DOI: 10.4274/jarem.galenos.2025.58076
J Acad Res Med 2025;15(2):101-6

Evaluation of the Combined Effectiveness of Transforaminal and Facet Joint Injections in Low Back and Leg Pain Unresponsive to Conservative Treatment

Osman Boyalı[1], Onur Öztürk[2], Gülseli Berivan Sezen[3], Eyüp Can Savrunlu[1], Ömer Özdemir[1], Serdar Kabataş[1]

[1]University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital, Department of Neurosurgery, İstanbul, Türkiye
[2]Acıbadem Taksim Hospital, Clinic of Neurosurgery, İstanbul, Türkiye
[3]Giresun Training and Research Hospital, Clinic of Neurosurgery, Giresun, Türkiye

Cite this article as: Boyalı O, Öztürk O, Sezen GB, Savrunlu EC, Özdemir Ö, Kabataş S. Evaluation of the combined effectiveness of transforaminal and facet joint injections in low back and leg pain unresponsive to conservative treatment. J Acad Res Med. 2025;15(2):101-6

ABSTRACT

Objective: This study evaluates the short- to mid-term effectiveness of simultaneous transforaminal anterior epidural injection (TAEE) and facet joint injections (FJI) in patients with acute low back and leg pain and assesses the impact of obesity on treatment outcomes.

Methods: Sixty-seven patients (22 males, 45 females) underwent TAEE and FJI. Pain levels were assessed using the visual analog scale (VAS) and Oswestry Disability Index (ODI) before treatment and at the 6-month follow-up. Non-parametric tests and logistic regression were used for statistical analysis.

Results: A total of 105 TAEE and 302 FJI procedures were performed. Significant reductions in VAS and ODI scores were observed at 6 months ($p<0.05$). Obese patients had significantly higher VAS scores at follow-up ($p=0.002$ for low back pain, $p=0.019$ for radicular pain). However, logistic regression analysis showed that obesity was not an independent predictor of post-treatment VAS scores ($p=0.211$, $p=0.168$).

Conclusion: TAEE and FJI effectively reduce pain in patients with low back and leg pain unresponsive to conservative treatment. While obesity may delay pain relief, it does not independently affect treatment success.

Keywords: Low back pain, radiculopathy, facet joint injection, transforaminal anterior epidural injection, steroids, obesity

INTRODUCTION

Low back pain is a significant problem that causes dysfunction in the musculoskeletal system, leading to socio-economic losses in all societies. Epidemiological studies have shown that 65-80% of the general population suffers from low back pain at some point in their lives. It can generally be managed with bed rest, medical treatment, and physical therapy. However, it can become chronic and reduce patients' quality of life. One of the most important causes of chronic low back pain is intervertebral disc degeneration (1). In patients with low back pain, specific cases of lumbar disc herniation (LDH) and lumbar spinal stenosis account for only 15%, while the remaining 85% are diagnosed with "non-specific low back pain" (2).

Minimally invasive methods can be applied to reduce pain and improve quality of life for patients who do not respond to conservative treatment, have failed surgical treatment, or do not require surgical intervention. Lumbar transforaminal anterior epidural and facet joint injections (FJI) are the most well-known ones among these methods. Transforaminal anterior epidural injection (TAEE) is a safe method for the non-surgical treatment of spinal stenosis and can also support the indications for surgical treatment (3). Anterior epidural steroid injections performed under fluoroscopy are commonly used for the treatment of low back and lower extremity radicular pain. These procedures have been shown to be effective in relieving pain in the short term and are relatively safe (3).

