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Lumbar discectomy in post epidural steroid treated patients for disc prolapse

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Abstract
Aim: In spine surgery, it is common practice to thoroughly exhaust all conservative measures before surgery. With the increasing popularity of injection procedures, significant number may still require surgery post epidural steroid infiltration (ESI). We aim to study the incidence of such patients who eventually go in for surgery after a failed ESI. We also studied and compared the functional outcomes of transforaminal (TF) versus interlaminar (IL) procedures in intervertebral disc prolapse (IVDP) patients.
Materials and Methods: 150 patients with lumbar disc prolapsed were subjected to epidural steroid infiltration after 6 weeks of failed conservative management, of which 101 underwent IL and 49 TF procedure according to surgeon's preference, and followed up for 6 weeks. Those with persisting (or worsening) Visual analogue scale (VAS), Modified Oswestry diability index (ODI) and with progressive neurological deficits, underwent lumbar discectomy and all were followed up for 6 months.
Results: Out of 150 patients, 45 patients underwent discectomy (30 %) after total 6 months follow up, and out of the remaining 105 patients, 40 (81.6%) from TF group and 65 (64.4%) from IL group improved. In total, 62% of females went to surgery, Minimal disability in ODI score was seen in 77.8% in surgery group and 98.1% in epidural group at final follow up.
Conclusion: Our study observed a much smaller crossover rate (30%) to surgery, and a significant difference in outcomes of the two injection methods and concludes that TF is a better procedure than IL.

Keywords: Epidural steroid infiltration, transforaminal, interlaminar, lumbar discectomy

1. Introduction
Low back pain is an extremely common ailment encountered in our day practice. Lumbar disc herniation is the most common cause of lumbar radiculopathy. The symptoms of 80-90% of patients with disc prolapse usually resolves with conservative treatment. Nonoperative management of this condition may include physical therapy, anti-inflammatory medications and epidural steroid injections [1] (ESI).
Operative management is advised in cases of noncompliance to conservative treatment, progressive neurological deficits, patients with radiculopathy with significant compression by disc herniation and patients with cauda equina syndrome. There is considerable controversy about thel efficacy of epidural steroid in the management of lumbar disc herniation [1].
The largest study of epidural injections is a prospective, randomized trial of 160 patients, and this study showed a benefit of steroid treatment at two weeks but none at three, six, or twelve months. Although many articles support the benefits of epidural steroid infiltration for low back ache, other studies dispute the benefits of these procedures [2].
Unfortunately, most of these studies were with many problems. More studies are needed to further elucidate efficacy of epidural steroid infiltration in the treatment of low back pain[3]. Additionally, the crossover to surgery after this intervention has not been determined. Given this uncertainty, the aim of this study was to analyse the occurrence of lumbar discectomy post epidural steroid infiltration in lumbar disc prolapsed and to assess the factors influencing surgical intervention [5].

1.2 Objectives of the study
To Study the occurrence of persistent pain in Disc Prolapse Cases treated with Epidural Steroid Injection.

2. Materials and Methods

2.1 Source

The study was conducted in Department of Orthopaedics, KR Hospital and MMCRI, Mysuru from September 2018 to October 2020 fulfilling the Inclusion Criteria. Adult patients of either gender aged 20-45 years diagnosed with MRI proven lumbar disc prolapse presenting with back pain and radiculopathy after 6 weeks of failed conservative Management. Total 150 Patients were followed prospectively in this study in which Male -77 and Female -73 were in Number.

Exclusion criteria included age more than 45 years, progressive neurological deficits, cauda equina syndrome, spinal canal stenosis, failed back syndrome, facet joint arthropathy, psychiatric illness, those having received lumbar ESI in the past, corticosteroids or anesthetics allergy, taking anticoagulants or bleeding diathesis, pregnant and lactating women.

2.2 Type of study: Multicentric Prospective Study

2.3 Method of Collection of Data

After obtaining valid consent, the complete data is collected from the patients by taking history, detailed clinical examination and relevant investigations. All cases with Disc Prolapse Were evaluated using the proposed criteria. Written informed consent was obtained from all the patients who were subjected to the proposed research work.

