

Full-endoscopic interlaminar discectomy for the treatment of a dorsal migrated thoracic disc herniation

Case report

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Abstract

Rationale: Thoracic disc herniation (TDH) is an infrequent spinal disease and difficult to treat well. Various surgical approaches and procedures were introduced in many literatures. The authors report a patient with dorsal migrated TDH compressing the spinal cord at T10-11 level.

Patient concerns: A 65-year-old male patient presented with complaints of severe paresthesia of both legs and progressive motor weakness for 1 week.

Diagnoses: Magnetic resonance imaging (MRI) of the thoracic and lumbar spine revealed TDH and migration of dorsal side on spinal cord at T10-11 level.

Interventions: Successful decompressive surgery was performed through a posterior interlaminar approach using only endoscopic instruments.

Outcomes: After the operation, patient's symptoms, paraparesis and paresthesia, immediately improved.

Lessons: The successful results of this case suggest that full endoscopic laminotomy and discectomy may be an attractive minimally invasive surgical technique for treating TDH with dorsal migrated fragments.

Abbreviations: ESS = endoscopic spine surgery, MED = microendoscopic discectomy, TDH = thoracic disc herniation, VATS = video-assisted thoracoscopic surgery.

Keywords: dorsal migration, full endoscopic surgery, interlaminar approach, minimally invasive spine surgery, thoracic disc herniation

1. Introduction

Disc herniation at thoracic spine is an uncommon spinal disease. The surgical results of thoracic disc herniation (TDH) are less satisfactory than those of lumbar and cervical disc herniation. Many articles about the surgical techniques and results have already been published.^[1–14] The conventional surgical methods include posterior approach requiring wide exposure and extensive

resection of the facet complex and laminar,^[4,5,14] anterolateral retropleural approach using thoracotomy.^[3,15] The minimally invasive surgical techniques include video-assisted thoracoscopic approach for discectomy^[12], microendoscopic discectomy (MED), and transforaminal endoscopic foraminoplasty and discectomy.^[6,8–10,16–18] This article reports a case of myelopathy from dorsal migrated TDH that was successfully removed by full-endoscopic interlaminar thoracic discectomy. The successful results of this surgical technique suggest that full-endoscopic interlaminar thoracic discectomy can be used to treat dorsal migrated TDH without complications.

2. Case report

The patient has provided documented informed consent for publication of the case. A 65-year-old male patient presented with complaints of severe paresthesia of both legs and progressive motor weakness for 1 week. A neurological examination revealed symmetrically increased knee and ankle jerks and motor weakness of G2 of both whole lower extremities. This patient had a history of discectomy in lumbar spine. He had medical history of arrhythmia, hypertension, and angina. X-ray showed degenerative scoliosis in lumbar spine (Fig. 1). Magnetic resonance imaging (MRI) of the thoracic and lumbar spine revealed TDH and migration of dorsal side on spinal cord at T10-11 level (Fig. 2). A computed tomographic scan revealed no calcification at index level. Under general anesthesia, the patient

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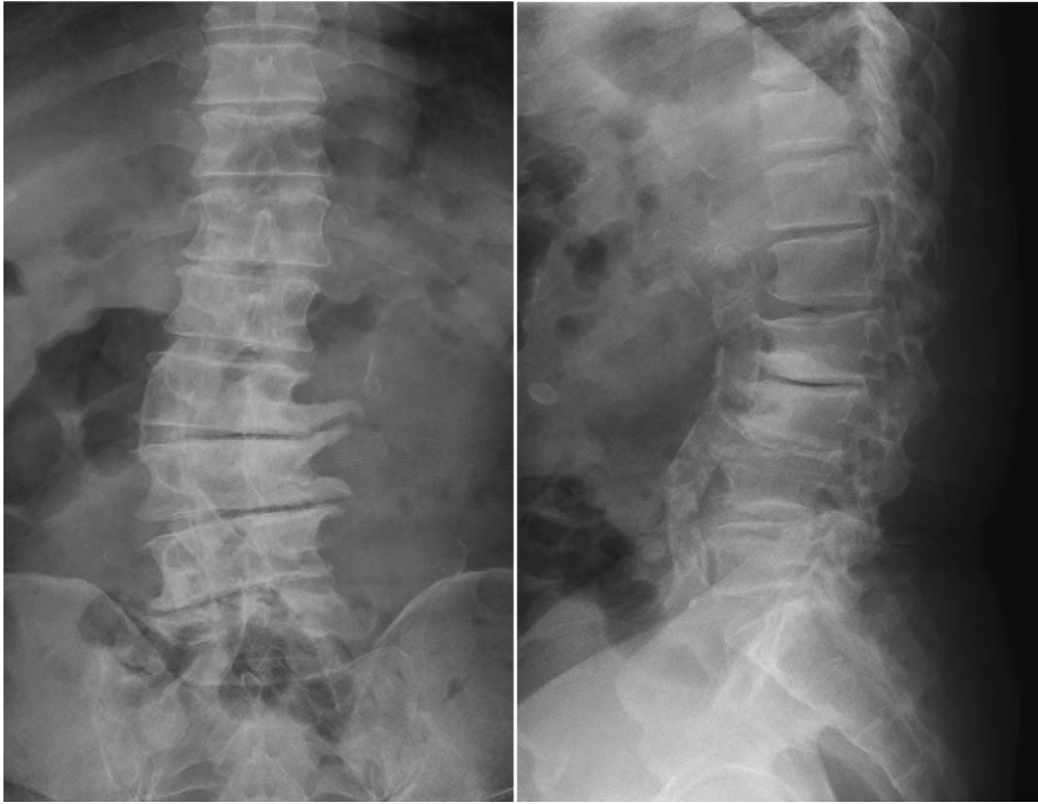