Although the primary indication for transforaminal anterior epidural steroid injection is symptomatic disc herniation that does not require surgery, it is also widely and effectively used for lumbar canal stenosis, failed back surgery syndrome, postoperative

ORCID IDs of the authors: O.B. 0000-0002-2500-1718, O.Ö. 0000-0003-1766-1625, G.B.S. 0000-0001-9129-5470, E.C.S. 0000-0001-9022-200X, Ö.Ö. 0000-0003-3783-0203, S.K. 0000-0003-2691-6861

Corresponding Author: Osman Boyalı, MD;
E-mail: drosmanboyali@gmail.com
Received Date: 17.12.2024 **Accepted Date:** 01.08.2025
Publication Date: 08.08.2025

J Acad Res Med 2025;15(2):101-6

epidural fibrosis, spondylolisthesis, infectious radiculitis, and neuralgic pain (4,5).

This study aims to retrospectively analyze the data of 67 patients, in a single center, with low back and radicular pain who underwent combined TAEE and facet joint injection, without having had lumbar surgery, evaluating short- to mid-term clinical efficacy and reliability.

METHODS

This retrospective study was conducted with ethics approval granted by the Institutional Ethics Committee of a University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital (approval number: 19, date: 03.07.2024), and all participants provided written informed consent in accordance with the Declaration of Helsinki.

Sixty-seven patients who underwent combined transforaminal epidural and FJI, and had pre- and post-procedure six-month records were included in the study. Patients were included in the study if they had not responded to previous conservative treatments and experienced low back and radicular pain lasting more than two months. Additionally, their visual analog scale (VAS) pain scores were higher than 4, and Oswestry Disability Index (ODI) scores were above 18. Those excluded from the procedure were pregnant or had a suspected pregnancy history, were candidates for surgery or had previously undergone surgery, had wounds in the procedure area, had bleeding disorders, allergies to the medications administered, serious chronic illnesses, low Karnofsky scores, or any form of organ failure. The sex, height, weight, body mass index (BMI), complaint, and neurological signs were noted. Before the procedure, VAS and ODI scores were recorded for all patients.

All the patients were evaluated again six months after the procedure. VAS and ODI scores were measured to objectively assess changes in pain levels. For the VAS, the scores ranging between 0 and 2 were classified as optimal responses to the treatment, the scores of 3 and 4 as suboptimal responses, and the scores of 5 and above as insufficient responses.

Surgical Procedure

The patients were taken to the operating room, and procedures were performed under sterile conditions. A fluoroscopy device was used for imaging. The patient was placed in a prone position on the operating table, aligned with the fluoroscopy device. The area to be injected was cleaned according to asepsis-antisepsis rules and covered with a sterile drape. Local anesthesia (0.5-1 ml of 1% lidocaine) was applied to the area before the procedure. Using fluoroscopy, the entry point for foraminal injection was targeted from anteroposterior (AP), lateral, and oblique angles, aiming for the triangle described by Kambin and Gellman (6), which lies between the facet joint posteriorly, the exiting nerve root laterally, and the vertebral pedicle inferiorly. A 24-G spinal needle was used for all foraminal injections. When the target point was reached as confirmed by fluoroscopic control, the accuracy of the needle position was checked with 0.5 mL of non-ionic contrast material. The contrast material should spread in a straight line in the anterior epidural space in the lateral view (Figure 1). After confirming the correct spread of the contrast material on fluoroscopy, a total of 5 mL of drug consisting of 3 mL of bupivacaine, 1 mL of isotonic solution, and 1 mL containing 40 mg of methylprednisolone was administered. Additionally, FJI were performed in these patients. For the facet joint injection, the needle was placed in the target facet joint using AP-lateral fluoroscopy control (Figure 2). No contrast control was performed for the facet joint injection. Similar to the transforaminal injection, a 5 mL drug solution consisting of 3 mL of bupivacaine, 1 mL of isotonic solution, and 1 mL/40 mg of methylprednisolone was administered for the facet joint injection. After the procedure, the patients were monitored for 2 hours before being mobilized and discharged on the same day.

