

## ORIGINAL RESEARCH

# Efficacy of selective nerve root block using bupivacaine with or without steroid in lumbar radicular pain: A randomised controlled study

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### ABSTRACT

Low back pain is the most common presenting complaint to the orthopedic outpatient department across the world. Intervertebral disc herniation constitutes up to 6% of cases of low back pain. Herniated disc causes radicular pain, sensory disturbance, motor weakness, bowel/bladder disturbance in accordance with the level and severity of condition. Treatment options available include conservative management, local injections and surgical management. Appropriate treatment differs in each case considering Severity of pathology, clinical picture and patient profile. Young patients with mild to moderate Pathology and elderly patients who are not fit for surgical procedure benefit from Selective nerve root block, which relieves pain and provides opportunity for Patient to postpone surgery temporarily or permanently. Here we intend to determine the efficacy of Selective Lumbar nerve root block in herniated disc/neural foraminal stenosis in pain relief and improvement in disability.

Adult patients of either sex admitted/visiting our hospital for low back pain due to herniated disc or neural foraminal stenosis during March 2020 to October 2022 were taken into study. A total of 60 patients were included in randomized study, 30 were treated with cocktail of (Bupivacaine + Triamcinolone) and the other 30 were treated with Bupivacaine alone. Patients were followed up for 3 months with serial neurological examination and functional outcome.

Patients treated with Cocktail of Bupivacaine + Triamcinolone had more favorable scores of VAS and ODI which is statistically significant ( $p<0.04$ ). Among Patients with IVDP and Neural foraminal stenosis, Patients with IVDP had better VAS score and ODI which was statistically significant. Improvement in Scores is better in patients who are not obese, with no sensory/motor involvement, which was statistically significant. Most of the patients treated with Cocktail returned to work/regular activities in 6 weeks.

**Conclusion:** Patients with IVDP Treated with cocktail of Bupivacaine + Triamcinolone had pain relief and improvement in disability at the end of 12 weeks compared to control group.

**Key words:** Bupivacaine + Triamcinolone, bupivacaine, radicular pain, inflammatory diseases

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### INTRODUCTION

Chronic lumbosacral radicular pain is defined as lower back pain radiating down the unilateral or bilateral lower limbs following specific dermatomal pattern which may be accompanied by sensory or motor deficit <sup>1</sup>. Lumbar radicular pain is one of the common causes of disability in the adult working population with a lifetime prevalence estimated to be 5.3% in men and 3.7% in women. The proportion of patients facing loss of work and wages is up to 20%.

The percentage of patients seeking operative care is about 10-15%<sup>2-4</sup>.

Causes for the low back pain are varied; include mechanical low back ache, herniated disc, lumbar spondylolisthesis, spondylosis, osteoporotic vertebral compression fractures, facet joint arthropathy, tumors, infection and inflammatory diseases.

Since disc herniation was identified as one of the major causes for radicular pain, it was considered as the pressure effect of herniated material over the root which caused pain. Subsequent studies have

established that both mechanical and Patho-biochemical changes at the site of herniation contribute towards the occurring symptoms<sup>5</sup>. Disc is anatomically composed of central nucleus pulposis and peripheral annulus fibrosis. Disc acts as a shock absorber and helps in transmission of load across the spinal column. Degenerated disc herniates out of annulus fibrosis and causes symptom complex<sup>5</sup>. The nucleus pulposis material is one such protein which is not exposed immune system while development. Thus an autoimmune response is generated to the herniated material. Inflammatory mediators such as cytokines, interleukins, prostaglandins, substance P have been isolated from the site<sup>5</sup>.

The initial treatment of radicular pain in the low back is conservative consisting of bed rest, anti-inflammatory medication and physical therapy the condition is known to resolve with conservative management in 28-43% of patients<sup>6</sup>. Patients not responding to the conservative management or those who are medically unfit for surgery can be given non-surgical interventions such as interlaminar epidural steroid injection and Selective Nerve Root Block (SNRB) before surgical intervention<sup>6</sup>. SNRB involves delivering steroids directly to the inflamed nerve tissue. The needle is placed next to the presumed affected nerve root resulting in a precise and concentrated delivery of drug to the immediate vicinity of that nerve. Surgical treatment for lumbar radiculopathy is burdened by morbidity, complications and high cost of operation.

Compared with operative procedures, the injective therapies are cost-effective, have fewer complications and allow patients to avoid operative intervention for a significant period of time. SNRB technique permits precise application of desired agent to the vicinity of the irritated nerve root, resulting in a massive concentration of the agent at desired site<sup>8</sup>. There are less number of good quality randomized controlled studies available over the efficacy of SNRB and the benefit of using steroids. And there is a need for further studies to determine the same.

### OBJECTIVES

1. To determine the efficacy of selective nerve root block.
2. To determine the therapeutic efficacy of Selective Nerve Root Block using Bupivacaine with or without steroids in lumbar radicular pain.
3. To determine the incidence of complications in of Selective Nerve Root Block using bupivacaine with or without steroids in lumbar radicular pain.