Figure 1. X-ray shows degenerative scoliosis in lumbar spine.

was placed in the prone position. Intraoperative neuromonitoring was evaluated during the surgical procedure. The T10-11 level was marked by drawing the lines under the C-arm guidance. The midline and affected disc level were marked with a marking pen. The skin entry point was about 1 to 2 cm from the midline. After checking exact level, skin and fascia incision was made; after the opening of the lumbodorsal fascia with a scalpel, an obturator was introduced under fluoroscopic image guidance. The obturator was put over the T10 lamina (Fig. 3A). Then, working

cannula was inserted along the obturator in the end. Anteroposterior and lateral fluoroscopic images were recommended to confirm final location of endoscopic cannula with a diameter of 10 mm. Finally, this working cannula was put in a fixation with connection to the cannula holding arm (Fig. 3B). A 10-mm outer diameter beveled cannula was placed at interlaminar space. Laminotomy was then done using endoscopic diamond drill, tip-control burr, and Kerrison punch under the C arm and endoscope control with continuous irrigation system (Fig. 4A). The

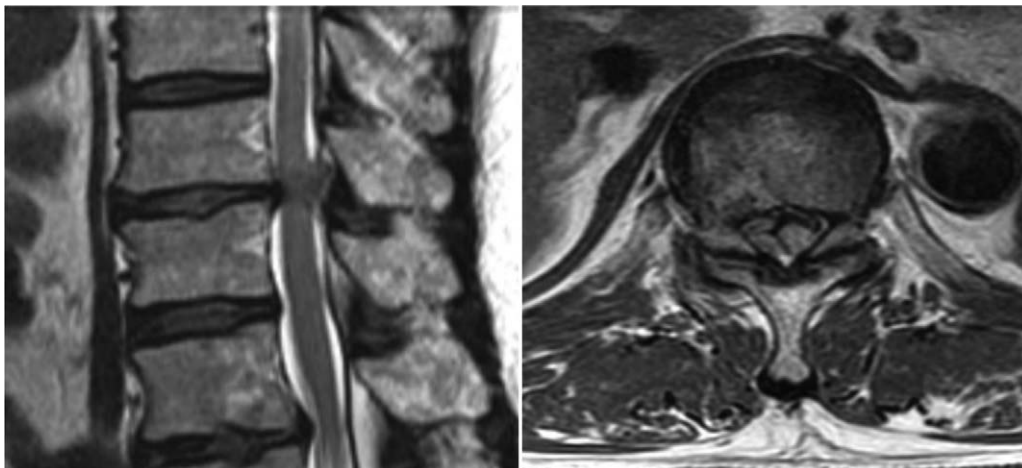


Figure 2. Magnetic resonance imaging (MRI) of the thoracic spine reveals disc herniation and migration of dorsal side on spinal cord at T10-11 level.

