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Case Report

Successful treatment of symptomatic facet joint synovial cysts using C-arm fluoroscopy-guided percutaneous aspiration: report of two cases

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Abstract: Lumbar facet-joint synovial cysts are an important cause of back pain and radiculopathy. Treatment options for facet-joint synovial cysts include surgical excision, facet-joint steroid injections, and facet-joint cyst aspiration. Although percutaneous facet-joint synovial cyst aspiration is an effective and minimally invasive procedure for treating patients with symptomatic facet-joint synovial cysts, its success rate is known to be low. Here, we report out experience with treating two men using this approach. The men presented with back pain or radiculopathy. In both cases, magnetic resonance imaging showed facet-joint synovial cysts in the lumbar spine at various locations. Depending on the location of the cysts, 2-3 needles and various needle approaches were required for treatment. The facet-joint synovial cysts were aspirated using the intra-articular, interlaminar, or safe triangle approach. After aspiration, both patients experienced immediate improvement in their symptoms, and neither of them relapsed during more than 12 months of follow-up. Percutaneous aspiration of symptomatic facet-joint synovial cysts under fluoroscopic guidance is a treatment option worth considering in patients with facet-joint synovial cysts.

Keywords: Back pain, injection, lumbar vertebra, radiculopathy, synovial cyst

Introduction

The facet-joint constitutes the posterior wall of the spinal canal and the intervertebral foramen. It maintains the stability of the spine by resisting compression and axial shear forces. Abnormal changes in facet-joint pressure can lead to facet-joint degeneration [1].

Although the pathogenesis of facet-joint synovial cysts remains unclear, they are widely regarded as part of a spinal degenerative process, commonly caused by conditions such as spinal instability and trauma [2-6]. They are most commonly found in people with an average age of around 60 years [3, 5]. Facet-joint synovial cysts occur most often in the lumbar spine, but can also occur in the thoracic and cervical spine [7, 8].

Facet-joint synovial cysts are usually asymptomatic, and in these cases, most resolve without special treatment [9]. Symptomatic facet-joint synovial cysts are very rare, with a reported prevalence of 6.5% in patients who visit a spine clinic [10]. These cysts were also reported to be found in less than 0.5% of the general symptomatic population [3]. Patients with facet-joint synovial cysts may present with back pain, radiculopathy, or neurogenic claudication, with associated sensory loss and motor weakness, and cauda equina syndrome [2, 3, 6, 10-14].

Magnetic resonance imaging (MRI) provides the best method for diagnosing and visualizing facet-joint synovial cysts, particularly when using contrast agents [15]. MRI may reveal compression of the nerve roots when cysts are on the ventral aspect of the lumbar facet-joint. In these patients, physical examination may reveal tenderness around the facet-joints or a positive straight leg raising test on the symptomatic side.

Conservative treatments, such as cyst aspiration, have been reported to have a failure rate of 50-100% [2, 9, 14]. In most reports, an intra-

articular approach was used for cyst aspiration [2, 9]. However, it is rarely the case that an interlaminar approach or the safe triangle approach, using two or more needles, would be used for successful aspiration of a cyst under C-arm fluoroscopic guidance. Nevertheless, here we report our experience of successful percutaneous aspiration of facet-joint cysts in two patients, using an interlaminar approach or the safe triangle approach under C-arm fluoroscopic guidance. We also report the course of the disease and the treatment outcomes of these two patients.

Case report

This study was approved by our Hospital Clinical Research Review Committee (approval number 2019-12-035-001). Both patients provided written informed consent for the publication of their data.

Case 1

A 58-year-old man (168 cm, 55 kg) visited the anesthesiology department as an outpatient with complaints of pain in the back and left leg after bowling 2 weeks prior to presentation. He had no history of surgery or any related procedure to the back or spine. The pain was exacerbated by walking or standing up, with a visual analogue scale (VAS) score of 7-8. It was associated with a stretching sensation and numbness on the lateral part of the left thigh. Physical examination revealed tenderness around the left L5-S1 facet-joint region and a positive straight leg raising test in the left leg.

