

ORIGINAL ARTICLE

Chronic Low Back Pain Management: Comparison of Facet Denervation with Radiofrequency Thermoablation and Facet Joint Injection

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Abstract

Introduction: Chronic low back pain (CLBP) remains a prevalent and challenging condition to manage. This study aims to reassess and compare the effectiveness of two minimally invasive treatments, which are facet joint denervation via radiofrequency thermoablation (RFT) and facet joint injection (FI).

Methods: A retrospective analysis was conducted on 84 patients suffering from CLBP. The cohort was divided into two groups: 42 patients underwent RFT, and 42 underwent FI. Pain was assessed using a Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (worst pain), with evaluations conducted at the first and sixth months post-treatment.

Results: Initial findings indicated a significant reduction in pain scores in the RFT group, with a 60.9% reduction after the first month and 74.3% after six months. In contrast, the FI group showed a 51.8% reduction in pain scores after the first month, which decreased to 35.4% after six months. These results suggest more pronounced and sustained pain relief in patients undergoing RFT than those receiving FI.

Discussion and Conclusion: The comparative analysis reaffirms the efficacy of RFT in managing CLBP, outperforming FI in both short-term and especially long-term pain reduction. This study underscores the importance of selecting appropriate treatment modalities based on individual patient profiles and specific anatomical targets for optimal outcomes in CLBP management.

Keywords: Chronic lower back pain; facet injection; facet joint denervation; pain management; radiofrequency thermocoagulation.

Chronic low back pain (CLBP) is a pervasive health issue globally, affecting a significant portion of the adult population and contributing to substantial healthcare costs and loss of productivity^[1]. Its etiology's complexity, encompassing biomechanical and psychosocial factors, makes CLBP a challenging condition to treat effectively^[2]. Among the various sources of CLBP, facet joint pathology is increasingly recognized as a critical contributor, necessitating targeted therapeutic interventions.

Recent advancements in minimally invasive techniques have opened new avenues for CLBP management, mainly focusing on the lumbar facet joints. These joints, integral to the spinal structure, can be sources of significant discomfort due to their susceptibility to degenerative changes and stress-induced injuries^[3]. The evolving understanding of facet joint-related pain has led to the development of two primary treatment modalities: facet joint injection (FI) and facet denervation using radiofrequency thermocoagulation (RFT).

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FI, a technique involving the administration of corticosteroids and anesthetics directly into the facet joint, aims to provide immediate pain relief and reduce inflammation^[4]. On the other hand, RFT, a more recent approach, employs radiofrequency waves to disrupt nerve function in the affected area with thermoablation, potentially offering longer-lasting pain relief. However, the comparative effectiveness of these treatments in the context of CLBP remains a subject of ongoing research and debate^[5].

This study aims to fill this gap by comprehensively comparing FI and RFT in treating CLBP. By evaluating the outcomes of these two approaches in a retrospective patient cohort, we seek to offer insights into their relative efficacy, thereby guiding clinical decision-making in managing this debilitating condition.

Materials and Methods

Study Design and Setting

This retrospective study, conducted at Ümraniye Training and Research Hospital, aimed to compare the efficacy of facet denervation using radiofrequency thermocoagulation (RFT) and facet joint injection (FI) in treating chronic lower back pain. The study period spanned from January 2023 to November 2023.

The study cohort comprised 84 patients, divided into two groups. The RFT group included 42 patients treated with radiofrequency thermocoagulation, and the FI group formed 42 patients who received facet joint injections.

Inclusion Criteria

Adult patients (18-65 years) diagnosed with CLBP lasting over six months. Patients have only low back pain without radiating to the buttock or extremities. All patients first had medical treatment, but they had no improvement.

Exclusion Criteria

Patients with neoplasias, neurological deficits, radicular leg pain in physical examination, and previous lumbar surgeries, fractures, spondylolisthesis, disc herniations evident on MRI were excluded from the study.

Treatment Procedures

Facet Denervation

Under local anesthesia and fluoroscopic guidance, patients in the FD group underwent radiofrequency thermocoagulation targeting the medial branch nerves of the affected bilateral facet joints. A 21-gauge, 10 cm

guide needle was sent percutaneously to the medial nerve transition zone of the facet joint to be processed. The radiofrequency thermocoagulation process, using 80° heat, was completed in two minutes.

Facet Injection

The FI group received injections into the bilateral facet joints, consisting of a corticosteroid (0.5cc Depo-Medrol) and a local anesthetic (2cc Marcaine), administered under fluoroscopic control.

Outcome Measures

Pain Assessment

The primary outcome was pain intensity, measured using the Visual Analog Scale (VAS), where 0 represented 'no pain' and 10 indicated 'the worst imaginable pain'.

Statistical Analysis

Data analysis involved comparing VAS scores from baseline to each follow-up point within and between the treatment groups. The SPSS program was used for calculating statistical significance, which was set at a p-value of less than 0.05.

Results

The study included 84 patients, with an average age of 48.6 years in the FD (facet denervation) group and 49.2 years in the FI (facet injection) group. The FD group comprised 21 females and 21 males, while the FI group also comprised 21 females and 21 males, indicating a balanced gender distribution across both treatment modalities. There was no statistical significance in gender and age.

Patients in the FD group reported a significant decrease in pain. The average pre-treatment Visual Analog Scale (VAS) score was 8.2, which reduced to 3.2 at the one-month follow-up (a 60.9% reduction) and further decreased to 2.1 at the six-month follow-up (74.3% reduction).

