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Exploring Innovative Treatment Options for Lumbar Extradural Cysts: A Case Report

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1. Abstract

Spinal synovial cysts, rare fluid-filled sacs associated with facet joints, are typically linked to degenerative changes affecting spinal stability. These cysts, predominantly found at the L4/5 facet joint, can cause back pain, radiculopathy, and neurological deficits, varying by size and location. Although MRI remains the diagnostic gold standard, treatment options range from conservative methods to surgical excision. Conservative management often fails due to recurrence or insufficient symptom relief, while surgical interventions can be invasive and are not suitable for all patients. This case report presents a novel non-surgical approach to managing pain caused by an L4/5 lumbar synovial cyst. A 63-year-old male, unresponsive to prior treatments, had been underwent a combined interlaminar approach targeting the retrodural Okada space and a direct intra-articular facet joint injection under fluoroscopic guidance. This method utilized ropivacaine, triamcinolone, and contrast agents to precisely target the affected site. After the procedure, the patient reported an 85nearly 100% improvement in pain and symptoms with imaging confirming significant cyst size reduction after the one year later follow-up, with imaging confirming significant cyst size reduction. This innovative technique demonstrates the potential efficacy of fluoroscopy-guided Okada space and facet joint injections as a minimally invasive alternative for managing lumbar synovial cysts, particularly for patients unsuitable for surgery. Further research and long-term follow-up are recommended to validate these findings and explore the mechanism of action within the Okada space.

2. Introduction

Spinal synovial cysts, also called lumbar extradural or juxtafacet cysts, are fluid-filled sacs connected to the facet joints of the spine. These cysts can develop as a result of conditions that compromise spinal stability, such as degenerative diseases [1]. First described by Kao in 1974, with an emphasis on differential diagnosis and related symptoms, they are a rare cause of lower back or radiating pain [2]. The incidence of lumbar synovial cysts varies widely, ranging from less than 0.5% to 10% [4,5]. They most commonly locate at the L4/5 facet, the spine's most mobile segment, followed by L5/S1, L3/L4, and L2/L3 [3,4]. A slight female predominance is observed [3,4], with Efstathios J. studies showing female rates of 51.2% as compared to males 48.8% [3], with gender ratios varying from 1:1 to 4:1 [4]. Lumbar synovial cysts typically affect individuals in their 60s and 70s [3,4].The symptoms of synovial cysts can differ among individuals, depending on factors such as the cyst's size, location, and its impact on nearby structures. These cysts may lead to radicular pain and are often associated with neurological deficits. A range of symptoms, including sensory and motor impairments, neurogenic claudication, and reflex abnormalities, have been reported in the literature [4,6,7]. MRI and CT are essential diagnostic tools for identifying cysts, with MRI considered the gold standard due to its higher sensitivity of 90%, compared to 69% for CT [8].Back pain with radiculopathy caused by spinal synovial cysts can be managed using a combination of pharmacological and non-pharmacological treatments, depending on the severity of the symptoms. Asymptomatic cysts are typically monitored, while symptomatic cysts may require either conservative or surgical approaches. However, the effectiveness of conservative treatments can vary. A literature review by Rinoo et al. [9] reported a 47.6% failure rate for conservative management, with factors such as cyst involution, unsuccessful aspiration, failed steroid injections, or cyst recurrence contributing to the lack of success [8]. CT-guided percutaneous cyst aspiration or rupture has been suggested as an option, but it often offers only temporary relief, as the cyst may regrow due to the intact synovial wall [9]. Due to this risk of recurrence, surgery may be considered to provide a more lasting solution. Identifying the lesion and closing any dural communication during surgery has been shown to lower recurrence rates [10]. For long-standing or recurrent cysts, surgical excision has demonstrated a low recurrence rate, with no recurrence reported after a 42-month follow-up[(11].However, not all patients are suitable candidates for surgical intervention. In this case report, we present a scenario where non-surgical options, such as fluoroscopy interventions, may still be considered for managing pain caused by an extradural cyst in the lumbar spine when oral analgesia fails to provide relief, as seen in our case. We adopted an innovative treatment approach, combining Okada space and facet joint injection.

