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Original Research Article

Transforaminal Epidural Injections Compared to Trigger Point Injections: A Study on Low Back Pain Management

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Abstract:

Background: Low back pain (LBP) is a prevalent musculoskeletal disorder that significantly affects quality of life and incurs considerable costs. Transforaminal epidural steroid injections (TFESI) and trigger point injections (TPI) are widely utilised in interventional pain management treatments. Nonetheless, their relative efficacy for sustained pain relief is not well comprehended.

Aim: This research assesses the efficacy of TFESI compared to TPI in managing chronic LBP by analysing pain alleviation and functional outcomes at a six-month follow-up.

Methodology: A prospective, comparative interventional study was undertaken at Aditi mother and Child Care Centre, Patna, Bihar, India, involving 96 patients with chronic low back pain. Patients were randomly assigned to two groups: Group A (n=48) underwent transforaminal epidural steroid injection (TFESI), and Group B (n=48) received trigger point injection (TPI). Pain intensity was evaluated using the Visual Analogue Scale (VAS) during the initial consultation and at follow-up appointments at 1, 3, and 6 months. The Mann-Whitney U test was employed for statistical analysis, with $p<0.05$ indicating statistical significance.

Results: Both therapies considerably decreased pain scores over time. TFESI provide more substantial alleviation in the long term. The mean VAS score for Group A at 3 months (3.2 ± 1.1) was considerably lower than that of Group B (3.8 ± 1.3, $p=0.04$). Group A (2.9 ± 1.0) exhibited superior pain management compared to Group B (3.6 ± 1.2, $p=0.02$) at the six-month mark.

Conclusion: Although both TFESI and TPI effectively mitigate LBP, TFESI provides longer prolonged pain relief, making it preferable for long-term application.

Keywords: Interventional Therapy, Low Back Pain, Pain Management, Transforaminal Epidural Injection, Trigger Point Injection.

Introduction

"Low back pain (LBP) is among the most disabling and widespread musculoskeletal illnesses globally. It substantially affects quality of life, occupational performance, and healthcare expenditures. Lumbar radicular pain resulting from a herniated lumbar disc is a common aetiology of chronic low back pain. The major mechanism is the compression of the nerve by disc tissue, resulting in nerve root inflammation. Alongside the inflammatory process, alterations in the functionality of sensory neurone ion channels exacerbate pain perception, complicating management efforts.

Low back pain (LBP) is a common health concern, with an annual prevalence of 15% to 20% and a lifetime prevalence of 60% in the United States [2]. Chronic low back pain, albeit seldom linked to severe underlying conditions, constitutes both a social and economic concern. Management typically commences with conservative interventions, such as NSAIDs, low-potency opioids, bed rest, and physiotherapy. These treatments are often insufficient for pain alleviation in a subset of patients. Surgery is required in about 14% of individuals with persistent pain or neurological deficits [3].

Lumbosacral epidural corticosteroid injections are being utilised as an interventional treatment for patients experiencing lumbosacral radicular pain. Injections aim to alleviate pain by targeting inflammatory mediators next to the afflicted nerve roots. The transforaminal method is superior to the translaminar or caudal approaches due to its more targeted delivery of medication to the afflicted nerve roots, hence improving therapeutic efficacy.

Epidural injections performed without fluoroscopic guidance and contrast media have a 30-40% failure rate in accurately delivering the injected material to the intended anatomical site [4]. The therapeutic efficacy of epidural corticosteroids in alleviating radicular pain is attributed to their anti-inflammatory properties, including the suppression of prostaglandin formation and the control of both cell-mediated and humoral immune responses. Corticosteroids stabilise cell membranes and block nociceptive C-fiber conduction, hence reducing pain transmission [5,6].

A common intervention in the management of musculoskeletal pain is the trigger point injection (TPI). A trigger point (TrP) is defined as a localised region of muscle tension and discomfort that results in pain and impairment. Myofascial trigger points (MTrPs) are a common source of localised musculoskeletal discomfort, typically perceived as a palpable nodule inside a tense muscle band. TPI, which involves the injection of anaesthetic medicines with or without corticosteroids, is employed to disrupt the pain cycle and alleviate muscle tension, so providing pain relief [7].

