Image-guided lumbar facet joint infiltration in nonradicular low back pain

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Abstract

Objective: To assess the efficacy of facet joint infiltrations for pain relief in 44 selected patients with chronic nonradicular low back pain (LBP). Materials and Methods: Forty-four patients with chronic LBP of more than 3 months’ duration were selected for facet joint infiltration. The majority (n = 24) had facetal pain with no evidence of significant facetal arthropathy on imaging. Fifteen patients had radiological evidence of facetal arthropathy, one had a facet joint synovial cyst, three were post–lumbar surgery patients, and two patients had spondylolysis. Facet joint injections were carried out under fluoroscopic guidance in 39 patients and under CT guidance in 5 cases. Pain relief was assessed using the visual analog scale at 1 h post-procedure and, thereafter, at 1, 4, 12, and 24 weeks. Results: A total of 141 facet joints were infiltrated in 44 patients over a 2-year period. There was significant pain relief in 81.8% patients 1 h after the procedure, in 86.3% after 1 week, in 93.3% after 4 weeks, in 85.7% after 12 weeks, and in 62.5% after 24 weeks. No major complications were encountered. Conclusions: Facet nerve block was found to be a simple, minimally invasive, and safe procedure. With meticulous patient selection, we achieved long-term success rates of over 60%. We conclude that this method represents an important alternative treatment for nonradicular back pain.

Key words: Facetal arthropathy; facetal infiltrations; low back pain

Chronic low back pain (LBP) has assumed endemic proportions, with an annual prevalence of 5–20% in the industrialized world.[1] It is not always possible to pinpoint the exact structure or pathology responsible for LBP. In 2001, a large study on patients with chronic LBP showed that in as many as 15–45% of patients the pain was due to pathology of the facet joints and only in 13–20% was the pain due to herniated discs.[2][3] With the realization by surgeons that not all backache is a ‘disc’ and not all patients with LBP will respond to surgery, there is increasing awareness of the role of percutaneous injection techniques in the nonoperative management of chronic LBP. The use of image-guidance with fluoroscopy or CT scan has increased the precision and safety of these procedures.[4] However, despite the increasing popularity of these procedures, there are few studies exploring their therapeutic efficacy. We report our experience of facet joint infiltration in 44 selected cases of chronic nonradicular LBP. To the best of our knowledge, this is the first sizeable series documenting the therapeutic use of facet joint injections in the Indian context.

Materials and Methods

Patient selection
All patients were initially assessed by a neurosurgeon before referral to the anesthesiologist-run pain clinic. A total of 44 patients were included in the study on the basis of the following criteria:

a. Chronic LBP of more than 3 months’ duration, not responding to conventional drugs, exercise, and physiotherapy
b. Symptoms suggestive of facetal pain; i.e., LBP with or without radiation to the buttocks, thigh, or groin; pain increasing on hyperextension; and pain when initiating movement
c. Focal tenderness over the facet joint elicited by digital pressure
d. Post–lumbar disc surgery patients with persistent pain and no MRI evidence of arachnoiditis or recurrent disc disease
All the patients had a preprocedure MRI for categorical exclusion of a discogenic cause for the LBP. Evidence of facet arthropathy on MRI was noted but was not considered an inclusion criterion by itself.

The exclusion criteria were:

a. A neurological deficit in the lower limb or a positive sciatic nerve stretch sign (i.e., radicular pain radiating below the knee, elicited by a passive straight leg raise of 60–90°)
b. Evidence of nerve root compression at the expected level on MRI
c. Clinical or imaging evidence of infection or neoplastic disease
d. Possible pregnancy, bleeding diathesis, or anticoagulant therapy
e. History of sensitivity to local anesthetics

There were 23 men and 21 women included in the study; the ages ranged from 20–74 years. The duration of symptoms varied from 3 months to 2.5 years (mean duration: 11 months). In our patient population, the largest subgroup (23/44) had clinical signs and symptoms of facetal pain but no evidence of significant facetal arthropathy on imaging (radiography / CT / MRI). Fifteen patients had clinical as well as radiological evidence of facetal arthropathy [Figure 1], one patient had a facet joint synovial cyst [Figure 2], three were post–lumbar surgery patients, and two patients had spondylolysis at the L₄₋₅ and L₃₋₄ levels, respectively.

