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Functional outcome of transforaminal epidural steroid injection in lumber disc herniation with radiculopathy

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ABSTRACT

Background: Transforaminal epidural steroid injection (TFESI) is a useful therapeutic tool for lumber disc herniation with radiculopathy. TFESI reduce inflammation and edema around herniated disc and nerve root, thus alleviating pain and accelerating the natural history of the herniated disc by shrinkage. This study aims to determine the effectiveness of TFESI in lumber disc herniation with radiculopathy.
Methods: In this prospective observational study, 273 patients were included considering inclusion & exclusion criteria. All subjects received TFESI for lumber disc herniation with radiculopathy. The primary outcome was assessed with a Bengali version of Oswestry disability index (ODI) score and Roland-Morris disability questionnaire (RMDQ) scores at 2 weeks, 1 month, 3 months and 1 year.
Results: From baseline (18.6±3.6), mean RMDQ score was significantly reduced at 2 weeks (14.4±3.7), at 1 month (13.8±3.8), at 3 months (11.6±3.6) and at 1 year (7.8±3.7) respectively. 69.2% patients had severe disability at baseline according to disability rank of ODI score; after procedure during follow up severe disability was found in 21.6% cases at 2 weeks, 9.1% at 1 month, 5.0% at 3 months and 1.2% at 1 year. The reduction of severe disability from baseline in subsequent follow up was significant. From baseline (45.7±10.0), mean ODI score was significantly reduced at 2 weeks (36.4±9.0), at 1 month (28.2±8.9), at 3 months (24.3±8.9) and at 1 year (18.9±10.5) respectively.
Conclusions: Transforaminal epidural steroid injection significantly reduced disability and provide improved functional outcome in patients with lumber disc herniation with radiculopathy.

Keywords: Radiculopathy, Steroid injection, Lumber disc herniation

INTRODUCTION

Lumbar radiculopathy is a very common medical issue, estimates of the annual prevalence range from 3% to 14%.[1-3] Surgery is the ultimate solution for immediate relief of symptoms, however functional outcomes of lower risk, non-operative treatments are almost equal to those following lumbar disc surgery.[4] Most of the patients recover with conservative treatment, physiotherapy and bed rest but 10-15% of patients eventually require surgery.[1]

Transforaminal epidural steroid injection (TFESI), is a minimally invasive interventional surgery, broadly used in

the treatment of lumbar disc herniation (LDH).[6] It provides fast onset without or with minimal complications. In this process, corticosteroid and local anesthetics are injected around the dural and nerve roots that causes radicular pain. Previous researches have proven that TFESI has a short-term positive result in lowering back pain. However, the medium- and long-term treatment efficacy is unadmirable.[6,7]

Kennedy et al reported that over 70% of 78 patients with radicular pain due to HLD achieved ≥80% reduction from the initial pain level six months after TFESI.[7] Recently, Burkhardt et al reported long-term outcomes after microsurgical subtotal discectomy.[8] They interviewed 158 patients and reported a mean postoperative follow-up period of 32 years. Of all the patients, approximately 69.9% were pain-free, while 13.9% took pain medications. Reoperations were conducted in 29.7% of the patients, among whom 8.2% had undergone surgery at the same level as the previous one. Kim et al performed a retrospective cohort study recruiting 1,856 patients from the nationwide sample database and reported a reoperation rate of 16% ten years after spine surgery for managing HLD-induced pain.[9] So, this study is designed to determine the effectiveness of transforaminal epidural steroid injection in lumber disc herniation with radiculopathy.

METHODS

This is a prospective observational study, though conducted in multiple centers but majority of cases was taken from minimal invasive care (Micare) Center, a dedicated center for minimal invasive spine and orthopedics in Cumilla Trauma Center, Cumilla, during the period of January 2016 and December 2023. Two hundred seventy-three patients underwent TFESI for lumber disc herniation with radiculopathy were included in the study considering inclusion and exclusion criteria.

