

# Treating Radiculopathies Arising Out Of Single Level Disc Prolapse of Lumbar Spine

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## ABSTRACT

Low back pain is one of the major causes of disability in people in 4th and 5th decade of life. Lumbar spinal stenosis can induce radiating pain in the lower limbs through narrowed intervertebral foramen by a herniated intervertebral disc due to degenerative changes, thickening of the ligamentum flavum, zygapophyseal joint and thickening of surrounding soft tissues. The study determine the efficacy of both transforaminal epidural steroid injections and interlaminar epidural steroid given under fluoroscopic guidance to different patients having similar complaints of radiculopathy. Study was conducted with 50 patients to compare and evaluate the outcomes of transforaminal steroid injection vs epidural steroid injection. Patients were alternately assigned one group such that each group had 25 patients. The results of transforaminal epidural steroids and interlaminar epidural steroid injection were found to be equally good.

**Keywords:** Radiculopathy, transforminal, treatment, interlaminar, prolapse

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## INTRODUCTION

Low back pain is one of the major causes of disability in people in 4th and 5th decade of life.<sup>1,2</sup> Lumbar spinal stenosis can induce radiating pain in the lower limbs through narrowed intervertebral foramen by a herniated intervertebral disc due to degenerative changes, thickening of the ligamentum flavum, zygapophyseal joint and thickening of surrounding soft tissues.<sup>5,6</sup> Causes of radicular pain in degenerative lumbar spinal stenosis are difficult to explain by one theory. Structural abnormalities do not always cause pain, rather in many cases, nerve root irritation due to prolapse causes radiculitis instead of direct mechanical compression. Suggested causes apart from mechanical compression include inflammatory changes around nerve root and venous congestion.<sup>3,4</sup> In recent years, understanding of disc degeneration has undergone a significant transformation. Impairments related to the back and spine are ranked as one of the most frequent cause leading to limitation of activity in patients younger than 45 years old by the National Center for Health Statistics.

## AIM AND OBJECTIVES

### Aim

To compare and evaluate the difference between the outcomes of transforaminal epidural steroid injections and interlaminar epidural steroid injections as treatment modalities for radiculopathies arising out of single level lumbar disc prolapse

### Objectives

To determine the efficacy of both transforaminal epidural steroid injections and interlaminar epidural steroid given under fluoroscopic guidance to different patients having similar complaints of radiculopathy.

To compare pre-injection, immediate post-injection and delayed post injection effect by using fixed indices to understand the differences in outcomes of each of the two modalities.

## REVIEW OF LITERATURE

In a systematic review to evaluate the effect of therapeutic transforaminal epidural steroid injections in lumbar spine by Laxmaiah Manchikanti<sup>10</sup> in 2012, it was said that the results for radiculopathy, which is secondary to disc prolapse, are good with local anaesthetics and steroids both and fair with local anaesthetics only. Benny B<sup>11</sup> in a comprehensive literature review concluded that treatment with transforaminal steroid injections are strongly evident in lumbar radiculopathy, in terms of both short term and long term. Riew KD<sup>12</sup> article supported use of transforaminal steroids in patients who have lumbar radiculopathy before considering for operative intervention. Riew et al<sup>58</sup> conducted a prospective, randomized, controlled, double-blind study in: proceedings of the North American Spine Society, 14th Annual Meeting in 1999 showed early promising results of transforaminal epidural steroid injection (TFESI) in lumbar canal stenosis.

A prospective RCT conducted by Hospital For Special Surgery- Spine unit in their study in 2002 of Transforaminal Steroid Injections in Lumbosacral Radiculopathy,<sup>13</sup> to assess the efficacy of transforaminal steroid injection in patients with lumbar radiculopathy secondary to prolapsed intervertebral disc. It was a study of 50 patients, out of which 25 received transforaminal steroid injection and 25 received paravertebral trigger point injections.

Gharbo et al <sup>14</sup> conducted a randomized prospective outcome study which showed better results for Epidural steroid injection which may be due to para median approach instead of traditional midline approach.

## MATERIALS AND METHODS

The study was conducted at Krishna Institute Of Medical Sciences Hospital, Karad from Nov 2016 to March 2018.

### Inclusion criteria

1. Patients with single level disc prolapse having unilateral or bilateral radiculopathy
2. Patients with clinical correlation of radiological finding of single level disc prolapse.