### METHODOLOGY

After obtaining ethical clearance and approval from institutional Ethics committee of Bangalore medical college and research Institute, Bangalore, written informed consent was taken from the patients fulfilling the criteria. Demographic data, history, clinical examination and details of investigations was

recorded in the study Performa after admission. Following admission the patients were randomised by computer generated number into study group or control group. All the study subjects are then evaluated using Oswestry disability questionnaire and visual analogue scale for leg and back pain. Both the groups of patients were subjected to the procedure of selective nerve root block under the C-Arm guidance. Under the C-Arm guidance spinal needle is advanced. A radio opaque dye is injected transforaminally to check accurately the position of tip of needle. Once the nerve root is localised, the patients under the study group were injected with 2 ml of 0.25% Bupivacaine and 2ml of 40mg/ml Triamcinolone, while the control group will be injected with 2 ml of 0.25% Bupivacaine alone at the nerve roots involved. Patients are observed in wards for 4 hours following the procedure and discharged. Patients will be followed up at 3 weeks, 6 weeks and 12 weeks post procedure and at each visit they are evaluated for relief from symptoms and improvement in function using ODI and VAS. The data is recorded using the appropriate Performa. The recorded data is statistically analysed and a comparison will be drawn between the two study groups upon the efficacy of SNRB and the efficacy of steroids.

Subjective outcome was assessed at each follow-up with VAS score for back and leg and ODI score. Patients were assessed at beginning of study and subsequently at 3 weeks, 6 weeks and at 12 weeks after the procedure. At final follow up the outcome was assessed in terms of the need for surgery or further root blocks. The need for further intervention was based on significant residual symptoms.

### INCLUSION CRITERIA

1. Patients willing to give a valid informed consent.
2. Skeletally mature individuals between the ages of 18 to 60 of either sex.
3. History of lower back pain radiating to unilateral or bilateral lower limbs with mild motor or sensory deficits for at least 4 to 6 weeks VAS score more than 6.
4. Patients completed at least 6 weeks of conservative treatment with oral anti-inflammatory medications, analgesics and physical therapy.
5. Patients with M.R.I diagnosis of herniated lumbar disc or lumbar foraminal stenosis.

### EXCLUSION CRITERIA

1. Acute back trauma.
2. Cauda equina syndrome.
3. Previous back operations/Tumor of vertebra/spine/neural elements.
4. Infection of vertebra/spine/neural elements, local infection at the injection site.
5. Patients with spinal instability.
6. Moderate to severe sensori-motor deficits.

7. Previous history of epidural steroids or root block.
8. Deranged PT/INR.
9. Pregnancy.
10. Allergy to treatment agents.

#### TREATMENT PROCEDURE

Total of 60 patients were randomised into study and control group. Study group to receive or 2 ml of 0.25% bupivacaine and 2ml (80 mg) triamcinolone cocktail, and the control group to receive 2 ml of 0.25% bupivacaine alone. The same senior surgeon performed all of the procedures.

The patients were prone on the operating table and a spinal needle 26G was used to approach the nerve root under fluoroscopic guidance. C-Arm was adjusted

cephalo-caudally to get the end plates parallel at the desired level. C arm was tilted obliquely to obtain the 'scotty-dog' appearance of the vertebra. Exiting nerve root under the pedicle was targeted. Safe triangle/ kambin triangle was visualized and the spinal needle was directed towards the triangle. Once a satisfactory position of the needle was confirmed on both antero-posterior and lateral projections, iohexol contrast medium were injected to confirm a satisfactory neurogram and patient reported reproduction of radiating pain during injection. The treatment agent was then injected slowly around the nerve root. Patient's report of reduce in pain was noted as the injection was administered. Patients were allowed to walk immediately following the procedure and discharged after observation for atleast 6 hours.

