respectively; at 3 mths, very marked or marked improvement reported in 36% and 28% of groups 1 and 2 respectively; although SS differences in favour of steroids noted at 6 mths, discredited by inconsistent improvement over time and concurrent interventions; side effects: transient local pain at injection site
Nash ²⁴	states that this is RCT but allocation not random; blinded outcome assessment; no statistical tests performed; reviewer-conducted analyses indicated 2 groups comparable with	admitted consecutive patients with diagnosis of FJ pain; primarily LBP with no evidence of root irritation; did not exclude those with previous surgery	group 1 (n=33): FJI of 0.5 mL of lignocaine (2%), 0.5 mL bupivacaine (0.5%), and 20 mg methylprednisolone acetate suspension; group 2 (n=34): medial branch posterior rami nerve blockade with 1 mL lignocaine (2%) and 1 mL bupivacaine (0.5%)	rated pre- and 1 mth post-intervention: pain (nil, mild, moderate, severe, or very severe); work status (nil, limited, full); analgesic consumption	11 of 67 (16.4%) lost to follow-up; reviewer-conducted analyses revealed: no SS difference in pain or work distribution between groups 1 mth post-intervention; no SS difference in change in pain medication use between groups at 1 mth post-intervention

Table 1: Randomized controlled trials involving FJIs

Study	Methods	Participants	Interventions	Main Outcomes	Findings (including side effects)
	respect to work status and pain pre-intervention				
Lilius <i>et al.</i> ¹⁴	RCT; blinded outcome evaluation; all groups equal pre-intervention; t-test, chi-square, and ANOVA	mean age 44 years, range 19 to 64; LBP >3 mths localized to 1 side; negative straight leg raise; approximately 25% had previous disc surgery; conservative treatment unsuccessful	group 1 (n=28) received FJI with 6 mL bupivacaine hydrochloride (30 mg) and 2 mL methylprednisolone acetate (80 mg); group 2 (n=39) received same mixture as group 1 but injected peri-capsularly; group 3 (n=42) received FJI with 8 mL saline	measured pre-intervention, and 1 hour, 2 weeks, and 6 weeks post-intervention: pain on 0 to 100 mm VAS; verbal categorization of pain; range of motion; objective disability during standing, walking, sitting, sitting with legs extended, climbing on examination table, and dressing; return to work; measured at 3 mths post-intervention: pain on 0 to 100 mm VAS; verbal categorization of pain; return to work	-3 patients were lost to follow-up -for the group as a whole, SS improvement was seen in return to work, pain, and disability -no SS difference between the 3 groups with respect to return to work, pain, and disability -range of motion findings were not consistent -at 3 mths, 31% of patients reported improvement in or disappearance of symptoms and 27% said they were slightly better Side effects: side effects reported in 7/106 (6.6%) not detailed

RCT=randomized controlled trial, ANOVA=analysis of variance, LBP=low back pain, mth(s) = month(s), FJ=facet joint, FJI=facet joint injection, SPECT=single photon emission computed tomography, SS=statistically significant, VAS=visual analogue scale, ANCOVA=analysis of covariance