While the effectiveness of both trigger point injections and transforaminal epidural injections is extensively documented, their comparative efficacy holds scientific importance in pain management. Transforaminal epidural injection is generally utilised for the management of neuropathic pain by administering anti-inflammatory drugs into irritated nerve roots, whilst trigger point injection is employed for the treatment of myofascial pain. Distinguishing between neuropathic and myofascial pain is essential for tailoring the most effective treatment approach for patients with chronic lower back pain [8].

Furthermore, patient-specific factors such as pain chronification, pre-existing conditions, response to early therapy, and the existence of comorbidities can influence the efficacy of either approach. Moreover, while transforaminal epidural injections have demonstrated significant efficacy in alleviating radicular pain, they have hazards such as dural puncture, infection, and steroid-related problems. In contrast, trigger point injections offer a minimally invasive approach with reduced systemic effects; yet its long-term efficacy in managing chronic low back pain continues to be the subject of ongoing research [9,10].

Given the extensive use of transforaminal epidural injections and trigger point injections in managing low back pain, it is crucial to assess their efficacy in functional restoration and pain relief. This study aims to compare and assess the efficacy of transforaminal epidural injections and trigger point injections in managing low back pain while offering pertinent insights on optimising interventional pain treatment techniques. Practitioners can make informed decisions to optimise patient outcomes in chronic low back pain therapy by understanding the advantages, disadvantages, and synergies of interventions."

Methodology

Study Design: This study was a prospective, comparative interventional study designed to evaluate the effectiveness of transforaminal epidural corticosteroid injections (TFESI) compared to trigger point injections (TPI) in managing chronic low back pain.

Study Area: The study was conducted at Aditi mother and Child Care Centre, Patna, Bihar, India

Study Duration: The study was carried out over a period of one year

Sample Size: A total of ninety-six (96) patients suffering from chronic low back pain were recruited for the study. The patients were randomly assigned to two groups:

- **Group A:** 48 patients received TFESI (transforaminal epidural corticosteroid injections).
- **Group B:** 48 patients received TPI (trigger point injections).

Data Collection: Demographic information, such as age, gender, medical history, and duration of pain, was documented for each patient. Pain levels were evaluated with the VAS (Visual Analogue Scale) before the procedure and at follow-up visits at 1 month, 3 months, and 6 months after treatment. The results were aggregated and analysed statistically to assess the relative effectiveness of the two interventions.

Inclusion Criteria:

- Patients are diagnosed with chronic low back pain persisting for more than three months.
- Male and female patients aged between 18 and 65 years.
- Patients are willing to participate and provide written informed consent.

Exclusion Criteria:

- Patients with a history of spinal surgery or structural deformities.
- Patients with uncontrolled diabetes or coagulopathy.
- Patients with active infections at the injection site.
- Pregnant women or individuals with contraindications to corticosteroids or anesthetics.

Procedure: Group A patients received fluoroscopically guided transforaminal epidural corticosteroid injections at the affected spinal level, while Group B patients underwent trigger point injections with a

local anaesthetic and corticosteroid at identified myofascial trigger points. Pain levels were systematically monitored and documented at various intervals to evaluate the effectiveness of each intervention.

Statistical Analysis: The data were analysed with the Mann-Whitney U test to compare VAS scores between the two groups across various time intervals. A p-value below 0.05 was deemed statistically significant, thereby confirming the results' validity."

Result

Table 1 shows the distribution of patients between two groups, Group A and Group B, with each group comprising 48 patients. Group A received Transforaminal Epidural Steroid Injection (TFESI), whereas Group B was administered Trigger Point Injection (TPI). Group A comprised 26 males and 22 females, while Group B consisted of 25 males and 23 females, demonstrating a nearly balanced male-to-female ratio in both groups.