3. Cases

A 63-year-old man with a medical history of hypertension, hyperthyroidism, and vertigo came to our clinic reporting cramping in his right lower limb that started in March 2022. By April 2022, this discomfort progressed to pain in the right lower back with numerical rating scale of 6, along with numbness in the right leg. Initially, he pursued rehabilitation, where he was suspected of having piriformis muscle syndrome. He received a piriformis injection on the right side, but this did not lead to any improvement. Additionally, he was prescribed oral analgesics, including NSAIDs (Diclofenac) and Tramadol, but these treatments were ineffective for relieving his

symptoms.Upon further questioning, patient denied any prior trauma related to the onset of his symptoms. Examination showed tenderness mainly in the lower back during palpation. Both the piriformis compression test and the Patrick test were negative. However, the straight leg raise test was positive for the right lower limb, and there were no neurological deficits noted.We conducted an MRI of the back in October 2022, which revealed a synovial cyst at the right L4/5 facet, likely compressing the L5 nerve root (Figure 1). After reviewing the MRI findings, we opted to perform a right L4/5 paramedian interlaminar epidural approach to the cyst, and an intra-articular facet joint injection under fluoroscopy in January 2023.The patient was placed in the prone position, with a pillow positioned under the mid to lower abdomen to reduce lumbar lordosis and increase intervertebral space. Standard American Society of Anesthesiologists (ASA) monitors were applied. Local anesthetics and mild sedation were administered. Aseptic technique was maintained applied with using an antiseptic solution and sterile drapes. Emergency equipment and medications were prepared and readily available.Under fluoroscopic guidance, an anteroposterior view was initially obtained to identify the L4/5 target level. An interlaminar approach was performed using an epidural Tuohy needle to target the synovial cyst at the right L4/5 facet, and a mixture comprising 20 mg of ropivacaine (2 ml), 20 mg of triamcinolone (0.5 ml), 3 ml of contrast medium, and 4.5 ml of 0.9% saline was instilled with each divided 1-2 ml. Figure 3 illustrates the contrast-filled area infiltrating extensively into the Okada space

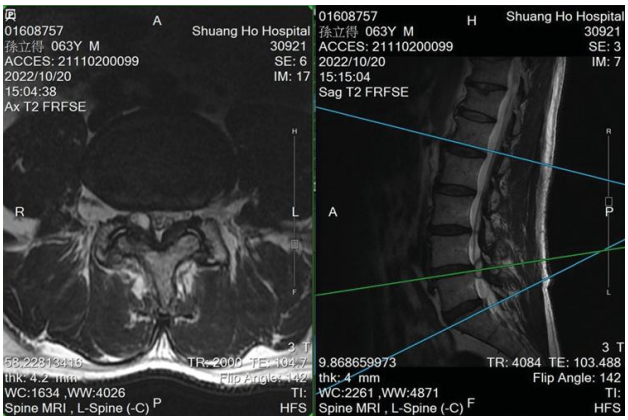

Figure 1: Right huge synovial cyst right L4/L5 facet joint.

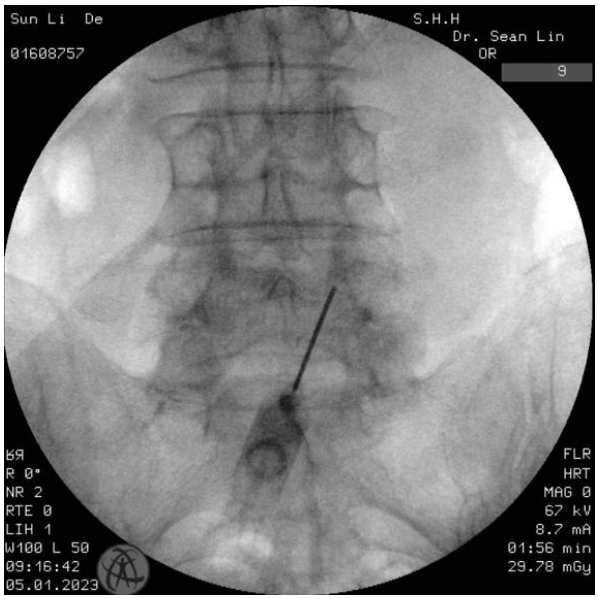

Figure 2: C-arm fluoroscopy image showed that Touhy needle inserted at L4/L5 through paramedian interlaminar approach and aimed toward the pathology site.