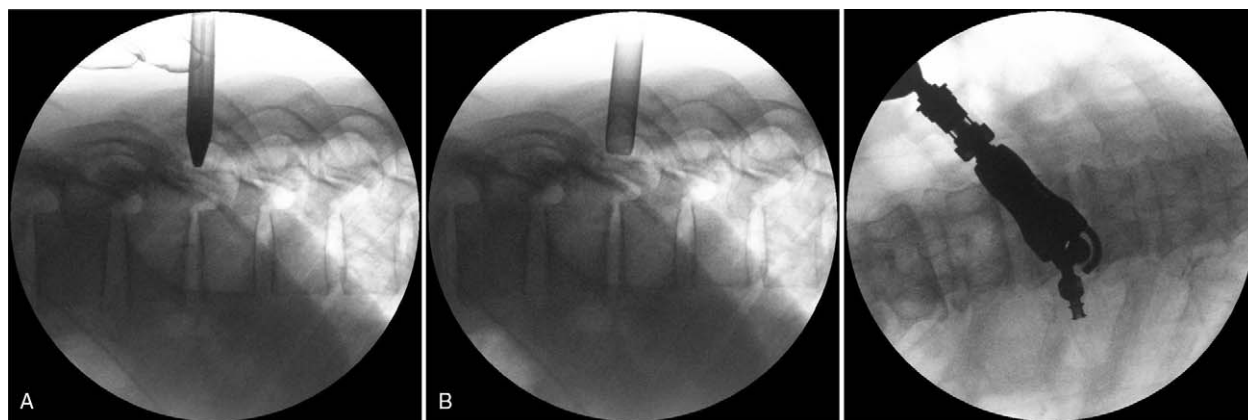


Figure 3. (A) Placement of obturator over lamina under C-arm guidance. (B) The working cannula is put over the lamina. This working cannula is fixed with connection to the cannula holding arm.

endoscope has working channel with a diameter of 5.7 mm and 20° angle view. Most of the endoscopic instruments and optic systems were supported by WOLF (Richard Wolf GmbH, Knittlingen, Germany). After clearing of endoscopic view, the surgeon could find the migrated disc fragments on dorsal side of thoracic spinal cord, which were removed by endoscopic forceps and right-angled articulated hook (Fig. 4B; Supplemental Video 1, <http://links.lww.com/MD/C982>). After enough laminotomy and discectomy, surgeon could see well-decompressed thoracic spinal cord (Fig. 4C). Hemostatic agent (FloSeal, Baxter, CA) was used to control minor epidural bleeding. Motor evoked potential was evaluated again after surgical procedure. However, there was no definite change after removal of ruptured disc fragments. The working channel and endoscope were removed, and the operation wound was closed by usual fashion. No drain was inserted. After operation, severe paresthesia and tingling sensation along lower extremities immediately subsided. The thoracic cord was successfully decompressed, and the result was confirmed by postoperative MRI images on the next day of surgery (Fig. 5). Motor grade improved from G2-3 to G3-4 with mild numbness and tingling sensation (Supplemental Video 2, <http://links.lww.com/MD/C982>). MRI taken after postoperative 6 weeks at the outpatient clinic demonstrated successful decompression of the spinal cord (Fig. 6).

3. Discussion

TDH is relatively rare than lumbar disc herniation or cervical disc herniation, and more difficult to treat well. Myelopathy is a common clinical manifestation of TDH,^[1] which should be treated by decompression with or without instrumentation. Many kinds of surgical approaches to treat TDH have been introduced, including anterior,^[3,15] posterior,^[4,5,14] posterolateral, and circumferential methods.^[1] The lateral extracavitary approach or costotransversectomy,^[2,4,7] which is classified as conventional posterolateral surgical method, can be one of the surgical options for the removal of TDH in this patient. Other conventional method via anterior approach, open thoracotomy, can also be done. However, these conventional open surgical methods have relatively high morbidity associated with approaches and mortality in patients with medical comorbidities. The posterior approach including total laminectomy and facetectomy with instrumentation is other conventional method