The inclusion criteria were age ≥20 years; both sex, history of unilateral PLID evidenced by magnetic resonance imaging; pain for less than six months before receiving TFESI presented unilaterally or bilaterally. Patients with back pain greater than leg pain, nonradicular pain, unclear diagnosis, or more than one potential pain generator demonstrated on magnetic resonance imaging (MRI), lumbar stenosis, prior spine surgery, prior spine injection, any condition that increased injection risk such as bleeding tendencies, workers' compensation, pregnancy, and litigation were excluded from the study. All subjects received TFESI in a dose of 40 mg triamcinolone and 0.5 ml of 5% bupivacaine per root or foramen either unilaterally or bilaterally and exiting or traversing nerve root depending on symptoms and MRI findings. The primary outcome was assessed with a Bengali version of Oswestry disability index (ODI) score and Roland-Morris disability questionnaire (RMDQ) scores at 2 weeks, at 1 month, 3 months and 1 year. Collected data were compiled and appropriate analyses were done by using computer-based software, statistical package for social sciences (SPSS) version 23.0. Qualitative variables were summarized by percentage and quantitative variables were summarized mean and standard deviation. Data were presented by tables, diagrams and graphs based on data nature. Quantitative variables were compared by paired t-test. P value of less than 0.05 was considered as significant.

This study was conducted in accordance with the ethical standards of the institutional research committee. Ethical approval for this study on TFESI was obtained from the Ethical Review Board of Cumilla Medical College (Approval No. COMC/IRB/2015/04, Date: 13.12.2015. All participants provided informed consent prior to their inclusion in the study.

Procedure

All subjects signed a written informed consent. At first, the patient is placed in the prone position. Then C'arm should be positioned perpendicular to the fracture table and the patient so that the spinus process aligned in the midline and both pedicle is in equidistance from the midline. That is called centralization (Figure 1). Then the C'arm is tilted in cephalic or caudally to achieve squaring of the vertebra (Figure 1). It ensures that the anterior border and the posterior border of the vertebral body lies in the same level. After that, C'arm is tilted in right or left oblique about 15-20 degrees to gain Scottie dog view of the vertebra (Figure 2).

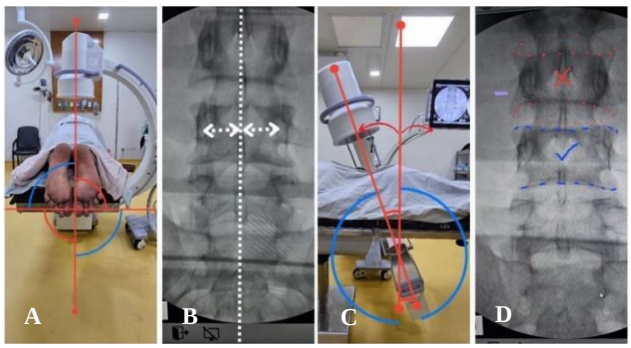

Figure 1 (A-D): Centralization and squaring.

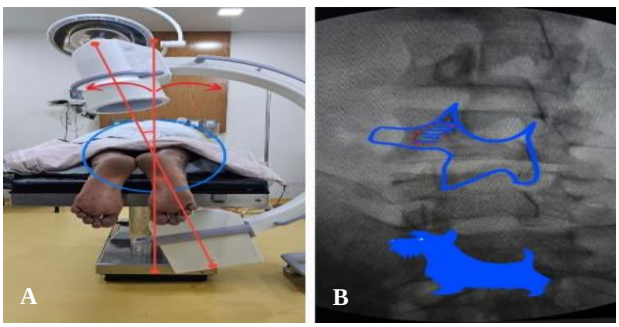

Figure 2 (A and B): Scottie dog.

In Scottie dog position the pedicle forms the eye and the pars interarticularis is equivalent to the neck of the dog.

The needle is entered afterwards lateral to pars (neck of the Scottie dog) and inferior to the pedicle (Figure 3). The needle trajectory is maintained with the angle of the C'arm (end on view). In imaging, needle should be seen as a pointed spot only (Figure 3).

