

COMPARATIVE STUDY BETWEEN SELECTIVE NERVE ROOT BLOCK VS EPIDURAL STEROID INJECTION IN LUMBAR DISC HERNIATION- A PROSPECTIVE STUDY

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Abstract

Background: Chronic lumbar radiculopathy affects a significant portion of the population, with a higher prevalence in men (5.3%) than in women (3.7%). Although the condition often resolves on its own, about 30% of cases continue to experience severe symptoms even after a year. This study aimed to compare the effectiveness of epidural steroid injection and selective nerve root block in managing pain and disability in patients with lumbar disc herniation through a prospective study. **Materials and Methods:** A total of 160 patients diagnosed with single-level lumbar disc herniation were evenly divided into two groups using a computer-generated random allocation method. Group (a) received three injections of steroids mixed with local anaesthetics through epidural injections, while group (b) received a single injection of steroid mixed with a local anaesthetic agent through selective nerve root block. Pain relief and reduction in disability were assessed in both groups. **Result:** In the selective nerve root block group, pain decreased by more than 50% for up to 6 months, whereas in the epidural group, this reduction was sustained for 1 year. The Oswestry Disability Index (ODI) showed a 52.8% reduction at 3 months, 48.6% at 6 months, and 46.7% at 1 year in the selective nerve root block group. In comparison, the epidural group exhibited improvements of 59.6%, 64.6%, 65.1%, and 65.4% at the corresponding follow-up periods, respectively. **Conclusion:** Epidural block emerged as a simpler and safer method, providing superior pain relief and functional improvement compared to selective nerve root block. The latter procedure demands technical expertise and must be administered by a skilled anaesthetist.

INTRODUCTION

Chronic lumbar radiculopathy is characterized by persistent back and leg pain, accompanied by sensory, reflex, or motor deficits along a nerve root distribution, lasting for more than 12 weeks. Studies show that this condition affects approximately 5.3% of men and 3.7% of women during their lifetime. While some cases spontaneously resolve, up to 30% of patients still experience significant symptoms after a year, leading to work impairment in 20% of cases and surgical intervention in 5-15% of cases.^[1-3]

Aim: A prospective study was conducted to compare the efficacy of epidural steroid injection and lumbar steroid injection (selective nerve root block) in management of pain associated with prolapsed lumbar intervertebral disc in patients who were not relieved by nonsurgical treatment modalities.

MATERIALS AND METHODS

The research took place at a tertiary care hospital from January 2019 to December 2019. Patients with single-level lumbar disc herniation, experiencing both backache and radiculopathy, and who hadn't responded to conservative therapy for a period of 6 weeks, were eligible for the study. The diagnosis was confirmed through clinical and MRI examinations. Exclusion criteria comprised individuals with prior back surgery, cauda equina syndrome, back pain or radiculopathy due to other causes (such as facet joint pain and spinal canal stenosis), pain resulting from spinal fractures, neoplastic and vascular causes, pregnant or lactating women.

Ethical clearance was obtained from both the Institutional Research Committee and the Ethical Committee, and informed written consent was collected from all participants. The sample size, calculated to achieve significant pain relief at a 0.05 two-sided significance level, with a power of 80% and an allocation ratio of 1:1, determined that 80

participants were needed in each group. In total, 160 cases were enrolled, and participants were randomly assigned to either the epidural or selective nerve root block group through computer-generated random allocation.

All participants provided written and informed consent for the procedures. These interventions were performed under C-arm imaging control: epidural injections were administered by an anaesthesia specialist, while selective nerve root block procedures were conducted by an orthopaedic specialist. In the epidural group, patients received 2 ml of methylprednisolone (80 mg) along with 10 ml of 2% lignocaine, diluted in 20 ml of normal saline. A total of 3 epidural injections were given at 3-week intervals, regardless of the effectiveness of previous injections. The selective nerve root block (SNRB) group received a single injection of 2 ml of methylprednisolone (80 mg) mixed with 5 ml of 2% lignocaine.

The technique for an epidural injection involves the precise delivery of medication into the epidural space in the spine. This procedure is typically performed under fluoroscopic guidance for accuracy. The patient is positioned carefully, and the area is sterilized. Local anaesthesia is administered to numb the skin and underlying tissue. A needle is then inserted into the epidural space, guided by imaging, and the medication (usually a combination of steroids and local anaesthetics) is injected.

In selective nerve root block patient was positioned face down, and the targeted area was cleaned and covered. Using fluoroscopic imaging, the affected level was identified. A local anaesthetic was injected 5-8 cm from the midline using a 20-gauge needle, guided until it contacted the base of the transverse process. Paraesthesia along the affected root confirmed the needle's position. Radio-opaque dye was injected, monitored using the C-arm in different views. The needle's position was confirmed in an

oblique view. The drug was then injected slowly. The process was repeated on the opposite side or other roots if necessary. Patients were observed for an hour post-procedure and then discharged.