Statistical Analysis

SPSS version 26.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. The normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The results indicated that the data did not follow a normal distribution ($p<0.05$ for all key variables); therefore, non-parametric tests were used. The Mann-Whitney U test was applied for pairwise comparisons, and the Kruskal-Wallis test was used for

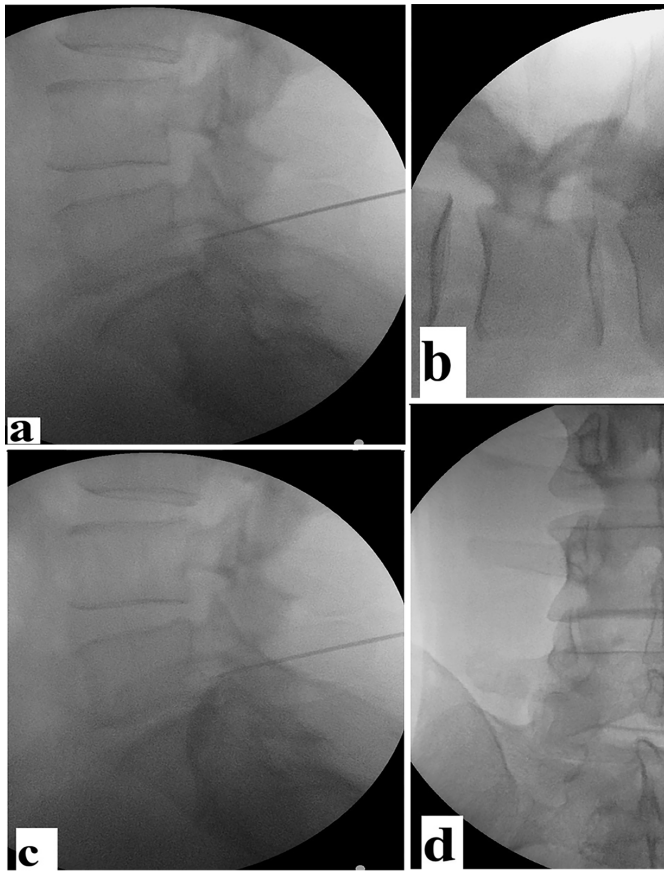

Figure 1. Staining the root and epidural space with contrast material in the ap/lateral view in transforaminal injection (a, b, c, d)

J Acad Res Med 2025;15(2):101-6

multi-group analyses. Categorical variables were analyzed using the chi-square test.

A post-hoc power analysis was performed, considering the sample size and effect size, revealing that the study had a statistical power of 1.0, indicating a high probability of detecting significant differences.

A logistic regression analysis was conducted to determine whether obesity significantly influenced post-treatment VAS scores. The dependent variable was converted into a binary outcome (VAS ≤3 as successful, VAS >3 as unsuccessful). Independent variables included obesity status (BMI ≥30 categorized as obese) and age. A p-value <0.05 was considered statistically significant.

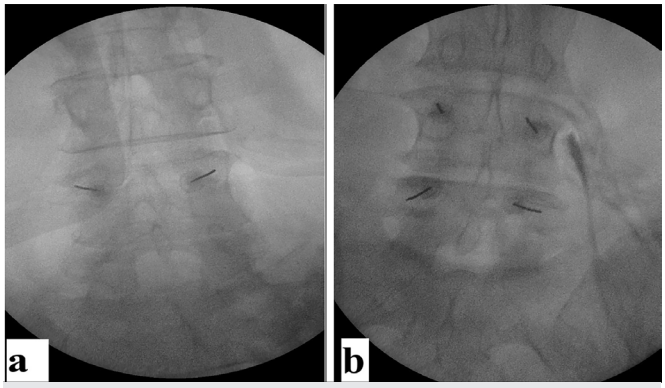

Figure 2. Needle localization in facet injection (a and b)

Table 1. Demographic and clinical characteristics of the patients

Variable	p-value
Patients (N)	67
Sex (M/F)	22/45
Age (years)	51.95±10.65
Height (cm)	165.51±7.18
Weight (kg)	79.02±12.05
BMI	28.81±3.85
Low back pain, n (%)	67 (100)
Radicular pain, n (%)	67 (100)
Right	26 (38.8)
Left	33 (49.3)
Bilateral	8 (11.9)
Facet injections, n (%)	
L3-L4	20 (29.9)
L4-L5	64 (95.5)
L5-S1	67 (100)
Transforaminal injections, n (%)	
L3-L4	13 (19.4)
L4-L5	58 (86.6)
L5-S1	24 (35.8)