**Procedure**

The procedure was explained to the patient in detail and written consent was obtained. Injections were performed under fluoroscopic guidance in most (39/44) patients. CT guidance was used in five cases. The levels and side(s) to be injected were selected by the treating pain physician on the basis of the tenderness elicited over the joint, correlated with imaging findings, if any.

**Fluoroscopic procedure:** The patient was placed in the prone position with a pillow under the abdomen to correct the lumbar lordosis. The joint to be injected was located and marked. The x-ray tube was then slowly rotated till the joint appeared in profile as two parallel lines. After cleaning and draping, and administration of local anesthesia, a 22-G spinal needle was inserted in line with the x-ray beam till it contacted bone at the lip of the facet joint. With fine movements the needle tip could be made to enter the joint with a distinct ‘give.’ In the early cases, we confirmed the intra-articular position of the needle by injecting 0.5 ml iohexol (Omnipaque®; Amersham Health, New Jersey, USA) under fluoroscopy. Later, with increasing experience, we found that confirmation of correct needle placement could be made by feel and by viewing the joint in the lateral oblique projection [Figure 3]. Once the needle was in place, 0.5 ml of 0.25% bupivacaine (a long-acting local anesthetic) and 0.5 ml (20 mg) of methylprednisolone acetate were injected into the joint. The patient was observed for 1 h after the procedure to document pain relief and to monitor for allergic reactions.

**CT-guided procedure:** The patient was placed in the prone position and 5-mm axial sections were obtained at the level of interest to determine the entry site and the angle of approach. The entry site was marked on the skin and a 22-G needle was advanced into the joint [Figure 4]. The drug injection protocol was identical to the one used with fluoroscopic guidance.

**Assessment of pain relief**

Pain relief was assessed using a visual analog scale (VAS), with a score of 0 denoting ‘no pain’ and a score of 10 the ‘worst pain possible’ [Figure 5]. The VAS score was assessed before the procedure, 1 h after the procedure and, thereafter, at 1, 4, 12, and 24 weeks. A reduction in the VAS score of
Figure 3: Fluoroscopy-guided lumbar facet joint injection at L4–5. The oblique spot image shows the intra-articular position of the needle (arrow).

Figure 4: CT-guided facet injection. Axial CT scan in the prone position shows the needle positioned at the lip of the right L5–S1 facet joint.

Table 1: Levels of facet joint infiltrations

| Level  | Bilateral | Unilateral | Total | Percentage |
|--------|-----------|------------|-------|------------|
| L5–S1  | 14        | 16         | 30    | 21.3       |
| L4–5   | 25        | 20         | 45    | 31.9       |
| L3–4   | 21        | 16         | 37    | 26.5       |
| L2–3   | 12        | 11         | 23    | 16.3       |
| L1–2   | 02        | 02         | 04    | 2.7        |
| DJ2–L1 | 01        | 01         | 02    | 1.3        |
| Total  | 75        | 66         | 141   | 100        |

50% or more from the pretreatment score was considered as significant pain relief and the patient was labeled a ‘responder.’

Results

A total of 141 facet joints (75 bilateral and 66 unilateral) were infiltrated in 44 patients, over a period of 2 years. The maximum number of infiltrations were at L4–5 (31.9%) followed by L3–4 (26.5%) [Table 1]. Only a small proportion of the patients (6/44) had an injection at a single level; most required injections at multiple levels: 14 at two levels, 16 at three levels, and 8 at four or more levels.

Pain relief

The number of patients with significant postprocedure pain relief on day 1 and at 1, 4, 12, and 24 weeks is detailed in Table 2. Immediately postprocedure, 81.8% reported significant pain relief. This number increased slightly at 1 week and reached a peak at 4 weeks, by which time as many as 93.3% patients had responded. However, the number of patients with pain relief declined to 62.5% at 24 weeks.

At 4 weeks, the three patients who did not respond were re-injected at the affected levels. Of these, one responded to the reinjection; the other two remained non-responders throughout the period of follow-up. Four of the patients who had responded well at 4 and 12 weeks required repeat injections between 16 and 20 weeks to maintain the pain relief. Another four patients who had good relief till 12 weeks received repeat injections at 24 weeks as the effect waned.