2.4 Area of Study

Department of Orthopaedics, KR Hospital and Mysore Medical College & Research Institute, Mysuru.

2.5 Methodology

150 patients with lumbar disc prolapse were subjected to epidural steroid infiltration out of which 101 underwent interlaminar (IL) procedure and 49 underwent transforaminal (TF) epidural steroid injections under fluoroscopic guidance according to surgeon's preference.

Epidural IL or TF injections were given at the level of prolapse, methyl prednisolone in IL approach and dexamethasone in TF approach, by determining the appropriate dermatomal level for injection according to distribution of the patient's pain and corresponding MRI findings. In order to perform IL epidural steroid injections, the patients were placed in either sitting position, lateral position or prone position with a pillow underneath the abdomen to partially correct lumbar lordosis and facilitate the opening of interspinous spaces. To facilitate the access to the epidural space. The back area was prepared and draped. 19 G Touhy needle advanced until just a few millimetres posterior to the epidural space. In this point, loss of resistance (LOR) was performed using glass syringe with simultaneous advancement of the needle. A solution of 80 mg methylprednisolone acetate with 4 cc of 0.25% bupivacaine was then injected. For the TF epidural steroid injections, the patients were put in the prone position on fluoroscopic table. The back area was prepared and draped in aseptic manner. The fluoroscopic beam was turned 20–30 degrees in oblique direction (to the side of prolapse). The entry site was identified at desired foraminal level and a 23-gauge needle advanced until change in resistance felt. Then, lateral view was taken to assure needle tip placement within the epidural space. An injection of nonionic contrast with assured proximal spread and no vascular uptake and it was completed in AP view. If vascular uptake was noticed, needle was repositioned. For the confirmation of anterior epidural spread, lateral fluoroscopic image was obtained. A solution of 4 mg of dexamethanone with 2 cc of 0.25% bupivacaine was injected. For pain, the patients were allowed to use tramadol one to two tablets, 50 mg every 6 hours as the rescue medication as needed (max 400 mg/24 hour). The patients were then followed and assessed at each visit at 1, 3 and 6 weeks and 6 months following the injection using Visual Analog Scale (VAS) of 0 to 10 for assessment of current back and lower-extremity pain. A pain drawing was used to indicate the distribution of the pain (with a high score representing a greater area of bodily pain), and Oswestry Disability Index (ODI) was employed to quantitate the level of function (on a 0 to 100-point scale, in which a higher score represented greater disability) and followed up as per the proforma. Those who had no improvement of symptoms, whose VAS score was persistently same or increasing, ODI was worsening or same, who develops progressive neurological deficits and patients wanting surgery for worsening symptoms were subjected to surgical intervention i.e, lumbar discectomy. All the patients including the patients who improved with epidural steroid infiltration alone and those who underwent surgery were followed up for 6 months. All study patients were receiving conservative management including Pregabalin 75 mg, Amytryptiline 10 mg, Tramadol SOS and exercise programme before joining the study.

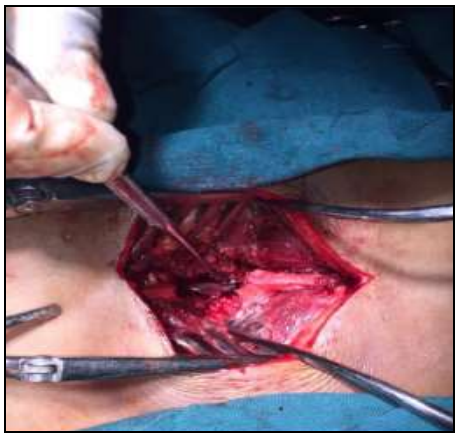

Fig 1: Intra Op picture of lumbar discectomy

Fig 2: Picture showing C ARM pictures of transforaminal epidural steroid infiltration with dye