After confirming proper positioning of the needle in all AP, lateral and contrast view (Figure 4), TFESI in a dose of 40 mg triamcinolone and 0.5 ml of 5% bupivacaine is administered (Figure 4).

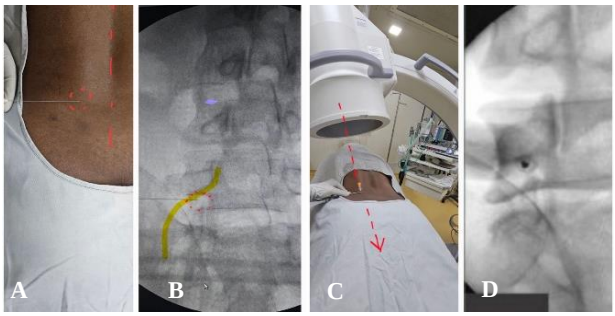

Figure 3 (A-D): Needle entry and needle trajectory.

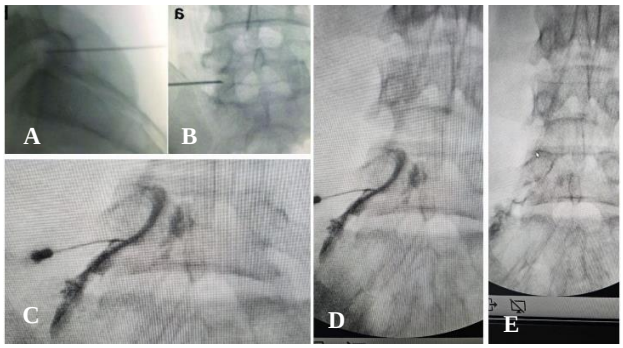

Figure 4 (A-E): Position confirmation and TFESI.

RESULTS

Out of 273 patients, majority 101 (37.8%) patients belonged to age group 41-50 years with the mean age 45.5±8.2 years. Male patients were predominant 161(59.0%) and female were 112 (41.0%). Male to female ratio was 1.4:1 (Table 1). Regarding level of PLID, majority 168(61.5%) patients had PLID level at L4-5 followed by 93 (34.1%) had PLID level L5-S1 (Figure 5). Almost three fourth 211 (77.3%) had unilateral pain and 62 (22.7%) had bilateral pain (Figure 6). Majority 232 (85.0%) patients given both (traversing and existing). From baseline (18.6±3.6), mean RMDQ score was significant reduced at 2 weeks (14.4±3.7), at 1 month (13.8±3.8), at 3 months (11.6±3.6) and at 1 year (7.8±3.7) respectively (Table 2). 189 (69.2%) patients had severe disability at baseline according to disability rank of ODI score; after procedure during follow up severe disability was found in 59 (21.6%) cases at 2 weeks, 24 (9.1%) at 1 month, 13 (5.0%) at 3 months and 3 (1.2%) at 1 year. The reduction of severe disability from baseline in subsequent follow up was significant. From baseline (45.7±10.0), mean ODI score was significantly reduced at 2 weeks (36.4±9.0), at 1 month (28.2±8.9), at 3 months (24.3±8.9) and at 1 year (18.9±10.5) respectively (Figure 7). Regarding complications, 4 (1.5%) patients had root injury and 2 (0.7%) had discitis (Table 3).

Table 1: Socio-demographic characteristics of the study patients (n=273).

Variables	Frequency	Percentage
Age (years)		
≤30	8	2.9
31-40	80	29.3
41-50	101	37.0
51-60	84	30.8
Mean±SD	45.5±8.2	
Range (min-max)	27-60	
Sex		
Male	161	59.0
Female	112	41.0

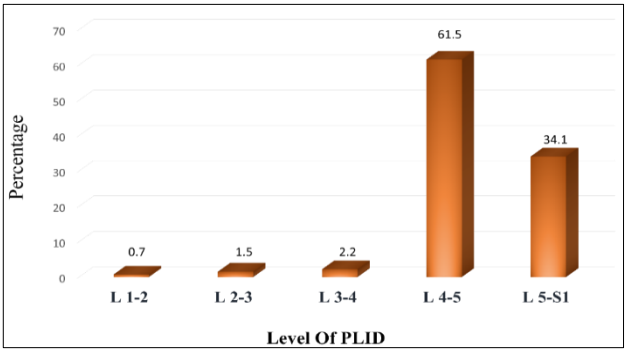

Figure 5: Distribution of the study patients by level of PLID.

