Transforaminal Epidural Injection with Local Anesthesia and Steroid for Single-level Radiculopathy and Pain Score: A Prospective Study in the Tertiary Center of Western Nepal

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ABSTRACT

Introduction: Radiculopathy resulting from prolapse of intervertebral disc commonly at L4-L5 and L5-S1, the prominent cause of low back pain affecting daily activities and has a significant socioeconomic burden. Hence, this needs to be addressed with a prominent solution, of which, the transforaminal epidural steroid injection has been one of the promising solutions these days. **Aims:** To assess the short term and long-term pain relief after transforaminal epidural steroid injection. **Methods:** 58 patients with radiculopathy at the single level of the lumbar or lumbosacral region were included for transforaminal epidural steroid injection with local anesthesia. Visual analog score, pain score was recorded before, in 15 minutes and four weeks after the steroid injection under C-arm guidance. Statistical analysis was done on the basis of Wilcoxon Signed Ranks Test, Spearman's correlation test. A p-value < 0.05 was considered to be statistically. **Results:** The change in Visual Analog Score from the time of presentation in relation to short and long term was significant, viz; VAS0/VAS15m $p<0.5$ and VAS0/VAS4wks was $p<0.5$. There was a positive correlation between immediate pain relief and long-term pain reduction however it was not significant ($r=0.28$, $p=0.10$) **Conclusion:** This study suggested the improvement of symptoms with transforaminal epidural steroid injection with local anesthesia and showed a positive correlation between immediate and long-term relief of pain, however it may not be significant.

***Keywords*:** Anesthetics, Radiculopathy, Steroids

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INTRODUCTION

Radiculopathy of the lumbar region is one of the most common presentations of low back pain visiting the outpatient department, resulting in activity limitation, work loss, and socioeconomic burden.[1-3] Disc herniation, spondylosis, osteoarthritis of the facet joint, and hypertrophy of ligamentum flavum are major causes leading to compression of the nerves at the spinal canal viz; lateral recess, intervertebral foramen, or outside the foramen exiting it. The common sites are L4-L5 and L5-S1.[3,4] This disorder is mostly treated conservatively, but patients' satisfaction is not adequate with it. Hence, there are increasing use of therapeutic injections of steroids under fluoroscopy and has a promising, safe, and effective role in management for the lumbar radiculopathy and it is on an increasing trend.[5-8]

Different approaches are used for epidural injection which include; transforaminal epidural steroid injection (TFESI), interlaminar or caudal, and TFESI is most practiced as it can guide to the targeted site, ventrolateral epidural space where the pathology lies. This is done under fluoroscopy or computed tomography (CT) guided to locate the exact site of the lesion and place the needle at the site of pathology.[9,10] The combination of steroid (triamcinolone acetate or methylprednisolone) with local anesthetic (e.g. lidocaine) are used to relief the pain resulting from nerve compression, as steroid is a long-acting anti-inflammatory drug and radicular pain is caused by mechanical compression of the nerve root and local inflammation. Hence, local injection symptomatically relieves the radiculopathy for weeks to months.[3,10] Local anesthesia has dual effects like immediate relief of pain resulting from nerve

compression and uneasiness caused by the procedure itself. In our institution, we performed the serial interview regarding the pain before and after TFESI. This would provide an idea about the status of improvement of pain depending upon VAS score. Hence, we hypothesized, that the outcome has impact on both short term and long-term pain relief outcome compared to the initial presentation of pain with TFESI. Therefore, our goal was to assess and evaluate the correlation regarding pain relief after TFESI, both short term and long term (after 4 weeks) with discogenic lumbar radiculopathy.

METHODS

This is the prospective study with low back pain with radiculopathy, who failed the conservative treatment, after the approval of the institutional review committee (IRC) who presented to the Nepalgunj Medical College for the duration of four months from December 2023 to March 2024. For all the patients, who were treated with TFESI were included in the study after informed written consent for the use of data for research.

Statistical analysis :

Statistical analysis was done based on SPSS 26; The test was subjected to the Wilcoxon Signed Ranks Test and Spearman correlation was calculated for statistical significance with p-value less than 0.05.