familiar with spine surgeons, but, it usually require the retraction of spinal cord for the removal of ruptured disc fragments, which could induce and aggravate ischemic condition of thoracic spinal cord. If the ruptured disc fragments are large and located in the central area, the removal of disc herniation is quite difficult without retraction of spinal cord, which may pose a moderate-to-high risk of permanent neurologic deficit.^[11,14,15] It is why some surgeons tried to remove TDH via transdural approach.^[11] Otherwise, some kinds of minimally invasive spinal surgery have been adopted for the removal of herniated disc fragments in thoracic spine and have become an increasingly common and popular surgical option to manage TDH.^[6,8-10,12,13,16-18] Among the minimally invasive spinal surgery in thoracic spine, video-assisted thoracoscopic surgery (VATS) is “keyhole surgery” and could provide enough exposure and visualization of the surgical target. However, VATS for discectomy in thoracic spine still have major technical challenges to most spine surgeons. Contrary to VATS, MED, which was introduced in 1997, has become popular in spinal surgery.^[19] This was also introduced in thoracic discectomy by some surgeons.^[6,7] Through this technique, surgeons can minimize bony resection and damage to paraspinal back muscles to access TDH. Recently, there has been great leap of evolution in endoscopic spine surgery (ESS) for the treatment of lumbar disc herniation.^[20] Literature shows that ESS already has had much evidence for the treatment of lumbar disc herniation in various types and locations. So, some articles about transforaminal ESS have been adopted and published in thoracic spine.^[16,17] However, even though transforaminal approach have a few advantages – less damage to back muscles compared with MED, smaller incision, no need to resect facet joint, less postoperative pain, less blood loss, etc – in thoracic spine, it still has many cons – steeper learning curve than transforaminal ESS in lumbar spine, technically challenging to remove large or sequestered disc herniation just like our case, or TDH combined with spinal stenosis; it is an unfamiliar approach than interlaminar procedure. Besides these, the endoscopic working cannula could not pass the intervertebral foramen in most thoracic level because of its narrow window. So, foraminoplasty technique to make wider foramen is mandatory for transforaminal endoscopic thoracic discectomy. More abundant and larger epidural vessels of thoracic spine than lumbar spine also make it more difficult for endoscopic procedure. The thoracic spinal cord compressed by TDH is very vulnerable to