3. Analysis of Data

In our study majority of the patients who were diagnosed with disc prolapse were in the age group 25 to 35 years (57.3%). 51% patients diagnosed with disc prolapse were males and

49% were females. Out of the total 150 patients, 105 (70%) improved in their symptoms only with epidural steroid and 45 patients (30%) proceeded to surgery, which was statistically significant. 101 patients were given epidural steroid by the IL technique and 49 patients by the TF technique, out of which 35.6% cases who were given steroid by IL technique proceeded to surgery whereas only 18.4% cases who were given steroid by TF technique proceeded to surgery. This was found to be statistically signifcant. Hence showing that TF technique was better although there was wide difference in sample size of patients who were given IL and TF. 64.4% cases in the age group 36 to 45 years had to proceed to surgery for the symptoms to resolve. This finding of having greater number of patients in this age group proceeding to surgery was found to be statistically significant. 62.2% of the females who were given epidural steroid proceeded to surgery compared to 37.8% males which was also found to be statistically significant. 80% of patients who were in strenuous occupations proceeded to surgery as compared to 20% in non strenuous work group who proceeded to surgery.

The decline in VAS score was steeper in patients who had undergone only epidural steroid as compared to patients who had undergone surgery after epidural, and it was statistically significant. The decline in VAS score of TF group was statistically significant as compared to the decline in IL group throughout the follow up of 6 months. As per our study it was inferred that 83.3% patients had moderate ODI score following surgery at the end of 6 months whereas 74.6% patients had mild ODI score following only epidural steroid which was also found to be statistically significant. In the surgery group, there were more number of patients (53.3%) in the severe group and 46.7% in the moderate group in the pre procedure scores which considerably changed to more number of patients in mild group (77.2%) and 22.8% in moderate group at the 6 months follow up. Additionally there was significant difference in 2nd, 3rd and 6th months follow up in the scorings. In the epidural steroid only group, there were more number of patients (48.6%) in the severe group and 51.4% in the moderate group in the pre procedure scores which considerably changed to have more number of patients in mild group (98.1%) and 1.9% in the moderate group at the 6 month follow up. Additionally there was significant difference in 1st, 2nd, 3rd and 6th month follow up in the scorings. The improvement of OD scores was declining more rapidly in epidural steroid improved group than the surgery group. The decline in the OD score in TF group was steeper yet the final scores in both the groups were comparable at the end of 6 months follow up.

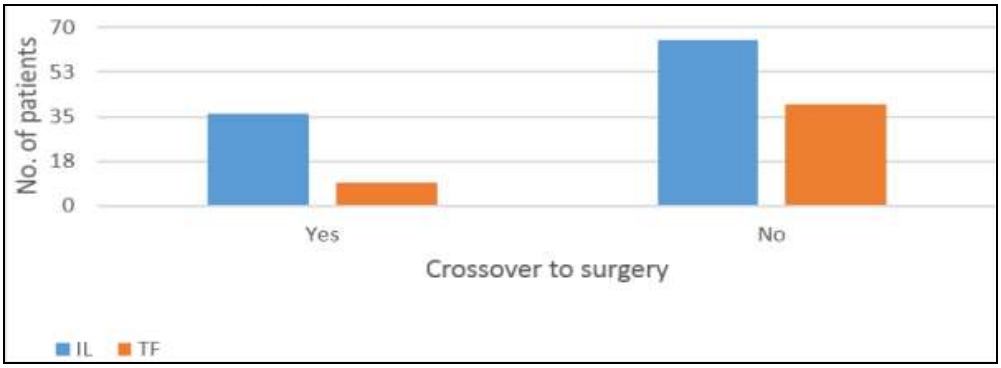

Fig 3: Comparison between IL and TF methods for crossover rate to surgery

Table 2: Crossover rate to Surgery

Total number of patients	Epidural steroid infiltration	Crossover to surgery	Improved with epidural steroid
150	150	45 (30%)	105 (70%)