Inclusion criteria:

1. Age above 18 years
2. Lumbar radiculopathy (L4, L5, or S1 nerve root) on clinical examination confirmed by MRI (Magnetic resonance imaging)
3. Patient who failed the conservative treatment
4. Those who gave consent

Exclusion criteria

1. History of steroid injection in the past
2. Lumbar neoplasia/ metastasis or infection
3. Spondylolisthesis
4. Lesion on both sides or multiple levels
5. Missing data
6. Those not willing to take part in the study or with no consent

A thorough history and examination were done for the neurological examination, and then MRI was advised for the confirmation of the clinical finding of the lesion on the targeted nerve root (lateral recess, neuroforamen, or extraforaminal). A trial of the oral medication was tried for two weeks and observed. When there was no improvement with it, then they were subjected to the TFESI. We reviewed the patient at the first time of presentation at OPD then 15 minutes after injection, and 4 weeks after the treatment and further analysis was done.

Procedure

All patients were treated on a daycare basis. Each procedure was done by a trained Orthopedic Surgeon. For the procedure, standard injection protocol was performed. Inside the operation theater, after the IV cannulation, the patient was kept prone on the operation table to maintain the natural lumbar curvature. Sub-pedicular approach for TFESI was used. The l evel of the steroid injection, target level, was confirmed under fluoroscopy in the posterior-anterior direction and the X-ray beam was aligned and targeted to the inferior vertebral endplate of the upper vertebra. Visualization of the target point, the posterior surface of the vertebral body adjacent to the caudal border of the pedicle above the target nerve, opposite the sagittal bisector of the pedicle (six o'clock" position of the pedicle).[10]

At the target point, in the oblique view with the caudal or cranial tilt, Scotti's terrier sign was accessed and the sub-pedicular space was identified under the fluoroscopy. Under aseptic conditions, local anesthesia, 1% lidocaine was infiltrated at the target point under the skin. A solution of 2ml of 1% plain lidocaine with depot methylprednisolone 20 mg was prepared in a 5ml syringe. At the target level, a 25-gauge spinal needle was inserted below the pedicle with the needle tip aligned to the C-arm and in the optimal trajectory and was advanced on this position to the target point. This was viewed on the lateral view for the position of the needle in the intervertebral foramen. A 10-cc syringe with air was blown into the needle and the release of airflow resistance was used to confirm the level.

Outcome evaluation

The outcome was evaluated based on the intensity of pain of the low back pain and/or radiculopathy based on the visual analog score questionnaire, before the procedure (VAS0) then after 15 minutes (VAS15m) and at four weeks (VAS4wks) following the procedure. Each patient described the pain intensity ranging from 0 with no pain and 10 with unbearable pain. The short-term pain reduction percentage (VASP15m) was calculated by subtracting VAS 15 minutes from the baseline VAS0 divided by VAS0. Long-term pain reduction percentage (VASP4wks) was calculated on a similar basis. After the procedure, the postprocedural pain score VAS was quantified as (1) "good responder" with at least a 50% reduction in VAS score and (2) "poor responder" with below 50% reduction in VAS score, at 4 weeks after the peri-radicular injection. At the end of four weeks, patients were asked for the symptoms, limitation of activities, and quality of life concerning low back pain and/or radiculopathy after TFESI.

RESULTS

During four months period 521 patients with low back pain with or without radiculopathy were assessed and treated conservatively. Among them, 68 patients who did a poor performance on a conservative study were included in the study. Ten patients lost the follow-up. Hence, 58 patients who were subjected to TFESI were included in the study. The demographic profiles are shown in Table I.

Variables	
Age	45.52 ± 6.16 years
Gender	
Male	30 (51.7%)
Female	28 (48.3%)
Side	
Right	32 (55.2%)
Left	26 (44.8%)
Level	
L4	12 (20.7%)
L5	25 (43.1%)
S1	21 (36.2%)

Table I: Patient characteristics. Demographic variables age, gender, side and level are shown

The mean VAS0 score at the time of presentation was 6.4±1.2, VAS at 15min was 3.9±0.9 and VAS at four weeks was 3.2±1.1.

