

# Intracranial hypotension without postural headache after minimally invasive lumbar endoscopic surgery: A case report

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## Abstract

We report a patient presenting with chronic pain after artificial disk placement performed five years ago for herniation of the lumbar vertebral disk. He had recently undergone endoscopic minimally invasive transforaminal adhesiolysis for progressive radiculopathy. There were no symptoms, including headache, of postoperative complications until discharge except a complaint of general malaise. He presented with diplopia without classic postural headache to the emergency department on the ninth postoperative day after the transforaminal percutaneous endoscopic lumbar surgery. Emergent brain magnetic resonance imaging (MRI) revealed features of low intracranial cerebral pressure. Complete spine MRI revealed a left ventral dural defect and cerebrospinal fluid leakage over the lumbar region. He recovered after revision neurosurgery performed to repair the dural tear over the ventral sac using the Biodesign dural graft and fibrin glue. It is interesting to note that the patient did not present with typical postural pain, only non-specific fatigue, which cannot be diagnosed to a specific etiology during hospitalization and return visits. The dural tear manifested as intracranial hypotension and diplopia on the ninth day after the surgery. Hence, pain physicians should be aware of the potential risk and treatment of dural tears during lumbar transforaminal endoscopic surgery.

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## Key Words:

minimally invasive lumbar endoscopic surgery, dural tear, headache, diplopia

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## ***I*ntroduction**

Percutaneous endoscopic lumbar discectomy and microendoscopic discectomy are effective treatment modalities for radiculopathy associated with a herniated disk [1]. Transforaminal percutaneous endoscopic lumbar surgery, performed under local anesthesia, has been developed for the aging population [2]. This technique is applied to decompress the herniated disk or lateral recess stenosis in elderly patients for whom general anesthesia is not safe and/or effective [3]. The technique causes minimal surgical trauma, which results in fewer complications of the muscle-ligament complex and allows the stabilization of the spine. However, the surgical technique is associated with limitations and complications [4]. The risk of dural tears in percutaneous endoscopic lumbar discectomy has been reported as 1~20% according to the surgical type. If such tears remain undetected or are not properly closed, patients can experience postural headache, nausea, vomiting, and/or pain or tightness in the neck or back [5]. They even manifest as radicular pain, which is more serious than cerebrospinal fluid (CSF) leakage [6]. Undetected dural tears with nerve root herniation may cause severe neurological deficits. Additionally, retroperitoneal hematoma, intraoperative seizures, and thrombophlebitis can occur. The unique characteristics of each patient combined with a steep learning curve for a surgeon render the prevention or avoidance of such complications difficult [7].

## ***B*rief history**

Here, we present a case of unrecognized dural tear with symptoms of intracranial hypotension without postural headache after transforaminal percutaneous endoscopic lumbar surgery. A 51-year-old man presented

to the emergency department with the sudden onset of diplopia. His medical history comprised Type-2 diabetes mellitus, hypertension, and failed back surgery syndrome; all well-controlled with oral medications. Five years back, he underwent an open lumbar spine surgery for the treatment of L4-L5 intervertebral disk herniation by laminectomy and cage implantation. Post-laminectomy T2-weighted magnetic resonance imaging (MRI) showed transpedicular screw placement and discectomy with intervertebral cage placement in L4-L5 (Figures 1a and 1b). He had residual paresthesia over the left leg after the surgery. Due to progressive pain over the left L4 dermatome, he had undergone a transforaminal percutaneous endoscopic lumbar surgery for L4-L5 adhesiolysis due to progressive paresthesia over the left L4 dermatome, 9 days before visiting the emergency department. The postoperative course was uneventful, and he only had general fatigue and was discharged from the hospital 3 days back. Before the development of diplopia at night, he had consulted his general physician for non-specific symptoms such as malaise and fatigue that morning. The physician had prescribed prophylactic antibiotics considering the differential diagnosis of postoperative atelectasis, occult pneumonia, or surgical site infection. At the emergency department, his vital signs and blood profiles were within the normal range. The results of physical examination were unremarkable except for left-side sixth cranial nerve palsy and L4 dermatome paresthesia. We immediately performed brain MRI suspecting a stroke, but noted the presence of meningeal enhancement only, without any specific lesion. As meningeal enhancement in MRI is a sign of sudden intracranial hypotension due to CSF leakage after the spinal surgery, a complete spine MRI was performed. MRI showed a postoperative change in L4-L5 with a dural defect on the ventral side and CSF leakage in the left paraspinal region (Figures