Clinical and neurological assessments were conducted, including pain evaluation using the visual analog scale (VAS) and functional disability using the Oswestry Disability Scale (ODI). Significant pain relief was defined as a reduction of more than two points on the VAS scale and at least a 40% decrease in ODI score within 3 weeks. Patients were given NSAIDs as needed. Follow-ups occurred at one month, 3 months, 6 months, and 1 year post-procedure.

Statistical analysis was performed using SPSS version 17.0. Chi-square test assessed categorical data, while continuous variables were analysed with Student t-test and repeated ANOVA. Results were presented as median (range) and number (percentage) for continuous variables. A p-value <0.05 was considered significant, and p-values <0.001 were highly significant.

RESULTS

A total of 160 patients were involved in the study, with 98 men and 62 women evenly distributed between the two groups. Each group comprised 80 patients. The average age was 36.48 years (range: 18–62) in the selective nerve root block (SNRB) group and 36.98 years in the epidural group. Height averaged 173.7 cm (range: 152–187 cm) in the SNRB group and 170.17 cm in the caudal group. Weight averaged 79.93 kg (range: 68–99 kg) in the SNRB group and 80.12 kg in the caudal group. The duration of pain was 15.07 months in the SNRB group and 11.08 months in the epidural group. The demographic profiles of both groups were comparable.

Table 1: Showing demographic data of studied patients.

Demographic parameter	Groups						p value
	SNRB			Epidural			
	N	Mean ±SD	Range	N	Mean ±SD	Range	
Age (year)	80	36.48±10.5	(18–62)	80	36.98±11.3	(19–58)	0.839
Weight (kg)	80	79.93±8.7	(68–99)	80	80.12±9.6	(66–99)	0.922
Height (cm)	80	173.70±8.1	(152–187)	80	170.17±9.02	(145–187)	0.070
Duration of pain (months)	80	15.07±3.3	(9–26)	80	11.08±3.8	(3–19)	0.000
Onset of pain (acute)	80	80(100%)		80	80(100%)		A

Table 2: Showing degree of improvement in VAS and ODI for Caudal and SNRB groups at follow-up.

	VAS				ODI			
	SNRB (Mean±SD)	Improved (%)	Epidural (Mean±SD)	Improved (%)	SNRB (Mean±SD)	Decreased (%)	Epidural (Mean±SD)	Decreased (%)
Initial	7.65±0.5	-	7.42±0.6	-	78.20±2.8	-	78.15±05.4	-
After 1 month	3.23±0.5	57.7%	2.85±0.7	61.0%	36.90±7.1	52.8%	31.55±08.7	59.6%
After 3 month	3.40±0.7	55.5%	3.00±1.2	61.5%	39.55±5.1	52.8%	27.60±11.8	64.6%
After 6 month	3.60±0.8	52.9%	2.9±1.3	59.6%	40.20±5.2	48.6%	27.20±13.9	65.1%
After 12 month	4.07±0.9	46.8%	3.10±1.5	58.2%	41.70±5.5	46.7%	27.00±14.1	65.4%

Table 3: Showing the differences of VAS and ODI at follow-up and their significance in both groups.

Difference between	VAS		ODI	
	SNRB Mean±SD (p value)	Epidural Mean±SD (p value)	SNRB Mean±SD (p value)	Epidural Mean±SD (p value)
Initial	4.43±0.7 (0.001)	4.57±0.8 (0.001)	41.30±7.7 (0.001)	46.60±8.2 (0.001)
After 1 month	4.25±0.8 (0.001)	4.42±1.2 (0.001)	38.65±5.9 (0.001)	50.55±11.7 (0.001)
After 3 month	4.05±0.9 (0.001)	4.50±1.4 (0.001)	38.00±5.8 (0.001)	50.95±13.9 (0.001)
After 6 month	3.58±1.1 (0.001)	4.33±1.5 (0.001)	36.50±6.3 (0.001)	51.15±03.9 (0.001)

Intervertebral disc prolapse occurred at various levels: L1–L2 (6 cases, 4 in SNRB and 2 in the epidural group), L3–L4 (32 cases, 16 in each group), L4–L5 (86 cases, 40 in SNRB and 46 in epidural group), and L5–S1 (36 cases, 20 in SNRB and 16 in caudal group). In the SNRB group, the initial Visual Analog Scale (VAS) was 7.65 ± 0.5 , decreasing to 4.07 ± 0.9 at the one-year follow-up. In the caudal group, the initial VAS was 7.42 ± 0.6 , reducing to 3.10 ± 1.5 . Additionally, in the SNRB group, the initial Oswestry Disability Index (ODI) was 78.20 ± 2.8 , decreasing to 41.70 ± 5.5 after one year. In the epidural group, the initial ODI was 78.15 ± 5.4 , lowering to 27.00 ± 14.1 at the one-year follow-up. Both groups showed a reduction in ODI of more than 40%, indicating a significant decrease in disability. Two cases in the epidural group (L1–2) and eight cases in the selective nerve root block group (L4–5 & L5–S1) did not exhibit a positive response within three weeks after the injection. No complications were observed during the study.