Table 2: Observational studies involving FJIs

Study	Methods	Participants	Interventions	Main outcomes	Findings (including side effects)
Shih <i>et al.</i> ³²	prospective cohort; t-test and chi-square test	277 consecutive outpatients with principal complaint of chronic LBP (≥ 1 year); aged 15 to 82 years; 50.9% females; no root signs, neural compression signs on previous imaging, back surgery, or history of inflammatory arthritis or spondyloarthropathies	277 patients undergoing FJI; site of injection dependent on subjective complaints and x-ray findings; FJI consisting of 0.8 mL to 1.5 mL mixture of lidocaine, betamethasone dipropionate, and iopamidol (1:1:0.5)	10-point VAS for pain relief within 1 day of injection, then at 1, 3, 6, and 12 weeks after injection; scores of 0 to 5=excellent to good, 6 to 10=fair to poor	204 of 277 (73.6%) had initial excellent or good response at 1 week; 147 of 277 (53.1%) had excellent or good response at 3 weeks; 83 of 277 (30.0%) had excellent or good response at 6 weeks; 64 of 277 (23.1%) had excellent or good response at 12 weeks; 59 of 204 (28.9%) patients receiving initial relief had radiofrequency rhizotomy within 8 to 313 days of injection, confounding effect of FJI
Mayer <i>et al.</i> ³⁴	prospective cohort; blinded evaluation of outcome measures; paired t-tests and repeated measures ANOVA	39 industrial LBP patients receiving workers' compensation; minimum 4 mths disability; mean age 40 years; 51% had previous surgical treatment; 97% had previous facet injections; pain increased on active lumbar extension; observed segmental rigidity at ≥ 1 levels of lumbar spine on lateral bend (measured with standardized observation)	all were provided same intervention (n=39); bilateral FJIs in lumbar regions demonstrating segmental rigidity; FJ injected with 2 mL bupivacaine hydrochloride (0.25%) and 1 mL methylprednisolone acetate; if joint would not accept full 3 mL, needle withdrawn and peri-articular overflow allowed; standardized home stretching program for 2 to 4 weeks after FJI; after stretching program, admission to rehabilitation program (8 hrs/day for 4 weeks) consisting of exercise, education, and counselling	measured pre-FJI, after home stretching program, and after rehabilitation program: pain with VAS; The Dallas Analog Disability scale; inclinometric measures of lumbar range of motion	SS improvements noted for all outcomes over time

Dolan <i>et al.</i> ³⁵	prospective observational; Mann-Whitney and chi-square tests; SPECT positive patients older (mean age 54 versus 41 years), range of motion and pain measures similar pre-intervention	LBP >3 mths duration; fulfilled criteria for FJ pain: more pain on spinal extension than flexion, pain relieved by rest and worsened on sitting or standing, and not made worse by coughing or sneezing; excluded those with previous spinal surgery, signs of nerve root compression, inflammatory or metabolic disorder, or general ill health	all received FJI and no other treatment permitted; FJI consisted of 0.5 mL lignocaine (1%) and 40 mg methylprednisolone; when joint space could not be seen, injection placed adjacent to joint; patients with increased SPECT uptake (n=19) at lumbar FJ received FJI at these sites; patients without uptake at FJ on SPECT (n=35) received FJI to sites of maximal tenderness	measured pre-intervention: sites of tenderness on palpation, x-rays of lumbar spine, planar bone scintigraphy; measured pre and 1, 3, and 6 mths after FJI: spinal flexion and extension range of motion, pain measured with modified McGill Pain Questionnaire (MPQ), Present Pain Intensity (PPI) score, and VAS; analgesic intake	no SS differences noted in range of motion between SPECT positive and negative patients; SPECT positive patients had SS lower pain (MPQ, PPI, VAS) at 1 mth and 3 mths (MPQ), but not at 6 mths; at 6 mths, SS greater proportion of SPECT positive patients had stopped analgesics (42% versus 14%); sites of tenderness and x-ray changes had little relationship to increased uptake on SPECT
Goupille <i>et al.</i> ³³	retrospective cohort; chi-square, ANOVA, simple linear regression	206 consecutive patients treated with lumbar FJI at teaching hospital; chronic LBP (≥6 mths) suggestive of facet syndrome; no disc disease or spinal canal stenosis; mean age 47 years (range 25 to 81 years)	FJI with betamethasone (1 ampoule) in L4/L5 and L5/S1 on 1 or both sides of body; 93 (45%) patients received 1 injection session, 68 (33%) patients received 2 injection sessions, and 45 (22%) received 3 injection sessions	measured at 10 to 34 mths after FJI: patient report of success or failure; clinical score of excellent, average, or failure depending on pain; activity limitations; continued need for treatment	follow-up time ranged from 10 to 34 mths; 86 (41.7%) patients self-reported success; clinical score excellent in 48 (23.3%), average in 63 (30.6%), and poor in 95 (46.1%); age, sex, overweight, and number of injection sessions had no influence on treatment outcome; those with no occupation, no history of occupational injury, and no discectomy had more favourable clinical outcomes (SS); numbers of patients receiving pain relief over time inconsistent and are not reported

