Am J Transl Res 2022;14(10):7607-7611
www.ajtr.org /ISSN:1943-8141/AJTR0145260

Case Report

A rare case of facet joint synovial cyst connected to the intrathecal space: a case report

Joo Yong Lee*, Hyeon Tae Kim*, Ji Young Park*, Young Duck Shin*

*Department of Anesthesiology and Pain Medicine, Chungbuk National University Hospital, College of Medicine, Chungbuk National University, Chungbuk 28644, Korea. *Equal contributors.*

Received July 10, 2022; Accepted September 14, 2022; Epub October 15, 2022; Published October 30, 2022

Abstract: Unexpected injection of local anesthetics into the intrathecal space can cause adverse effects, such as hypotension, shortness of breath, bradycardia, numbness or weakness, nausea and vomiting and serious complications, such as respiratory arrest, loss of consciousness and cardiac arrest. In this study, we report a case of a 68-year-old woman with a facet joint synovial cyst connected to the intrathecal space. The patient's clinical symptoms and radiological findings were consistent with those of a facet joint synovial cyst; however, during facet joint synovial cyst aspiration, it was found that the cyst was connected to the intrathecal space. Our experience shows that during the procedure of facet joint injection and facet joint synovial cyst aspiration, local anesthetics may be inadvertently injected intrathecally. Although this is highly uncommon, it can lead to serious side effects, such as total spinal anesthesia. Therefore, we present this case, along with a brief literature review.

Keywords: Local anesthetics, facet joint synovial cyst, intrathecal, injections, complications

Introduction

Intraspinal cysts include arachnoid, neuroenteric, ependymal, ligamentum flavum, discal, ganglion and facet joint synovial cysts. Facet joint synovial cysts are distinguished from other intraspinal cysts by their connection to the facet joint, presence of a synovial lining layer and location in the extradural space. The pathogenesis of facet joint synovial cysts is generally regarded as part of a degenerative change in the spine caused by conditions such as spinal instability and trauma [1-3]. Patients with symptomatic facet joint cysts may present with lower back pain, radiating pain, associated sensory loss, motor weakness, neurogenic claudication and cauda equina syndrome [1, 3, 4]. Surgical resection, with or without segmental fusion, is generally considered the standard treatment for symptomatic synovial cysts. However, approximately 10% of patients who undergo surgical resection, with or without segment fusion, remain symptomatic, while the rate of cyst recurrence is approximately 2% and reoperation is required in approximately 15% of cases [5-7]. Although facet joint cyst aspiration is a safe and cost-effective procedure for the treatment of facet joint cysts, it has a very high failure rate [3, 8].

Local anesthetics generally used during the procedure can cause serious complications if unintentional intravascular and intrathecal injections occur. During facet joint synovial cyst aspiration, we found a water droplet-shaped cyst in the anterior-posterior view with contrast medium gradually flowing toward the cephalad in the spinal intrathecal canal of the lateral view under c-arm guidance. This means that the facet joint synovial cyst was connected to the intrathecal space. In our case, if a local anesthetic had been injected, the drug could have reached the intrathecal space, resulting in a total spinal or complete spinal block.

There are several reports of facet joint synovial cysts in literature [1-4, 9-12]; however, to our knowledge, our case is the first report of a facet joint synovial cyst connected to the intrathecal space.

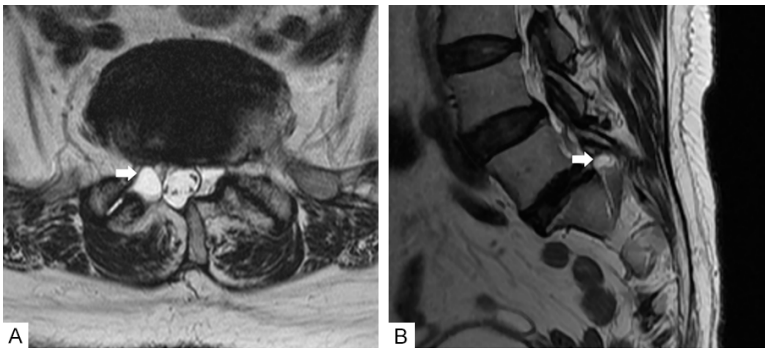

Figure 1. Patient's magnetic resonance images (MRI). (A) Axial and (B) sagittal MRI images of the lumbar spine demonstrating an intraspinal facet joint cyst located in the right L5/S1 facet region.