DISCUSSION

Epidural steroid injections (ESI) have been employed since 1953 to alleviate lumbar radiculopathy. In addition to mechanical nerve root compression, lumbar radiculopathy can be triggered by various proinflammatory chemicals, leading to abnormal neuron firing. Steroids injected into the epidural space or around the affected nerve root are believed to inhibit these inflammatory mediators. ESI reduces inflammatory swelling of injured nerve roots, diminishes sensitization of dorsal horn neurons, and dampens the transmission of pain-conducting C-fibers.^[4,5]

In nonsurgical pain management for lower back pain, epidural injections, utilizing drugs like local anaesthetics, corticosteroids, or a combination of both, are commonplace. While different combinations have been advocated, recent evidence suggests that local anesthetics with or without steroids are equally effective. In our study, methylprednisolone (80 mg) was administered, although higher doses did not yield additional benefits.^[6,7]

Medications are delivered into the lumbar epidural space through three main routes: (a) the caudal route, (b) the transforaminal route, and (c) the interlaminar route. Earlier studies favored the caudal route, but recent trends favor the interlaminar route, and presently, the transforaminal route is widely used. Each route has its advantages and complexities; the

caudal route, despite utilizing larger drug volumes, is the easiest and safest with minimal risk of dural puncture. The interlaminar route delivers medication closer to the pathology site, requiring less medication but posing limitations in multilevel disc protrusion. The transforaminal approach, delivering drugs closest to the irritated nerve root, requires minimal medication and results in better ventral epidural spreading, but it demands skilled interventionists and imaging support.^[8]

Studies have explored lumbar epidural steroid injections (LESI) through transforaminal or caudal routes for managing low back pain. However, few have compared caudal epidural steroid injection and selective nerve root block (SNRB) for lumbar prolapsed intervertebral disc (PIVD). In our study, the SNRB group's initial pain score (VAS) was 7.65 ± 0.5 , reducing to 4.07 ± 0.9 at one-year follow-up, with reductions of 57.5% at 1 month, 55.5% at 3 months, and 52.9% at 6 months. Although there was a slight increase in pain at the one-year follow-up (46.8%) compared to the 6-month period (52.9%), the reduction in pain scores was statistically significant ($p = 0.001$) at all follow-ups. In the caudal group, the initial VAS score was 7.42 ± 0.6 , decreasing to 61.0% at 1 month, 61.5% at 3 months, 59.6% at 6 months, and 58.2% at the one-year follow-up. Pain relief exceeded 50% in the caudal group and remained statistically significant ($p = 0.001$) until the one-year follow-up period. Furthermore, the initial Oswestry Disability Index (ODI) in the SNRB group was 78.20 ± 2.8 , decreasing to 41.70 ± 5.5 at one year, indicating improvements of 52.8% at 1-month and 3-month periods, 48.6% at 6 months, and 46.7% at 1-year. In the caudal group, improvements were 59.6% at 1 month, 64.6% at 3 months, 65.1% at 6 months, and 65.4% at the one-year period. ODI values steadily decreased in all follow-up periods for the caudal group, remaining statistically significant at the one-year follow-up. This trend was not observed in the SNRB group. Both groups experienced a reduction in ODI of more than 40%, signifying significant disability reduction. Moreover, the change in ODI in both groups was statistically significant at all follow-up periods. In terms of ODI reduction, the caudal group (27.00 ± 14.1) outperformed the SNRB group (41.70 ± 5.5) at 3 months, 6 months, and one-year follow-ups, indicating greater disability reduction. This decrease in disability index persisted until the one-year follow-up.^[9,10]

However, 2 case in the L1–2 region did not show a positive response, possibly due to the higher level of

pathology. Additionally, 16 cases in the SNRB group, all with disc herniation at the L5–S1 level, were non-responders. Successful nerve root block for S1 demands technical precision and CT scan guidance, which we did not employ in our study. The outcomes of our caudal epidural group align with various similar studies, demonstrating pain reduction of 58.2% and disability index decrease of 65.4% at the end of one year. Comparable results were reported by Kumar et al. and Manchikanti et al. (2008), indicating substantial pain relief ($\geq 50\%$) in 79–81% of patients with significant functional improvement ($\geq 40\%$ reduction in Oswestry scores) in 83–91% of patients at the one-year follow-up. Sayegh et al. also observed similar results in their long-term follow-up study comparing caudal epidural injections with and without steroids for low backache and sciatica. Karppinen et al. (2001) noted short-term benefits of peri radicular corticosteroid injections for sciatica in terms of leg pain improvement.^[11]

CONCLUSION

Our research indicates that epidural block is a straightforward and secure approach, offering superior short-term, midterm, and long-term pain relief, as well as enhanced functional improvement, compared to selective nerve root block in cases of lumbar intervertebral disc herniation. Selective nerve root block injection is a technically complex procedure that requires the expertise of a trained physician.

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