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Transforaminal Epidural Steroid Injection in Lumbar Radicular Pain

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Abstract

Objective: To evaluate the efficacy of transforaminal epidural steroid injection (TFESI) in patients with lumbar radicular pain and emphasis on the 1 year outcome of this minimally invasive pain management procedure.

Patients and Methods: 84 patients with lumbar radicular pain due to inter vertebral disc degeneration (IVDD) and facetal hypertrophy causing neural foraminal narrowing without motor deficit or bladder/bowel disturbance were treated with TFESI between May 2014 to August 2018 in a Tertiary care medical center in India. Patient's pain status was assessed at 1 month, 6 months and 1 year of discharge. 59 out of 84 patients (70%) with follow-up data were included in the study and patients with motor or bladder/bowel deficit were excluded from the study.

Results: 58 out of 59 patients had significant pain relief at the time of discharge after a day of the procedure. 1 patient had persistent pain and was managed surgically. 2 patients developed pain & EHL weakness at 3rd month and 6th month follow up respectively and were managed surgically. 5 patients had recurrence of pain with no any neurological deficit. They were taken up for repeat TFESI after repeat MRI spine scan and all improved symptomatically. To summarize, 56 (94.91%) patients were benefited by TFESI at the end of 1 year of follow-up and 3 (5.09%) patients were benefited by surgical intervention after failed TFESI. No peri procedural complication is encountered.

Conclusion: TFESI is an effective minimally invasive procedure in patients with lumbar radicular pain with a good 1 year post procedural pain relief.

Keywords: Lumbar radicular pain; Wong-Baker's faces pain scale; Transforaminal epidural steroid injection.

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Introduction

Spinal Canal Stenosis (SCS) is the narrowing of spinal canal those results in pain with or without neurologic deficit due to compression of the spinal cord or spinal nerve roots. SCS can occur at any level from cervical spine to sacral spine. Symptomatically, neurogenic claudication is of significance and the symptoms are influenced by posture of the body or activities like walking, standing, sitting or bending. Examination of a patient during an asymptomatic period might be normal, although sensory deficits, motor weakness, and diminished reflexes are elicited when the patient is examined following physical activity/excursion. Straight Leg Raising Test (SLRT) is positive in a number of cases [1]. Lateral recess syndrome is marked by facet hypertrophy with narrowing of the lateral recess of the spinal canal through which the nerve root exits which results in a localized nerve root compression [2].

Myelography with contrast agent demonstrates obliteration of subarachnoid space and restricted pattern of contrast movement within the spinal canal in fluoroscopy, which is obsolete, now-a-days [3]. CT scan delineates the bony and soft tissue anatomy, including the lateral recess, canal dimensions, osteophytes, ligament hypertrophy and intervertebral disc and it has been shown to greatly increase the diagnostic accuracy of herniated discs in the setting of stenosis [4]. Sagittal T2-weighted MRI spine scan is helpful in evaluating the hydration status and

degeneration of the intervertebral disc. Changes associated with flexion, extension and weight bearing can also be studied.

The various modalities of treatment available for lumbar canal stenosis include life style modification, physiotherapy, pain killers (NSAIDs) along with other medications (SSRIs, NERIs), minimally invasive intervention (TFESI) and surgery, usually tried in combination for the best results.

Transforaminal Epidural Steroid injection (TFESI) is a technique of injecting long acting steroid + local anesthetic agent in the neural foramen at the site of nerve root exit. This technique is also called as Root sleeve block, Root block or Transforaminal epidural block. The long acting steroid that is injected reduces the inflammatory reactions around the spinal nerve root and articular facet which reduces the symptoms caused by inflammation and irritation.

Research Methodology

From May 2014 to August 2018, 84 patients who have failed adequate multimodal non-invasive measures for control of lumbar radicular pain due to inter vertebral disc degeneration and facetal hypertrophy causing spinal canal/neural foraminal narrowing without motor deficit or bladder/bowel disturbance were treated with Transforaminal epidural steroid injection. Patients with motor deficit, bladder/bowel disturbance or not consenting for TFESI were excluded from the study. Patients were given a combination of 40 mg depo-medrol and 0.25% bupivacaine epidurally, under C-arm guidance. The patient's pre and post procedural pain was compared using Wong-Baker's faces pain scale. The data were collected from hospital's Digital Medical Record Department. Patient's pain statuses were assessed at 1 month, 6 months and 1 year of discharge. 59 out of the 84 patients with 1 year latest post procedural follow-up data collected in review OPD or through phone call were included in the study and analyzed retrospectively.