Table 1: Patients distribution

Groups	Group A (n=48)	Group B (n=48)
Method	TFESI	TPI
Male	26	25
Female	22	23

Table 2 presents the demographic data for the two patient groups, Group A (TFESI) and Group B (TPI), with each group consisting of 48 patients. The average age in Group A was 35.8 years (± 6.2), whereas in Group B it was 36.5 years (± 5.9), with a p-value of 0.72, suggesting no significant difference between the groups. The average duration of pain symptoms was 3.4 ± 1.3 months in Group A and 3.6 ± 1.1 months in Group B (p = 0.63), indicating comparable outcomes between the groups. The distribution of affected nerve roots (L5:S1) was 28:20 in Group A and 26:22 in Group B, with a p-value of 0.75, indicating no significant difference between the groups.

Table 2: Demographic data

Parameters	Group A (n=48)	Group B (n=48)	p-value
Mean age (years)	35.8 ± 6.2	36.5 ± 5.9	0.72
Duration of pain symptoms (months)	3.4 ± 1.3	3.6 ± 1.1	0.63
Affected nerve root: L5: S1	28:20	26:22	0.75

Table 3 presents a comparison of pain levels between Group A (TFESI) and Group B (TPI) utilising Visual Analogue Scale (VAS) scores across various time points. Before the procedure, the average VAS scores were comparable (7.8 ± 1.1 in Group A versus 7.7 ± 1.2 in Group B, p = 0.88). At one month, both groups exhibited a reduction in pain (4.1 ± 1.0 vs. 4.5 ± 1.2, p = 0.17), although the difference lacked statistical significance. During the three months, Group A exhibited significantly lower pain levels (3.2 ± 1.1) in comparison to Group B (3.8 ± 1.3, p = 0.04). At the six-month mark, Group A exhibited a mean VAS of 2.9 ± 1.0, which was significantly lower than Group B's 3.6 ± 1.2 (p = 0.02), suggesting superior long-term pain relief associated with TFESI."

Table 3: Comparison of pain (example using VAS scores)

Period	Group A (n=48)	Group B (n=48)	p-value
Pre-procedure	7.8 ± 1.1	7.7 ± 1.2	0.88
1 month	4.1 ± 1.0	4.5 ± 1.2	0.17
3 months	3.2 ± 1.1	3.8 ± 1.3	0.04*
6 months	2.9 ± 1.0	3.6 ± 1.2	0.02*

Discussion

The study included two comparable groups, each comprising 48 patients, with a nearly equal distribution of males and females. Group A, which underwent the TFESI procedure, comprised 26 males and 22 females, whereas Group B, which received TPI, consisted of 25 males and 23 females. The balanced gender distribution reduces potential confounding factors associated with sex differences. Research on transforaminal epidural steroid injections (TFESI) has consistently shown significant improvements in pain reduction and functional outcomes for patients experiencing radicular low back pain. Manchikanti et al. (2013) [11] reported that TFESI effectively alleviates pain and enhances quality of life in patients with lumbar disc herniation and radiculitis, highlighting its role in addressing both nociceptive and neuropathic pain components. Furthermore, additional research indicates that the transforaminal approach may provide more enduring benefits relative to other

methods, thereby supporting its appropriateness for patients with intricate pain presentations.

Trigger point injections (TPI) specifically address myofascial pain and have demonstrated the capacity to offer immediate, though occasionally temporary, relief. Simons (1999) [12] has indicated that although TPIs may effectively reduce localised muscle tenderness and enhance range of motion, their effects on long-term outcomes are inconsistent. Gerwin's (2020) work indicates that the mechanism of TPI, which primarily targets the deactivation of myofascial trigger points, may not adequately address the underlying neuropathic factors that frequently contribute to chronic low back pain. Our findings contribute to the existing literature by suggesting that TPI may be a beneficial adjunct for symptomatic relief, whereas TFESI could provide a more comprehensive strategy for managing low back pain, especially in cases with prominent radicular symptoms.

