

Interventional Pain Management in Degenerative Spine Disorders: A Case Report

Muhammad Bayu Zohari Hutagalung¹

¹Department Orthopaedic and Traumatology, Faculty of Medicine, Airlangga University/Dr. Soetomo General Hospital, Surabaya, Indonesia

Corresponding Author: bayuzohari@gmail.com

Abstract — Low back pain (LBP) is a common health issue affecting a significant portion of the population, particularly adults aged 35-55 years. Nearly 70-80% of individuals in developed countries experience LBP at some point in their lives. We reported a 54-year-old female presenting with LBP persisting for one year. Her pain predominantly occurs during walking, limited to 100 meters, and is characterized by gripping sensations in the thigh and calf, exacerbated by positional changes but relieved with rest. Imaging revealed anterior listhesis of the L4 vertebral body relative to L5 (<25%) and multiple bulging discs at various lumbar levels, most notably severe at L4-5 with moderate central and severe bilateral neural foraminal stenosis. The patient underwent Selective Nerve Root Block (SNRB) and facet joint blocks with local anesthetic and steroid medication, resulting in a reduction of pain complaints and decreased leg numbness post-intervention. Understanding and addressing specific spinal pathologies in this case was expected to guide effective treatment strategies to alleviate symptoms and improve patient function.

Keywords — Degenerative Spine Disorders, Interventional, Pain Management

How to cite: Hutagalung MBZ. Interventional Pain Management in Degenerative Spine Disorders: A Case Report. Journal of Medicine and Health Technology. 2024,1(2):1-5.

*Manuscript received 23 April 2024; revised 29 April 2024; accepted 30 April 2024. Date of publication 10 November 2024.
JMHT is licensed under a Creative Commons Attribution-Share Alike 4.0 International License.*



INTRODUCTION

Low Back Pain (LBP) is one of the common health problems encountered in society. Nearly 70-80% of the population in developed countries have experienced LBP. Every year, 15-45% of adults suffer from LBP, and one out of 20 patients requires hospitalization due to acute attacks. LBP often occurs between the ages of 35-55 years, and nearly 80% of the population in industrialized countries have experienced it [1,2].

Lumbar spinal stenosis is one of the frequently encountered problems, which is a degenerative disease of the spine in the elderly population. Its prevalence is 5 out of 1000 individuals above the age of 50 in America. It is the most common condition that leads to spinal surgery in individuals over 60 years old. More than 125,000 laminectomy procedures are performed for cases of lumbar spinal stenosis. The incidence is higher in men compared to women. Its pathophysiology is not associated with race, gender, body type, occupation, and most commonly affects the fourth and fifth lumbar vertebrae, as well as the third and fourth lumbar vertebrae [3,4]. The pathophysiology of pain is not solely caused by compression of the spinal nerve root or cauda equina; some studies suggest that pain is attributed to neurogenic claudication. Inflammation and irritation of the nerve root are necessary for symptoms to manifest in the lower extremities. Compression of the nerve root will result in symptoms such as paresthesia, sensory deficits, motor weakness, abnormal reflexes, and radicular pain. Irritation and inflammation can also occur during movement of the lower extremities or spine when nerves are forced to elongate and deviate from their resting position [5].

Symptoms of LBP can arise from anatomical structures such as nerve roots, muscles, fascial structures, bones, joints, intervertebral discs, and organs within the abdominal cavity. Furthermore, symptoms can originate from disturbances in neurological pain signal processing, leading to neuropathic LBP. Diagnostic evaluation of patients with LBP can be complex and intricate, requiring appropriate and precise clinical decisions. Identifying the source of pain is crucial in determining the appropriate therapeutic approach [1].