and bilateral L4/L5 facet joints (Figures 2-3).Subsequently, a right L4/5 intra-articular facet joint injection was performed using an 9-cm Ciba needle for the double confirmation. The C-arm was obliqued ipsilaterally until the L4/5 facet joint space was clearly visualized. Entry was made at the lower third of the facet joint. A 0.5-ml contrast medium was injected to confirm intra-articular positioning, followed by the administration of 1–2 ml of the prepared mixture. No complications were observed throughout the procedure (Figure 4,5).Two weeks after the procedure, the patient reported that his pain level had decreased from 6 to 2 on the numerical pain scale, and he no longer experienced cramping in the right lower limb. When we followed up with him five months post-procedure, he stated that his condition had improved by approximately 85% compared to before the intervention. An MRI performed in February 2024 after the intervention one year later was conducted to evaluate the synovial cyst at the L4/L5 facet joint, revealing a significant reduction in the cyst's size, as illustrated in Figure 6.

4. Discussion

Several reports have indicated that steroid injections into affected facet joint, with or without lidocaine, can provide pain relief lasting more than a month. Follow-up MRIs have also shown that the cyst shrinks, with no recurrence observed more than one month after the procedure [12-14]. While most reports focus on direct injection into the facet joint where the cyst is located, we adopted a different approach. We used an interlaminar epidural technique to guide the needle toward the cyst, followed by the administration of contrast. The contrast spread was observed in the retrodural Okada space, which is connected to the facet joint. Once the Okada space was accessed, we proceeded with a direct intra-articular injection into the affected facet joint to improve the procedure's effectiveness. The Okada space, located dorsal to the ligamentum flavum in the interlaminar region, links to the extradural interspinous space and bilateral facet joints. Initially described in the cervical spine [15], it has also been identified in the lumbar spine [16-17], though its exact anatomy remains unclear. It connects the bilateral facet joints and adjacent paraspinal structures. This space may serve as a conduit for the transmission of immune-inflammatory processes, and it has also been considered as a potential target for therapeutic interventions. Stolzenberg et al. demonstrated that accessing this space requires contrast under fluoroscopic guidance. In their study, they performed a

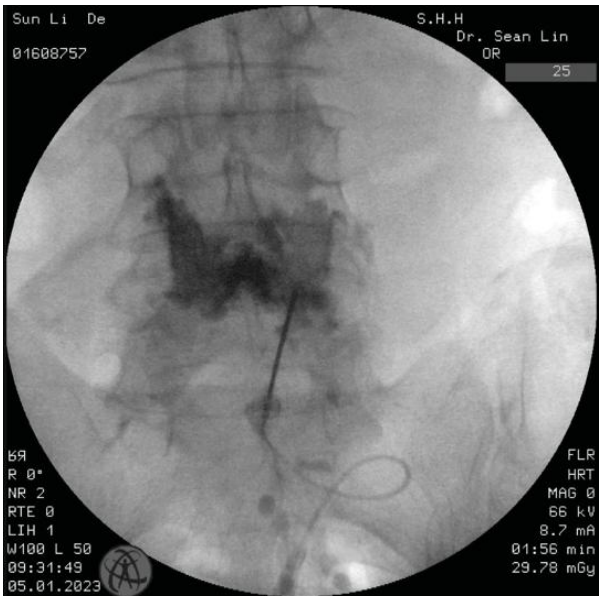

Figure 3: C-arm fluoroscopy image showed a Touhy needle inserted at the L4/L5 intervertebral level using a paramedian interlaminar approach. Upon injection of the dye, the contrast appears to fill the retrodural Okada space. The dye-filled area connected to the bilateral L4/L5 facet joint.

