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A Prospective Study on Effectiveness of Therapeutic Trans Kambin Block in Management of Lumbar Radiculopathy

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ABSTRACT

Lower back pain constitutes over 50% of orthopedic clinical presentations. Initial management typically involves a combination of rest, analgesics and physiotherapy. Epidural steroid injection (ESI) is increasingly being recognized as a reliable and effective modality for the management of chronic low back pain in orthopedic practice globally. This preliminary report presents findings from an ongoing prospective study on the use of ESI in the treatment of low back pain in patients admitted to the Department of Orthopedics at Tagore Medical College and Hospital, Chennai. A prospective clinical trial was conducted on patients presenting with chronic low back pain unresponsive to conventional conservative management. Clinical assessments were performed pre-and post-intervention using the Japanese Orthopaedic Association (JOA) Score. Pain severity, improvement in clinical signs and functional outcomes, including the ability to perform activities of daily living (ADLs), were systematically evaluated and documented. A total of 20 patients were prospectively observed over an average follow-up period of one year. The mean duration of symptoms prior to intervention was six months. Following administration of an epidural steroid injection, 85% of patients reported significant pain relief within 24 hours, although some exhibited a delayed onset of analgesic effect. The mean duration of sustained pain relief was approximately 20 days. At the three-month follow-up, clinical outcomes were stratified as excellent in 45% of patients, good in 40%, fair in 10% and poor in 5%, based on functional and symptomatic improvement. Overall, 95% of patients demonstrated the ability to perform activities of daily living (ADLs) independently. No major adverse events, including neurovascular complications, dural puncture, or infectious sequella, were reported throughout the study period. Epidural steroid injection (ESI) is a well-established and efficacious interventional therapy for the management of chronic low back pain. It facilitates a temporary pain-free interval, enabling patients to participate in physiotherapeutic rehabilitation, thereby promoting functional recovery and enhancing overall treatment outcomes.

INTRODUCTION

Chronic low back pain (CLBP), with or without associated sciatica due to lumbar intervertebral disc prolapse, is a prevalent and challenging orthopedic condition. According to a study by **Damian Hoy**[1] **and Christopher Bain**, the global mean prevalence of low back pain is approximately 31%, with the highest prevalence observed among women and individuals aged 40-80 years. CLBP contributes significantly to disability, loss of productivity and imposes substantial individual, social and economic burdens worldwide. Management of low back pain typically involves conservative approaches such as analgesic medications and physiotherapy. However, in some cases, low back pain may persist and progress to a chronic condition, often associated with degenerative disc disease. Degenerative disc disease is characterized by structural and functional deterioration of the intervertebral disc, where the disc itself becomes a source of pain-termed "discogenic pain." This pain arises independently of nerve root compression or irritation. Non-surgical management of discogenic pain includes a spectrum of interventions such as physiotherapy, manual manipulations and traction techniques. In certain cases, surgical interventions such as lumbar discectomy or excision are considered. However, these procedures carry inherent risks, including persistent back pain, postoperative infection, adhesions and mechanical spinal instability. **Solberg *et al.*** reported a 4% incidence of symptom exacerbation following lumbar discectomy. The present study aims to evaluate the efficacy of epidural steroid injections (ESIs) in managing chronic lumbar spinal pain. ESIs represent a minimally invasive intervention designed to alleviate inflammation and pain associated with degenerative disc pathology, potentially providing an effective alternative to more invasive surgical options.

Review of Literature: Epidural analgesia was first introduced by Corning[2] and has since been utilized in the management of low back pain for over a century. Initially, various agents, including cocaine, procaine and normal saline, were administered via the epidural route for pain relief. Over the past five decades, epidural corticosteroid administration has emerged as a widely accepted treatment modality for managing symptoms associated with lumbar intervertebral disc prolapse. Epidural steroid injections (ESIs) are delivered through three primary anatomical approaches:

- **Interlaminar Approach:** Steroids are injected into the posterior epidural space between two adjacent vertebrae, targeting diffuse epidural inflammation.
- **Caudal Approach:** Steroids are administered through the sacral hiatus to access the epidural space, particularly for lower lumbar or sacral pathologies.
- **Transforaminal Approach:** Steroids are precisely delivered into the neural foramen near the affected nerve root, providing targeted anti-inflammatory effects.