CASE PRESENTATION

A 54-year-old female had complained of lower back pain for the past year. The pain was mainly experienced while walking, lasting only up to 100 meters. The pain gripped her thigh and calf and was triggered by changes in position. Resting alleviated the pain. Anterior listhesis of the L4 vertebral body relative to L5 was observed to be <25%, with grade 1 anterior listhesis. A lumbosacral MRI revealed multiple bulging discs at levels L2-3, L3-4, L4-5, and L5-S1, with the most severe condition at L4-5 accompanied by moderate central stenosis and severe bilateral neural foramina stenosis. The patient was diagnosed with canal stenosis at L4-5 + spondylolisthesis L4-5 grade 1 and underwent Selective Nerve Root Block (SNRB) + Facet Joint L4 block + Medial Branch Block. Post-intervention evaluation showed that the pain had decreased with a current VAS of 1-2. Additionally, the numbness in her legs was reported to have decreased.



Fig. 1. Clinical Presentation of the Spine



Fig. 2. Lumbosacral Radiographs AP; Static Lateral and Dynamic Photos (Flexion-Extension)

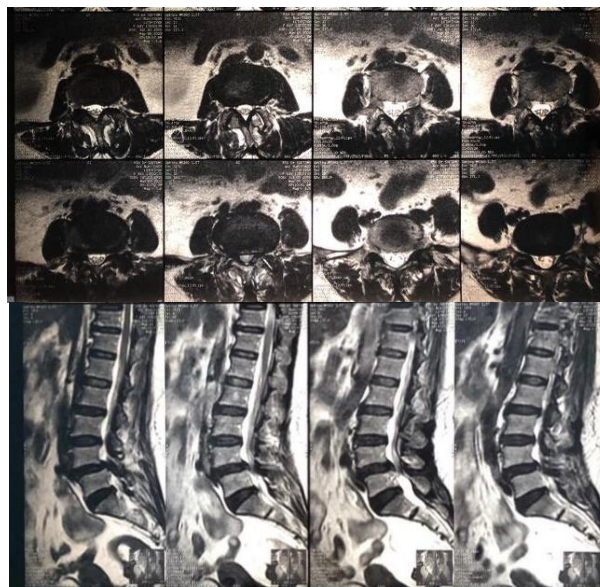


Fig. 3. Axial and Sagittal Views in MRI

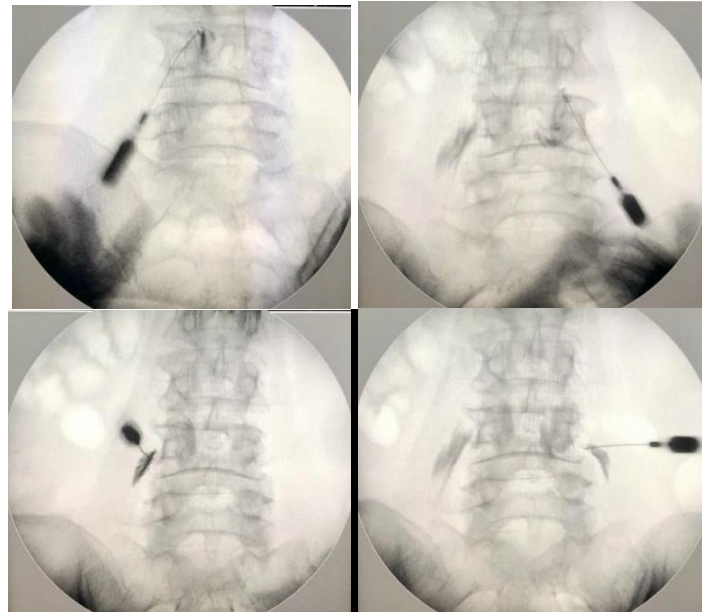


Fig. 4. Radiological image of Intraoperative Fluoroscopy; (A) Left L4 Facet Joint Injection and (B) Right L4 Facet Joint Injection; (C and D) Left and Right Selective Nerve Root Block (SNRB)

DISCUSSION

In this case, based on clinical and radiological examinations, canal stenosis at the level of L4-5 + spondylolisthesis L4-5 grade 1 was diagnosed, and spinal injections were performed including Selective Nerve Root Block (SNRB), Facet Joint L4 block, Medial Branch Block with Ropivacaine HCl, and Triamcinolone Acetonide medication. Degenerative lumbar spondylolisthesis is a common cause of lower back pain, radiculopathy, and neurogenic claudication in adults. The superior vertebra slips anteriorly, causing narrowing of the central canal and lateral recesses posteriorly, resulting in various clinical presentations. Various types of non-operative treatments for this condition include medication therapy, physical therapy, strengthening exercises, or spinal manipulation. If the patient does not show improvement in symptoms after these treatments within 4 to 6 weeks, pain management with spinal injection interventions may be considered [6].