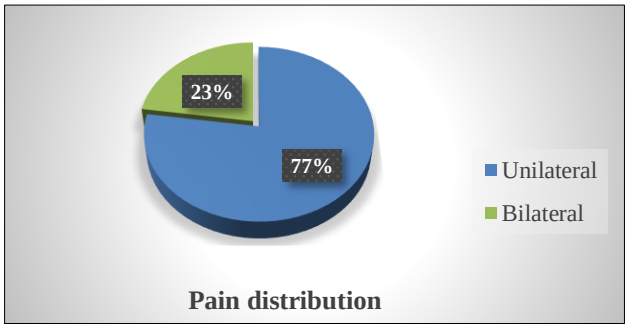

Figure 6: Pain distribution of the study patients.

Table 2: RMDQ score in different follow up.

RMDQ score	Total (n)	Mean±SD	P value
Baseline	273	18.6±3.6	
At 2 weeks	273	14.4±3.7	0.001
At 1 month	265	13.8±3.8	0.001
At 3 months	261	11.6±3.6	0.001
At 1 year	252	7.8±3.7	0.001

P value reached from paired t-test

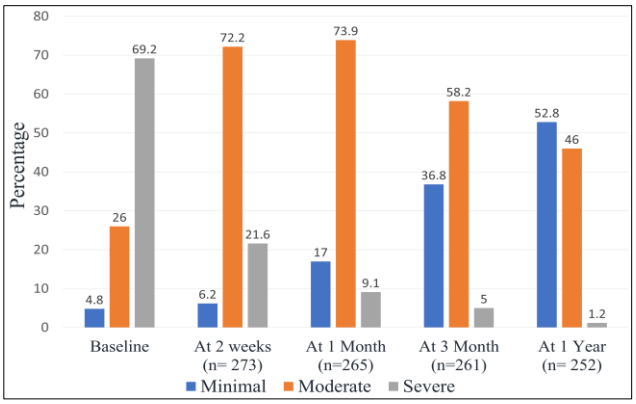

Figure 7: ODI score in different follow up.

Table 3: Complications of the study patients (n=273).

Complications	Frequency	Percentage
Root injury	4	1.5
Discitis	2	0.7

DISCUSSION

Lumbar disc herniation (LDH) is a common cause of low back pain affecting the daily life of patients. Therefore, it is important to relieve the pain to improve the quality of life of the patients. TFESI is usually administered in patients with LDH. The aim is to inject the drug directly to the affected spinal nerve root. Several previous studies have demonstrated excellent short-term outcomes of TFESI in patients with LDH.[10] Therefore in this study 273 patients underwent TFESI for lumber disc herniation with radiculopathy were included to determine the effectiveness of transforaminal epidural steroid injection in lumber disc herniation with radiculopathy.

In this study observed that majority 101(37.8%) patients belonged to age group 41-50 years with the mean age 45.5±8.2 years. In a study done by Ostelo et al found that the mean age was 43.3±8.8 years.[11] Morita et al described that the mean age was 40.5 years.[12] Jang and Chang reported that the mean age was 57.2±12.0 years.[13] Suleiman et al. revealed that the mean age of the patients was 58.2±11.6 years.[14]

In present study observed that male patients were predominant 161 (59.0%) and female were 112 (41.0%). Male to female ratio was 1.4:1. Kuvad had observed that out of 25 patients, 16 (64.0%) male and 9 (34.0%) female.[1] Ostelo et al reported that male was 58.8% and female was 41.2%.[11] Morita et al obtained that out of 48 patients, male was 25 (52.1%) and female was 23 (47.9%).[12] Jang and Chang showed that male to female ratio was 25:25.[13] Suleiman et al. demonstrated that out of 47 patients, 26 males (55.3%) and 21 (44.7%) females.[14]