2a and 2b). Epidural blood patch was not suggested because of the large size of the defect. Although visual impairment in such cases is reversible and was resolved in this case after conservative treatment such as hydration and bed rest, the patient could not work as a driver. He was referred to a neurosurgeon, and a second surgery was performed, where the dural defect of 1.5-cm diameter was sealed using the Biodesign dural graft and fibrin glue (Cook dura and Tisseel). He recovered and resumed his duties as a driver. A follow-up MRI performed 1.5 years after the revision surgery showed resolution of the CSF leakage (Figures 3a and 3b).

## ***D***iscussion

Transforaminal percutaneous endoscopic lumbar surgery performed under local anesthesia is a growing outpatient surgical technique. It is different from traditional lumbar spine surgeries such as open microdiscectomy under general anesthesia, which requires postoperative hospitalization, does not allow ambulation, and poses a higher risk to elderly patients. Percutaneous endoscopic lumbar discectomy is an outpatient surgery that does not require general anesthesia and allows early ambulation. However, the technique is associated with unrecognized and/or inadequately repaired intraoperative durotomies, which may lead to CSF leakage, pseudomeningocele, postural headache, and diplopia. Due to the small size of the operative field and continuous irrigation, distinguishing the CSF from the irrigating water after dural tear is difficult. Therefore, the identification of dural tears in transforaminal percutaneous endoscopic lumbar surgery is more difficult than that in traditional lumbar surgeries. Moreover, early ambulation could lead to sudden intracranial hypotension resulting from sixth cranial nerve palsy (the abducens nerve), as the nerve runs

a long course from the brainstem to the lateral rectus muscle [8].

A cohort study with 86,212 patients revealed that late-presenting dural tears (LPDTs) occur in every 2 of 1,000 patients who undergo spine surgery, with the majority of reoperations or readmissions occurring within the initial two postoperative weeks [9]. LPDT is a rare, but potential etiology for postoperative complications such as infection. Early postoperative identification of LPDT based on cardinal symptoms (for example, postural headache, nausea, and vomiting) may facilitate the institution of suitable interventions before the spread of infection. The reason for the absence of classic positional headache after the transforaminal percutaneous endoscopic lumbar surgery in this patient remains unknown. A previous study has shown that headache and nausea/vomiting are significantly more prevalent in younger female patients [10]. The postoperative analgesic medications could have masked the headache sign of intracranial hypotension, and could be the cause for delayed diagnosis in this patient.

Subdural hematoma, venous sinus thrombosis, or severe brain displacement are serious sequelae of misdiagnosed intracranial hypotension [11]. The misdiagnosis of spontaneous intracranial hypotension is frequent in the emergency department [12]. According to the results of a cohort study with 797 patients that had undergone spinal percutaneous biportal endoscopic surgery, 10% patients showed unsuccessful outcomes. The incidences of hematoma, incomplete surgery, and dural tear are significantly higher in the first 50 surgeries of a particular surgeon due to the inadequate surgical experience [13]. The pain interventionist should bear this in mind and inform the patient of the rare but severe complications of the surgery, before performing the procedure, decrease the risk of intraoperative dural tear, and prevent the delay in diagnosis of dural tear during

hospitalization. No difference in the incidence rate and outcome were observed for incidental durotomy between open and tubular revision microdiscectomy. Most durotomies are repaired only with an absorbable fibrin sealant patch, which is an effective strategy for dural repair [14].

