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## CASE REPORT

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# A Rare Case of Anterior Transdural Thoracic Spinal Cord Herniation: Magnetic Resonance Imaging Features

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### ABSTRACT

*Idiopathic transdural thoracic spinal cord herniation is a rare cause of thoracic myelopathy. The cord herniates or prolapses through an anterior or anterolateral defect of the dura mater. Magnetic resonance imaging is the gold standard investigation for this condition as the imaging features are diagnostic. We report on a patient with thoracic myelopathy due to idiopathic transdural thoracic spinal cord herniation. Radiologists should be able to recognise this condition as increased awareness may result in early diagnosis. To the authors' knowledge, this is the first report of idiopathic transdural thoracic spinal cord herniation in Hong Kong.*

*Key Words: Dura mater; Hernia; Magnetic resonance imaging; Spinal cord diseases; Thorax*

## 中文摘要

### 經硬脊膜胸段脊髓前疝的罕見病例：磁共振成像特點

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特發性經硬脊膜胸段脊髓疝是一種胸脊髓病變的罕見病因。脊髓通過前方或前外側的硬腦膜缺損疝出或脫垂。由於此症的影像特徵具診斷意義，磁共振成像是黃金標準檢查。本文報告一宗特發性經硬脊膜胸段脊髓疝為誘因的胸脊髓病變。放射科醫生應能識別該徵象，增強意識可獲早期診斷。據筆者所知，這是香港特發性經硬脊膜胸段脊髓疝的首例報告。

### INTRODUCTION

The first case of idiopathic spinal cord herniation was first reported in 1974.<sup>1</sup> The thoracic cord is the only affected spinal location to date.<sup>2</sup> There have been about 150 cases reported in the literature. There is increasing diagnosis of the condition due to the increasing application of magnetic resonance imaging (MRI).<sup>3</sup> MRI is diagnostic if there is focal ventral

displacement and angulation of the thoracic spinal cord, with herniation of the cord through the dural defect. There may also be associated cord atrophy. Failure to recognise these characteristic features could result in delayed diagnosis, which is commonly reported in the literature.<sup>2</sup> This report is of a patient with typical MRI features, which are presented to familiarise radiologists with this condition.

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## CASE REPORT

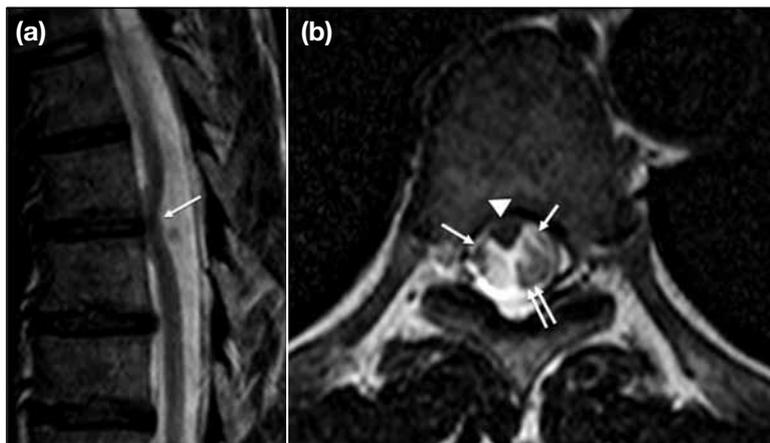
A 42-year-old man presented in May 2010 with progressive bilateral generalised lower limb weakness, which was more severe on the right side, for 2 years and walking difficulty for 6 months. There was associated burning sensation in the left abdominal wall and left lower limb below the umbilicus. The patient had no history of trauma or previous surgery to the spine and his drug history was unremarkable. Physical examination only revealed mild weakness (grade 4/5) on right knee flexion and a mild increase in right ankle conus. Otherwise, the power and sensation of both lower limbs were normal. Clinically, this was suggestive of Brown-Séquard syndrome. MRI showed anterior kinking of the spinal cord in the sagittal plane (Figure 1a). The spinal cord herniated through the right ventrolateral dural sac at the T6/7 level in axial section (Figure 1b). There was associated slight cord atrophy. The features were compatible with cord herniation through a thecal sac defect. No syrinx or intramedullary or extramedullary lesions were present. The dural defect was confirmed intraoperatively and repaired via T6/7 laminectomy and right costotransversectomy. The herniated cord was reduced successfully. The limb power of the patient subsequently improved although

the numbness persisted. The 6-month postoperative MRI revealed resolution of the anterolateral cord herniation (Figure 2). Mild postoperative change to the spinal cord with mild oedema was present.

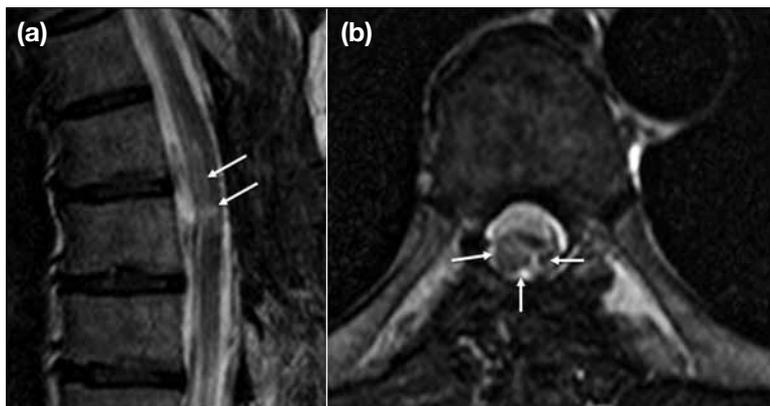
## DISCUSSION

Idiopathic thoracic cord herniation is more common among women than men, with a ratio of 3:2, and middle-aged individuals (mean age, 49 years; range, 22-71 years).<sup>2,4</sup> Most cases (>80%) occur at the T4-7 level, with the cord usually herniating through an anterior or anterolateral dural defect.<sup>2,4</sup> Both sides are involved equally.<sup>3</sup>