A further analysis of the pain relief in the different subgroups of patients is shown in Table 3. There was no difference in the number of responders in the group of patients with imaging evidence of facetral arthropathy as compared to those with no imaging findings. The single patient with a synovial facet cyst and both the patients with spondylolysis showed good pain relief in the immediate postprocedure period and remained pain-free for the entire duration of follow-up. The three patients with failed back surgery syndrome (FBSS) showed a poor response, with only one patient responding in the short term; none had any significant pain relief after 4 weeks, despite re-injections.

Complications

We saw no major complications. Five patients had minor undesired effects in the form of soreness or local skin bruising; these symptoms lasted 2–3 days and subsided without treatment.

Figure 5: The visual analog scale for pain assessment (Source: Nature Clinical Practice Rheumatology 2007; 3: 610-618)
Discussion

Facet joints are true synovial joints which are innervated by the medial branches of the dorsal rami. The presence of nociceptive nerve fibers in the synovium and fibrous capsule of the facet joints suggests that these joints may be a cause for LBP when they are stressed due to segmental instability, inflammatory synovitis, degenerative arthritis, or a combination of all of these.[5,6] Based on studies using controlled diagnostic blocks, it has now been conclusively proved that facet joints are a source of pain in as much as 15–45% of patients with LBP.[2,7]

Unfortunately, there are no clinical or imaging findings to definitively diagnose facet pain and very often the term ‘facet syndrome’ is used as a ‘dustbin diagnosis’ when nothing else fits. However, there are some features that are characteristic of facet arthropathy. These include diffuse referred pain over the buttock and posterolateral thigh, exacerbation of pain with hyperextension or lateral bending, tenderness localized over one or more facet joints on deep pressure, and absence of root pain or neurological deficits.[6]

Imaging is not reliable for the diagnosis of facet osteoarthritis since the changes seen on x-ray, CT, and MRI are equally common in patients with and without LBP, and most studies have failed to show a correlation between radiologic imaging findings and facet joint pain.[8–10]

Facet joint injection with local anesthetic and steroid is the simplest and most common procedure for facet joint–mediated pain. These infiltrations are diagnostic as well as therapeutic and the choice of guidance—whether CT or fluoroscopic—is largely a matter of personal preference and experience, as both are equally effective.[4,9,10] The immediate pain relief after the injection is attributed to the effect of the long-acting local anesthetic which interrupts the pain–spasm cycle. The corticosteroid begins to act by 1 week and by about 3 weeks the peak effect sets in. There may be a nonspecific synovitis present in many of these joints that is relieved by the anti-inflammatory action of corticosteroids. In many cases, rupture of the articular capsule during injection results in the drugs diffusing into the neural foramina too, thus, acting on the adjacent nerves as well [Figure 6]. A simple physical effect, whereby inflammatory exudates or adhesions are cleared from the joint and the nerve root sleeve, may also play a role.[11–13]

Accurate assessment of pain is a prerequisite for the effective management of patients with LBP. Of the numerous tools available to assess pain, we adopted the numerical visual analog scale (VAS) since it is an objective measure and can be used to track serial changes.[13] Many recent studies of facet joint injections have also used the VAS as the scoring system for pain, thus allowing us to compare our findings with other studies. Also in accordance with these studies, we considered a 50% reduction in the VAS score from the preprocedure level as indicating significant pain relief.[12,14]

Table 2: Assessment of pain relief after facet injections

| Duration following injection | No. of patient ‘responders’ | Percentage | Remarks |
|-----------------------------|----------------------------|------------|---------|
| 1 hour                      | 36 / 44                    | 81.8       |         |
| 1 week                      | 38 / 44                    | 86.36      |         |
| 4 weeks                     | 41 / 44                    | 93.3       | 3 Nonresponders reinjected |
| 12 weeks                    | 36 / 42                    | 85.7       | 2 Patients lost to follow-up |
| 24 weeks                    | 25 / 40                    | 62.5       | 4 Patients lost to follow-up |

