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Case Report

Full-Endoscopic Confirmation of a Discal Cyst by Indigo Carmine Injection during Lumbar Spine Surgery: A Technical Note

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Abstract

A 28-year-old man presented complaining of left leg pain. Magnetic resonance imaging revealed herniated nucleus pulposus (HNP) with a discal cyst that was compressing the L5 nerve root. Conservative therapy failed; therefore, surgical treatment was selected. Minimally invasive transforaminal full-endoscopic excision of the discal cyst as well as the HNP under local anesthesia was planned. Before surgery, a mixture of indigo carmine and contrast medium was injected into the disc space, and entry of this fluid mixture into the cystic space was confirmed using a C-arm image intensifier. Foraminoplasty was performed first to allow manipulation and rupture of the cyst wall with a radio-pulse bipolar device. Rupture of the cyst wall was confirmed by release of the blue indigo carmine dye from the cyst. The HNP and the ventral cyst wall were removed under full-endoscopic guidance. The leg pain disappeared immediately after surgery, and he returned to work 20 days later. In this report, we describe the endoscopic views during surgery.

Keywords: *Full-Endoscopic Surgery; Discal Cyst; Indigo Carmine; Herniated Nucleus Pulposus*

Introduction

Herniated nucleus pulposus (HNP) is a common pathology of the lumbar spine and can cause leg symptoms. A discal cyst may also be present with the HNP, especially in young adults [1-4]. Various surgical methods for removing a discal cyst have been described [3-6]. Transforaminal full-endoscopic spine surgery (FESS) was initially introduced for removal of HNP [7,8]. FESS can be performed under local anesthesia and requires only an 8-mm skin incision; at present, it is the least invasive type of disc surgery available [9,10]. More recently, FESS has been used to treat spinal canal stenosis [11,12], discogenic pain [13] and type 1 Modic change [14]. With refinement of the technique, discal cysts can now be removed using FESS [3,4]. Under full-endoscopic guidance, the cyst wall can be ruptured and removed with the HNP fragment [3,4]. In this report, we demonstrate the significance of indigo carmine injection into a discal cyst during full-endoscopic surgery.

Case Presentation

A 28-year-old man presented with a complaint of left leg pain. He had a 5-year history of mild low back pain and a 2-month history of worsening leg pain that had not responded to conservative treatment. Magnetic resonance imaging (MRI) performed 1 month after onset of the leg pain revealed HNP, and he was referred to our hospital after a further month. Neurological examination revealed hypoesthesia

in the left L5 dermatome. Muscle weakness as found in the left extensor hallucis longus with a manual muscle test (MMT) grade of 3/5. Patellar and Achilles tendon reflexes were normal. The femoral nerve stretch test was negative bilaterally; however, the straight leg raise test was positive at 30 degrees on the left side. Visual analog scale scores for low back and leg pain were 6.2 and 8.7 out of 10, respectively. Based on these clinical and neurological findings, the patient was suspected to have HNP compressing the left L5 nerve root.

An MRI examination at the initial visit suggested HNP. Figure 1 shows the HNP at L4/5 on the left side on T2-weighted MRI. The signal intensity in the HNP was very high, suggestive of a discal cyst. Discography was then performed for a more accurate diagnosis. As shown in figure 2A, the contrast medium injected into the nucleus pulposus migrated into the HNP fragment (yellow arrow), strongly suggesting a discal cyst. Computed tomography discography clearly confirmed these findings (Figure 2B and 2C).

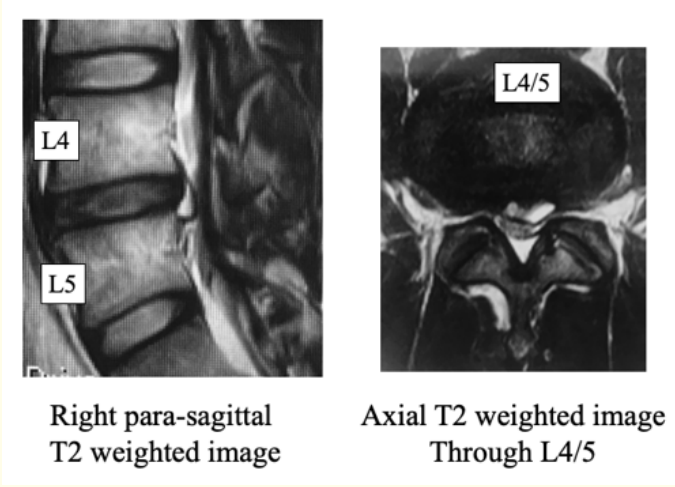

Figure 1: *Magnetic resonance images obtained before surgery. The herniated nucleus pulposus has a very high signal intensity, suggesting a discal cyst.*