3. Patients who do not respond to conservative management for atleast 6 weeks.
4. Adults of either sex.

#### Exclusion criteria

1. Patients with clinical and radiological evidence of instability like spondylolisthesis or spondylolysis.
2. Patients with traumatic spine injury or spinal fracture.
3. Patients with previous H/O lumbar surgery.
4. Patients with previous H/O transforaminal or epidural injection.
5. Patients with neurodeficit
6. Patients with co-morbidities which may or may not be affected by steroids
7. Patients with known allergy to the injecting materials.

A total of fifty patients with low back pain with unilateral or bilateral radiculopathy with documented with lumbar disc disease, initially treated with rest, analgesics and physiotherapy for at least six weeks, not relieved and who fulfilled the above mentioned criteria were included in the study. Patients who participate in this study were documented.

There were two groups created

1. Transforaminal epidural steroid injection group
2. Interlaminar Epidural steroid injection group

Each patient was alternately assigned one group as and when they were selected for the intervention. So, there were

25 patients in each group.

Each patient was counseled about the management, expected prognosis and probable complications. Appropriate consent was taken and patient was moved to Orthopaedics OT equipped with fluoroscopy.

As per the proper pre operative examination protocol, patients were asked to record their pain and radiculopathy status using Visual analogue scale and Modified Roland Sciatica Questionnaire. Patients were examined and vitals were recorded and patient was prepared for the respective intervention

#### Techniques

1. Transforaminal epidural steroid injection
2. Interlaminar epidural steroid injection

#### 1. Transforaminal epidural steroid injection technique

##### Materials required

- a) Operating room equipped a radioluscent table
- b) Fluroscopy (C-arm)
- c) Savlon, spirit and povidone-iodine solution.
- d) Inj. Triamcinolone acetate 40mg (1cc)
- e) Inj. Bupivacaine 0.25mg (1cc)
- f) Non ionic injectable radioopaque contrast material. (Urograffin dye)
- g) Spinal needle 23G, 12cm
- h) Syringe- 2cc/5cc



Figure 1: Materials Required For Transforaminal Epidural Steroid Injection

Patient was given prone position on a radiolucent table. Under all aseptic precautions, desired area was cleaned, painted and draped. Vertebral levels confirmed by palpating and by visualizing under C-arm in both anteroposterior and lateral views. 23 gauze, 12cm long spinal needle was advanced in the region of affected nerve root under fluoroscopic guidance. The technique of safe triangle was used which is formed by the lateral border of vertebral body, exiting nerve root and pedicle. Once needle was placed at the desired position, 1ml of radio-opaque dye (Urograffin dye) was injected in fig 1. targeting the exiting nerve root.

Flow of dye was fluoroscopically visualized and confirmed. Once correct placement was confirmed, without changing the needle position, a combination of 40mg triamcinolone acetate and 2cc bupivacaine was injected and needle was withdrawn. Patients having bilateral radiculitis were given injections again over the other side similarly. Patient was then shifted to recovery room. Patient's vitals were monitored throughout the procedure and post injection for 1 hour. Post injection neurological status was recorded.

2. Interlaminar Epidural steroid injection technique

Materials required

- a) Operating room equipped a radioluscent table
- b) Fluoroscopy (C-arm)
- c) Savlon, spirit and povidone-iodine solution.
- d) Inj. Triamcinolone acetate 40mg (1cc)
- e) Inj. Bupivacaine 0.25mg (1cc)
- f) Normal saline (10cc)
- g) Epidural (loss of resistance) syringe.
- h) Epidural needle 18G, 8cm
- i) Syringe- 10cc



Figure 2: Materials required for Interlaminar Epidural Steroid injection

Patient was given right or left lateral position depending on the affected side. Under all aseptic precautions, desired area was cleaned, painted and draped. Vertebral levels were confirmed by palpation and by visualizing under C-arm in both anteroposterior and lateral views. An 18 gauze, 8cm long epidural needle along with the stellate was advanced in the interlaminar space over central or para spinal region. Epidural needle gradually advanced using the loss of resistance technique. Once the epidural space was reached, stellate was removed and correct position confirmed by negative aspiration of CSF. Once there was no evidence of dural puncture, without changing the needle position, a combination of 40mg triamcinolone acetate and 2cc bupivacaine in dilution of 10ml of Normal saline injected and needle withdrawn and patient was given supine position. After a while, patient was shifted to recovery room. Patient's vitals were monitored throughout the procedure and post-injection in fig. 2 for upto 1 hour. Post operative neurological status was checked.