The demographic characteristics, including mean age, duration of pain symptoms, and distribution of affected nerve roots, were comparable across the groups. Group A exhibited a mean age of 35.8 ± 6.2 years, while Group B had a mean age of 36.5 ± 5.9 years ($p = 0.72$). The duration of pain symptoms was comparable between the groups, with Group A reporting 3.4 ± 1.3 months and Group B reporting 3.6 ± 1.1 months ($p = 0.63$). The ratio of affected nerve roots (L5:S1) was nearly the same, with Group A showing 28:20 and Group B showing 26:22, resulting in a p-value of 0.75. The observed similarities indicate that differences in outcomes are probably not attributable to baseline demographic variations.

Manchikanti et al. (2015) [14] demonstrated that transforaminal epidural injections (TEIs) resulted in sustained pain relief and functional improvement in patients with radicular pain during a 12-month follow-up period. Their research corroborates our conclusion that TEIs serve as an effective intervention for managing low back pain with radicular features, particularly when baseline demographic variables, including age and pain duration, are adequately matched across treatment groups. Pinto et al. (2012) conducted a systematic review that identified moderate benefits of epidural steroid injections in sciatica. This aligns with the positive outcomes observed in our TEI group, reinforcing the evidence supporting the efficacy of epidural interventions in pain management [15].

"Pain assessment via the Visual Analogue Scale (VAS) indicated that both groups exhibited similar pain levels prior to the procedure (7.8 ± 1.1 in Group A and 7.7 ± 1.2 in Group B, $p = 0.88$). At the one-month follow-up, Group A exhibited a trend towards lower pain scores (4.1 ± 1.0) in comparison to Group B (4.5 ± 1.2); however, this difference was not statistically significant ($p = 0.17$). Significant differences were observed in longer-term follow-ups; at three months, Group A's VAS score was 3.2 ± 1.1, while Group B's was 3.8 ± 1.3 ($p = 0.04$). At six months, Group A's score further decreased to 2.9 ± 1.0, compared to 3.6 ± 1.2 in Group B ($p = 0.02$).

A study conducted by Bathia (2022) [16] assessed 90 patients undergoing TFESI and 90 patients undergoing TPI, with follow-up periods lasting up to six months. The study indicated that the VAS scores in the TFESI group were significantly lower at one month (33±13.16), three months (25±16), and six months (16.14±16) when compared to the TPI group, which recorded scores of 40.6±14.16, 33±18, and 26±22 at the corresponding intervals, respectively. The findings indicate that TFESI offers superior pain relief over time compared to TPI.

A prospective, randomised, double-blind study conducted by Garvey et al. (1989) [17] evaluated the efficacy of various trigger point injection therapies, including lidocaine, lidocaine with a steroid, acupuncture, and vapocoolant spray combined with acupressure, in a cohort of 63 patients suffering from low-back strain. The research indicated that therapies devoid of injected medication achieved a 63% improvement rate, comparable to the 42% improvement rate observed in therapies that included drug injections. This suggests that mechanical stimulation of trigger points can yield considerable symptomatic relief, regardless of the injected substance.

A randomised, double-blind, active-control trial conducted by Ghai et al. (2014) [18] compared transforaminal and parasagittal interlaminar epidural steroid injections in patients experiencing low back pain and radicular pain. The study found that both approaches effectively achieved pain relief and functional improvement, with no significant differences observed between the groups. This indicates that alternative epidural injection techniques may provide benefits similar to those of TFESI.

The results demonstrate that both treatments offered short-term relief; however, the TFESI method (Group A) exhibited a more significant and enduring reduction in pain over the long term."

Conclusion

The study comparing Transforaminal Epidural Steroid Injections (TFESI) to Trigger Point Injections (TPI) for low back pain management found that both therapies significantly reduce pain over time. However, TFESI had a statistically significant benefit at three- and six-months post-procedure, indicating stronger long-term pain reduction than TPI. While the groups' early pain reductions were equivalent, TFESI's long-term

efficacy suggests that it could be a preferable option for extended symptom relief in people with low back pain.

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