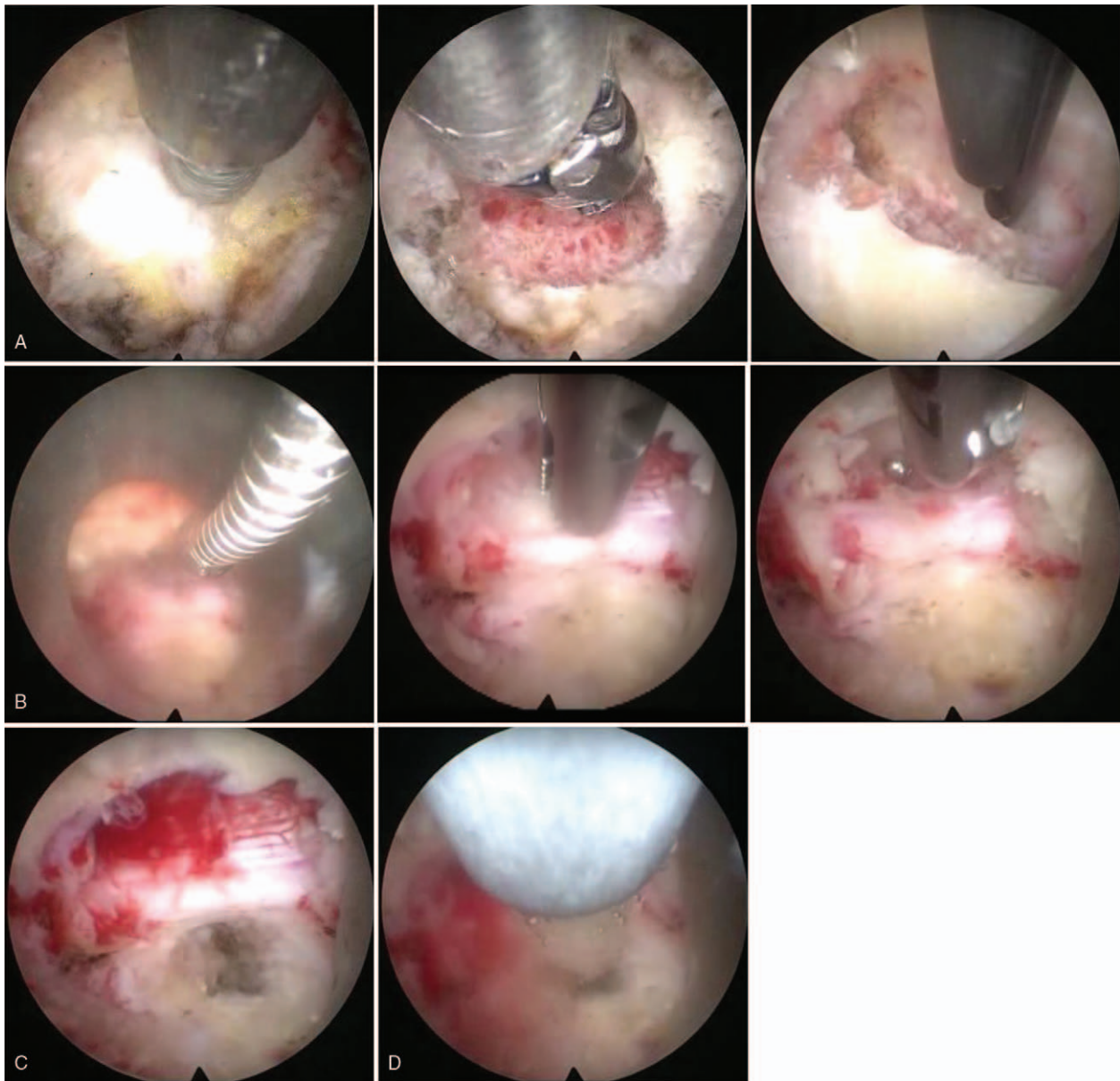


Figure 4. (A) Laminotomy was done using endoscopic diamond drill, tip-control burr, and Kerrison punch. (B) Migrated disc fragment on dorsal side of thoracic spinal cord were removed by endoscopic forceps and right-angled articulated hook. (C) After sufficient laminotomy and discectomy, well-decompressed thoracic spinal cord was observed. (D) Hemostatic agent (Flo Seal, Baxter, CA) was used to control minor epidural bleeding.

any minor trauma during the surgery; therefore, care and attention is strictly mandatory during the surgical procedure. For the successful surgical outcomes, this interlaminar approach includes laminotomy first and step-by-step removal of dorsally migrated ruptured fragments, and then, discectomy of ventral protruded disc that are ideal serial surgical procedures in our case. This interlaminar thoracic discectomy is certainly not a novel technique based on endoscopic surgical practice. We make a description a modified adoption of the full-endoscopic interlaminar discectomy that is used to treat the disc herniation in lumbar spine.^[21,22] However, this technique may be the first technical note of full-endoscopic interlaminar thoracic discectomy for the treatment of TDH. Although there have been numerous articles of full-endoscopic interlaminar discectomy in

lumbar spine, up to date, there has been no report of full-endoscopic interlaminar discectomy for the treatment of TDH. The reason may be due to limited endoscopic working channel (4.1 mm) of Vertebri 2 that is limited space for drills, Kerrison punch, etc, to do laminotomy. Other reasons may be the incidence of symptomatic TDH that is not common and most surgeons prefer the conventional surgical method than endoscopic surgery. Recently, new-generation spinal endoscope (Vertebri stenosis) that could provide wider endoscopic working channel with a diameter of 5.7 mm is enough for laminotomy and discectomy using 3.5-mm diameter endoscopic drill, tip-control burr, large Kerrison punch, flexible forceps, right-angled hook, and scissors. These well-developed endoscopic instruments enable surgeon to perform endoscopic procedures, not only