Regarding level of PLID, majority 168 (61.5%) patients had PLID level at L4-5 followed by 93 (34.1%) had PLID level L5-S1, 6 (2.2%) L3-4, 4 (1.5%) L2-3 and 2 (0.7%) L1-2. In a study done by Kuvad reported that 56% patients had pathology at L4-5 level, 28% at L5-S1 level, 12% at L3-4 level and 4% (1 patient) at L2-3 level.[1] Jang and Chang also found that PLID level at L5 was found in 32.[13]

In this study almost three fourth 211 (77.3%) had unilateral pain and 62(22.7%) had bilateral pain. In a study conducted by Suleiman et al described that more than two third (68.1%) patients had unilateral pain and 31.9% had bilateral pain, that was almost similar with my study.[14]

In present study observed that from baseline (18.6±3.6), mean RDMD score was significant reduced at 2 weeks (14.4±3.7), at 1 month (13.8±3.8), at 3 months (11.6±3.6) and at 1 year (7.8±3.7) respectively. In a study done by Morita et al. demonstrated that the median RMDQ score was 17.5. The median scores for trait anxiety and state anxiety were 44.5 and 54.0, with 81.8% of the patients showing a high state anxiety and 52% showing a high trait anxiety. Chae et al described that there were no significant differences in RMDQ scores between the two groups in terms of functional disability and pain scores during injection, with no significant differences at 4 weeks after treatment. At 4 weeks after the procedure, both groups showed statistically significant improvements in functional status according to RMDQ scores ($p<0.05$).[15] The Oswestry disability index may be better for detecting functional changes in patients with more severe disability, whereas the RMDQ may be more appropriate for patients with minor disability.[16]

In this study observed that 189 (69.2%) patients had severe disability at baseline according to disability rank of ODI score; after procedure during follow up severe disability was found in 59 (21.6%) cases at 2 weeks, 24 (9.1%) at 1 month, 13 (5.0%) at 3 months and 3 (1.2%) at 1 year. The reduction of severe disability from baseline in subsequent follow up was significant. From baseline (45.7±10.0), mean ODI score was significantly reduced at 2 weeks (36.4±9.0), at 1 month (28.2±8.9), at 3 months (24.3±8.9) and at 1 year (18.9±10.5) respectively. In a study done by Wei et al reported that the ODI of the low back pain and sciatica at each observation point of the post-operation were significantly decreased compared with the pre-operation ($p<0.05$).[10] Suleiman et al obtained that 21 (45%) patients were observed to be functionally compromised with ODI of severe and moderate scores respectively. The ODI scores at baseline and at six months' follow-up improved significantly 45.1±11.5 versus 32.4±11.5 ($p=0.001$).[14] At two months, one study reported success as either a 50% reduction in pain or >40% improvement in Oswestry disability index (ODI) score. It reported success in 58% of subjects (95% CI=54–62%) at two months.[17]

Regarding complications, 4 (1.5%) patients had root injury and 2 (0.7%) had discitis. In a study conducted by Kuvad revealed that there were no reported complications of dural tear, nerve root injury and infection in total 43 injection procedure.[1] Güçlü et al had observed that no major

complications were noted; however, in the transforaminal epidural steroid injections for the foraminal disc herniation group, 16 patients (4.7%) had minor complications (including infection, headache, and temporary motor deficit) and 35 (3.5%) for the paramedian lumbar disc herniation group. This proves that transforaminal epidural steroid injection is a risk-free safe procedure.[18]

Limitations

This study mainly involved one center, therefore, the results should not be generalized to bigger populations. Another weakness of this study is the absence of a placebo or control group.

CONCLUSION

Transforaminal epidural steroid injection significantly reduced disability and provide improved functional outcome in patients with lumber disc herniation with radiculopathy.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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