In the FI group, the average pre-treatment VAS score was 7.9. This score decreased to 3.8 at one month (51.8% reduction), but then regressed to 5.1 at six months, indicating only a 35.4% reduction from the baseline.

A detailed comparison between the FD and FI groups revealed that FD was more effective in providing sustained pain relief and functional improvement. This was more evident in the VAS scores over six months. The FI treatment showed initial effectiveness, but its benefits in pain relief and functional improvement appeared to diminish over time (Table 1).

Table 1. The Visual Analog Scale(VAS) scores of facet injection(FI) and facet denervation(FD) procedures. The results of comparison between preoperative and sixth month scores of procedures.

VAS	Preoperative	Postoperative 1 st month	Postoperative 6 th month	P value of comparison 6 th month
FI	7.9	3.8	5.1	0.670
FD	8.2	3.2	2.1	0.012

These results suggest that FD, with its sustained effectiveness in reducing pain and improving functionality, might be a preferable long-term management strategy for chronic lower back pain. The findings underscore the importance of considering immediate and long-term outcomes when selecting a treatment modality for chronic lower back pain.

Discussion

Many factors put patients at risk for the development of CLBP, including age, body mass index, educational status, psychosocial factors, and environmental factors^[6]. Evaluation of patients with back pain includes completing an appropriate history, performing physical and neurological examinations, and radiodiagnosics^[7]. Treatment of CLBP includes relative rest, activity modification, nonsteroidal anti-inflammatories, physical therapy, and interventional percutaneous treatments^[8,9].

Facet joints are a well-recognized source of pain in subjects with persistent spinal pain. These joints are well innervated by the medial branches of the dorsal rami^[10]. Free and encapsulated nerve endings in facet joints, as well as nerves containing substance P and calcitonin gene-related peptide, are found. Facet joint capsules contain low-threshold mechanoreceptors, mechanically sensitive nociceptors, and silent nociceptors. Lumbar and cervical facet joint capsules can undergo high strains during spine loading^[11,12].

The results of our study offer significant insights into the management of CLBP, particularly in comparing the efficacy of FD (facet denervation) using radiofrequency thermocoagulation and FI (facet injection). Our findings suggest a clear advantage of FD over FI in terms of pain reduction and functional improvement over six months. The sustained pain relief observed in the FD group can be attributed to the mechanism of radiofrequency thermocoagulation, which targets the nerve supply of the facet joints. This approach aligns with the growing body of evidence supporting radiofrequency treatments in chronic pain conditions. The lasting effect of FD, as seen in our study, underscores its potential as a preferred treatment modality for CLBP, offering immediate and prolonged relief.

In contrast, the FI group showed initial improvements, which were not maintained over time. This pattern of short-term efficacy followed by a gradual return of symptoms is consistent with other studies on steroid injections for joint pain. While effective initially, these injections may not provide long-term relief for chronic conditions like CLBP. This raises important considerations about using FI in clinical practice, particularly for patients seeking long-term solutions.

Our study's comparative analysis of FD and FI also highlights the importance of patient selection and treatment customization in CLBP management. Individual patient characteristics, including the nature and duration of pain, previous treatment responses, and overall health status, should inform the choice between FD and FI.

Lakemeier et al.^[13] compared FI and RFT. They found that intraarticular steroid infiltration or radiofrequency denervation appears to be a managing option for chronic function-limiting low back pain of facet origin, with favorable short- and midterm results in terms of pain relief and function improvement, but improvements were similar in both groups.

Lee et al.^[14] found that conventional radiofrequency denervation resulted in significant reductions in low back pain originating from the facet joints in patients showing the best response to diagnostic block over the first 12 months when compared with sham procedures or epidural nerve blocks, similar to our study in long-term results.

Zhou et al.^[15] investigated that improved X-ray-guided radiofrequency thermocoagulation denervation is an effective, minimally invasive, and convenient method for treating low back pain secondary to lumbar facet syndrome.

RFT could be performed in various styles, where you could change the thermoablation degree and ablation time^[16]. Ertilav et al.^[17] found that in patients with lumbar facet syndrome, RFT application at different degrees and seconds is effective because it generates equal energy, and there was no significant difference in pain relief between the groups.

Our study contributes to the ongoing dialogue in the medical community about the most effective

and patient-centric approaches to managing CLBP. It underscores the need for a nuanced understanding of different treatment modalities, their mechanisms, and their long-term outcomes.

Moreover, the study's findings have implications for healthcare resource utilization. Given the chronic nature of lower back pain and its impact on quality of life and economic burden, identifying more effective and lasting treatments is crucial. With its longer-term efficacy, FD could reduce the need for repeated interventions and ongoing medical management, thereby alleviating both patient suffering and healthcare costs.

There are limitations to this study, including that the number of patients could be increased, and the affected lumbar levels could be separated in analysis. Thus, treatments could be compared according to the levels of the lumbar spine.

Conclusion

In conclusion, our study reinforces the superiority of facet denervation using radiofrequency thermocoagulation over facet joint injection in treating chronic lower back pain, especially regarding long-term benefits. This is evidenced by its sustained effectiveness in reducing pain. However, the treatment choice should be tailored to the ability to find the technical equipment, individual patient needs, and further research is warranted to explore these treatments' long-term effects and optimal application in diverse patient populations.

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