Procedure

The awake patient was positioned prone and through 'C' arm guidance a 22G needle of 10 cm length with its tip slightly angled was inserted after infiltrating the skin and sub cutaneous tissues with local anesthetic agents. The needle was positioned in such a way that in lateral view, the tip was in the postero superior quadrant (**Figure 1a**) of the neural foramen and in AP view the tip was in sub-pedicular region at 6'O clock position (**Figure 1b**). Iodine contrast was injected to confirm the position of the needle (**Figure 1b**). 2 ml of methyl prednisolone (depo-medrol 40 mg) + 2 ml of 0.25% bupivacaine injection were injected slowly. Patient may develop transient dermatomal parasthesia but motor functions were not impaired. The needle was removed and sterile compression dressing applied. This procedure can be done unilaterally, bilaterally or at multiple levels based on clinic-radiological correlation. Pre and post procedural pain was assessed using Wong-Baker's FACES pain rating scale and compared for any significant changes. The patients were observed and on symptomatic improvement with no any complication, they were discharged on the next day. Follow up neurological status of the patients were collected at 1st month, 6th month and 1 year of discharge after their latest TFESI procedure in review OPD or via phone call.

Statistical analysis

Quantitative variables were presented as median (interquartile range) in cases of non-normal distributions or as mean, standard deviation (SD) for normal distributions. Categorical variables were presented as absolute numbers and percentages. Group comparisons were analyzed with Student t test for numeric variables and with c2 or Fisher exact test for categorical variables. Variables found to be statistically significant in the univariate logistic regression analysis were used to identify the risk factors for poor clinical grade with odds ratios (ORs) and 95% confidence intervals (CIs). A P value <0.05 indicated statistical significance.

Demography

Out of the 59 patients, 27 (44%) were male and 32 (56%) were female. Distribution by age for female patients was 26 to 73 years and for male patients it was 27 to 69 years. Mean age of presentation was 44.10 (± 12.48) years. Mean age of presentation in males was 46 years and females was 42.57 years (**Table 1a**). Duration of symptoms at presentation range from 1 to 15 months with an average of 4.10 (± 3.13) months (**Table 1a**).

Evaluation

L4-L5 (67.8%) level was the most common level involved followed by L5-S1 (16.9%), both L4-L5/L5-S1 together (11.9%) and L3-L4 (3.4%) (**Figure 2**) (**Table 2**) Wong-Baker's faces pain scale/Visual analogue scale (VAS) was assessed in the pre and post procedure period (**Tables 3a** and **3b**) and compared.

Results

A decrease in VAS score of ≥5 in the post procedure status compared to pre procedure status was considered to be an effective and successful outcome of TFESI in our study, provided the post procedure VAS score is ≤2. No any complication of in advent IV injection or infection or hemorrhage or any significant

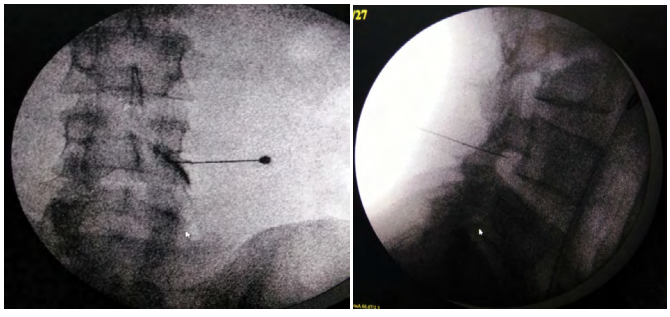

Figure 1 **(a & b)** Intra-op x-rays sowing the position of the needle tip.

Table 1 Age of patients and duration of symptoms.

Variables	No. of patients	Minimum	Maximum	Mean
Age (in years)	59	26	73	44.10
Duration of symptoms (in years)	59	1	15	4.10

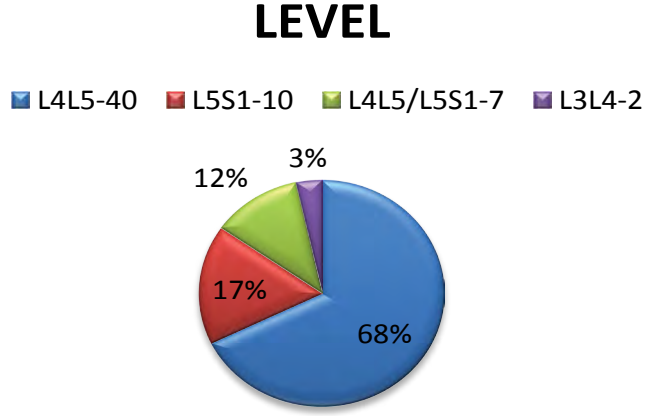

Figure 2 Shows the rounded value % of level of involvement.