M: Male, F: Female, BMI: Body mass index

RESULTS

A total of 67 patients were included in this study, comprising 22 men (32.8%) and 45 women (67.2%). The mean age of the patients was 51.95±10.65 years (25-76 years). The mean height and weight of the patients were 165.51±7.18 cm (146-180 cm) and 79.02±12.05 kg (53-102 kg), respectively. When calculating BMI, 12 patients (17.9%) were classified as normal weight, 28 patients (41.8%) as overweight, and 27 patients (40.3%) as obese. In the pre-procedural assessment of the patients, low back pain and signs of lumbar tenderness were found in all patients. Additionally, 26 patients (38.8%) had right leg pain, 33 patients (49.3%) had left leg pain, and 8 patients (11.9%) had pain in both legs (Table 1).

All patients underwent facet joint injection and anterior epidural transforaminal injection. Only 3 patients (4.5%) received a single-level facet joint injection, whereas 64 patients (95.5%) received multiple-level FJI. A single-level transforaminal injection was performed in 59.7% of the patients (40 patients), while 43.3% (27 patients) received multiple-level transforaminal injections. Injections to the facet joints were applied bilaterally at every level. Twenty patients (29.9%) received injections at the L3-L4 level, 64 patients (95.5%) at the L4-L5 level, and 67 patients (100%) at the L5-S1 level. In transforaminal injections, the side with leg pain was selected. In 8 patients (11.9%), bilateral injections were performed. Transforaminal injections were given at the L3-L4 level in 13 patients (19.4%), at the L4-L5 level in 58 patients (86.6%), and at the L5-S1 level in 24 patients (35.8%) (Table 2).

The VAS and ODI scores reported by the patients for low back pain before the procedure were 8.31±0.99 (6-10) and 32.09±7.41 (18-47), respectively. The VAS and ODI scores reported for radicular pain before the procedure were 8±0.87 (7-10) and 31.06±6.16 (19-45), respectively. At the 6-month follow-up after the procedure, the VAS and ODI scores for low back pain were found to be 2.18±1.54 (0-5) and 11.88±3.62 (6-21). For radicular pain, they were 2.03±1.11 (0-5) and 12.08±3.30 (5-21) (Table 3, Figure 3).

The normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests, which indicated that the data did not follow a normal distribution ($p<0.05$ for all key variables). Therefore, non-parametric tests were used in the analysis. The Mann-Whitney U test was applied for pairwise comparisons, and the Kruskal-Wallis test was used for multi-group comparisons.

The Mann-Whitney U test showed that obese patients had significantly higher VAS scores for low back pain compared to non-obese patients at the 6th-month follow-up ($p=0.002$). However, for radicular pain, the difference was not statistically significant in the preoperative assessment ($p=0.73$), but became significant by the 6th month ($p=0.019$) (Table 3).

The Kruskal-Wallis test demonstrated significant differences among normal weight, overweight, and obese groups in terms of VAS scores for low back pain ($p=0.024$ preoperatively, $p=0.0002$ postoperatively). Post-hoc analysis showed that normal weight and overweight patients had significantly lower VAS scores compared

Table 2. Comparison of preoperative and 6-month postoperative VAS and ODI scores
Mann-Whitney U test was used for comparisons

Pain scores	Before procedure (mean ± SD)	Sixth month after procedure (mean ± SD)	p-value
VAS for low back pain	8.31±0.99	2.18±1.54	0.001
VAS for radicular pain	8.00±0.87	2.03±1.11	0.001
ODI for back pain	32.09±7.41	11.88±3.62	0.001
ODI for radicular pain	31.06±6.16	12.08±3.30	0.001