The symptoms are usually non-specific, which is a diagnostic challenge for clinicians. Patients usually present with Brown-Séquard syndrome (ipsilateral hemiparesis with loss of proprioception and vibratory sensation, and contralateral loss of pain and temperature sensation) as for this patient.<sup>2</sup> There may also be gait disturbances or faecal / urinary incontinence.<sup>2,4</sup> The symptoms are usually long-standing (1-12 years) with slowly progressive neurological dysfunction.<sup>2</sup> All patients, including this patient, had symptoms for more than 2 years before diagnosis.<sup>2</sup>



**Figure 1.** Magnetic resonance images of the patient with idiopathic spinal cord herniation. (a) A sagittal T2-weighted image shows anterior kinking of the thoracic spinal cord (arrow) at the T6/7 disc level; there is increased cerebrospinal fluid space dorsal to this segment of the thoracic cord, no intradural cystic lesion is present dorsal to the deviated cord, and the cord is slightly atrophic, and (b) the corresponding axial T2-weighted image shows deviation of the cord anteriorly and slightly lateral to the right side; the cord (arrowhead) herniates through the dural sac (arrow) at the right ventrolateral region. The features are compatible with cord herniation. There is flow void artefact (double arrows) posterior to the spinal cord suggestive of free cerebrospinal fluid flow. No evidence of intradural arachnoid cyst or extradural mass posterior to the spinal cord is noted.



**Figure 2.** Postoperative magnetic resonance images: (a) a sagittal T2-weighted image shows restoration of the normal cord position; the mild increase in signal intensity (arrows) within the cord is suggestive of postoperative change, and slight atrophy of the cord is noted, and (b) the corresponding axial T2-weighted image shows the normal position of the cord within the dural sac (arrows).

Idiopathic thoracic cord herniation results from a dural defect of unknown origin, and is different from herniation due to trauma or operation, which can be diagnosed by history and imaging.<sup>5-8</sup> It has been postulated that previous occult minor trauma or a remote traumatic event might account for the dural defect.<sup>2</sup> However, several authors have suggested that an underlying congenital abnormality of the dura mater (such as duplication of the dura with the cord herniating between the two layers) may be another explanation.<sup>2,3,9</sup> In a recent report, Brus-Ramer and Dillon<sup>10</sup> suggested that unrecognised trauma by a herniated disc or endplate osteophytes on the anterior dural surface resulted in a dural defect. In conjunction with congenital absence, tear, or loosening of the dentate ligaments, this may allow the cord to move through the defect and induce adjacent tissue reaction.<sup>2</sup> The cord may be compromised as a result of adhesion, distortion, or vascular impingement. Negative pressure in the thoracic extradural space and the proximity of the heart amplifying cerebrospinal fluid (CSF) pulsations may account for the thoracic symptoms.

Idiopathic thoracic spinal cord herniation can be diagnosed by MRI, conventional thoracic myelography, and computed tomographic myelography. Nowadays, MRI is the usual imaging technique used to diagnose this disorder. On sagittal sections, the cord kinks anteriorly in a C-shaped manner with dorsal expansion of the posterior subarachnoid spaces.<sup>2-4</sup> On axial sections, the cord deviates either anteriorly or anterolaterally and attaches to the ventral dura mater with no intervening CSF.<sup>2-4</sup> The cord herniates through the dural defect, showing up as an extradural mass-like lesion with signal intensity similar to cord.<sup>2-4</sup> These features are usually limited to one to two segments in the thoracic spine, usually between T4 and T7.<sup>9</sup> There is occasional associated cord atrophy and increased T2-weighted signal intensity as in this patient.<sup>2</sup> In some cases of suspected idiopathic spinal cord herniation, only focal ventral cord displacement and angulation can be observed without explicit demonstration of a segment of cord parenchyma extending outside the dura mater.<sup>8</sup> If the condition is sufficiently long-standing, there could be scalloping of the posterior thoracic vertebral body.<sup>2</sup> Phase-contrast cine MRI and conventional myelogram can demonstrate the free subarachnoid CSF movement posterior to the herniated segment and absence of filling defect in order to exclude a dorsal intradural filling defect such as that caused by an arachnoid cyst.<sup>2-4,9</sup> On myelogram, attachment of the cord to the ventral dura

with no intervening CSF would be demonstrated.<sup>3,9</sup>

Missed diagnoses and misdiagnoses are common for this condition.<sup>2</sup> The differential diagnoses include intradural arachnoid cyst, dural adhesion, extradural mass with cord compression, and disc herniation with cord tethering. However, careful scrutiny of the MRI scans will reveal no intradural or extradural lesions. Also, disc herniation with cord tethering could be confidently identified and excluded by MRI.

Surgery is the mainstay of treatment.<sup>2</sup> Surgical reduction of the herniated segment and dural repair have been shown to improve symptoms, even in patients with chronic dysfunction.<sup>2</sup>

## CONCLUSION

The MRI appearances of cord herniation are characteristic and specific for diagnosis of idiopathic spinal cord herniation. Radiologists should be aware of this entity and suggest the diagnosis preoperatively to guide the neurosurgical approach.

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