The short-term percentage (relative) pain reduction, VASP15m, was 36.9±18.3 % and the long-term percentage pain reduction, VASP 4 weeks, was 50.1±17.7% as shown on table II.

Pain Assessment				
	Mini	Max	Mean	S.D
VAS0	5	8	6.4	1.2
VAS15m	2	5	3.9	0.9
VAS4wks	2	5	3.2	1.1
VASP15m (%)	0	63	36.9	18.3
VASP4wks (%)	0	75	50.1	17.7

Table II: The VAS scores at three points of time; 1; at the time of presentation (VAS0), 2; 15 min after the TFESI (VAS15m), and 3; one month after TFESI (VAS4wks). VASP15m represents the percentage of relative pain reduction after 15 min of TFESI, and VASP4wks is percentage of relative pain reduction after 1 month of TFESI

Comparison of VAS scores		
	Z	P value
VAS0 - VAS15m	-6.267	0.00
VAS0 -VAS 4wks	-6.543	0.00
VAS15m-VAS 4wks	-4.658	0.00

Table III: Wilcoxon Signed Ranks Test; comparison of VAS scores with initial (VAS0), short term (VAS15m) and long term (VAS4wks) pain relief

The test results of the improvement of pain scores, after the injection compared to the initial presentation were significant (p-value <0.05) in both short term and long-term as shown on table III.

VAS score correlation	Correlations (spearman's rho)	P-value
VAS0/VAS15m	0.10	0.46
VAS0/VAS 4wks	0.42	0.001
VAS15m/VASe 4wks	0.28	0.10

Table IV: Correlation analysis: Data presents the correlation of pain relief at 15 mins (VAS15m) and 4 weeks (VAS4wks) of TFESI in relation to the initial time of presentation (VAS0) and VAS15m with VAS4wks

There was a positive and strong correlation with long-term pain reduction(r=0.42). The short-term pain relief and long-term pain relief have positive correlation however, the relationship was weak (r=0.28).

DISCUSSION

Lumbar transforaminal epidural steroid injection (TFESI) has been an important intervention in the management of low back pain resulting from the prolapse of the intervertebral disc with the foraminal component. The outcome of pain management is good in terms of immediate and long-term. In this prospective longitudinal observational study, we did the retrospective data analysis and the relationship between short-term pain relief and long-term pain relief in single-level unilateral discogenic radiculopathy were assessed. Our study has a comparable finding as other studies in both short-term and long-term pain reduction scores with VASP15m 36.98±18.31% and VASP4wks 50.48±17.74%.[4-5,13-15]

The early improvement of pain at 15 mins might be contributed to the local anesthesia and the persistence of the improvement at 1 month period might be contributed to the subsidence of the local inflammatory reaction which is caused by disc herniation.[3,10,16]

Similar to the study done by Tagowiski et al. and German at el, our study also suggested the improvement in the VAS pain score with both short-term pain relief at 15mins (VAS15m) and long-term pain relief at 4 weeks (VAS4wks) was significant compared to the initial time of presentation before the TFESI.[5,6]

Though, there was a positive correlation with change in VAS score in terms of short- and long-term pain reduction in our study (r=0.21) similar to the study done by Germann et al. However, the improvement was not significant in our study (p = 0.10) which contradicts with the finding with Germann et al (p=0.002).[3]

In contrast to some studies done by Antoniadis et al and Wald et al. which was done on CT guided cervical nerve root injection, suggested there was no correlation between immediate and long-term pain relief. This difference may be contributed to the different techniques of the procedure.[17,18]

LIMITATIONS

This is the short-term study with limited number of people, long term outcome could not be projected as back pain is the persistent problem in many patients. Meanwhile, it is nonrandomized trial and it lacks validity in case of generalization.

CONCLUSION

The study suggests the improvement of symptoms with the TFESI and there is a positive correlation among short and long-term relief of pain, however it may not be significant.

REFERENCES

1. Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA; American Society of Interventional Pain Physicians. Comprehensive review of epidemiology, scope, and impact of spinal pain. Pain Physician. 2009;12(4):E35-E70.