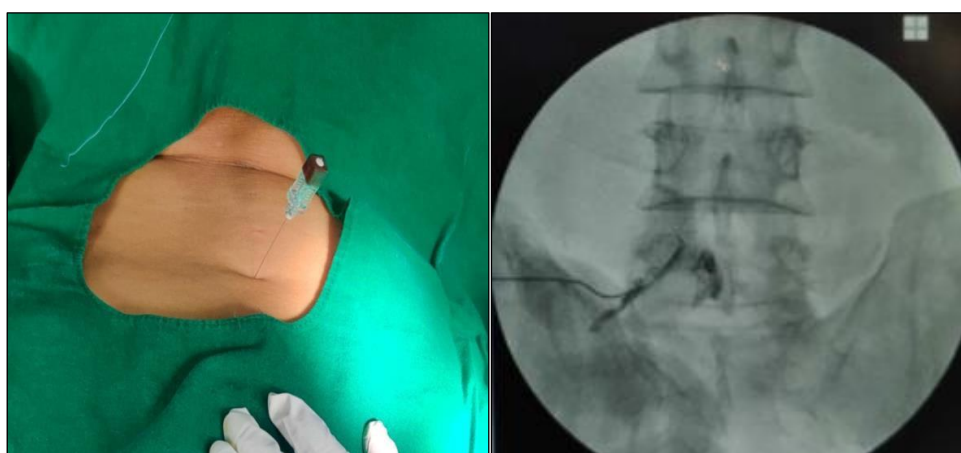


Figure 1A: Clinical image of localizing spinal needle; B. radiculogram



Figure 1C: Lateral view of spinal needle; D: drug injection

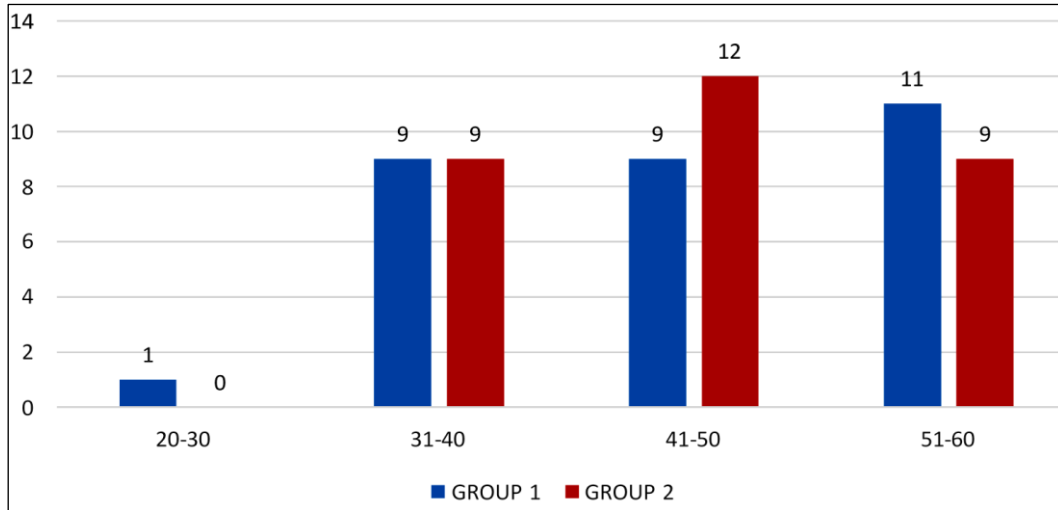
#### RESULTS

In this study. The mean age of study participants in group 1 and 2 were found to be

45.50±9.497 and 44.80±8.360 respectively. The association was not found to be statistically.

**Table 1: Age distribution**

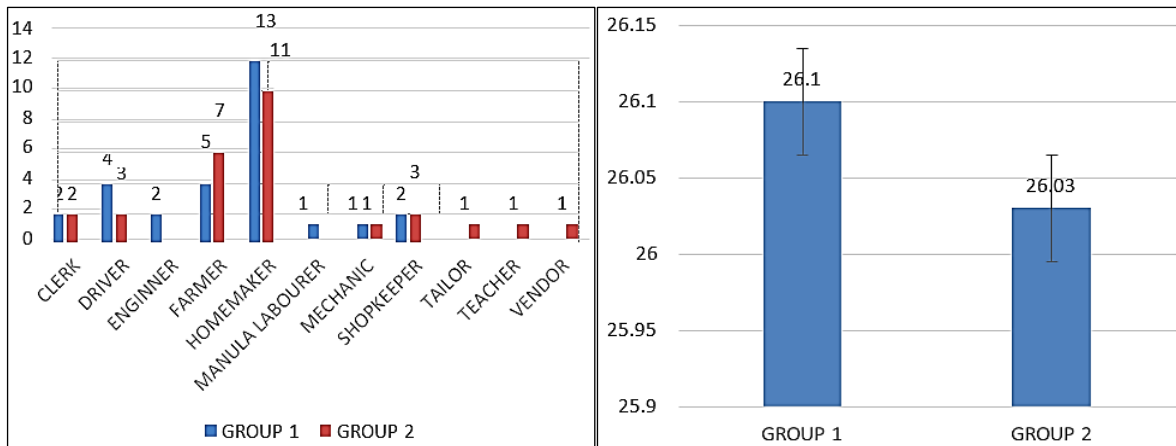
Age Group		Group		Total	P Value
		1	2		
20-30	Count	1	0	1	0.762
	%	3.3%	0.0%	1.7%	
31-40	Count	9	9	18	
	%	30.0%	30.0%	30.0%	
41-50	Count	9	12	21	
	%	30.0%	40.0%	35.0%	
51-60	Count	11	9	20	
	%	36.7%	30.0%	33.3%	
Mean $\pm$ SD		45.50 $\pm$ 9.497	44.80 $\pm$ 8.360	45.98 $\pm$ 8.12	



**Figure 2: Age distribution graph**

In this study, 56.7% of the study participants in group 1 were females. 56.7% of the study participants in group 2 were females. No statistically significant association was found between gender and the 2 groups. The mean BMI of study participants in group

1 and 2 were found to be 26.10 $\pm$ 3.898 and 26.03 $\pm$ 3.873 respectively. The association was found to be statistically significant between BMI and the 2 groups of study participants.



**Figure 3: Graph depicting distribution of occupation among the study participants and Average BMI of the study and control group**

The mean duration of symptoms of study participants in group 1 and 2 were found to be 8.83 $\pm$ 3.860 and 8.93 $\pm$ 3.433 months respectively. The mean duration of conservative management of study participants in group 1 and 2 were found to be 9.07 $\pm$ 2.083 and

9.60 $\pm$ 2.127 weeks respectively. In this study, 66.7% of the study participants in group 1 were affected at L4-L5. 73.3% of the study participants in group 2 were affected at L4-L5. The association was not found to be statistically significant between level affected

and the 2 groups of study participants. In a study by Kannan *et al.*<sup>[4]</sup> majority i.e., 42.1% of the study subjects were affected at L4-L5 which was similar to this study. This was also similar to a study by Riewet *al.*<sup>[6]</sup> in which there was no significant difference in levels of disease between the groups. The mean duration of hospital stay in group 1 and 2 were found to be 12.60±11.50 and 9.53±2.90 respectively. Immediate mobilization was achieved in 96.7% of the study participants in group 1 and 96.7% of the study participants in group 2. The association was not found to be statistically significant between duration of hospital stay and the 2 groups of study

participants. The mean ODI score at day 0 of study participants in group 1 and 2 were found to be 31.20±4.12 and 29.27±3.87 respectively. The ODI scores are comparable at day 1 of follow-up in both the groups. The ODI scores at 3rd week, 6<sup>th</sup> week and 12th week were found to be better among Group 1. The mean ODI score at 12th week of study in group 1 and 2 were found to be 24.64±5.30 and 30.31±3.47 respectively. The association was found to be statistically significant between ODI score at 6th week, 12th week and the 2 groups of study participants.