Each approach has specific indications based on the underlying pathology, anatomical considerations and the distribution of pain. **Lievre**[3] injected hydrocortisone into the epidural space via the first sacral foramina and reported benefit in his 20 patients. **Cyriax**[4] reported similar results by use of steroid injection through caudal epidural route. **Macnab**[5] described Selective Nerve Root Blocks (SNRBs) as a diagnostic test to evaluate patients with negative imaging studies and clinical finding of nerve root irritation. Since then many studies have reported the efficacy of this technique through the transforaminal route. **Warr**[6] reported good results in 63% of their series of 500 patients, in whom epidural medication of 40 ml of 0.75% lignocaine mixed with steroid was injected through L3-L4 inter space in the epidural space. Similar reports were published by the successive studies. However, controversy still persists regarding the efficacy of epidural steroids in reducing the pain and regarding the preferred route of injection.

MATERIALS AND METHODS

A prospective observational study was conducted in the Department of Orthopedics at Tagore Medical College and Hospital, Chennai, from November 2023 to November 2024, involving patients presenting with low back pain, with or without radicular symptoms. All patients underwent a thorough clinical evaluation, including a detailed medical history and physical examination, followed by imaging studies such as X-rays and magnetic resonance imaging (MRI) of the lumbosacral spine. Patients diagnosed with prolapsed lumbar intervertebral disc as the underlying cause of their symptoms were selected for inclusion in the study. Prior to participation, all eligible patients were provided with comprehensive information about the study protocol and objectives and written informed consent was obtained in compliance with ethical standards. A total of 20 patients meeting the inclusion criteria were subsequently enrolled in the study.

Inclusion Criteria:

- Single or multiple level disc herniation confirmed by MRI.
- Signs and symptoms consistent with the nerve root irritation.
- Failure after a minimum of 8 weeks of non-surgical management.
- No history of lumbar surgery.

Exclusion Criteria:

- Migrated or sequestrated Herniation on imaging.
- Motor deficit.
- Cauda Equina syndrome.

- Segmental instability.
- Medical problems that contraindicated the procedure.
- History of allergic reaction to local anaesthetic or corticosteroids.
- Psychogenic disorders, tumours, malformation deformities, post traumatic root compression or infectious aetiologies.

An approval of the ethics committee was taken and the procedures were in accordance of the standards mentioned in **Helsinki declaration of 1975** and revised in 2000. All patients were analyzed according to the **Japanese Orthopaedic Association Score** and were assigned a pre-injection score. Patients were then injected in the epidural space by **transforaminal route**. **Medication used**-2% xylocaine (1 ml)+dexamethasone 8mg (2 ml).

Japanese Orthopaedic Association Score

Items	Points
Subjective Symptoms(9 Points)	
Low Back Pain	3,2,1,0
Leg pain and/or Tingling	3,2,1,0
Gait	3,2,1,0
Clinical Signs (6 Points)	
Straight-Leg-Raising Test	2,1,0
Sensory Disturbance	2,1,0
Motor Disturbance	2,1,0
Restriction of Activities of Daily Living (14 Points)	
Turning Over While Lying	2,1,0
Standing	2,1,0
Washing	2,1,0
Leaning Forward	2,1,0
Sitting (1h)	2,1,0
Lifting or Holding Heavy Object	2,1,0
Walking	2,1,0
Urinary Bladder Function	0,-3,-6

Transforaminal Injection: The patient was positioned prone on a radiolucent table to facilitate optimal imaging and access to the affected neural foramen on the symptomatic side. The neural foramen was approached using a posterolateral extra pedicular technique with an 18-gauge spinal needle. Under fluoroscopic guidance, the target site was identified, and the entry point on the skin was marked at a distance of 5-8 cm lateral to the midline. Following strict aseptic precautions, sterile preparation, draping, and infiltration of local anesthesia, the spinal needle was advanced toward the target site. The precise position of the needle tip, located inferior to the pedicle and within the superior aspect of the neural foramen, was verified under both anteroposterior (AP) and lateral fluoroscopic views, ensuring that the needle did not extend beyond the mid pedicular line. A small volume (1-2 ml) of radiopaque contrast agent was then injected to delineate the posterior annular boundary and confirm the proximity to the affected nerve root. Once satisfactory contrast dispersion to the target region was observed and after ensuring that neither blood nor cerebrospinal fluid (CSF) was aspirated, the therapeutic solution was administered.