VAS: Visual analog scale, ODI: Oswestry Disability Index, SD: Standard deviation

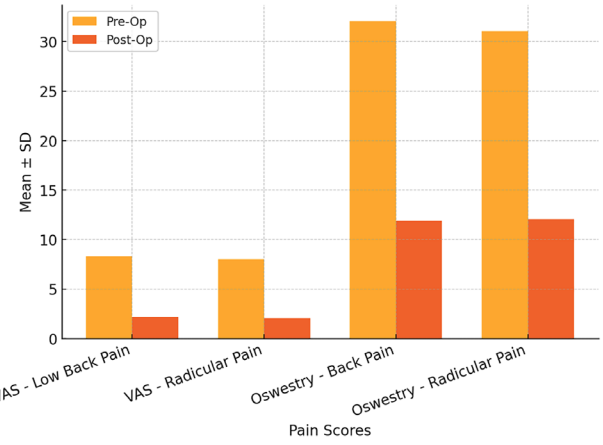

Figure 3. Comparison of preoperative and 6-month postoperative VAS and ODI scores
VAS: Visual analog scale, ODI: Oswestry Disability Index, SD: Standard deviation

Table 3. Comparison of treatment response in VAS scores between obese and non-obese patients
Mann-Whitney U test was used for comparisons

VAS score category	Non-obese (BMI <30) n (%)	Obese (BMI ≥30) n (%)	Total n (%)	p-value
VAS for low back pain				
Optimal	29 (72.5)	9 (33.3)	38 (56.7)	**0.002**
Suboptimal	10 (25.0)	12 (44.4)	22 (32.8)	-
Insufficient	1 (2.5)	6 (22.3)	7 (10.5)	-
VAS for radicular pain				
Optimal	31 (77.5)	14 (51.9)	38 (56.7)	**0.019**
Suboptimal	9 (22.5)	12 (44.4)	22 (32.8)	-
Insufficient	0 (0.0)	1 (3.7)	1 (1.5)	-

VAS: Visual analog scale

to obese patients (p=0.002 and p=0.021, respectively). For radicular pain, only normal weight patients showed a significant difference compared to obese patients (p=0.036).

A logistic regression model was used to evaluate the effect of obesity on post-treatment VAS scores. The dependent variable was converted into a binary outcome (VAS ≤3 as successful, VAS >3 as unsuccessful). The results showed that obesity was not a statistically significant predictor of post-treatment VAS scores (p=0.211 for low back pain, p=0.168 for radicular pain). Age was also not found to have a significant effect (p=0.168) (Table 4).

DISCUSSION

With advancing technology, TAEE and FJI are frequently utilized as alternative treatment methods for cases of low back and leg pain caused by LDH, spinal stenosis, and facet joint degeneration. Particularly in cases where pain is the primary issue, surgical treatment is unnecessary unless methods such as physical therapy, medical treatment, TAEE, or FJI are applied. In approximately 90% of patients with LDH, radicular pain responds to conservative treatment; however, surgical intervention is required for 10-15% of cases (7,8). Among patients whose radiculopathy persists following LDH surgery, recurrent disc herniation is the most common cause. In such cases, medical and/or physical therapy may be insufficient. Selective nerve root blocks and/or combined interventions can provide additional relief in these scenarios. Today, it is well-known that inflammation and irritation in the nerve root play a significant role in the development of radicular pain (9). Any disc herniation affecting the nerve root not only exerts pressure but also causes localized inflammation. The chemical mediators released due to this inflammation further intensify radicular pain by irritating the nerve root.

In our study, we compared pain levels before and after the application of TAEE combined with facet joint steroid injection, in patients with acute and subacute low back and leg pain. It was observed that TAEE, combined with FJI, known for its effectiveness in lumbar radicular pain and effective in controlling pain caused by degenerated facet joints, is a more efficient method for pain palliation.