An L-spine MRI revealed osteoarthritis of the facet-joints and a cystic lesion on the ventral aspect of the left L5-S1 facet. The size of the cyst was 6.8 × 8.5 × 14 mm (**Figure 1**). There were no other lesions that could have been responsible for his symptoms. Conservative treatments, such as analgesics and physiotherapy, were trialed, but there was no significant improvement. Facet-joint steroid injections were administered, but his symptoms persisted. Because the patient did not want to undergo surgical treatment, cyst aspiration through a facet-joint injection was planned.

The patient was placed in the prone position on a procedure table. A 25-G Quincke needle was used to inject contrast agent into the L5-S1 facet-joint, but the facet-joint cyst was not visible on the contrast-enhanced image. A second attempt to identify the cyst was made by inserting another 25-G Quincke needle into the L5-S1 facet-joint. The shape and location of the facet-joint cyst then became visible on a contrast-enhanced image. An attempt to aspirate the cyst using the two 25-G Quincke needles was not successful.

A second attempt at aspiration was made by inserting a 22-G Quincke needle directly into the facet-joint synovial cyst, using the interlaminar approach; this time, approximately 2 ml of a turbid fluid was aspirated. Following aspiration, the contrast enhancement of the cyst disappeared. The procedure was concluded by injecting 5 mg of dexamethasone through the 22-G needle inserted into the site of the cyst (**Figure 1**).

After the procedure, the patient was observed for 3 hours in the recovery room. In the absence of neurological side effects, he was discharged. When the patient visited the hospital as an outpatient a week later, the pain he had experienced in the waist and left leg had completely resolved, and his VAS score was 0. Follow-up observation was performed after 2 weeks, and the patient did not show any signs of aggravation or recurrence during a 14-month follow-up period.

Case 2

A 60-year-old man (176 cm, 77 kg) complained of back pain, with a VAS score of 7-8 and a stretching sensation and numbness from the lateral side of the right thigh to the calf. Physical examination revealed a positive straight leg raising test in the right leg. The patient's L-spine MRI revealed cystic lesions at the ventral aspect of the right facet-joint at the L5-S1 level, and a possible right L5 nerve root compression. The size of the cyst was 5.7 × 8.7 × 4.8 mm (**Figure 2**). Intra-articular and transforaminal epidural steroid injections were administered, but his symptoms persisted. Therefore, cyst aspiration was planned.

After a 25-G Quincke needle was used to inject contrast into the L5-S1 facet-joint, the shape and location of the facet-joint cyst became visible on a contrast-enhanced image. An attempt to aspirate the cyst was made, but failed.