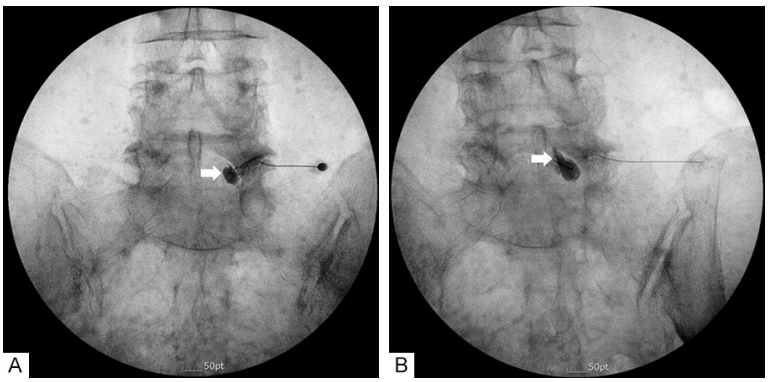

Figure 2. Anterior-posterior fluoroscopic images. A. An intraspinal facet joint cyst filled with dye was seen as a circular shape at the L5/S1 level. B. An intraspinal facet joint cyst filled with dye was seen as water droplet-shaped at the L5/S1 level.

Case presentation

This study was approved by the Chungbuk National University Hospital Clinical Research Review Committee (approval number: 2022-05-030). The patient provided written informed consent for the publication of her data.

A 68-year-old woman (154 cm, 55 kg) visited the anesthesiology department as an outpatient, complaining of back pain with a Visual Analog Scale score of 5-6 and numbness in the posterior aspect of the right buttock, thigh and calf area. The pain was exacerbated on walking or standing. Nine years before, the patient underwent right L5 hemilaminectomy for back and right leg pain. The patient had no other underlying medical conditions and had not undergone any other procedures related to back pain.

Physical examination revealed tenderness around the right L5-S1 facet joint region and a positive straight leg raising test in the right leg. L-spine magnetic resonance imaging (MRI) revealed a cystic mass in the right neural foramen of the L5/S1 communication with the joint space of the right L5/S1 facet joint (**Figure 1**). Transforaminal epidural steroid injections were administered; however, the patient's symptoms persisted. The patient declined surgical treatment; therefore, a facet joint steroid injection, or facet joint cyst aspiration was planned.

The patient was placed in the prone position on a procedure table. A 25-G Quincke needle was used to inject a contrast agent into the right L5-S1 facet joint. The shape and location of the facet joint cyst could then be assessed using contrast-enhanced images. An attempt to aspirate the cyst failed. A second aspiration attempt was made by inserting a 22-G Quincke needle directly into the facet joint cyst, using the interlaminar approach. We noted a water droplet-shaped facet joint cyst (**Figure 2**). In the lateral view of the C-arm, it was possible to confirm that the contrast medium gradually flowed toward the cephalad in the spinal intrathecal canal (**Figure 3**). We explained to the patient the potential for serious complications if the procedure was continued and stopped it due to possible side effects, after obtaining the patient's consent.

Discussion

Various types of cystic lesions can be present in the spinal canal and are classified according to their location, etiology, histology, and pathology. Spinal canal cysts are broadly classified into intradural and extradural types. Intradural cysts include arachnoid cysts, neuroenteric cysts and ependymal cysts. Extradural cysts