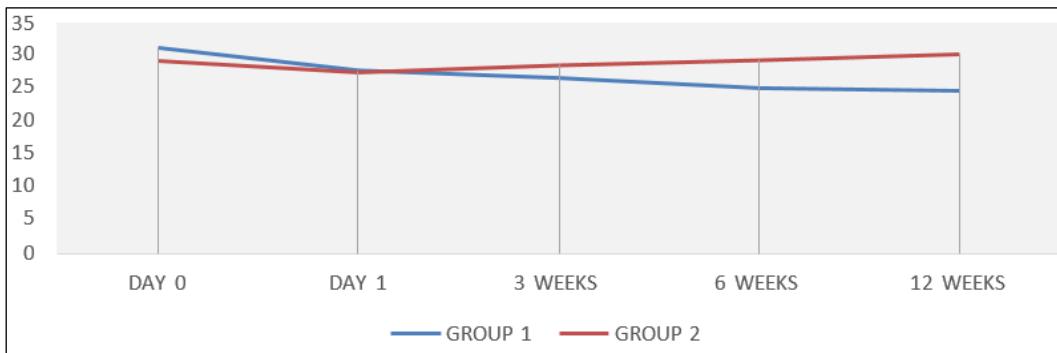


Figure 4A

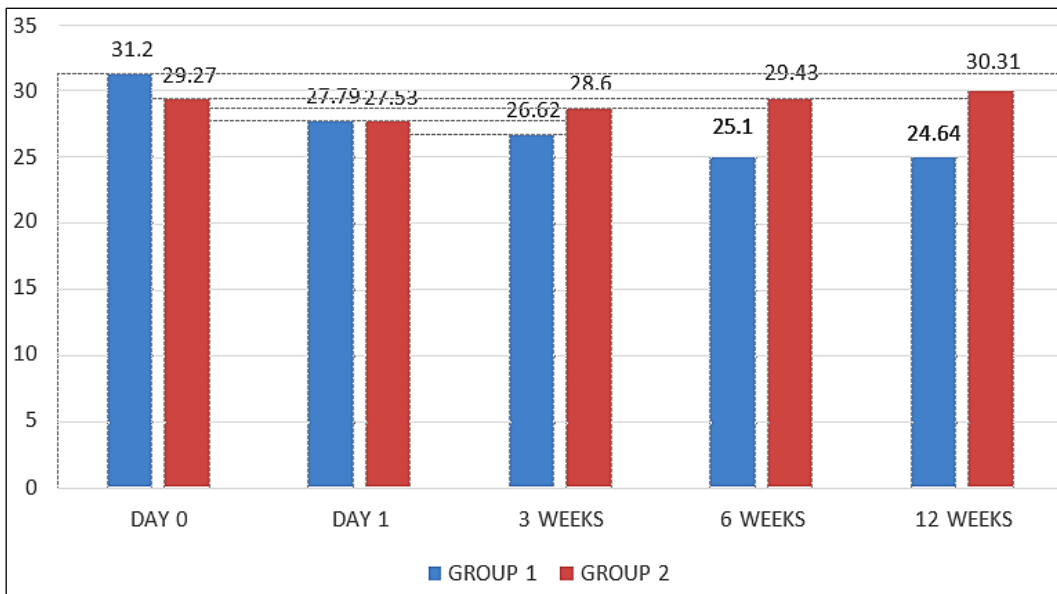


Figure 4B

Figure 4A & B: Graph representing the ODI at different follow-up visits in both groups

Table 2: Representing the distribution of ODI scores at different follow-up visits

ODI Scores	Group	Mean	Std. Deviation	P Value
Day 0	1	31.20	4.122	0.066
	2	29.27	3.877	
Day 1	1	27.79	3.977	0.807
	2	27.53	4.158	
3 Weeks	1	26.62	5.017	0.102
	2	28.60	4.107	
6 Weeks	1	25.10	5.570	0.001

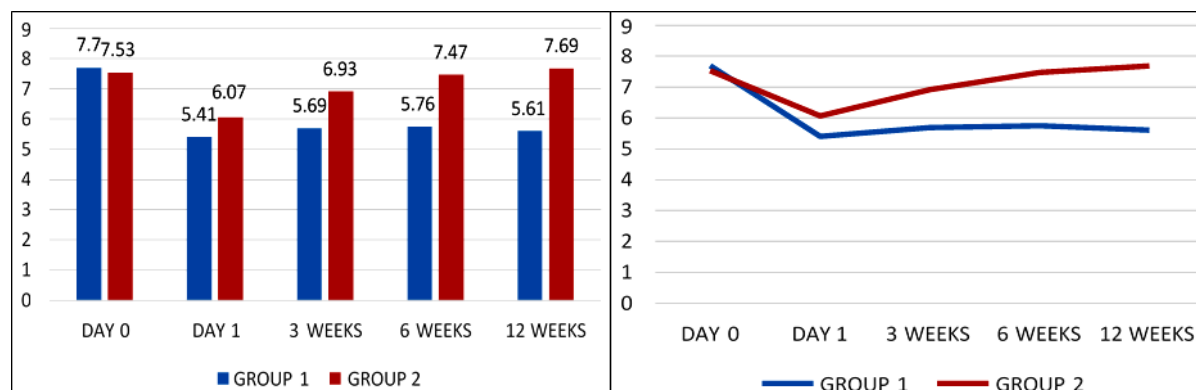
	2	29.43	3.928	
12 Weeks	1	24.64	5.307	0.000
	2	30.31	3.475	

The mean VAS (BACK) at day 0 of study participants in group 1 and 2 were found to be  $7.70 \pm 0.877$  and  $7.53 \pm 0.973$  respectively. The VAS (BACK) scores at 3rd week, 6th week and 12th week were found to be better among Group 1. The mean VAS (BACK) score at 12th week of study in group 1 and 2 were found to be  $5.61 \pm 1.618$  and  $7.69 \pm 0.967$  respectively. The association was found to be statistically significant between the two groups of study participants.