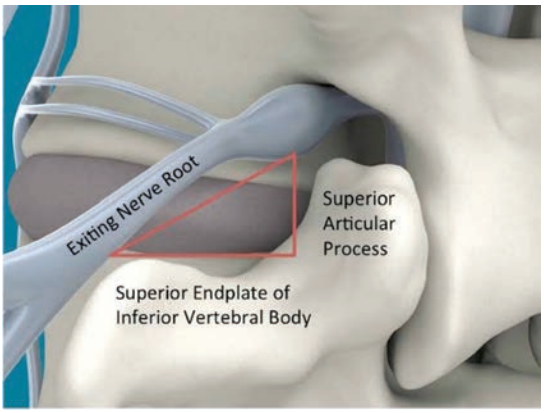

Fig.1: Patient Positioning and Draping

RESULTS AND DISCUSSIONS

A total of 23 patients were initially enrolled in the study. However, 3 patients did not present for the procedure due to unknown reasons, resulting in 20 patients being included for analysis. Among the participants, 12 were male and 8 were female, with the majority of cases observed in the age group of 30-40 years. Post-procedural assessments were conducted at intervals of 1 week, 2 weeks, 4 weeks, 3 months, 6 months and 1 year. The outcomes were evaluated based on the rate of clinical improvement following the intervention. The average follow-up duration in this study was 1 year, allowing for comprehensive long-term assessment of the therapeutic efficacy of the injections.

Rate of Improvement (RI)=Post-Injection Score-Pre-Injection Score/29-Pre-Injection Score×100: Accordingly, the results were classified as., Excellent (Rate of improvement 90% and above), Good (Rate of improvement of 75-89%), Fair (Rate of improvement of 50%-74%) and Poor (Rate of improvement ≥49%). The cases with good, fair and excellent results were considered to be effective in relieving the pain. Response to the therapy in aspect of Rate of Improvement (RI) in JOA score at one year after injection is shown in the following table.

Rate of Improvement	No of patients
Poor	1(5%)
Fair	2(10%)
Good	8(40%)
Excellent	9 (45%)

Lumbar disc prolapse was traditionally thought to cause back and leg pain primarily through mechanical compression of the nerve roots. However, it is now well understood that the extrusion of nucleus pulposus material induces a cascade of inflammatory responses, resulting in localized pain within the disc, irritation of the facet joints and chemical neuroradiculitis mediated by the release of pro-inflammatory substances.