Table 3: Crossover of IL and TF method to Surgery

			IL_TF		Total
			IL	TF	
SURGERY	Yes	Count	36	9	45
		% within IL_TF	35.6%	18.4%	30.0%
	No	Count	65	40	105
		% within IL_TF	64.4%	81.6%	70.0%
Total		Count	101	49	150

Table 4: Correlation of Age and Surgery

			SURGERY		Total
			Yes	No	
Ages	25-35 y	Count	16	70	86
		% within SURGERY	35.6%	66.7%	57.3%
	36-45 y	Count	29	35	64
		% within SURGERY	64.4%	33.3%	42.7%
Total		Count	45	105	150
		% within SURGERY	100.0%	100.0%	100.0%

4. Results

Out of the total 150 patients, 105 (70%) improved in their symptoms only with epidural steroid and 45 patients (30%) proceeded to surgery, which was statistically significant. 101 patients were given epidural steroid by the IL technique and 49 patients by the TF technique, out of which 35.6% cases who were given steroid by IL technique proceeded to surgery whereas only 18.4% cases who were given steroid by TF technique proceeded to surgery. This was found to be

statistically signifcant. Hence showing that TF technique was better although there was wide difference in sample size of patients who were given IL and TF.

5. Discussion

Many treatment options are available for treatment of lumbar disc herniation and controversy exists among the treatment options available. Oral NSAID's, Epidural steroid injections and surgery are commonly used. Many studies have studied the efficacy of individual treatment options and also comparison between treatment methods. But here in our study we have tried to find out efficacy of epidural steroid infiltration in providing better outcome and the probability of patients who have been given epidural steroid injections to proceed to surgery. In a total of 150 patients included in the study, all the patients underwent epidural steroid infltration either by transforaminal or interlaminar route and those who worsened in their symptoms and signs underwent lumbar discectomy [1].

Out of the fifty patients with lumbar disc prolapse, 26 (52%) were male and 24 (48%) female in a study conducted by Baral *et al.* [2]

Of the 84 patients with lumbar radicular pain studied by Owlia *et al.* 45% were female and 55% were males 5, whereas in our study 51.3 % were males and 48.7% were females with disc prolapse. As per our study 62.2% of the females who were given epidural steroid proceeded to surgery compared to 37.8% males which was also found to be statistically significant. Men had a statistically significantly higher discectomy rate after ESI ($p = 0.001$) as per the study conducted by William *et al.* [1]

Only 4.8% of women proceeded to a discectomy, while 6.7% of men proceeded to discectomy considering the entire study population in the study conducted by William *et al.* [1]

In our study majority (57.3%) of the patients who were diagnosed with disc prolapse were in the age group25 to 35 years supporting its incidence as in a systemic review conducted by Jo Jordon which states that the highest prevalence is among people aged 30-50 years [6].

According to our study, 64.4% cases in the age group 36 to 45 years had to proceed to surgery for the symptoms to resolve in contrast to study done by William *et al.* which showed that the need for surgery post epidural injection decreases with increasing age [1].

80% of patients who were in strenuous occupations proceeded to surgery compared to 20% in non-strenuous work group who proceeded to surgery which was also found to be statistically significant in our study [6].

Runu *et al.* [7] reported that 59% of patients benifitted from epidural steroid in a study done in 2005 whereas in our study it was observed that 70% of patients had improvement with epidural steroids alone which is quite high and may be attributed to the proper follow up, good physiotherapy and life style modifications of patients [7].

Loy *et al.* [8] observed an improvement in 93.35% of patients subjected to epidural steroid alone as a treatment modality.

According to a study conducted by Beyaz *et al.* [8] 5.1% improved after epidural steroid injection. 9 In another recent study conducted by Nawani *et al.* interlaminar injection provided superior pain relief in up to 92% of patients, whereas transforaminal injection provided pain relief in up to 90.5% of patients 10, but in our study it was noticed that superior pain relief was obtained for TF method than IL method and the improvement in VAS score was more gradual for TF method than IL method, though both the groups were not comparable [8].