In this study, mean VAS (LEG) at day 0 of study participants in group 1 and 2 were found to be  $8.20 \pm 0.977$  and  $7.57 \pm 1.433$  respectively. The VAS (LEG) scores at 3rd week, 6th week and 12th week were found to be better among Group 1. The mean VAS (BACK) score at 12th week of study in group 1 and 2 were found to be  $5.07 \pm 2.017$  and  $7.93 \pm 1.100$  respectively. The association was found to be statistically significant between the two groups of study participants.

**Table 3: The distribution of VAS (BACK) scores between the two groups**

VAS (Back)	Group	Mean	Std. Deviation	P Value
Day 0	1	7.70	.877	0.487
	2	7.53	.973	
Day 1	1	5.41	1.053	0.017
	2	6.07	.980	
3 Weeks	1	5.69	1.137	0.000
	2	6.93	.907	
6 Weeks	1	5.76	1.300	0.000
	2	7.47	.900	
12 Weeks	1	5.61	1.618	0.000
	2	7.69	.967	



**Figure 5: VAS (BACK) Scores of two groups over the follow-up**

**Table 4: VAS (leg) scores between the two groups over the follow- ups**

VAS (LEG)	Group	Mean	Std. Deviation	P Value
Day 0	1	8.20	.997	0.051
	2	7.57	1.431	
Day 1	1	4.83	1.256	0.002
	2	5.73	.868	
3 Weeks	1	5.52	1.430	0.000
	2	7.00	1.414	
6 Weeks	1	5.10	1.952	0.000
	2	7.63	1.326	
12 Weeks	1	5.07	2.017	0.000
	2	7.93	1.100	

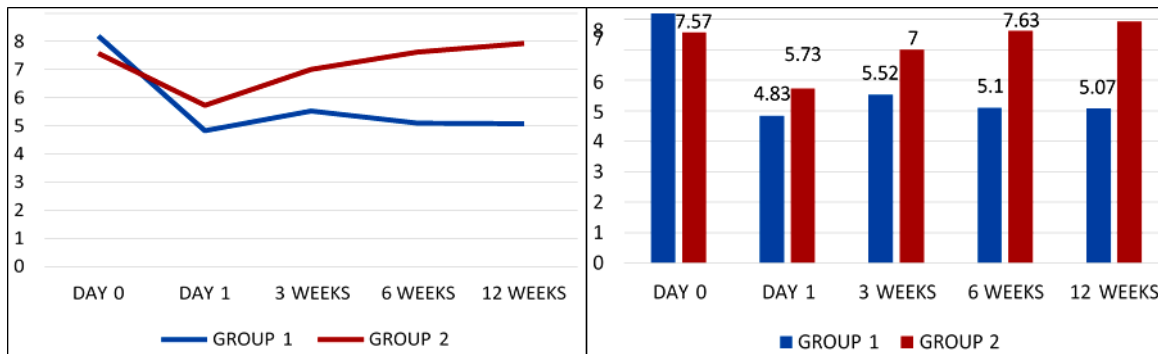


Figure 6: VAS (LEG) distribution between the two groups

Table 5: The results of the two groups

Results		Group		Total	P Value
		1	2		
Satisfactory	Count	26	0	26	0.000
	%	86.7%	0.0%	43.3%	
Not Satisfactory	Count	0	29	29	
	%	0.0%	96.7%	48.3%	
Drop Out	Count	1	0	1	
	%	3.3%	0.0%	1.7%	
Surgical Management	Count	3	1	4	
	%	10.0%	3.3%	6.7%	

In this study, 6.7% and 3.3% of study participants in group 1 and 2 were drop-outs. There were two drop outs (6.7%) in group 1 and one in group 2 (3.3%) respectively. One participant in group 1 reported dye allergy and one participant had spinal administration of the drug. These patients were treated accordingly and observed. In this study, 86.7% of study participants in group 1 were found to have satisfactory outputs. The association was not found to be statistically significant between outcomes.

**DISCUSSION**

Lower back pain is a common complaint and results in a significant number of patients requiring long-term sick leave<sup>1</sup>. Non-operative management plays a large role in the management of those patients with radiculopathy secondary to nerve root impingement. SNRBs are used frequently. Despite the widespread use of SNRBs, a lack of level one evidence means there is still debate about whether injection of local anaesthetic alone<sup>10-12</sup> or a combination of steroids and local anaesthetic<sup>2, 3</sup> is most effective at relieving symptoms for both diagnostic and therapeutic purposes. Hence the study was undertaken to assess the efficacy of selective nerve root block using bupivacaine with or without steroid in lumbar radicular pain.

Disc herniations are a common manifestation of degenerative lumbar disc disease. They occur early within the degenerative cascade representing the tensile failure of the annulus to contain the gel-like nuclear portion of the disc<sup>17</sup>. With improvements in advanced imaging techniques they are increasingly

recognized in both symptomatic and asymptomatic individuals<sup>17</sup>.