Pathology in the facet joints was found in about 50 percent of individuals who suffered from chronic axial lower back pain. This was caused by age-related degeneration of weight-bearing structures in the lumbar region, which ultimately placed additional stress on these joints. Although facet joint dysfunction was recognized as one of the common causes of axial lower back pain, there was controversy regarding the efficacy of intervention procedures targeting the facet joints due to a lack of large-scale and prospective randomized trials evaluating these interventions.

In a recent study of 60 patients with chronic lower back pain due to facet joint dysfunction, 85 percent of patients reported a reduction in pain of <50% at 12 months, and 78 percent of patients showed significant functional improvement after a series of medial branch block interventions with local anesthesia and steroids. Similar results were also observed in the comparison group that underwent medial branch block with local anesthesia alone. Several randomized trials have shown significant improvement in pain scores in individuals with chronic lower back pain after radiofrequency neurotomy of the medial branch nerve [7].

Injection into the facet joint or medial branch block should be considered in individuals with low risk and high potential benefit in alleviating pain and improving functional ability. Intra-articular facet joint injections or medial branch blocks are indicated when it is believed that the patient's pain is caused by pathology in the facet joints. Intra-articular injections into the facet joint are most often performed in cases of acute onset of pain where a single facet joint is identified as the pain generator.

Following successful diagnostic medial branch block (less than 50 percent reduction in pain during the duration of local anesthesia), longer-term pain reduction can be achieved by performing radiofrequency ablation of the medial branch nerve [7].

Selective nerve root block in the lumbosacral segment can be used as a diagnostic and therapeutic modality for various conditions causing lower back and lower limb pain; however, to date, there is no consensus regarding the use of selective nerve root injections for diagnostic and therapeutic purposes. The reduction in pain following injection of local anesthesia around the nerve root is difficult to explain. Pain reduction theoretically should not occur unless the local anesthesia reaches the proximal part of the pain generator (proximal to the nerve root irritated by disc material, bone spurs, or scar tissue). However, research by North et al. suggests that peripheral sciatic nerve blocks can reduce pain originating from more central segments in the lumbosacral region. Research by Loh et al. indicates that central thalamic pain can improve after injection of local anesthesia at a distal location from where the pain is felt. This implies that SNRB procedures have the potential to alleviate complaints and provide positive outcomes for patients. SNRB procedures yield more accurate results with a reduction in the number of steroid injections required using fluoroscopy compared to conventional epidural steroid injections. SNRB procedures are similar to epidural injections in terms of preparation and approach. However, with SNRB, the procedure is always performed under fluoroscopy or another image intensifier to target the nerve root with the assistance of contrast medium [8,9].

The selection of medication for SNRB remains controversial with various alternative medication options available on the market. The use of a combination of local anesthetic and steroid is a widely recommended therapy in various literature. Pharmacodynamically, local anesthetics work by blocking nociceptive stimuli from afferent pathways while steroids act as anti-inflammatory agents by inhibiting inflammatory mediator pathways. Corticosteroids are potent anti-inflammatory agents. The rationale for their use involves the suppression of inflammation associated with the pathogenesis of radiculopathy and axial pain. Disruptions due to nerve root stretching, tethering, and compression provoke the same inflammatory response due to cell damage and ischemic injury. Corticosteroids inhibit cytokine release and prostaglandin synthesis, thus suppressing physiological responses. Corticosteroid injections are divided into two categories: non-particulate and particulate. Non-particulate corticosteroids have a rapid anti-inflammatory effect but a short duration of action, while particulate corticosteroids have a slower onset but a longer duration of action. Particulate suspensions contain insoluble corticosteroid esters, local anesthetic, and iodine contrast material. Meanwhile, particulate corticosteroids, including methylprednisolone acetate, triamcinolone acetonide, and betamethasone acetate, form a cloudy white mixture when agitated [10,11].