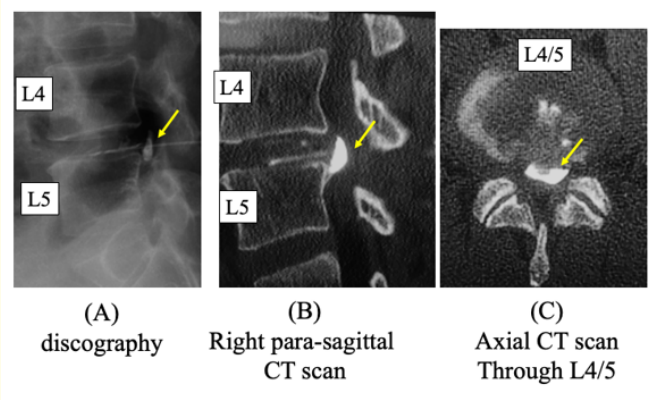

Figure 2: *Findings on discography and CT before surgery. (A) A discogram shows that the contrast medium injected into the herniated nucleus pulposus has migrated into the fragment (yellow arrow), strongly suggesting a discal cyst. (B, C) The findings are the same in (B) a right parasagittal CT scan and (C) an axial CT scan through L4/5. CT, computed tomography.*

The patient's pain continued despite 3 months of conservative therapy and was severe enough to interfere with his activities of daily living and ability to work. Minimally invasive transforaminal full-endoscopic excision of the discal cyst as well as the HNP under local anesthesia was planned. Before surgery, indigo carmine with contrast medium was injected into the disc space and confirmed to enter into the cystic space using a C-arm image intensifier. Foraminoplasty was performed first so that the cyst wall could be manipulated using a radio-pulse bipolar device.

Figure 3 shows a full-endoscopic view obtained just after foraminoplasty. Kambin's triangle was confirmed to be enlarged, exposing the lateral wall of the HNP. The wall was slightly stained blue by the indigo carmine dye. The radio-pulse bipolar device was then inserted in the epidural space (Figure 4, left panel) and used to rupture the cyst wall, which was confirmed when the blue indigo carmine dye was seen coming out of the cyst (Figure 4, right panel). The HNP fragments and the ventral cyst wall were removed under full-endoscopic guidance. The leg pain disappeared immediately after surgery. Three weeks later, manual muscle test of the extensor hallucis longus was normal. The patient returned to work 20 days after surgery. At that time, his visual analog scale scores for low back pain and leg pain were 1.0 and 0.0, respectively.

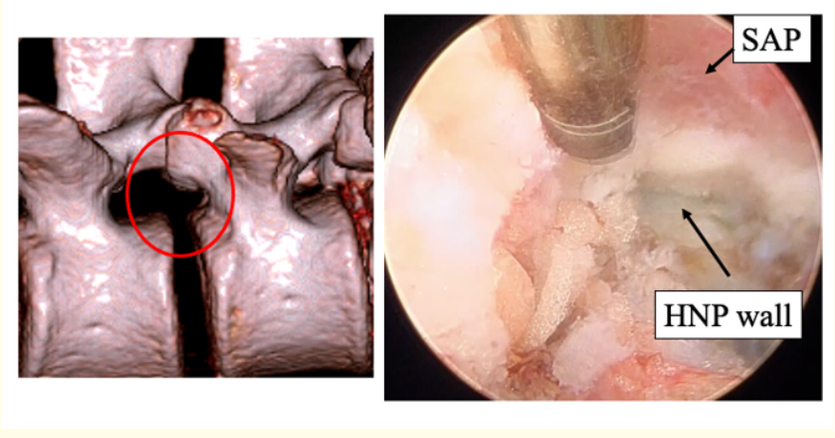

Figure 3: *Transforaminal full-endoscopic view after foraminoplasty. Kambin's triangle is enlarged, exposing the lateral wall of the HNP. The wall is stained slightly blue by the indigo carmine dye. HNP, herniated nucleus pulposus; SAP, superior articular process.*