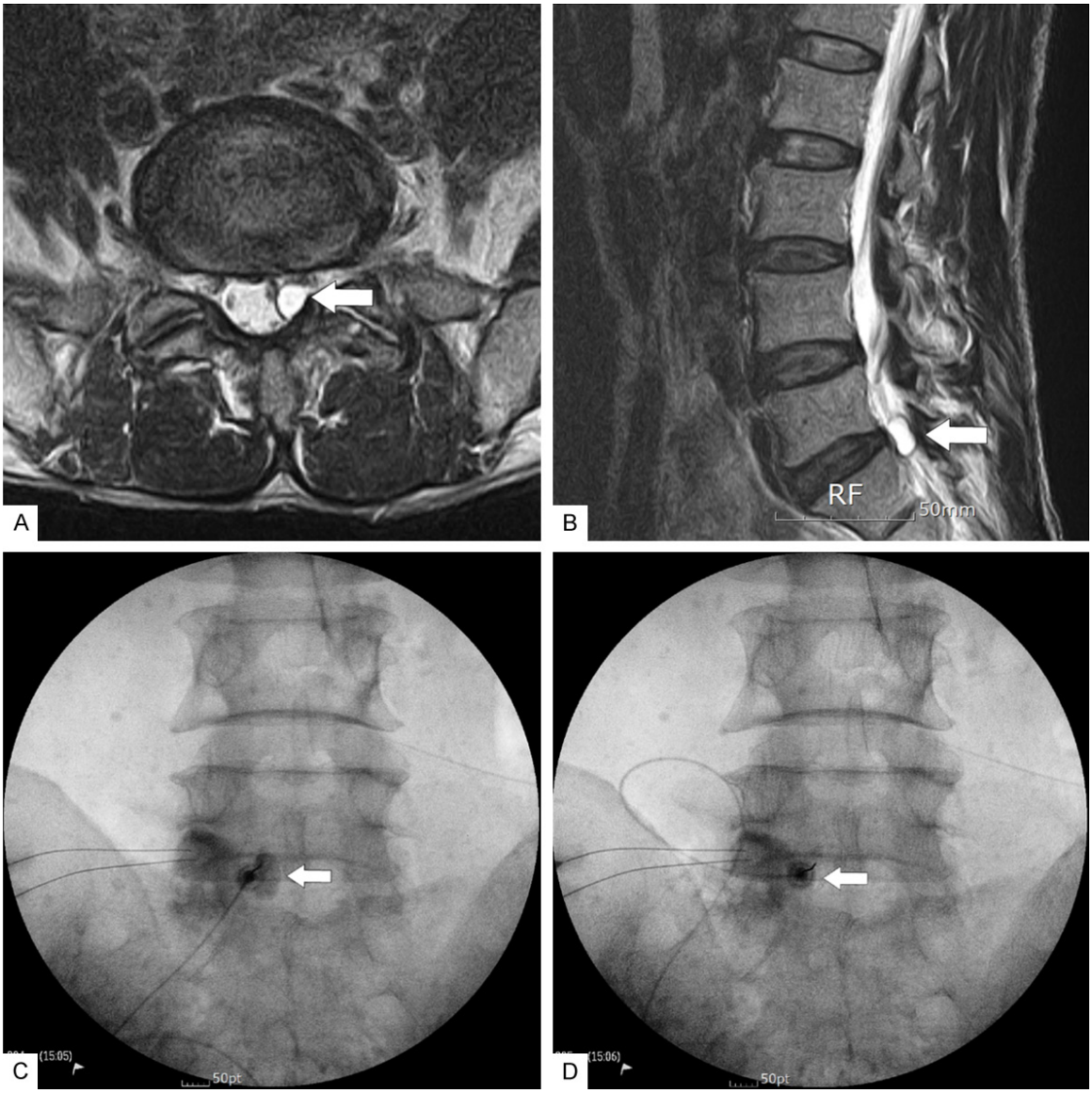

Figure 1. Case 1 magnetic resonance images (A, B) and C-arm fluoroscopic views (C, D). (A, B) Axial and sagittal MRI images of the lumbar spine demonstrating an intraspinal facet joint cyst located in the left L5/S1 facet region. The cyst measured 14.0 × 6.8 × 8.5 mm. (C, D) Coronal fluoroscopic images of the L5/S1 facet region showing three needles (two 25-G, one 22-G) inserted by intra-articular and interlaminar approaches. (C) An intraspinal facet joint cyst filled with dye (pre-aspiration) was seen at the L5/S1 level. (D) The same facet joint after aspiration of the cyst.

Another aspiration attempt was made using a 22-G Quincke needle inserted directly into the facet-joint cyst using the safety triangle approach. This allowed aspiration of approximately 0.5 ml of a turbid liquid. After aspiration, the contrast enhancement of the cyst disappeared. Next, 2.5 mg of dexamethasone was injected through the 22-G needle inserted at the site of the cyst (**Figure 2**).

When the patient visited the hospital as an outpatient a week later, the pain and altered sensation he had experienced in the waist, right thigh, and right calf had almost completely resolved, and his VAS score had decreased to 1-2. During the 12-month follow-up, the patient did not show any signs of aggravation or recurrence.

Discussion

We report the disease course and treatment outcomes of two patients in whom percutaneous aspirations of facet-joint cysts were per-