In a study conducted by Guyot on 298 patients undergoing SNRB, they were divided into 2 groups: group A (betamethasone 6 mg + lidocaine) and group B (triamcinolone 60 mg + bupivacaine). Post-procedure evaluation with a minimum duration of 8 months showed no significant difference in outcomes between the two groups. The mean duration between SNRB and surgery in group A was 86.79 (14-360) days and in group B was 75.76 (2-180) days ($P = .67$) [8]. Another study by Ram et al. also showed similar findings where there was no significant difference in VAS assessment post-SNRB between the use of Triamcinolone and Methylprednisolone at weeks 6, 12, and 24 [12].

CONCLUSION

Low back pain is one of the most common complaints that disrupt activities in both the adult and elderly populations. There are several pain intervention modalities that can be used to control complaints of low back pain from each specific pathological condition identified. Intra-articular facet blocks (IFB) and selective nerve root blocks (SNRB) have the primary goal of confirming the etiology of pain and, as a secondary goal, alleviating or eliminating pain caused by the structures to be injected. Pain intervention modalities in the lumbar region will be most effective when used synergistically with other adjuvant modalities such as physiotherapy.

REFERENCES

- [1] Paolucci T, Attanasi C, Cecchini W, Marazzi A, Capobianco SV, Santilli V. Chronic low back pain and postural rehabilitation exercise: A literature review. *Journal of Pain Research*. 2019;12:95-107.
- [2] Harwanti S, Ulfah N, Nurcahyo PJ. Faktor-Faktor Yang Berpengaruh Terhadap Low Back Pain (Lbp) Pada Pekerja Di Home Industri Batik Sokaraja Kabupaten Banyumas. *Kesmas Indonesia*. 2019;10(2):12.
- [3] Cowley P. Neuroimaging of Spinal Canal Stenosis. *Magnetic Resonance Imaging Clinics of North America*; 2016.
- [4] Lurie J, Tomkins-Lane C. Management of lumbar spinal stenosis. *BMJ*. 2016 Jan 4;352:h6234.
- [5] Roszell K, Sandella D, Haig AJ, Yamakawa KSJ. Spinal stenosis. *Clinical Spine Surgery*; 2016.
- [6] Vibert BT, Sliva CD, Herkowitz HN. Treatment of instability and spondylolisthesis: Surgical versus nonsurgical treatment. *Clinical Orthopaedics and Related Research*. 2006;(443):222-227.
- [7] Duckles B, Yi PK. Medial Branch Blocks. In: Gupta A, editor. *Interventional Pain Management*. Oxford: Oxford University Press; 2012. p. 113-119.
- [8] Guyot JP. Lumbar Selective Nerve Root Block: Comparative Study Using Two Pharmacological Formulae. *Global Spine Journal*. 2018;8(4):374-377.
- [9] Rathmell JP. Transforaminal and Selective Nerve Root Injection. In: *Atlas of Image-Guided Intervention in Regional Anesthesia and Pain Medicine*. Second Edi. Philadelphia: Lippincott Williams & Wilkins; 2006. p. 64-79.
- [10] Derby R, Lee SH, Date ES, Lee JH, Lee CH. Size and aggregation of corticosteroids used for epidural injections. *Pain Medicine*. 2008 Mar;9(2):227-234.
- [11] Benzon HT, Chew TL, McCarthy RJ, Benzon HA, Walega DR. Comparison of the particle sizes of different steroids and the effect of dilution: A review of the relative neurotoxicities of the steroids. *Anesthesiology*. 2007 Feb;106(2):331-338.
- [12] G Ram G, Sundar S, Kunal P, Giriraj JK, Vijayaraghavan P V. Methylprednisolone Acetate Versus Triamcinolone Acetonide for Pain Relief in Spinal Nerve Root Block for Low Back Pain. *American Journal of Pharmacology and Pharmacotherapeutics*. 2015;02(01).