Table 2 Level of spine involved.

Level	No. of patients	Percentage
L4-L5	40	67.8%
L5-S1	10	16.9%
L4-L5/L5-S1	7	11.9%
L3-L4	2	3.4%

Table 3a Pre procedure pain scale.

Wong-Baker's faces pain scale	No. of patients	Percentage (%)
6	7	11.9%
7	27	45.8%
8	22	37.3%
9	3	5.1%

Table 3b Post procedural (Day 1) pain scale.

Wong-Baker's faces pain scale	No. of patients	Percentage (%)
0	44	74.6%
1	12	20.3%
2	2	3.4%
7	1	1.7%

neurological deficit was encountered. Out of the 59 patients, 58 (98.30%) patients had a VAS of ≤ 2 in the immediate post procedure period and all were discharged the next day and only (1.70%) patient had VAS 7, whose admitting VAS was 9 and was taken up for surgery on the very next day (**Figures 3a and 3b**). 3.40% patients who were on regular follow up developed recurrence of pain symptoms along with focal motor neurological deficit of EHL weakness at 3 months and 6 months respectively, who were taken up for surgical management. 8.50% patients had recurrence of pain symptoms with no motor or bladder/bowel deficit and the recurrence occurred at 3, 5, 5, 7 and 6 months respectively. Repeat MRI spine scan was done to confirm the diagnosis and the involved level was found to be the same as that of the previous intervention in all the patients. TFESI was repeated and all of them improved after the procedure. Subsequently patients were discharged on the next day and advised for regular follow up in OPD clinic. 51 (86.40%) patients did not have recurrence of pain or any neurological deficit and were completely relieved of the symptoms even in the first setting.

Discussion

As evident from the data, 58 patients (98.30%) had significant relief of pain symptoms after TFESI in the immediate post procedure period and were discharged without any complications. The earliest review of the patient in follow up with a clinical complaint was at 3rd month, wherein one had recurrence of pain alone and another one had recurrence of pain along with EHL weakness. So all the 58 patients were comfortable at 1 month of follow up and clinical issues/recurrence of pain arose at or after 3 months only. 51 (86.40%) patients who were on regular follow up at 3rd month, 6th month and 12th month of discharge did not have any recurrence of symptoms or new neurological deficit. 5 patients (8.50%) with recurrent pain in follow up without neurological deficit were benefitted by repeat TFESI. Overall 56 patients (94.90%) had a satisfactory pain relief after one or two attempts of TFESI and their 1 year follow up pain status after the latest TFESI is shown in **Table 3c.** 3 patients (5.10%) had been operated in view of persistent pain (1 patient) in the immediate post procedural period or new neurological deficit (2 patients) in the follow up period. There was a statistical significance (p=0.05) in pain relief after TFESI procedure as evident in **Table 4.**

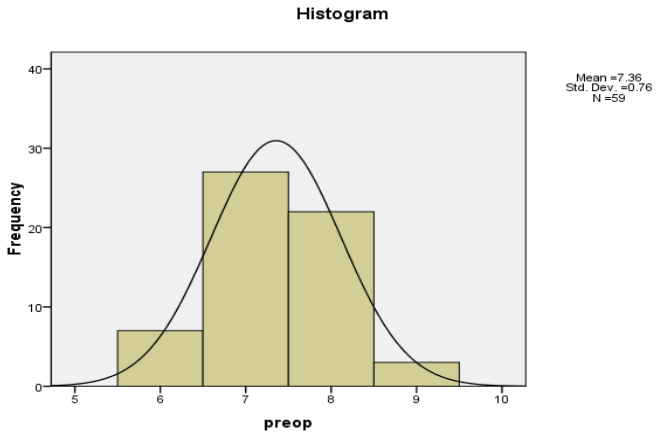

Figure 3a Pre-op VAS.