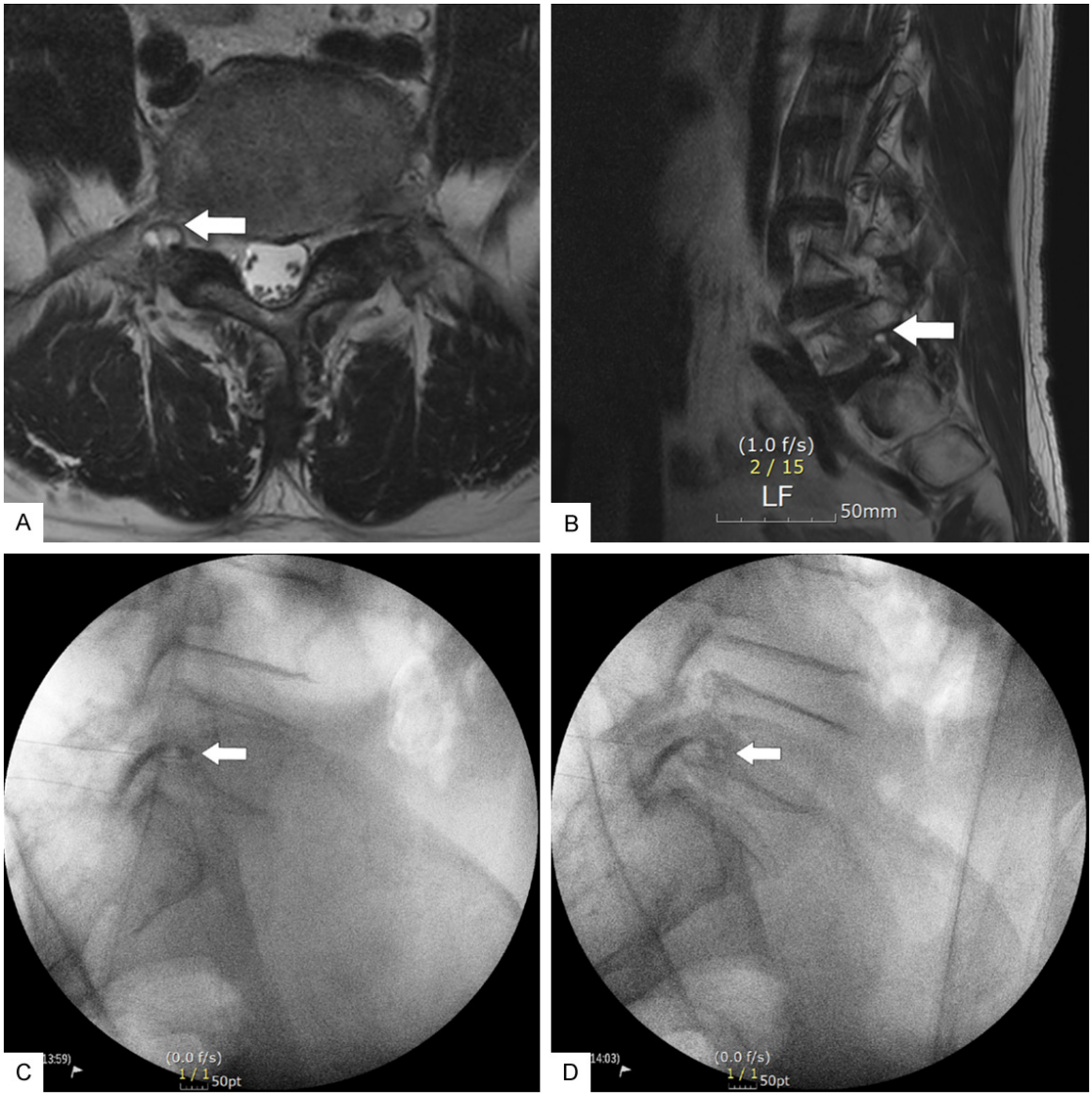

Figure 2. Case 2 magnetic resonance images (A, B) and C-arm fluoroscopic views (C, D). (A, B) Axial and sagittal MRI images of the lumbar spine demonstrating a facet joint cyst at the L5/S1 level measuring 5.7 × 8.7 × 4.8 mm, with associated compression of the right L5 nerve root. (C, D) Sagittal fluoroscopic images demonstrating the L5/S1 facet joint cyst. Two needles (one 25-G, one 22-G) were inserted using the intra-articular and safe triangle approaches to aspirate the facet joint cyst. (C) A facet joint cyst filled with dye (pre-aspiration) was seen at the L5/S1 level. (D) The same facet joint after aspiration of the cyst.

formed successfully under fluoroscopic guidance. Although no standards or guidelines have been established to guide clinicians in this treatment, several methods are currently employed for the treatment of symptomatic synovial cysts.

In rare cases, synovial cysts are reported to resolve spontaneously [16], but the first line of treatment is surgical excision, with or without segmental fusion. This is generally considered to be the gold standard for the treatment of symptomatic synovial cysts, due to the high recurrence rate and poor outcomes achieved by conservative treatment.