Transforaminal anterior epidural nerve root block reduces pain by suppressing inflammation in the nerve root and epidural space at the procedure site. In addition to their anti-inflammatory effects, corticosteroids also have membrane-stabilizing properties. This combined effect minimizes radicular pain by reducing the impact of external stimuli on sensitive root ganglia and damaged nerve roots (10). Lutze et al. (11) demonstrated a relative reduction in pain following periradicular anesthetic and depot steroid injections in 40 patients with radicular pain due to LDH (12,13). In another study, 33 procedures were performed via the transforaminal route followed for 16 months and divided into treatment and placebo groups. The success rate was 84% in the transforaminal selective

J Acad Res Med 2025;15(2):101-6

Table 4. Logistic regression analysis for predicting post-treatment VAS scores
Dependent variable: Post-treatment VAS ≤3 (success) vs. VAS >3 (failure)

Variable	OR	95% CI	p-value
Obesity (BMI ≥30)	1.153	0.654 – 2.961	0.211
Age	1.066	0.972 – 1.169	0.168

VAS: Visual analog scale, OR: Odds ratio, CI: Confidence interval, BMI: Body mass index

nerve root block group and 48% in the placebo group. The success rate of transforaminal anterior epidural and facet joint steroid injections in patients with low back and leg pain has been reported to be around 65%. These procedures yield better results in the short term, and moderate efficacy is reported for the long term (14,15).

In our study, the short- to mid-term effectiveness and safety of transforaminal epidural injection combined with facet joint steroid injection were evaluated and found to be consistent with the literature. Additionally, the literature indicates that while transforaminal nerve root block achieves good short-term outcomes for radicular pain, the results for selective nerve root blocks are moderate in patients with persistent low back and leg pain after failed back surgery. The effectiveness of transforaminal and facet injections in obese patients has been observed to be short-term and limited. This highlights the significant impact of obesity on treatment response.

In this study, we found that obese patients had significantly higher post-treatment VAS scores for low back pain compared to non-obese patients at the 6-month follow-up. However, logistic regression analysis showed that obesity was not a statistically significant predictor of post-treatment VAS scores (p=0.211 for low back pain, p=0.168 for radicular pain). These findings suggest that while obesity may influence short-term treatment outcomes, it does not independently predict long-term pain relief.

Previous studies have reported that obesity can negatively affect spinal interventions due to altered biomechanics, increased inflammation, and technical challenges during injections. However, our results indicate that the combined transforaminal and FJI provide substantial pain relief in both obese and non-obese patients, although obese individuals tend to have slightly higher residual pain levels.

The effect of obesity on spinal interventions remains controversial. While some studies suggest that obese patients respond less effectively to epidural steroid injections, others indicate that the outcomes are comparable to non-obese patients when proper technique and medication dosage are applied. Our findings align with studies demonstrating that while obesity may delay pain relief, it does not significantly alter overall treatment success rates.

Mavrocordatos and Cahana (16) reported moderate outcomes for transforaminal epidural root blocks in treating failed back surgery syndrome. Another study injected steroids and hyaluronidase via the transforaminal route in patients with persistent low back and leg pain following failed back surgery. Approximately half of these patients experienced a 50% improvement one month after treatment, with long-term benefits reported to persist (17).

Study Limitations

The limitations of the study included its retrospective nature, a limited sample size, and its conduct at a single center.

CONCLUSION

In conclusion, TAEE combined with facet joint steroid injection is a safe and effective method for alleviating pain and improving the quality of life in patients with low back and radicular pain unresponsive to medical and physical therapy. It is considered a viable alternative to surgery in appropriate cases.

Ethics

Ethics Committee Approval: Institutional Ethics Committee of a University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital (approval number: 19, date: 03.07.2024).

Informed Consent: Written informed consent to participate was obtained from all participants.