The most classic symptom of a herniated disc is a radicular pain in the lower extremity following a dermatomal distribution. Herniated discs large enough to cause mechanical compression of a nerve root may produce focal deficits, but sciatic-type pain is produced only if the nerve root is concurrently irritated or inflamed. Inflammation may be produced by prolonged neuroischemia of the microvasculature of the nerve root from mechanical compression or inflammatory biochemical factors. This phenomenon helps explain why some patients with small bulges or protrusions contacting inflamed nerves have pain inconsistent with degree of disc herniation. Additionally, these patients frequently do not have demonstrable sensory or motor deficit<sup>17</sup>.

**BIOCHEMICAL FACTORS IN DISC HERNIATION**

Neurochemical factors have a role related to the initiation of an immune response locally or systemically or both. Studies have shown the role of cytokines in the mediation of root pain. Olmarker and Rydevik<sup>66</sup> studied the effects of selective inhibition of tumor necrosis factor- $\alpha$  in a herniated disc model in pigs. They found a role of tumor necrosis factor- $\alpha$  in potentiating nerve dysfunction. Similarly, research has suggested that matrix metalloproteinase, nitric oxide, prostaglandin E2 and interleukin-6 in discs excised from patients with herniation and radiculopathy may have a causative role in pain production<sup>17</sup>. Other investigators have shown that in extruded or sequestered discs a cellular inflammatory reaction

may be locally mediated via T cells and macrophages.  
17

### **CLASSIFICATION OF INTERVERTEBRAL DISC PROLAPSE: BASED ON MORPHOLOGY**

Spengler and colleagues divided herniations into three types. A *protruded* disc was defined as eccentric bulging through an intact annulus fibrosus. An *extrusion* was defined as disc material that crosses the annulus but is in continuity with the remaining nucleus within the disc space. A *sequestered* disc represents a herniation that is not continuous with the disc space; this is the typical “free fragment”.

**CLASSIFICATION BASED ON LOCATION:**The herniation can be located within the central zone, a lateral recess (paracentral), foraminal, or extraforaminal regions.

### **PATHOGENESIS OF LUMBAR SPINAL STENOSIS PAIN**

The spinal stenosis condition implies pathomorphologic narrowing of the spinal canal, yet spinal stenosis cannot be thought of as a simple compressive lesion. Both venous engorgement and arterial insufficiency of radicular blood supply can lead to nerve root injury via an ischemic neuritis. Venous engorgement or hypertension results in elevated epidural and intrathecal pressures, which causes microcirculatory neuroischemic insult and claudication symptoms. Arterial insufficiency, like venous congestion, can cause nerve root injury due to microvascular ischemia.

### **EPIDURAL STEROID INJECTION**

Epidural steroid injections are offered when there is no improvement in pain relief after conservative treatment for at least 6 weeks. As it is known that large amounts of inflammatory mediator produced due to disc herniation/stenosis site leading to inflammation and pain<sup>11</sup>.

Epidural space is can be approached using the interlaminar, caudal, or Transforaminal (TF) routes. Interlaminar method the epidural needle is introduced from the midline, the dosage of drug reaching the site of pathology is divided and effectively lesser compared to targeted injection the root. This method is advantageous in bilateral and multiple level pathologies where individual multiple Transforaminal blocks are painful and undesirable due to possible complications.

Caudal epidural steroid injection is administered through the sacral hiatus. The effective drug delivery

at the desired root is less due to the distance drug has to travel. This is the least effective method of the three routes. It can be used mostly for the lower lumbar and sacral roots. Advantage is that it is not burdened with complications.<sup>41</sup>

Lumbar trans-foraminal epidural injection of steroids (LTFIS) or trans-foraminal epidural steroid injection (TFESI) or selective nerve root block (SNRB), is a technique that provides precise delivery of drug in close proximity to dorsal root ganglion (DRG) and nerve root under image guidance, thereby optimizing the therapeutic effect.<sup>41</sup>

It is offered to patients with lumbar disc herniation (LDH) presenting with persistent, unilateral, radiculopathy after a course of conservative measures for about 6 weeks duration. However it can also be given bilateral multilevel pathology. It has been shown to yield better results than caudal or interlaminar epidural injections. The anti-inflammatory and nociceptive signal stabilization actions of steroids, as well as mechanical effects of washout of inflammatory mediators and neural lysis contribute to its efficacy.

There are three different approaches to the root. That is sub-pedicular, retro-neural and retro-discal. The procedure is performed under image guidance (fluoroscopy) using a water soluble contrast agent<sup>12</sup>.

Mechanism of action: there are several mechanisms described to explain the role of corticosteroids. Firstly Corticosteroids inhibit production of arachidonic acid and thereby block this pain-generating pathway. Secondly, steroids have been shown to inhibit ectopic discharges from unmyelinated C-fibres and also directly relieve central pain sensitization. Injection of substances (fluids) into the epidural space itself can push the dura back and forth, thereby stretch nerve roots, resulting in lysis of neural adhesions, wash out inflammatory mediators, thus causing pain relief<sup>12</sup>.