Surgical decompression has been reported to improve symptoms in most patients with symptomatic synovial cysts [17]. However, back pain recurred in approximately 20% of patients, and

cysts recurred in 1.8% [17]. It has been reported that, although micro-decompression for symptomatic synovial cysts relieved preoperative pain/symptoms in 88% of patients, additional surgery was required in 15% of patients [18].

Van Dijke et al. [12] performed surgical excisions without segmental fusion in patients with symptomatic synovial cysts; nevertheless, some patients complained of persistent symptoms, including back pain (7.6%) and radiculopathy (9.4%). When they performed surgical excisions with segmental fusion, symptoms such as back pain (12%) and radiculopathy (5.6%) still persisted in some patients. Reviewing reoperation rates due to recurrence revealed that surgical excision without segmental fusion had a reoperation rate of 8.8%, while surgical excision with segmental fusion had a reoperation rate of 2.2%.

Furthermore, surgical treatment is associated with a risk of complications, such as cerebrospinal fluid leak, discitis, epidural hematoma, seroma requiring drainage, and general anesthesia complications [11].

There have been reports that facet-joint steroid injections can lead to cyst regression and resolution, both clinically and radiologically [19, 20]. However, these studies also reported that 3667% of cases had unsatisfactory clinical outcomes, so that, eventually, surgical treatment was required in some cases.

Additionally, Hyun et al. reported the successful removal of a symptomatic facet-joint cyst using epiduroscopy (a non-operative treatment) [21]. This procedure involved rupturing cysts using the tip of the epiduroscope.

Facet-joint synovial cyst aspiration is known to be a safe, effective, and minimally invasive procedure for the treatment of facet-joint synovial cysts [13]. However, it has a very high failure rate. Even pain specialists are reported to have a failure rate of 50-100% when attempting to aspirate a cyst [2, 7, 9, 14]. The reasons for aspiration failure vary. First, it may be due to technical problems, such as a highly degenerated facet-joints [22] or the location of the cyst. Second, it may be due to the relative ball-valve effect caused by negative pressure during the first aspiration attempt [22]. Third, the facet-joint synovial cyst is pathologically categorized as a serosanguinous fluid involving gelatinous materials [14], and the viscosity of gelatinous cysts makes aspiration more difficult.

Our patients did not want to undergo surgical treatment. Therefore, we attempted a non-operative, simple procedure that required minimal exertion and cost to manage these patients with facet-joint cysts, as an alternative to surgical treatment. In our study, the average procedure time was 10 min and the average medical cost for treating the cyst was only $45 (USD), which was borne by the patients. The duration of hospital stay was also limited to only a few hours.

Case 1 required three needles, which was the highest number of needles used in both cases. The cyst was located on the ventral aspect of the facet-joint, and it was not visible on a contrast-enhanced image after using a single intra-articular contrast injection. After a second needle was inserted intra-articularly, the location of the cyst became visible on the contrast-enhanced image; however, aspiration was still not possible. Therefore, another needle was used by the interlaminar approach to aspirate the cyst (**Figure 1**).

Case 2 was unusual. Almost all symptomatic facet-joint synovial cysts are located within the intraspinal space or neural foramen. Symptomatic far-lateral extraspinal synovial cysts are rarely reported [24]. Although the safe triangle approach is the most suitable method to access cysts located in these sites, to the best of our knowledge, there are no reports of such cases to date (**Figure 2**).

In summary, the cases reported here demonstrate that it is possible to treat patients successfully when they present at a pain clinic with facet-joint synovial cysts, using simple procedures, at minimal cost. In addition, depending on their location and sizes, cysts can be aspirated using various approaches.

One limitation of this case series was that post-procedure imaging was not performed, as the patients experienced significant improvements in symptoms after undergoing the various procedures and did not want follow-up MRI. Nevertheless, we postulate that follow-up MRIs are necessary to evaluate the size of the cysts

and to confirm their complete resolution. Additionally, long-term follow-up may be needed to determine recurrence rate.

Our study indicated that aspiration under percutaneous C-arm fluoroscopic guidance is a treatment option for symptomatic facet-joint synovial cysts that is worth considering, and has the advantages of a shorter treatment time, shorter length of hospital stay, lower medical cost, less blood loss, and low radiation exposure. It is a suitable alternative for patients with facet-joint synovial cysts who do not want to undergo surgical treatment.

Disclosure of conflict of interest

None.

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