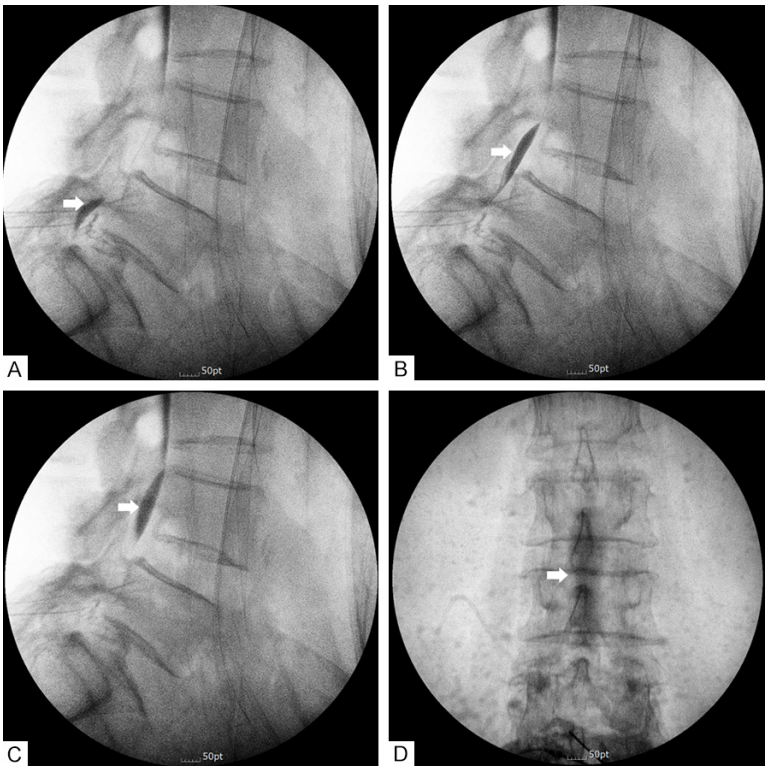

Figure 3. Fluoroscopic images of contrast medium moving towards the cephalad in the intrathecal space. A-C. Lateral view. Fluoroscopic images were taken at intervals of about 1 second and the images were arranged in chronological order. D. Anterior-posterior view. The shadow of the contrast medium that has spread to the L3 body level is confirmed.

include arachnoid cysts, ligamentum flavum cysts, intervertebral discal cysts, ganglion cysts and facet joint synovial cysts (as observed in our case) [13]. Extradural arachnoid cysts are also known as perineural or Tarlov cysts. Perineural cysts occur at the junction of the dorsal root and dorsal root ganglia [14]. On a T2-weighted MRI, it can be confirmed that perineural cysts contain nerve root fibers and are connected to the subarachnoid space [15]. Perineural cysts develop at the root of the nerve, most commonly at the level of the second and third sacral nerve roots [16]. It has been reported that they can cause back pain and radiculopathy along a distribution consistent with the location of the cyst in approximately 20% of patients with perineural cysts [14, 16]. Ligamentum flavum cysts can occur in association with ligamentous pseudocystic degeneration or hemorrhage and are attached or embedded in the ligamentum flavum [17]. Discal cysts are well-defined homogeneous cysts in the ventrolateral extradural space adjacent to the herniated intervertebral disc, where the dural sac is displaced dorsally [18]. On MRI, their cystic mass is more homogeneous than the cerebrospinal fluid and the boundaries of the lesion are clear [18]. Intraspinal ganglion cysts result from mucinous degeneration of ligamentous structures and have no true synovial lining or direct communication with the facet joint [19]. Unlike the other cysts, facet joint cysts have a characteristic synovial lining [9]. Facet joint cysts arise from myxoid degeneration, with cyst formation due to synovial fluid extrusion from weakened or destroyed facet joint capsular tissue [10].

In our case, MRI revealed an extradural cyst connected to the facet joint, rather than the subarachnoid space and ligamentous structures. There were no nerve root fibers in the cyst and the characteristic synovial lining was present. In addition, there were no other lesions detected that could cause the patient's symptoms. Therefore, we diagnosed a facet joint cyst and the radiologist's MRI findings were consistent with our diagnosis (**Figure 1**).

During the procedure, the contrast medium flowed into the intrathecal space from the facet joint cyst. Usually, in c-arm guidance, the facet joint cyst has a circular shape without a sharp point [11, 12] (**Figure 2**); however, in this case, contrast revealed a water droplet-shaped cyst on the anterior-posterior c-arm guidance image. Therefore, the lateral view was immediately obtained under c-arm guidance and it was confirmed that the contrast medium flowed into the intrathecal space and gradually moved toward the cephalad (**Figure 3**).