Table 3: Etiology-wise assessment of pain relief after facet joint injection

| Etiological group                | No of patients | 1 h | 1 Week | 4 Week | 12 Week | 24 Week |
|----------------------------------|----------------|-----|--------|--------|---------|---------|
| Clinical facet pain with no      | 23             | 19  | 20     | 22     | 19/22   | 13/20   |
| abnormal facet morphology on     |                |     |        |        |         |         |
| imaging                          |                |     |        |        |         |         |
| Radiological facet               | 16             | 14  | 15     | 16     | 14/15   | 10/15   |
| arthropathy + facetal cyst        |                |     |        |        | 1 lost to follow-up | 1 lost to follow-up |
| Spondylolisthesis                 | 02             | 02  | 02     | 02     | 02      | 02      |
| FBSS                             | 03             | 01  | 01     | 01     | 01      | 0       |
| Total                            | 44             | 36  | 38     | 41     | 36      | 25      |

Other studies in recent years have reported encouraging results with facet joint infiltrations and the results of the pain relief obtained in these studies are shown in Table...
These results demonstrate significant short-term (1–12 weeks) pain relief in 62–74% of patients. Though the pain response gradually declines over time, even in the medium term (up to 24 weeks) as many as one-third of patients still experience significant pain relief.[10,12,17,18] Our results showed short-term relief in 86–93% of patients and medium-term relief in 62%, which compare favorably with the results of these earlier studies. In our opinion, the high number of responders in our study could be due to meticulous adherence to the patient selection criteria, with elicitation of paraspinal tenderness over the facet joint being the most important inclusion criterion. The presence or absence of facet joint arthropathy on imaging was not related to pain relief in any way, and the main factor associated with a successful outcome of facet joint interventions was clinically elicited paraspinal tenderness.[10,12,14]

Injections for spondylolysis are a modification of facet injections, providing good response in most patients. Some workers feel that it is the fracture site which is painful and, accordingly, infiltrate the break in the pars interarticularis.[4] Others have demonstrated that injection of the adjacent facet joint also involves the spondylolytic area and the technique can thus be used for therapeutic injections.[10,19] On fluoroscopy, we could demonstrate the passage of contrast from the facet joint into the defect in the pars interarticularis [Figure 7], with good and sustained pain relief. The uniformly poor results with facet joint injections in patients with FBSS is because post–lumbar surgery pain is due to an interplay of numerous causes and facet joint injection addresses only one of them.[14,20] Due to the small number of FBSS patients in our series we could not derive any statistically significant information from our data.

The major complications of facet joint infiltrations are related to improper needle placement, bleeding, or infection. Complications include dural puncture, hematoma formation, spinal cord or neural trauma, spinal anesthesia, septic arthritis / spondylitis, and chemical meningitis.[21] Despite this long list and numerous anecdotal reports in literature,[22–24] it is our experience that with meticulous attention to technique and sterility, these major complications can be eliminated.

We acknowledge the following limitations of our study. Firstly, we did not have a control group receiving placebo injections. Secondly, we did not carry out a preliminary diagnostic block for patient selection prior to giving the therapeutic injection. This was because we found it difficult to justify a preliminary diagnostic block followed by a

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Table 4: Pain relief following lumbar facet injections in various recent studies

| Study                  | Total no. of patients | Percentage of patients with pain relief following facet injection |
|------------------------|-----------------------|------------------------------------------------------------------|
|                        |                       | 1 week | 3-4 weeks | 12 weeks | 24 weeks |
| Shih et al. (2005)[16] | 277                   | 73.6%  | 72.1%     | 31.4%    | Not assessed |
| Schulte et al. (2006)[17] | 39                | Not assessed | 62%     | 41%      | 36%     |
| Gorbach et al. (2006)[11] | 42                | 74%    | 33%       | 38%      |
| Destouet et al. (1982)[9] | 54             | Not assessed | 54%     |          |         |

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Figure 6: Fluoroscopy-guided lumbar facet joint injection showing intra-articular position of the needle tip and contrast filling the inferior recess (arrow). There is spread of contrast in the perifacetal region (arrowheads) due to rupture of the capsule.

Figure 7 (A–C): Facet injection in spondylolysis. The lateral radiograph (A) shows a break in the pars interarticularis (arrow). Oblique fluoroscopic spot image (B) shows a fluoroscopy-guided L4–5 facet injection with filling of the inferior recess (arrowhead). Note the spondylolysis (arrow). A more delayed image (C) shows tracking of contrast from the facet joint into the spondylolytic site (arrow). Note the emptying of contrast from the joint space.
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Source of Support: Nil, Conflict of Interest: None declared.