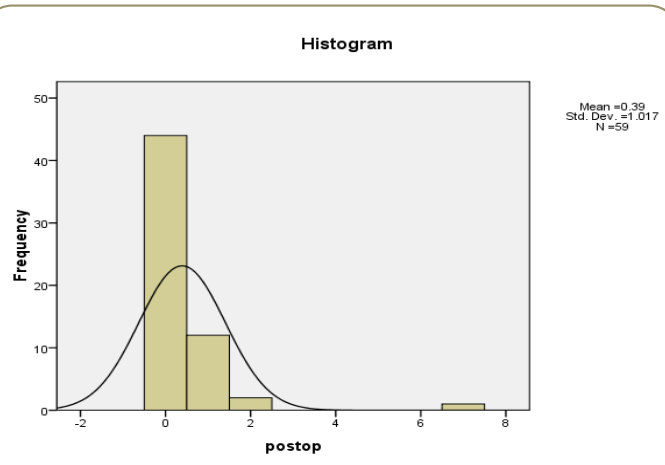

Figure 3b Post-op VAS on day 1.

Table 3c Pain scale at 1 year of TFESI.

Wong-Baker's faces pain scale	No. of patients	Percentage (%)
0	7	11.9%
1	46	82.2%
2	3	5.4%

Table 4 Results of paired t-test. Results of paired t-test with p-value 0.05 imply that there is a statistical significance.

Variables		Paired Differences					t	Significance	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-op – Post-op	6.966	0.946	0.123	6.720	7.213	56.547	0.05	0

Shorter duration of hospital stay, avoidance of general anesthetic medications and contemporary surgical morbidity which in turn has reduced the cost of the treatment drastically, makes this procedure more cost effective. Park et al. concluded that The Kambin's triangle approach is as efficacious as the subpedicular approach for short-term effect and offers considerable advantage (i.e., less spinal nerve pricking during procedure) [5].

Lee et al. has showed that preganglionic TFESI has the better therapeutic effect on radiculopathy caused by nerve root compression at the level of the supra-adjacent disc than does conventional TFESI, and the difference between the two treatments had borderline statistical significance [6]. According to Pandey et al. at one year after injecting the steroid, all the three routes were found to be effective in improving the JOA Score (Caudal route in 74.3%, transforaminal in 90% and interlaminar in 77.7%). Transforaminal route was significantly more effective than caudal (p=0.001) and interlaminar route (p=0.03) at both 6 months and one year after injection. No significant difference was seen between the caudal and interlaminar route (p=0.36) [7]. The Center for Disease Control (CDC) specifically identified 25 deaths (many due to Aspergillosis), 337 patients sickened, and 14,000 exposed to contaminated steroids [8]. Nevertheless, many other patients develop other complications that go unreported/underreported: Other life-threatening infections, spinal fluid leaks (0.4-6%), positional headaches (28%), adhesive arachnoiditis (6-16%), hydrocephalus, air embolism, urinary retention, allergic reactions, intravascular injections (7.9-11.6%), stroke, blindness, neurological deficits/paralysis, hematomas, seizures, and death. The Centers for Disease Control and Prevention (CDC) has launched an investigation into the outbreak which has led to 7 deaths and 91 infections (as of October 8, 2012). These infections have occurred in the following 9 states: Florida, Indiana, Maryland, Michigan, Minnesota, North Carolina, Ohio, Tennessee, and Virginia.

90 untoward events were reported to the FDA Adverse Event Reporting System (FAERS) between 1997 and 2014. In the December 10, 2015 issue of the New England Journal of Medicine, Racoosin et al. from the FDA, found that all the catastrophic neurological events (Brain and spinal cord infarctions resulting in permanent disability or death) reported to the FAERS were associated with injection of a glucocorticoid suspension, with only a few cases, involving temporary symptoms, reported with glucocorticoid solutions. However, the authors found that suspension formulations still accounted for more than 80% of the commercially available corticosteroid products used for epidural injections in 2013, according to Medicare and IMS health data, despite the increasing use of solutions [9]. There was Level I evidence that local anesthetic with steroids was effective in managing chronic spinal pain based on multiple high-quality randomized controlled trials. The evidence also showed that local anesthetic with steroids and local anesthetic alone were equally effective except in disc herniation, where the superiority of local anesthetic with steroids was demonstrated over local anesthetic alone [10]. 31 patients were screened and randomized. Twenty-six patients enrolled; 11 received clonidine and 15 triamcinolone. Radicular pain due to IDH improved rapidly with TFE injection of either clonidine or triamcinolone. Corticosteroid resulted in greater functional improvement, with unclear differences in analgesia. Future studies will determine if clonidine is superior to placebo and of particular use in those at risk for corticosteroid complications [11,12].

Conclusion

Transforaminal epidural steroid injection is a safe, minimally invasive and cost effective treatment modality in the management of Lumbar radicular pain and Lumbago without motor deficit or bladder/bowel disturbance.

Conflicts of Interest

None.

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