When a local anesthetic is injected intrathecally, complications differ depending on the level of the spread of the local anesthetics. Clinical signs include hypotension, shortness of breath, bradycardia, numbness or weakness, nausea,

vomiting, respiratory arrest and loss of consciousness [20]. The most serious and life-threatening problem of these complications is a total or complete spinal block, which occurs from unintentional diffusion of a local anesthetic into the subarachnoid space containing the brainstem and cranial nerves, resulting in a loss of consciousness [20].

If the local anesthetic injected into the intrathecal space is a hyperbaric solution, it spreads in the direction of gravity [21]. In our case, due to the patient's prone position, the injected local anesthetic was more likely to spread toward the cephalad. Usually, a combination of local anesthetic and steroids are used for facet joint injection [22] and the volume of local anesthetic is small (0.51 mL per site) [23]. In general, although it has been reported that total spinal anesthesia occurs when 100-200 mg, or more, of lidocaine is injected into the intrathecal space [24], total spinal anesthesia can occur with as little as 3 mL of 20 mg/mL lidocaine injected through an epidural catheter [25]. In this case, if the procedure was not stopped, total spinal anesthesia could have possibly occurred.

Furthermore, in this case, the right L5 hemilaminectomy performed 9 years before can be considered as the cause of the facet joint synovial cyst connected to the intrathecal space. First, the location of the cyst was consistent with the patient's previous surgical site. Second, the adhesions and inflammation that occurred after the surgery may have caused the cyst. Finally, the degenerative changes in the patient's lumbar spine from before and continuing after surgery should be considered.

A limitation of this case report is that the patient declined additional imaging tests such as myelography and surgical treatment, and as such, the cyst could not be accurately identified.

In summary, we found a facet joint synovial cyst connected to the intrathecal space during aspiration of a facet joint cyst. The occurrence of this cyst suggests that future studies on intraspinal cysts are needed to prevent possible complications and provide appropriate treatment. Furthermore, it should be considered that unexpected serious complications may occur even when a procedure is based on radiological diagnosis.

Acknowledgements

We would like to thank Editage (www.editage.com) for English language editing.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Young Duck Shin, Department of Anesthesiology and Pain Medicine, Chungbuk National University Hospital, College of Medicine, Chungbuk National University, 776, 1 Sunhwan-ro, Seowon-Gu, Cheongju, Chungcheongbuk-do 28644, Korea. Tel: +82-010-5482-0133; Fax: +82-43-272-0264; E-mail: yydshin@naver.com

References

[1] Khan AM and Girardi F. Spinal lumbar synovial cysts. Diagnosis and management challenge. Eur Spine J 2006; 15: 1176-1182.

[2] Howington JU, Connolly ES and Voorhies RM. Intraspinal synovial cysts: 10-year experience at the Ochsner Clinic. J Neurosurg 1999; 91 Suppl: 193-199.

[3] Shah RV and Lutz GE. Lumbar intraspinal synovial cysts: conservative management and review of the world's literature. Spine J 2003; 3: 479-488.

[4] Yarde WL, Arnold PM, Kepes JJ, O'Boynick PL, Wilkinson SB and Batnitzky S. Synovial cysts of the lumbar spine: diagnosis, surgical management and pathogenesis. Report of eight cases. Surg Neurol 1995; 43: 459-464; discussion 465.

[5] van Dijke M, Janssen SJ, Cha TD, Wood KB, Borges LF, Harris MB, Bono CM and Schwab JH. Comparison of decompression with and without fusion for patients with synovial facet cysts. Clin Spine Surg 2017; 30: 1399-1404.

[6] Bydon A, Xu R, Parker SL, McGirt MJ, Bydon M, Gokaslan ZL and Witham TF. Recurrent back and leg pain and cyst reformation after surgical resection of spinal synovial cysts: systematic review of reported postoperative outcomes. Spine J 2010; 10: 820-826.

[7] Weiner BK, Torretti J and Stauff M. Microdecompression for lumbar synovial cysts: an independent assessment of long term outcomes. J Orthop Surg Res 2007; 2: 5.

[8] Epstein NE and Baisden J. The diagnosis and management of synovial cysts: efficacy of surgery versus cyst aspiration. Surg Neurol Int 2012; 3: S157-S166.