Procedural techniques: Three different approaches have been described for trans-foraminal injections: sub-pedicular (SP), retro-neural (RN) and retro-discal (RD). The most frequently-used approach is the SP technique. In this technique, the needle is advanced into a “safe triangle”, just inferior to the pedicle. In the RN approach, the optimal target area is more dorsal to the inter-vertebral (IV) foramen, as compared to the SP approach. While certain studies have reported better outcomes with the RD approach, other studies have revealed no clear benefit of one approach over another.<sup>41 44</sup>



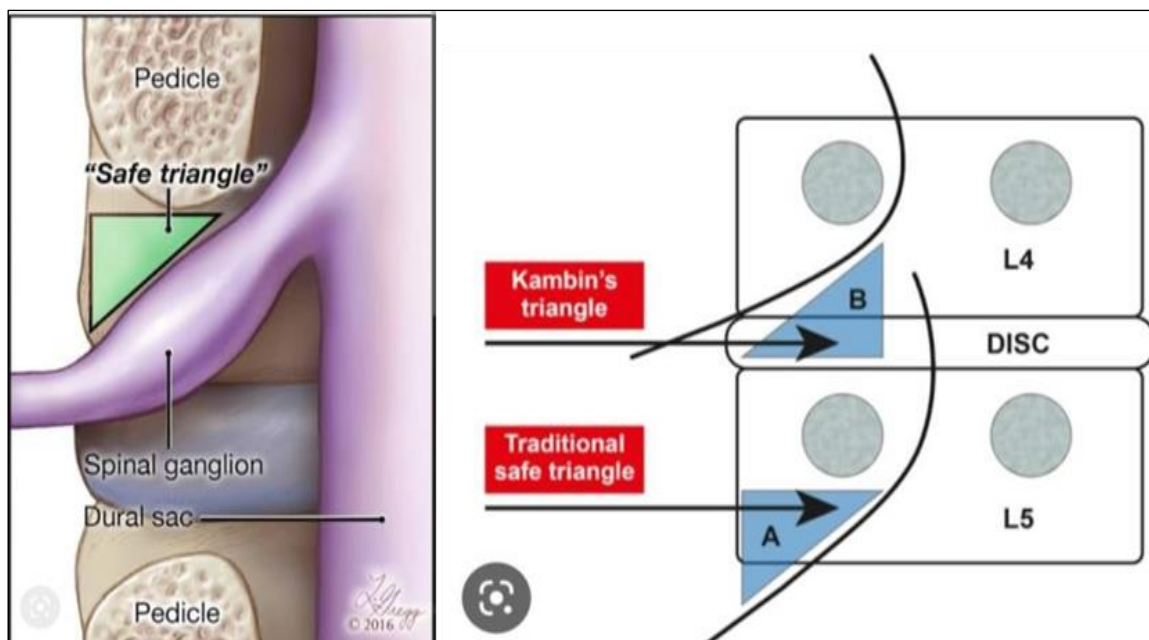


Figure 7: Safe triangle (Source: rothmann an s simone : the spine ; 6th ed.)

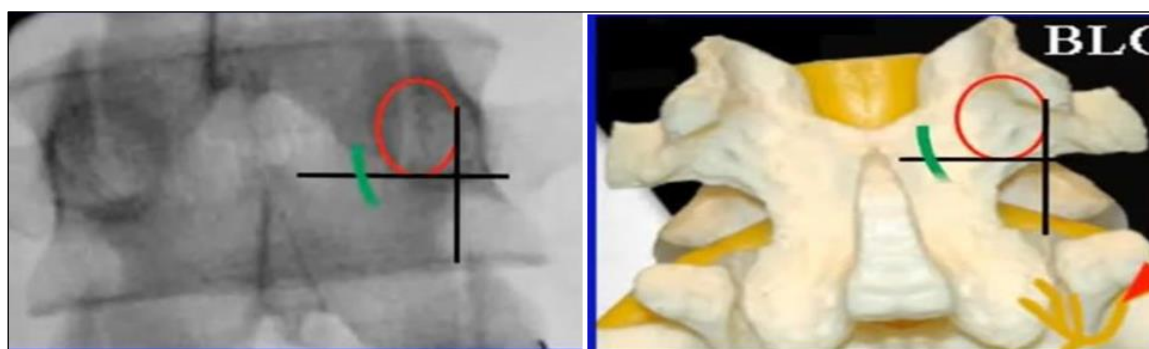
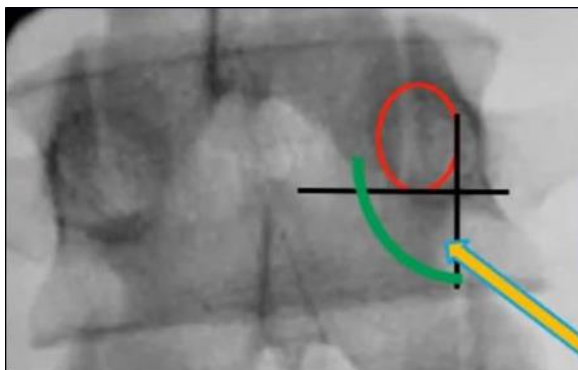


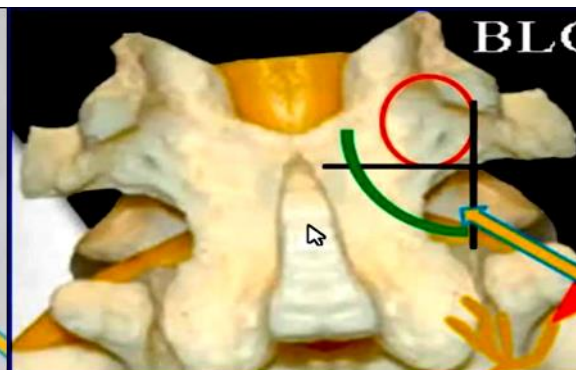
Figure 8: Safe triangle on fluoroscopy and bone model <sup>40</sup>



Figure 9: Scotty dog appearance <sup>40</sup>



**Figure 10: The safe triangle**



**Figure 11: Carmimager if classical SNRB**

Kanna *et al.*<sup>40</sup> described four patterns visible on extra-epineural radiculograms, namely “arm”, “arrow”, “linear” and “splash”. The “arm” pattern is defined as a thick band of dye distribution around the entire nerve root thickness, the “arrow” pattern describes dye distribution along the medial border of the root and around the thecal sac, the “linear” pattern is the flow of dye as a streak along the lateral nerve root border, and the “splash” pattern implies an irregular distribution of dye. Additionally, lateral imaging to evaluate the ventralspread of dye has also been suggested, which is shown by hugging of the contrast medium over the posterior aspect of contiguous vertebral body.