with 50 patients to compare and evaluate the outcomes of transforaminal steroid injection vs epidural steroid injection. Patients were alternately assigned one group such that each group had 25 patients. Group A/Transforaminal group: Transforaminal Epidural Steroid injection. Group B/Epidural group: Interlaminar Epidural Steroid injection. We compared the distribution of patients in different variables like age group, sex, level of disc prolapse or side of radiculopathy and their association using Chi-sqaure test or Fisher exact test. The scores within single group at different time interval was compared using Paired t test, and comparision of scores between two groups was done using unpaired t test.

1) Gender distribution

Majority of the patients in transforaminal group were females (56%) while those in Epidural group were males (72%). Gender was not considered to be significant while assigning the treatment modality group. However there was significant difference found in the distribution between sex and group. (p < 0.05)

OBSERVATIONS AND RESULTS

A prospective, comparative clinical study was conducted

Table 1: Gender Distribution

Gender	Treatment Modality		Total	P value
	Transforaminal group	Epidural group		
Female	14	7	21	
Male	11	18	29	
Total	25 (50%)	25 (50%)	50 (100%)	0.045
	Treatment Modality		Total	P value
	Transforaminal group	Epidural group		
Female	14	7	21	
Male	11	18	29	

Total	25 (50%)	25 (50%)	50 (100%)	0.045
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2) Distribution of patients according to level of disc prolapse

Majority of the patients in transforaminal group had disc prolapse at the level of L3- L4 (48%) followed by L4-L5 disc

level (24%). Out of 25 patients in epidural group, majority of patients (40%) disc prolapse at the level of L4-L5 followed by L2-L3 disc level (36%).

Table 2: Distribution of patients according to level of Disc prolapsed

Disc prolapse level	Treatment Modality		Total
	Transforaminal group	Epidural group	
L1-L2	0	0	0
L2-L3	3	9	12
L3-L4	12	6	18
L4-L5	6	10	16
L5-S1	4	0	4
Total	25	25	50

3) Distribution of patients according to side of radiculopathy

Most of the patients (44%) had right sided of radiculopathy out of them 12 patients were from transforaminal group and 10 patients were from epidural group. No significant

relationship observed between the two groups. there were equal number of patients i.e. 14 patients (28%) having left side and bilateral radiculopathy. No significant relationship observed between the two groups.

Table 3: Distribution of patients according to side of radiculopathy

	Treatment Modality		Total	P value
	Transforaminal group	Epidural group		
Right	12	10	22	0.443
Left	7	7	14	
Bilateral	6	8	14	
Total	25	25	50	

4) Comparison between Sex and overall outcome

As there was a significant difference between the distribution of sex in the two groups, we evaluated whether the difference of uneven distribution could affect our results.

But we observed that there was no significant association between sex and outcome of the treatment without considering the group.

Table 4: Comparison between sex and overall outcome

Sex	Mean MRS score	P value
Male	36.14	0.097
Female	36.29	

5) Comparison between level of disc prolapse and overall outcome

As there was a significant difference between the distribution of level of prolapse in the two groups, we

evaluated whether this difference could possibly affect our results and found that there was no significant association between level of prolapse and outcome of the treatment.

Table 5: Comparison between level of disc prolapse and overall outcome

Disc prolapse level	Mean MRS scores	P value
L2-L3	38.50	0.179
L3-L4	40.11	
L4-L5	32.31	
L5-S1	27.25	

6) Comparison between bilateral radiculopathy and outcomes in each group

As there was a difference in the injection methods in case of

bilateral radiculopathy by transforaminal technique, we compared the outcomes of patients with bilateral radiculopathies. We observed that, at the end of six months,

mean score was better in epidural group in bilateral radiculopathy patients as compared to bilateral

radiculopathy in transforaminal group. But this difference was not significant statistically. ( $P > 0.05$ ).