[9] Kjerulf TD, Terry DW Jr and Boubelik RJ. Lumbar synovial or ganglion cysts. Neurosurgery 1986; 19: 415-420.

[10] Franck JI, King RB, Petro GR and Kanzer MD. A posttraumatic lumbar spinal synovial cyst. Case report. J Neurosurg 1987; 66: 293-296.
[11] Shin KM, Kim MS, Ko KM, Jang JS, Kang SS and Hong SJ. Percutaneous aspiration of lumbar zygapophyseal joint synovial cyst under fluoroscopic guidance -A case report-. Korean J Anesthesiol 2012; 62: 375-378.
[12] Kim HT, Choi JH, Shin YD, Kim TY and Lee JY. Successful treatment of symptomatic facet joint synovial cysts using C-arm fluoroscopy-guided percutaneous aspiration: report of two cases. Am J Transl Res 2022; 14: 3547-3553.
[13] Hamamcioglu MK, Kilincer C, Hicdonmez T, Simsek O, Birgili B and Cobanoglu S. Giant cervicothoracic extradural arachnoid cyst: case report. Eur Spine J 2006; 15 Suppl 5: 595-598.
[14] Buxi TBS, Sud S, Vohra R, Kakkar A and Byotra SP. Giant spinal arachnoid cysts: computed tomography, magnetic resonance imaging and magnetic resonance myelography correlation. Australas Radiol 2000; 44: 216-219.
[15] Ospina Moreno C, Vela Marín AC, Castán Senar A, Montejo Gañán I, Cózar Bartos M and Marín Cárdenas MA. Radiological diagnosis of spinal arachnoid cysts: a pictorial essay. J Med Imaging Radiat Oncol 2016; 60: 632-638.
[16] Paulsen RD, Call GA and Murtagh FR. Prevalence and percutaneous drainage of cysts of the sacral nerve root sheath (Tarlov cysts). AJNR Am J Neuroradiol 1994; 15: 293-299.
[17] Mahallati H, Wallace CJ, Hunter KM, Bilbao JM and Clark AW. MR imaging of a hemorrhagic and granulomatous cyst of the ligamentum flavum with pathologic correlation. AJNR Am J Neuroradiol 1999; 20: 1166-1168.
[18] Kono K, Nakamura H, Inoue Y, Okamura T, Shakudo M and Yamada R. Intraspinal extradural cysts communicating with adjacent herniated disks: imaging characteristics and possible pathogenesis. AJNR Am J Neuroradiol 1999; 20: 1373-1377.
[19] Cho SM, Rhee WT, Choi SJ and Eom DW. Lumbar intraspinal extradural ganglion cysts. J Korean Neurosurg Soc 2009; 46: 56-59.
[20] Asfaw G and Eshetie A. A case of total spinal anesthesia. Int J Surg Case Rep 2020; 76: 237-239.
[21] Tetzlaff JE, O'Hara J, Bell G, Grimm K and Yoon HJ. Influence of baricity on the outcome of spinal anesthesia with bupivacaine for lumbar spine surgery. Reg Anesth 1995; 20: 533-537.
[22] Bykowski JL and Wong WH. Role of facet joints in spine pain and image-guided treatment: a review. AJNR Am J Neuroradiol 2012; 33: 1419-1426.
[23] Manchikanti L, Kaye AD, Boswell MV, Bakshi S, Gharibo CG, Grami V, Grider JS, Gupta S, Jha SS, Mann DP, Nampiaparampil DE, Sharma ML, Shroyer LN, Singh V, Soin A, Vallejo R, Wargo BW and Hirsch JA. A systematic review and best evidence synthesis of the effectiveness of therapeutic facet joint interventions in managing chronic spinal pain. Pain Physician 2015; 18: E535-E582.
[24] Gillies ID and Morgan M. Accidental total spinal analgesia with bupivacaine. Anaesthesia 1973; 28: 441-445.
[25] Steffek M, Owczuk R, Szlyk-Augustyn M, Lasinska-Kowara M and Wujtewicz M. Total spinal anaesthesia as a complication of local anaesthetic test-dose administration through an epidural catheter. Acta Anaesthesiol Scand 2004; 48: 1211-1213.