The mean fluoroscopy time for TFESI is around 11.43 to 46.6s. Mean radiation for transforaminal injections has been reported to be around 101.7  $\mu\text{Gy}\cdot\text{m}^2$  (101.7  $\text{cGy}\cdot\text{cm}^2$ ). The primary aim of radiation management is to ensure “as low as reasonably achievable (ALARA)”, as endorsed by experts so as to ensure the least possible exposure to patients, practitioners, and all operating room (OR) personnel without compromising on procedural safety<sup>40</sup>.

#### ALTERNATIVE IMAGING MODALITIES IN TFESI

Computerised Tomography (CT) is a well-accepted tool for spinal injections the main benefits of CT technology include improved accuracy, reduction of complications and enhanced patient comfort. These benefits need to be weighed against the potential drawbacks of higher radiation and infrastructure issues.<sup>40</sup> Ultrasound-guided has also been used for spinal procedures, as “no-radiation alternatives”. However, the major drawback of ultrasound-guided injections include difficulty in precise needle localization, as well as high operator dependency.

#### MEDICATIONS AND CONTRAST AGENTS

The most popular contrast agent is iohexol (usual volume of 0.5 to 3 ml). It is a low-osmolality contrast agent. The popular LA agents include 1-2% lidocaine and 0.25 to 0.5% bupivacaine.

#### STEROIDS

The steroid preparations for use in the epidural space are broadly classified into two groups, namely particulate (methylprednisolone, betamethasone and triamcinolone) and non-particulate (dexamethasone phosphate) agents. The particulate steroids have a longer duration of action (due to local depot effect causing continuous release of active drug) with slightly improved outcomes. On the other hand, the non-particulate agents are water-soluble, smaller sized and subjected to limited particle aggregation. Hence, they are rapidly cleared from the spinal canal and have shorter durations of action.<sup>42 43</sup>

Dexamethasone and betamethasone are rod-like and lucent, while particles of methylprednisolone and triamcinolone are opaque and amorphous. The particles of methylprednisolone and triamcinolone tend to coalesce into particles larger than 100  $\mu\text{m}$ . Such particles are capable of occluding capillaries, meta-arterioles and even arteries, resulting in ischemia and infarction. These agents have been reported to be associated with higher incidence of cord infarction secondary to embolic events. In contrast, particles of dexamethasone are smaller than 5  $\mu\text{m}$ , with low density and low propensity for aggregation.<sup>42 43</sup>

Overall success rate of SNRB has been reported to be between 76-88%. Most of the available studies report better outcomes with trans-foraminal delivery of medication as compared to other epidural approaches. However, over the longer term, the disease tends to take its natural course. Although it has been shown that steroids can be detectable in tissues for the initial 2 to 3 weeks, therapeutic effects far out-last the presence of measurable quantities of drug.<sup>42 43</sup>

Pain relief at the end of the first week is the most important indicator for pain relief at the end of one month. The patients with clinically meaningful, but transient, responses could be offered repeat TFESI within 2 to 3 weeks. However, patients with no initial pain relief would rather benefit from alternative treatment modalities<sup>42 43</sup>. Other clinical factors that have been reported to influence outcomes include duration of symptoms (duration less than 3 months is associated with better outcomes), present functional status, socioeconomic status, psychological factors

like depression and anxiety, and sleep quality. The clinical factors including significant sensory symptoms, high mean pre-injection ODI score, high mean post-injection score at 3 weeks and white-collar employment were associated with poor outcomes following SNRB.<sup>42 43</sup>

### COMPLICATIONS

While SNRBs are fairly safe procedures, complications including neural trauma, vascular trauma, intra-vascular drug and infection have been reported. The most dangerous complication following this procedure is spinal cord infarction, resulting in paraplegia of which there are case reports. These major neurological complications have been attributed to embolisation of particulate steroids causing vascular occlusion. Anatomical “safe triangle”, can contain radicular arteries, in which drug may get intravascular. Although arteria radicularis magna or artery of Adamkiewicz usually lies around the thoraco-lumbar region, variants of this vessel can arise anywhere down to the sacral vertebrae and thus an inadvertent injury of this artery can lead to conus medullaris infarction. Transient vasospasm secondary to needle placement has been reported with subpedicular approach. In addition, patients on chronic anti-platelet or anti-coagulant medications may develop epidural hematomas and neuro-deficits.<sup>43</sup>

### CONCLUSION

Majority of the subjects were in 41-50 years age group and females. Both the groups were comparable with respect to variables like age, gender and mean duration of symptoms, BMI, diagnosis, sensory and motor deficit, side involved and the diagnosis. There was no significant difference in duration of hospital stay, duration of procedure and mean number of C arm shots given between the groups. Mean ODI scores, mean VAS scores and outcome was significantly better in study (bupivacaine+ steroid) group compared to the control (bupivacaine) group. There was no significant difference in complications between the groups.

SNRB is an effective modality of treatment for chronic low back ache with radiculopathy. It is effective in relieving symptoms, improving quality of life and avoiding surgery or postponing surgical management in patients. It also has a diagnostic value in determining the source of low back ache in chronic cases and aid in definitive management. Hence we conclude that SNRB with steroids is an effective mode of treatment for lumbar radiculopathy where conservative management has failed, thereby preventing the need for operative procedures.

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