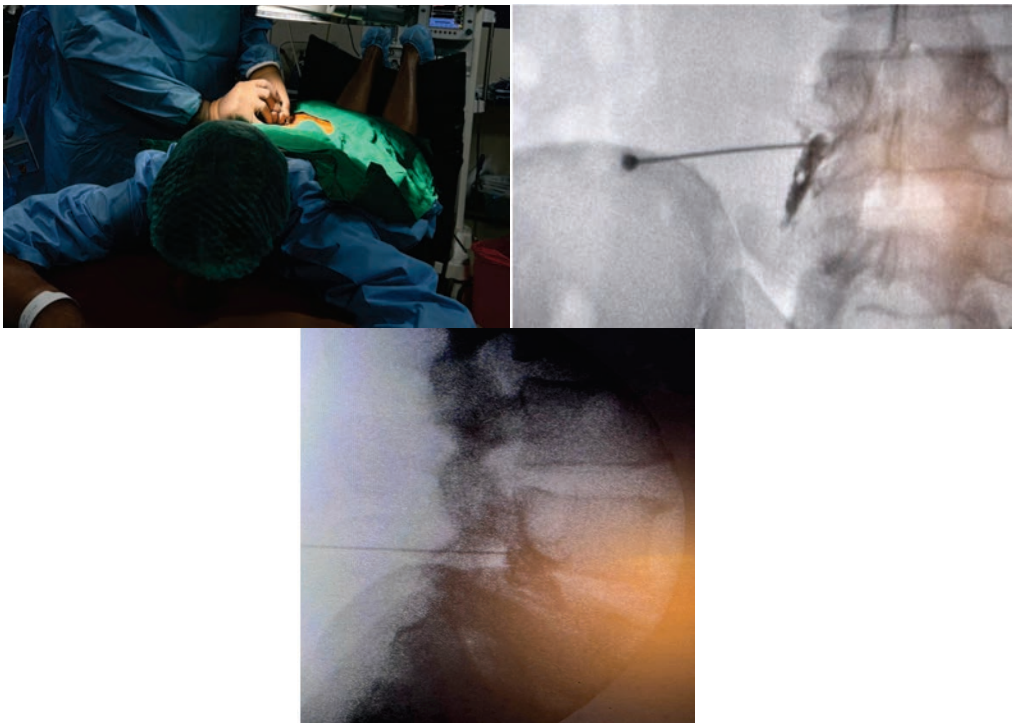

Fig. 2(A-C): C-Arm Pictures

Epidural corticosteroids are believed to exert their therapeutic effects by inhibiting the synthesis and release of these inflammatory mediators, there by alleviating intra neural edema, venous congestion and associated pain. Despite their widespread use, the literature reports conflicting evidence regarding the efficacy of epidural steroids in managing sciatic pain. **Abdi**[7] in a systematic review, demonstrated strong evidence for short-term pain relief and moderate evidence for long-term pain relief with epidural steroids. Similarly, **Boswell**[8] reported strong evidence supporting the efficacy of transforaminal epidural steroid injections and moderate evidence for caudal epidural injections in alleviating pain associated with lumbar disc prolapse. While several studies corroborate these findings, recent systematic reviews and meta-analyses have presented conflicting results, leading to ongoing debate and uncertainty among clinicians regarding their long-term efficacy and optimal use. **Manchikanti *et al.*** conducted a similar study involving 360 patients, comprising 139 males and 221 females, with a mean age of 44.5±13.26 years. In comparison, the mean age of patients in our study was 45.37 years (range: 35-65 years), with 29 males (44%) and 37 females (56%). The data revealed that lumbar disc prolapse was most prevalent in the 40-50-year age group in both sexes, with a male-to-female ratio of 0.8:1, while other age groups showed a nearly equal male-to-female distribution. **Datta and Upadhyay** (168) conducted a comparative study on the efficacy of three corticosteroids administered via the caudal route for low back pain[9-15]. Patients were divided into four groups: one received only bupivacaine (0.125%), while the others received bupivacaine combined with methylprednisolone acetate (80 mg), triamcinolone acetonide (80 mg), or dexamethasone acetate (15 mg), with a total injection volume of 10-15 mL. Short-term follow-up demonstrated that methylprednisolone and triamcinolone, administered at higher doses with local anesthetic, were more effective than dexamethasone or bupivacaine alone, highlighting the enhanced efficacy of corticosteroids when combined with local anesthetics. **Ghai *et al.*** (75) conducted an active-controlled trial comparing the efficacy of local anesthetic alone versus local anesthetic combined with corticosteroids in patients with disc herniation or radiculitis. The study involved 34 patients receiving 8mL of 0.5% lidocaine and 35 patients receiving 6mL of 0.5% lidocaine with 80 mg methylprednisolone. While the steroid group demonstrated superior outcomes at 3 months, this advantage diminished over time, with both groups showing comparable efficacy at the 12-month follow-up. In our study, 90% of patients experienced significant pain relief, while 5% showed no improvement. A successful outcome was achieved in 85% of the enrolled patients. This efficacy may be attributed to the enhanced ventral spread of the steroid solution, ensuring optimal contact with the herniated disc and extruded nucleus pulposus. The precise delivery of medication to the pathological site likely accounts for the superior effectiveness of the transforaminal approach. The transforaminal approach

poses a risk of nerve root injury during needle placement and a potential risk of paraplegia due to inadvertent intra-arterial injection of particulate corticosteroids into a radicular artery supplying the lower spinal cord. Major complications, though rare, have been reported due to needle placement, corticosteroids, or other agents in the formulation. Dural puncture may result in post-procedural headache and nausea, while subdural placement can lead to neurotoxicity[16-20]. Infection, although uncommon, necessitates strict aseptic precautions. Histamine release from contrast agents or steroids can cause acute hypotension, warranting the maintenance of intravenous access during the procedure. In our study, no patients experienced infection, post-dural puncture headache, contrast or medication reactions, or intra vascular or subarachanoid injections.

Limitation: This study is limited by the absence of a control group, lack of blinding, small sample size (n=20) and short follow-up duration. A double-blind, placebo-controlled design was not utilized due to ethical concerns regarding placebo administration in patients with severe pain. Future studies with larger cohorts, placebo-controlled groups and extended follow-up are necessary to assess the long-term efficacy and safety of the intervention.

CONCLUSION

Epidural corticosteroid injection for managing low back and radicular pain due to lumbar disc prolapse demonstrated satisfactory outcomes in this study. The findings support the rational and optimized use of epidural steroids as an effective symptomatic treatment, reducing disability and unnecessary hospitalizations. While not a novel technique, it warrants broader application and further scientific evaluation.

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