Murtagh ¹⁸	retrospective cohort, descriptive statistics	100 patients selected as candidates for diagnosis and treatment of lumbar facet syndrome on clinical grounds by referring orthopedic surgeons; radiculopathy or sciatica not exclusion criteria	FJI with 1 mL lidocaine(1%) and upon confirmation of pain relief, 1 mL of bethamethasone (6 mg); focal tenderness to digital examination decided site of injection; author reports that sensations felt on injection suggest that joint capsule is ruptured	self-reported pain on scale from 1 to 10 where 10 represents worst pain ever experienced	immediate relief reported in 183 of 194 (94.3%) injection sites; >3 mths relief reported in 105 of 194 (54.1%) injection sites
Lynch & Taylor ¹⁹	prospective cohort; descriptive statistics and chi-square tests; blinded outcome evaluations at 3 and 6 mths; patients blinded to intra or extra-articular injection site	50 patients diagnosed with chronic LBP arising from lumbar FJs; 76% women; mean age 44.7 years (range 20 to 76 years); inclusion criteria included LBP>6 mths, focal paraspinal tenderness, and worsening of pain on hyperextension; all patients previously treated by analgesics, physiotherapy, or support; exclusion criteria included motor weakness, anesthesia, systemic arthropathy, or radiological evidence of bone disease, spondylosis or spondylolisthesis	FJI of methylprednisolone 60 mg; injection site(s) determined by clinical and radiological examinations; joint above also routinely injected to allow for diagnostic errors due to overlapping sensory supply; goal was to inject intra-articularly, but could not always be achieved	subjective pain relief (total relief, partial relief, or no relief) at 2 weeks, 3 mths, and 6 mths	at 2 weeks results were 11 (22%) total relief, 28 (56%) partial relief, 11 (22%) no relief; at 3 mths results were 14 (28%) total relief, 17 (34%) partial relief, 19 (38%) no relief; at 6 mths results were 14 (28%) total relief, 14 (28%) partial relief, 22 (44%) no relief; total pain relief associated with site of injection such that intra-articular injections more effective than extra-articular (SS)