2. Tarulli AW, Raynor EM. Lumbosacral radiculopathy. Neurol Clin. 2007;25(2):387-405. doi:10.1016/j.ncl.2007.01.008.

3. Germann C, Götschi T, Sutter R. Predictive value of immediate pain relief after lumbar transforaminal epidural injection with local anesthetics and steroids for single level radiculopathy. Skeletal Radiol. 2022;51(10):1975-1985. doi:10.1007/s00256-022-04051-3

4. Bensler S, Sutter R, Pfirrmann CWA, Peterson CK. Particulate versus non-particulate corticosteroids for transforaminal nerve root blocks: Comparison of outcomes in 494 patients with lumbar radiculopathy. Eur Radiol. 2018;28(3):946-52. doi:10.1007/s00330-017-5045-z

5. Germann C, Graf DN, Fritz B, Sutter R. CT-guided transforaminal epidural steroid injection for discogenic lumbar radiculopathy: influence of contrast dispersion and radiologist's experience on clinical outcome. Skeletal Radiol. 2022;51(4):783-93. doi:10.1007/s00256-021-03881-x

6. Tagowski M, Lewandowski Z, Hodler J, Spiegel T, Goerres GW. Pain reduction after lumbar epidural injections using particulate versus non-particulate steroids: intensity of the baseline pain matters. Eur Radiol. 2019;29(7):3379-89. doi:10.1007/s00330-019-06108-9

7. Manchikanti L, Knezevic E, Knezevic NN, et al. Epidural Injections for Lumbar Radiculopathy or Sciatica: A Comparative Systematic Review and Meta-Analysis of Cochrane Review. Pain Physician. 2021;24(5):E539-E554..

8. Buenaventura RM, Datta S, Abdi S, Smith HS. Systematic review of therapeutic lumbar transforaminal epidural steroid injections. Pain Physician. 2009;12(1):233-51.

9. Dietrich TJ, Peterson CK, Zeimpekis KG, Bensler S, Sutter R, Pfirrmann CWA. Fluoroscopy-guided versus CT-guided Lumbar Steroid Injections: Comparison of Radiation Exposure and Outcomes. Radiology. 2019;290(3):752-59. doi:10.1148/radiol.2018181224

10. Marshall LL, Trethewie ER. Chemical irritation of nerve-root in disc prolapse. Lancet. 1973;2(7824):320. doi:10.1016/s0140-6736(73)90818-0

11. Knezevic NN, Manchikanti L, Urits I, et al. Lack of Superiority of Epidural Injections with Lidocaine with Steroids Compared to Without Steroids in Spinal Pain: A Systematic Review and Meta-Analysis. Pain Physician. 2020;23(4S):S239-S270.

12. Pfirrmann CW, Dora C, Schmid MR, Zanetti M, Hodler J, Boos N. MR image-based grading of lumbar nerve root compromise due to disk herniation: reliability study with surgical correlation. Radiology. 2004;230(2):583-88. doi:10.1148/radiol.2302021289

13. Bensler S, Sutter R, Pfirrmann CWA, Peterson CK. Is there a difference in treatment outcomes between epidural injections with particulate versus non-particulate steroids?. Eur Radiol. 2017;27(4):1505-11. doi:10.1007/s00330-016-4498-9

14. Chang MC, Lee DG. Outcome of Transforaminal Epidural Steroid Injection According to the Severity of Lumbar Foraminal Spinal Stenosis. Pain Physician. 2018;21(1):67-72.

15. Makkar JK, Gourav KKP, Jain K, et al. Transforaminal Versus Lateral Parasagittal Versus Midline Interlaminar Lumbar Epidural Steroid Injection for Management of Unilateral Radicular Lumbar Pain: A Randomized Double-Blind Trial. Pain Physician. 2019;22(6):561-73.

16. Lirk P, Hollmann MW, Strichartz G. The Science of Local Anesthesia: Basic Research, Clinical Application, and Future Directions. Anesth Analg. 2018;126(4):1381-92. surgery. J Med Sci Clin Res. 2019;7(5):120–6.