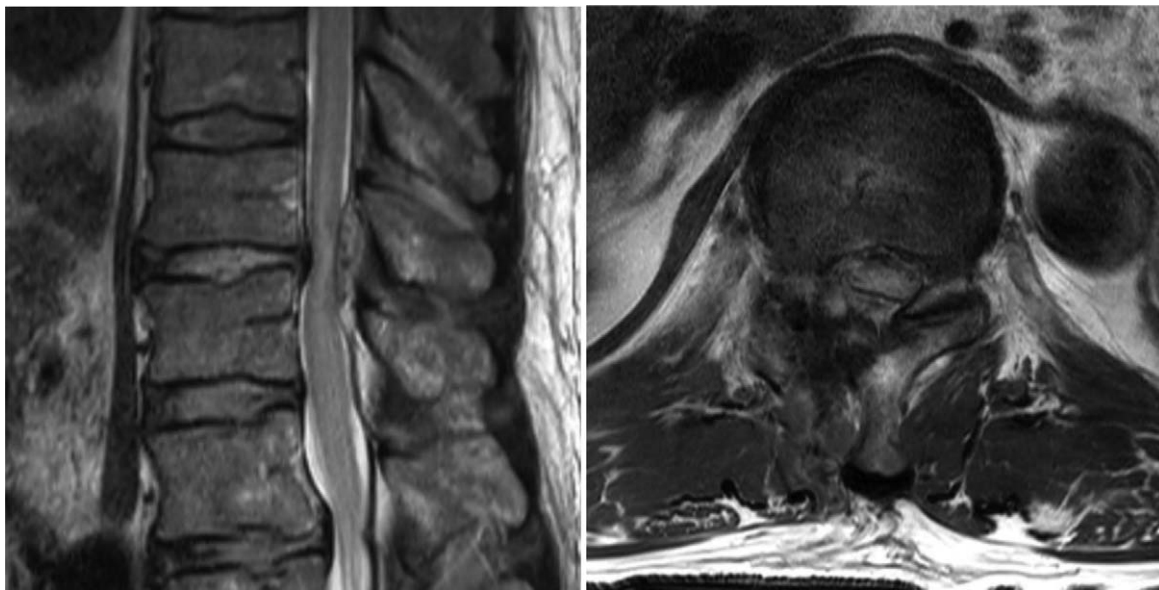


Figure 5. Postoperative magnetic resonance imaging (MRI) shows successfully decompressed thoracic spinal cord.

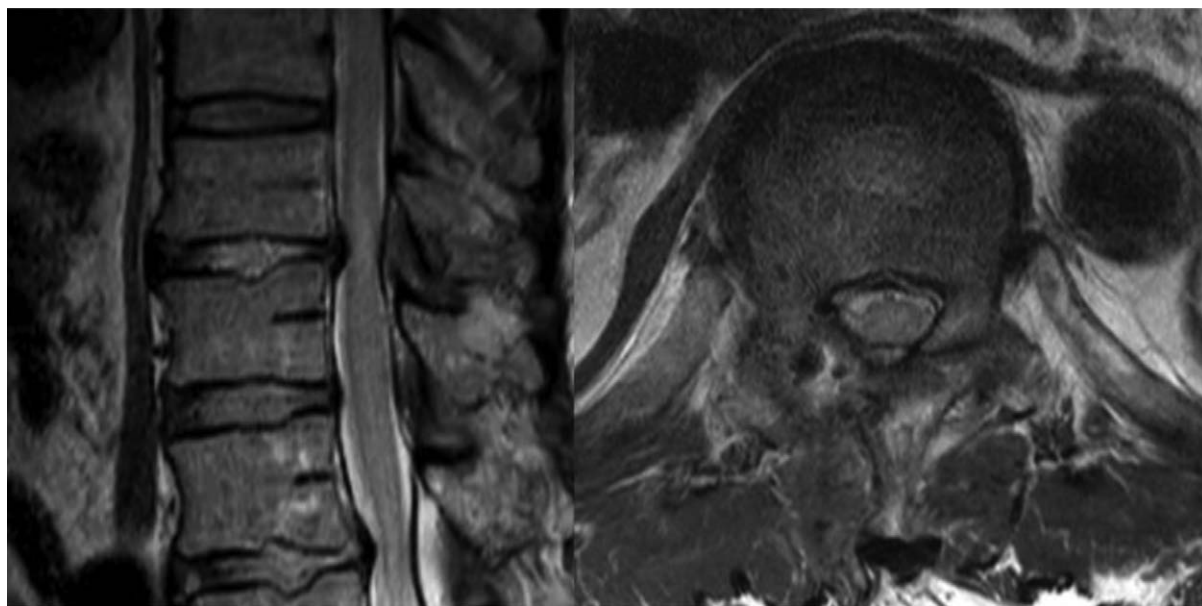


Figure 6. Magnetic resonance imaging (MRI) taken after postoperative 6 weeks demonstrated successful decompression of the spinal cord.

discectomy for disc herniation but also decompression for spinal stenosis in various spinal diseases just like this case with dorsally migrated TDH. We performed laminotomy using endoscopic diamond drill, tip-control burr, and Kerrison punch under the 5.7-mm full-endoscopic view. Then, we removed dorsal migrated fragments using right-angled hook, semiflexible forceps. After laminotomy and removal of dorsal migrated fragments, we could see restored pulsation of thoracic cord. The subsequent discectomy and annuloplasty were done for the ventral side decompression. It took about 95 minutes from skin to skin, which was longer time than full-endoscopic interlaminar discectomy in lumbar spine. We think that surgical time may be decreased after

the experience of a few cases. Therefore, authors in this report suggest that full-endoscopic interlaminar thoracic discectomy can be one of the minimally invasive surgical options like full-endoscopic interlaminar discectomy in lumbar spine.

Author contributions

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Validation: Jin-Sung Kim.

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Writing – review & editing: Jung-Woo Hur.

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