In 2006, Schaufele *et al.* [11] conducted a study on 20 patients comparing the two approaches of epidural steroid injections, and concluded the TF ESI was more effective. However, significant limitations existed in their study: the population number was very small (n = 20), and the age of patients was unknown. In our study, 101 patients were given epidural steroid by the IL technique and 49 patients by the TF technique out of which 35.6% cases who were given steroid by IL technique proceeded to surgery whereas only 18.4% cases who were given steroid by TF technique proceeded to surgery, which showed that TF method had a better outcome than IL method. This result may be attributed to proper administration of steroid under fluoroscopy in transforaminal group. As per our study it was inferred that 30% patients who were given epidural steroids had persistence or worsening of symptoms based on the VAS score and OD index and proceeded to surgery, thus our cross over rate was 30% [11].

Whereas in a study conducted by Nasreen *et al.* [6, 12] 16% of the patients who were subjected to epidural steroid injection had to undergo surgical treatment due to persistence of symptoms and this was judged by visual analogue scale of pain when the score was more than [6, 12].

According to Yang *et al.* [13]. ESI reduces the need for surgical decompression 13 which supports our study where in only 30% patients were subjected to surgery.

In a study conducted by Buttermann *et al.* [14], in a study group of 169 patients, a total cross over rate of 54 % post epidural steroid infiltration to surgery was seen which is higher than in our study.

In a study conducted by Baral *et al.* [14] the cross over rate to surgery was found to be 13% 15. In our study epidural steroid infilltration was given after a minimum of six weeks of non-invasive treatment however most cases were referred and hence this study does not truly define the natural history of disc herniation. However, it does support the notion that a minimum of six weeks of non-invasive treatment is reasonable prior to invasive treatment. In the initial follow up period of our study the improvement in OD scores were similar, but between the 3rd and 6th month of follow up there was considerable difference in the improvement of OD scores between the 2 groups, epidural steroid group better than surgery group.

Those with a successful epidural steroid injection had the same decrease in disability in the early follow-up period as did the discectomy group as per study conducted by Buttermann *et al.* [15]

The only difference among the groups with regard to the degree of improvement was that the discectomy group had a greater decrease in disability than did the injection group at final follow up.

According to our study there were more number of patients (53.3%) in the severe group and 46.7% in the moderate group in the pre procedure scores which considerably changed to more number of patients in mild group (77.2%) and 22.8% in moderate group at the 6 month follow up in the disability scores of patients in the surgery group whereas in the epidural steroid only group 48.6% were in the severe group and 51.4% in the moderate group in the pre procedure scores which considerably changed to more number of patients in mild group (98.1%) and 1.9% in moderate group at the 6 month follow up showing that epidural steroid injection was giving better results based on the OD index. Limitation of the study was that there was no radiographic parameter used to decide the treatment option and all MRI proven discs underwent ESI.

Butterman *et al*. [15] included the patients of lumbar disc herniation that encompassed >25% of the cross-sectional area of the spinal canal (as determined on axial magnetic resonance or computed tomography images) and compared between two treatment methods. In our study there were 10 patients who in spite of developing deficits were treated with just epidural left with some motor deficits which did not interfere with the quality of life and in surgery group 8 patients had mild weakness in spite of good VAS and functional scores. Whereas in a study of Butterman *et al*. [2] patients who improved in pain with epidural steroid and persisting deficits underwent discectomy. It has not yet been determined whether epidural steroids have an effect on various factors related to a disc herniation, such as the duration of pain, weakness, and sensory deficits and the size of the herniation. If one could identify which patients are likely to respond to an epidural steroid injection, the cost associated with the treatment would probably be decreased [15].

6. Conclusion

It is evident that epidural steroids have better results with a cross over rate of 30% to surgery and good functional and pain scoring at the end of follow up. By understanding the natural history of lumbar disc prolapse, good physiotherapy and healthy lifestyle with regular follow up has given better results. Hence, a multidisciplinary approach is required in the treatment of lumbar disc prolapse to gain good outcome.

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