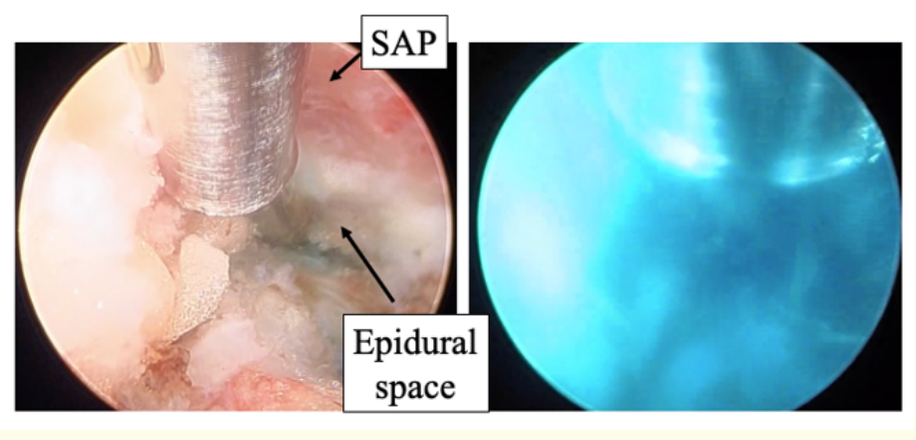

Figure 4: *Rupture of the cyst wall using a radio-pulse bipolar device. The device is inserted in the epidural space, where it is used to disrupt the cyst wall. The blue indigo carmine is then released from the cyst, confirming rupture of the cyst wall. SAP, superior articular process.*

Discussion

Since the first description of discal cyst by Chiba., *et al*. in 2001 [2], there has been many reports of this disorder in the literature. Various treatment methods have also been reported. Computed tomography-guided puncture is a minimally invasive method [15,16]; however, Kim., *et al*. have suggested, there is a problem with recurrence [17]. Microscopic [6], micro-endoscopic [5] and full-endoscopic [3,4] surgical removal has also been reported.

In this case, we opted to perform transforaminal FESS. It has been reported that discography can show the connection between a discal cyst and the corresponding disc [2]. Kwon., *et al*. [18] performed discography intraoperatively to make the cyst visible using a C-arm image intensifier. We had already confirmed preoperatively that there was a connection between the HNP and the cyst (Figure 2). Immediately before surgery. we injected indigo-carmine and contrast medium and confirmed that this fluid mixture entered the cyst. Later, during surgery, we could see the blue- fluid endoscopically, which confirmed rupture of the cyst wall.

There are several reports in the literature on full-endoscopic removal of a discal cyst [3,4,17,19]. Although indigo carmine was probably used during surgery in all cases, none of these reports discussed the value of this dye during surgery. As shown in figure 4, rupture of the cyst was easily confirmed by the blue color. Therefore, we recommend indigo carmine injection until it enters the cyst.

Unlike traditional surgery, FESS allows an early return to the patient's previous level of activity [20-22]. Takeuchi., *et al*. [20] reviewed 51 patients who underwent FESS and found that the mean interval until return to work was 32.1 days (range, 2 - 180). Our patient was returned to work 20 days after surgery. FESS appears to be the best surgical option for discal cyst in younger patients, especially in terms of early return to work.

Conclusion

Minimally invasive transforaminal full-endoscopic excision of the discal cyst under local anesthesia was explained in this technical note. Immediately before surgery, we injected indigo-carmine and contrast medium, so that rupture of the cyst wall was confirmed by release of the blue indigo carmine dye from the cyst. We emphasize that indigo-carmine injection into the cyst is very useful for understanding excision during full-endoscopic surgery.

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