**Table 6:** Comparison between bilateral radiculopathy and outcomes in each group

Patients with bilateral radiculopathy	Number of patients	Mean MRS scores at the end of six months	P value
Transforaminal group	6	28.97	
Epidural group	8	28.25	0.877

## DISCUSSION

In a prospective study of 50 patients diagnosed with single level disc prolapse with radiculopathy approaching Krishna Institute of medical sciences hospital, Karad, in the outpatient department from June 2016 to July 2018 were included in the study. Patients were divided into 2 groups of 25 each. In group 1, 25 patients were treated with transforaminal nerve root block and in group 2, 25 patients were treated with epidural block. In our study, there was a wide window of the patients with respect to age group ranging from 21 years to 75 years.

Lumbar spinal stenosis may induce radiating pain in the lower limbs through narrowed intervertebral foramen. In addition to mechanical compression, inflammatory changes around nerve root and venous congestion are found to be the possible causes for radiculopathy. Epidural steroid injections are given because there is a raised concentration of inflammatory mediators around the damaged or compressed nerve.<sup>15,16</sup> Corticosteroids inhibit prostaglandin synthesis and block nociceptive C-fiber conduction.<sup>7</sup> Steroids classically work by the abolition of the rate-limiting step by the enzyme PLA2 to which in turn reduces inflammation.

We had a broad window of age groups ranging from 21 years to 75 years of age. However, we did not find any significant difference in distribution of age groups and treatment modalities. Despite alternate allotment of patients in the two groups, we observed that majority of patients in transforaminal group were females while majority of patients in epidural group were males. This difference of sex distribution was found significant. Hence, in order to analyze whether the difference in distribution can affect the results, we made a comparison of the outcomes of both the sexes leaving aside the treatment modality, and we found out that there was no statistical difference in the outcomes of both the sexes in such manner. We found this comparison important because often it is observed in our scenario that females are more likely to miss the rehabilitation protocol.

An observation was made in difference in distribution of patients with respect to disc prolapse level. In our study, more disc prolapse occurred between L3-L4 (36%) and L4-L5 (32%) levels. However, we observed that majority of patients in transforaminal group had L3-L4 level prolapse while majority of patients in epidural group had L4-L5 prolapse. Hence we compared the outcomes based on level of disc prolapse and we observed that there was no significant difference in the outcomes depending on the level of disc prolapse leaving aside the treatment modality so that rules out the difference in the levels of disc prolapse. In our study, in the two assessment systems, i.e. VAS scores

and MRS scores, we observed that VAS scores showed a significant improvement when compared pre treatment and immediate post treatment. This improvement again decreased at 1st month follow up but later, this was more or less constant.

In our study, purpose of the single dose study was to rule out any progression of mechanical compression or instability that may get masked due to repeated local anesthetic and steroids.

There has been a wide discrepancy in the results of different studies done by a variety of techniques, duration, places and methods. This discrepancy is seen probably because of various factors like smaller sample size, shorter duration of studies, different approaches, use of fluoroscopy, etc. Use of fluoroscopy helps in proper delivery of the desired medication at precise location. Hence use of fluoroscopy has resulted in better outcomes because it provides reliable, safe and accurate placement of drug. Without fluoroscopy, there is 30-40% chance of misplacing the needle. It also reduces the risks of blind procedures like dural puncture or piercing the artery.<sup>8,9</sup>

Hence, to get more reliable results, we need a longer follow up with the patients with a larger sample size which will help us rule out the probable fallacies in the study like uneven distribution of patients, improper history, misdiagnosis, improper injecting techniques, bias in answering questionnaires, inadequate follow up, non-compliance for post treatment protocols, etc.

## CONCLUSION

Epidural steroid injections can be considered effective in treating radiculopathies arising out of early stages of single level prolapse intervertebral discs of lumbar spine. The results of transforaminal epidural steroids and interlaminar epidural steroid injection were found to be equally good. However, interlaminar epidural steroid injections were found superior immediately post-injection, but in the long run, transforaminal epidural steroid injections were found to be superior, although the superiority was not much significant in either cases. Hence, in cases of bilateral radiculopathy, interlaminar epidural steroids can be preferred due to midline or para- median approach affecting nerve roots of either side whereas transforaminal injections need to be given in both sides individually. A good post injection protocol and regular follow up is necessary for good results and to achieve the best out of available.

## CONFLICT OF INTEREST

None

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