## Conclusion

The possibility of unintended dural tear should be considered in patients after minimally invasive pain interventions, especially revision surgeries, even without any symptoms. MRI is an indispensable diagnostic modality for diagnosis in such cases. Various types of treatment procedures such as epidural blood patch and surgical repair have been suggested for the treatment of dural tear. We reported a patient with dural tear presenting with diplopia without classic postural headache in the emergency department on the ninth postoperative day after transforaminal percutaneous endoscopic lumbar surgery. He recovered after revision neurosurgery performed to repair the dural tear over the ventral sac by the Biodesign dural graft and fibrin glue.

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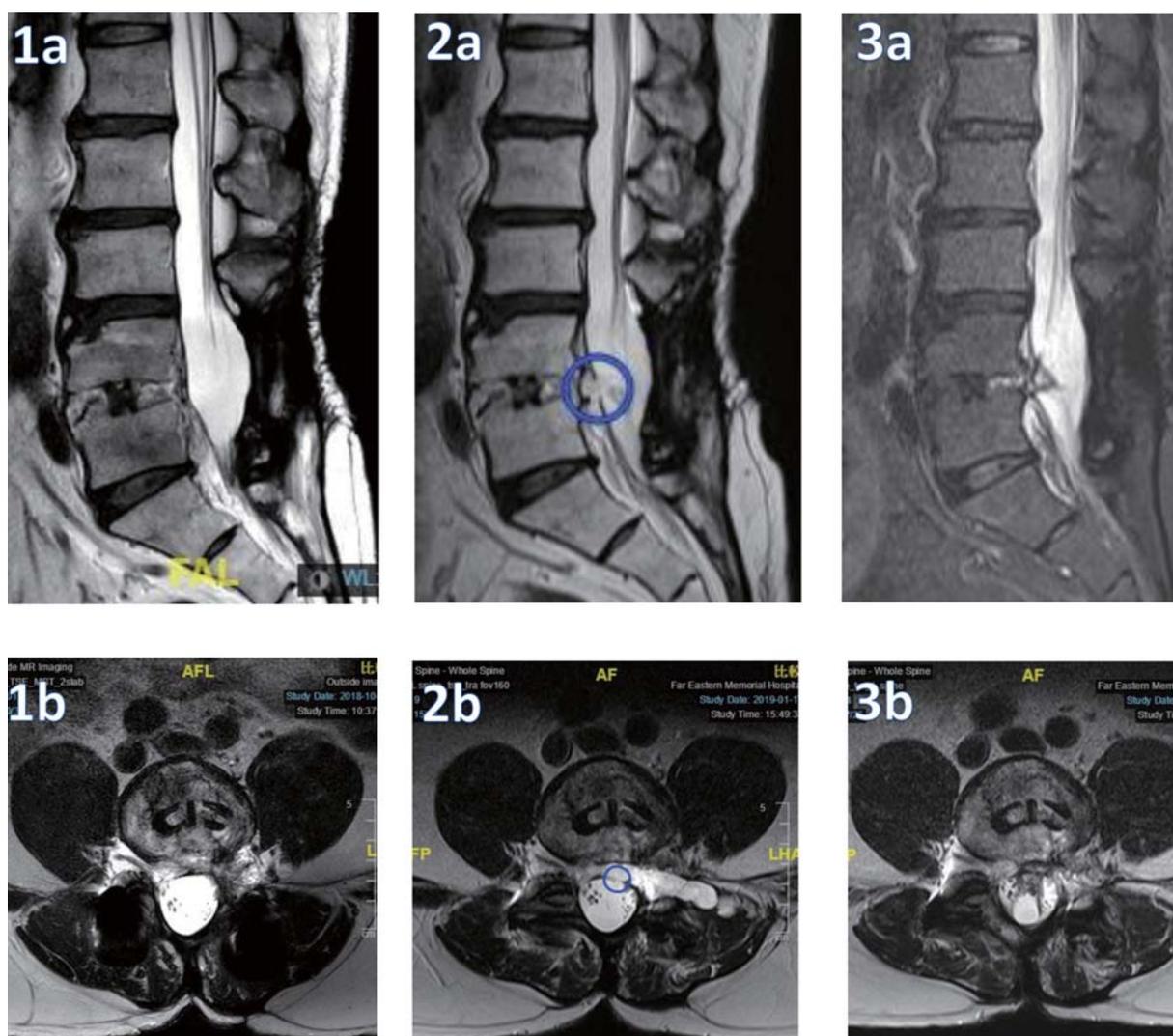