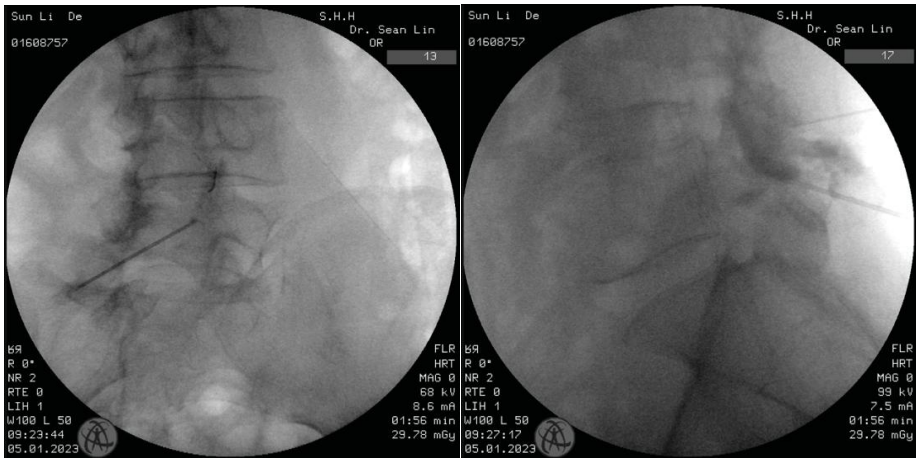

Figure 4,5: C-arm fluoroscopy image showed an L4/L5 facet joint injection (A) oblique view, (B) Lateral view was performed to enhance the effectiveness of pain relief.

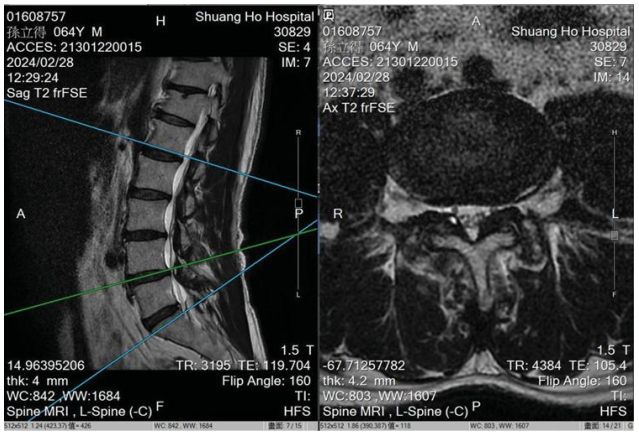

Figure 6: Noted the right synovial cyst at the L4/L5 facet joint shrunken in size after intervention one year later.

lumbar interlaminar epidural injection at the L4-5 interlaminar space, using a loss-of-resistance technique and contrast to confirm proper positioning[18]. In our case, the contrast spread as expected into the Okada space.Our patient experienced a highly positive postoperative outcome, with significant improvement in chronic low back pain, radiculopathy, and cramping, showing over 85% relief immediately. At the one-year follow-up, the Numeric Rating Scale (NRS) score decreased from 6 to 1-20-1 on occasion. The patient was able to resume daily activities and work, leading to a marked improvement in quality of life. Follow-up imaging revealed a substantial reduction in cyst size, with near-complete resolution. Fluoroscopy-guided Okada space and facet joint injections were highly effective in treating the extradural cyst. We will continue to conduct long-term follow-up to monitor the patient's symptom progression, including the recurrence of cysts and changes in pain intensity.

5. Conclusion

While surgery is typically the preferred treatment for extradural cysts, not all patients are suitable candidates or choose to undergo the procedure. Therefore, we recommend conservative treatment as the initial approach and hope that future research will further evaluate the potential of Okada space and facet joint injections as effective alternatives in managing extradural cysts.

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