Footnotes

Author Contributions: Surgical and Medical Practices - O.B.; Concept - O.B., E.C.S., S.K.; Design - O.B., E.C.S., Ö.Ö., S.K.; Data Collection and/or Processing - O.B., O.Ö., E.C.S.; Analysis and/or Interpretation - O.B., O.Ö., S.K.; Literature Search - O.B., G.B.S. Ö.Ö.; Writing - O.B., G.B.S.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Murphy K, Elias G, Steppan J, Boxley C, Balagurunathan K, Victor X, et al. Percutaneous treatment of herniated lumbar discs with ozone: investigation of the mechanisms of action. J Vasc Interv Radiol. 2016; 27: 1242-50.e3.
2. Merskey H, Bogduk N. Classification of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms. 2nd ed. Seattle, WA: IASP Press. 1994. p. 394.
3. Yuce I, Kahyaoglu O, Ataseven M, Cavusoglu H, Aydin Y. Diagnosis and Treatment of transforaminal epidural steroid injection in lumbar spinal stenosis. Sisli Etfal Hastan Tip Bul. 2020; 54: 327-32.
4. Ertekin C. Ağrının nöroanatomisi ve nörofizyolojisi. Ağrı ve tedavisi. İçinde: Yegül İ editor. İzmir: Yapım Matbaacılık; 1993. p. 1–18.
5. Kayhan Z. Klinik Anestezi. 2nd ed. İstanbul: Logos Yayıncılık; 1997. p. 759–87.
6. Kambin P, Gellman H. Percutaneous lateral discectomy of the lumbar spine: a preliminary report. Clin Orthop Relat Res. 1983; 174: 127-32.
7. Davis N, Hourigan P, Clarke A. Transforaminal epidural steroid injection in lumbar spinal stenosis: an observational study with two-year follow-up. Br J Neurosurg. 2017; 31: 205-8.
8. Bush K, Cowan N, Katz DE, Gishen P. The natural history of sciatica associated with disc pathology. A prospective study with clinical and independent radiologic follow-up. Spine (Phila Pa 1976). 1992; 17:1205-12.
9. Rowlingson JC. Chronic pain. In: Miller R, Cucchiara ED, Miller ED, editors. Miller's Anesthesia. 6th ed. Philadelphia (PA): Elsevier; 2004. p. 2763–84.
10. Bosscher HA, Gitlin MG, Kaye AD. Epidural steroids. In: Raj PP, editors. Textbook of Regional Anesthesia. Philadelphia: Churchill Livingstone; 2002. p. 687-702.

J Acad Res Med 2025;15(2):101-6

11. Lutze M, Stendel R, Vesper J, Brock M. Periradicular therapy in lumbar radicular syndromes: methodology and results. Acta Neurochir (Wien). 1997; 139: 719-24.
12. Riew KD, Yin Y, Gilula L, Bridwell KH, Lenke LG, Lauryssen C, et al. The effect of nerve-root injections on the need for operative treatment of lumbar radicular pain. A prospective, randomized, controlled, double-blind study. J Bone Joint Surg Am. 2000; 82: 1589-93.
13. Botwin KP, Gruber RD, Bouchlas CG, Torres-Ramos FM, Sanelli JT, Freeman ED, et al. Fluoroscopically guided lumbar transformational epidural steroid injections in degenerative lumbar stenosis: an outcome study. Am J Phys Med Rehabil. 2002; 81: 898-905.
14. Abdi S, Datta S, Lucas LF. Role of epidural steroids in the management of chronic spinal pain: a systematic review of effectiveness and complications. Pain Physician. 2005; 8: 127-43.
15. Boswell MV, Hansen HC, Trescot AM, Hirsch JA. Epidural steroids in the management of chronic spinal pain and radiculopathy. Pain Physician. 2003; 6: 319-34.
16. Mavrocordatos P, Cahana A. Minimally invasive procedures for the treatment of failed back surgery syndrome. Adv Tech Stand Neurosurg. 2006; 31: 221-52.
17. Devulder J. Transforaminal nerve root sleeve injection with corticosteroids, hyaluronidase, and local anesthetic in the failed back surgery syndrome. J Spinal Disord. 1998; 11: 151-4.