Lau <i>et al.</i> ²⁰	prospective cohort; descriptive statistics	50 consecutive patients with clinical diagnosis of lumbar FJ pain; criteria for diagnosis included moderate to severe LBP with or without referral to buttock(s) or lower limb(s); tenderness over facet area; increased pain with forced lumbar hyperextension; and absence of radicular signs; inclusion criteria: lumbar FJ pain for >3 mths; pain not controlled by rest, non-steroidal anti-inflammatory drugs and physical therapy; and absence of radiological evidence of disc herniation, spinal stenosis, or neural foraminal nerve root impingement; following characteristics relate to 34 patients not lost to follow-up: 52.9% female; mean age= 50 years (range 21 to 80 years); 4 (11.8%) had undergone laminectomies; 5 (14.7%) had spondylolysis; 18 (52.9%) receiving workers' compensation	FJI with 1.5 mL bupivacaine hydrochloride(0.5%) and methylprednisolone acetate 20 mg; unilateral or bilateral injections of L4/L5 and L5/S1 depending on whether pain unilateral or bilateral	subjective pain relief	16 of 50 (32%) lost to follow-up; following results relate to 34 patients followed for > 4 mths: 19 of 34 (55.9%) reported immediate post-injection pain relief; 12 of 34 (35.3%) reported >70% pain relief for ≥6 mths; according to authors, age, duration of symptoms, and presence of structural damage on x-ray and CT not useful predictors of response whereas litigation associated with poorer outcome (no statistical tests reported); side effects: authors reported no important adverse reactions; 1 patient had vasovagal reaction on infiltration of skin with local anesthetic
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Lippitt ²¹	retrospective cohort; descriptive statistics	99 patients; 41.4% women; age ranged from 17 to 71 years; duration of symptoms ranged from 2 weeks to 16 years; 57 of 99 (57.6%) workers' compensation injuries; 24 of 99 (24.2%) motor vehicle accidents with pending litigation; 20 of 99 (20.2%) had previous discectomies; all patients failed to significantly improve after 2-week trial of bed-rest and anti-inflammatory medication	FJI with 1 mL lidocaine 1% and 1 mL Depo-Medrol 80 mg	subjective change in pain and disability	17 of 99 (17.2%) had complete relief of symptoms for ≥ 3 mths and ability to return to work if previously not working (this statement contradicted later in text); 25 of 99 (25.3%) had >70% symptomatic relief and ability to return to work; 9 of 99 (9.1%) had 50% symptomatic relief, this being significant to alter lifestyle and ability to return to work; 4/99 (4.0%) slightly improved but no change in disability; 44/99 (44.4%) had no change in symptoms; 22 of 44 (50%) with no change in symptoms lost to follow-up; authors reported no observed association between treatment response and pain pattern, duration of symptoms, previous spine surgery, and presence of litigation or workman's compensation (no statistical tests reported); side effects: no complications and no patient was made worse
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Destouet <i>et al.</i> ²²	prospective cohort; descriptive statistics	54 patients with acute or chronic LBP; 42.6% women; age ranged from 21 to 60 years; 13 (24.1%) had previous laminectomy, discectomy or posterolateral fusion	FJI with 1 mL bupivacaine hydrochloride 0.25% and methylprednisolone acetate 40 mg; authors noted that in most patients joint capsule ruptures during injection of contrast material allowing medication to diffuse around branches of spinal nerve or into intervertebral foramen where nerve passes; choice of injection level based primarily on clinical evidence, particularly focal FJ tenderness	subjective pain relief	29 of 54 (53.7%) had partial or complete relief post FJI; 11 of 54 (20.4%) had continued complete pain relief (time period unclear); 6 of 54 (11.1%) had complete pain relief for 6 to 12 mths after injection; those with previous surgery had poorer responses (no statistical test reported); inconsistency noted in text regarding number of patients free of pain 6 to 12 mths post-injection
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LBP=low back pain, FJ=facet joint, FJI=facet joint injection, ANOVA=analysis of variance, mth(s)=month(s), VAS=visual analogue scale, SS=statistically significant, SPECT=single photon emission computed tomography, MPQ=McGill Pain Questionnaire, PPI=Present Pain Intensity, hrs=hours

Table 3: Funding of FJIs in Canada

Province or Territory	Funding
Newfoundland	no specific fee code for FJI, generic joint injection codes and nerve block codes may be used
New Brunswick	specific fee code for FJIs performed by radiologists; otherwise, codes for sacroiliac or vertebral injection by physician can be used; codes for paravertebral blocks exist
Ontario	no specific fee code for FJI, codes under “Injections or Infusions” may apply
Manitoba	pain clinic specialists (all anesthetists) use specific codes for fluoroscopic guided blocking of medial branch of spinal nerves, lumbar and cervical, both for diagnostic and therapeutic indications; physical medicine specialists have specific code for paraspinal injections
Saskatchewan	covers single facet injections and multiples to additional maximum of five
Alberta	no specific fee code for FJI, alternative “assessment” codes have been used
British Columbia	codes for nerve root and facet blocks in cervical, thoracic, and lumbar regions
Yukon	codes for nerve root and facet blocks (cervical and thoracic) under section of anesthesia