Figure 1a: Baseline T2-weighted magnetic resonance image of the longitudinal view of the lumbar spine showing evidence of post-laminectomy with transpedicular screw placement and diskectomy with intervertebral cage placement in L4-L5.

Figure 1b: Baseline T2-weighted magnetic resonance image of the transverse view of the L4-L5 lumbar spine showing evidence of post-laminectomy with transpedicular screw placement and diskectomy with intervertebral cage placement in L4-L5.

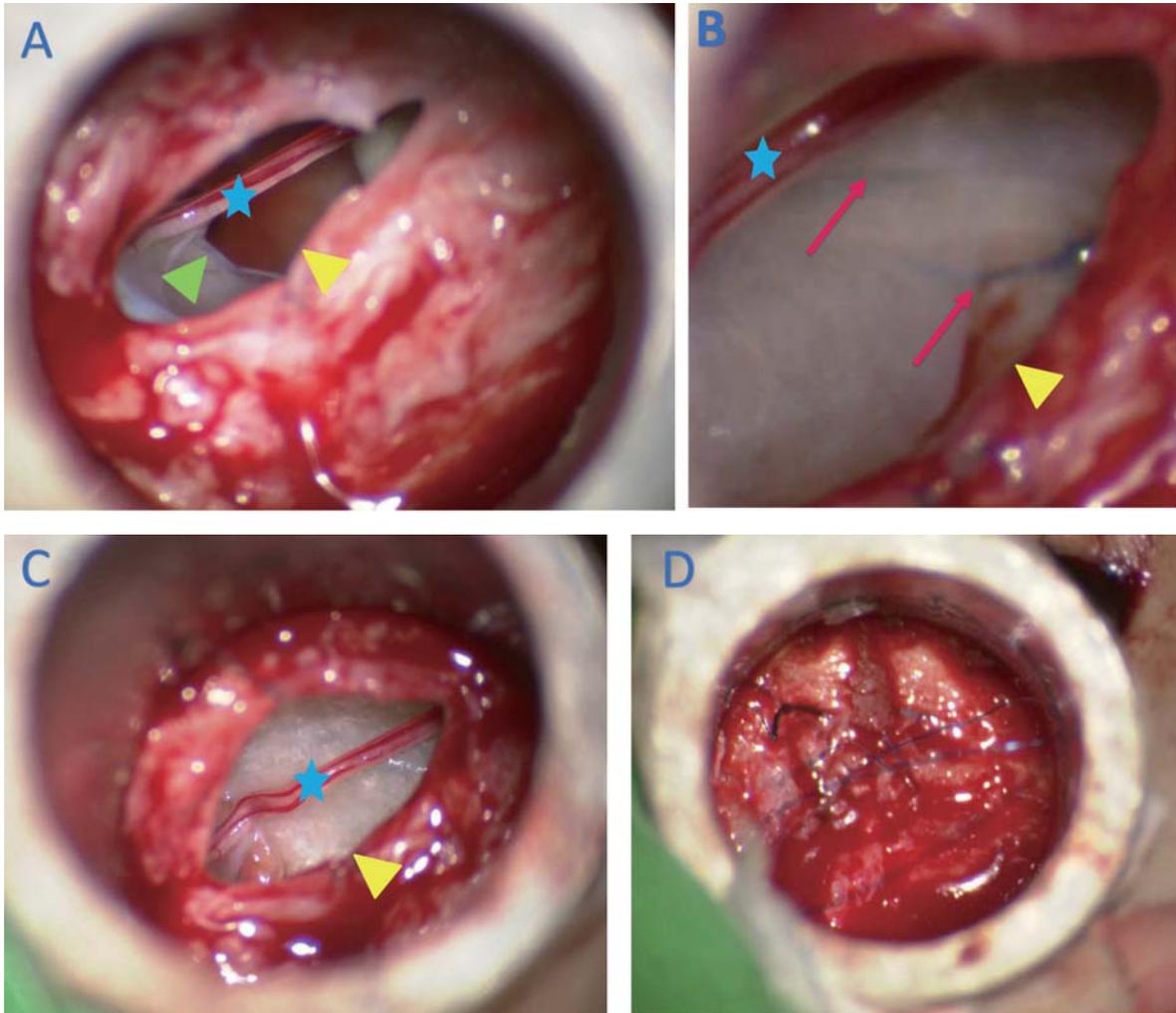
Figure 2a: T2-weighted magnetic resonance image of the longitudinal view of the lumbar spine at the emergency department showing a postoperative change in L4-L5 with a dural defect on the ventral side.

Figure 2b: T2-weighted magnetic resonance image of the transverse view of the L4-L5 lumbar spine at the emergency department showing a postoperative change in L4-L5 with a dural defect on the ventral side and cerebrospinal fluid leakage in the left paraspinal region.

Figure 3a: T2-weighted magnetic resonance image of the longitudinal view of the lumbar spine after revision surgery showing resolution of the cerebrospinal fluid leakage.

Figure 3b: T2-weighted magnetic resonance image of the transverse view of the L4-L5 lumbar spine after revision surgery showing resolution of the cerebrospinal fluid leakage.

L4-L5 lumbar spine after revision surgery showing resolution of the cerebrospinal fluid leakage.



L4-L5 lumbar spine after revision surgery showing resolution of the cerebrospinal fluid leakage.

A: Microendoscopic surgical view of the patient after a 1-cm longitudinal incision of the thecal sac on the dorsal side (yellow point) enabling the visualization of the ventral dural defect (green point) after cerebrospinal fluid drain-out. The blue star indicates a spinal nerve.

B: The ventral part of the dural defect was repaired using two 6-0 polyglactin 910 sutures (red arrow).

C: The ventral part of the dural defect was sealed

using the Biodesign dural graft and fibrin glue.

D: The dorsal side of the incision was closed using 6-0 polyglactin 910 sutures.

## 微創疼痛治療後無姿勢性頭痛的顱內低腦壓病例報告

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我們報告一個五年前因為腰椎椎間盤脫垂行腰椎第四五節人工椎間盤置入手術後長期因為左腳腰椎第四節神經到足部的輻射痛而在疼痛科門診追蹤的慢性疼痛病人，由於病人症狀加劇且有管制藥物濫用的問題，2018年11月經過評估再行內視鏡微創經椎孔神經沾黏解離手術，術後到出院都沒有任何姿勢性頭痛症狀，只有在術後第九天在門診固定回診時，有全身疲憊的主訴，以疑似感染給予抗生素治療，就在當晚因為複視而到急診就醫，緊急的腦部磁振造影發現有顱內低腦壓的特徵，接著的全脊椎磁振造影發現於腰椎第四五節的左腹側硬脊膜有破裂與腦脊髓液的滲漏，雖然病人在保守治療後複視症狀即緩解，但無法恢復駕駛工作，於是會診神經外科醫師施行硬脊膜修補手術，順利修補完成後於術後追蹤皆正常。我們認為病人沒有典型姿勢性疼痛，只有非特異性的疲憊，無法在住院中與回診時被辨認，而在術後第九天直接以顱內低腦壓與複視來表現，值得疼痛相關醫師注意腰椎孔鏡手術的硬脊膜破裂風險及處理方法。

**關鍵字：**微創腰椎孔鏡手術、硬腦膜破裂、頭痛、複視

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