



## CASE REPORT

# A rare case of concomitant cervical disc herniation and intradural meningioma treated with one-stage posterior surgery

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Received: 23 September 2017 / Accepted: 27 October 2017  
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## Abstract

**Study design** Case report.

**Purpose** To present a rare case of cervical disc herniation concomitant with intradural meningioma which was successfully treated using a single one-stage posterior surgery of tumor resection and transdural discectomy.

**Summary of background data** Coexistence of symptomatic disc herniation and intra-spinal tumor in the same cervical segment is extremely rare. Usually, two-stage anterior and posterior surgeries are needed to treat two conditions, respectively. One-stage posterior surgery to treat two pathologies simultaneously has not been reported in the literature.

**Methods and results** A 76-year-old man presented with leg weakness and numbness for 6 months and left arm pain for 2 months. Contrast MR imaging revealed C3/4 intervertebral disc herniation and a hyperintense intradural lesion at the right portion of C3 canal. A one-stage posterior surgery, including C3/4 laminectomy, intradural tumor resection, transdural C3/4 discectomy, and C3/4 lateral mass instrumentation and fusion, was performed to treat two distinct pathologies together. The patient's arm pain and numbness disappeared right after the surgery and symptoms of myelopathy fully recovered at 6-month follow-up. Histological studies confirmed a herniated disc and a meningioma.

**Conclusion** In rare case, intradural tumor coexists with cervical disc herniation. When suspicious findings were noticed, or clinical symptoms cannot be fully explained, contrast MR imaging is helpful in differential diagnosis. Microscopic transdural discectomy is safe, and could be used as an optional procedure for cervical disc herniation in some cases.

**Keywords** Cervical disc herniation · Spinal tumor · Intradural meningioma · Transdural discectomy

## Introduction

Cervical disc herniation is a common spinal disorder that can lead to radiculopathy and myelopathy [1]. For those who failed to respond to conservative treatments, anterior cervical discectomy and fusion (ACDF) currently is the standard treatment [2]. Cervical intra-spinal tumors are a group of less common diseases that may produce symptoms similar to those of cervical disc herniation [3]. Meningioma is one of the most common intra-spinal tumors in the cervical spine which typically needs surgical removal via a posterior approach [4]. Symptomatic disc herniation and intradural

tumor occur at the same cervical spinal level is extremely rare. Given the different surgical approaches for two pathologies, two-stage surgery would be a common choice for most spine surgeons. Here, we reported a rare case of C3/4 disc herniation concomitant with intradural meningiomas at the same level which was successfully treated using a single one-stage posterior surgery of tumor resection and transdural discectomy.

## Case presentation

A 76-year-old man presented with leg weakness and numbness for 6 months and left arm pain for 2 months. Six months ago, he started to have leg weakness and numbness. In walking, he often felt that his legs were stepping in cottons. Although the weakness reduced his mobility to some extents, he can live on his own and, thus, did not seek health care. Two months ago, however, he started to have left arm

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pain. His arm pain, which radiated from his neck down to his left shoulder and elbow, was severe and intolerable, together with a worsening of walking. He referred to a local hospital and magnetic resonance (MR) imaging revealed a herniated disc at C3/4 level. He received conservative treatments there for 2 weeks but the pain did not relieve. By the time he consulted us, hardly can he walk independently. He did not have bladder and bowel problems since he was sick.

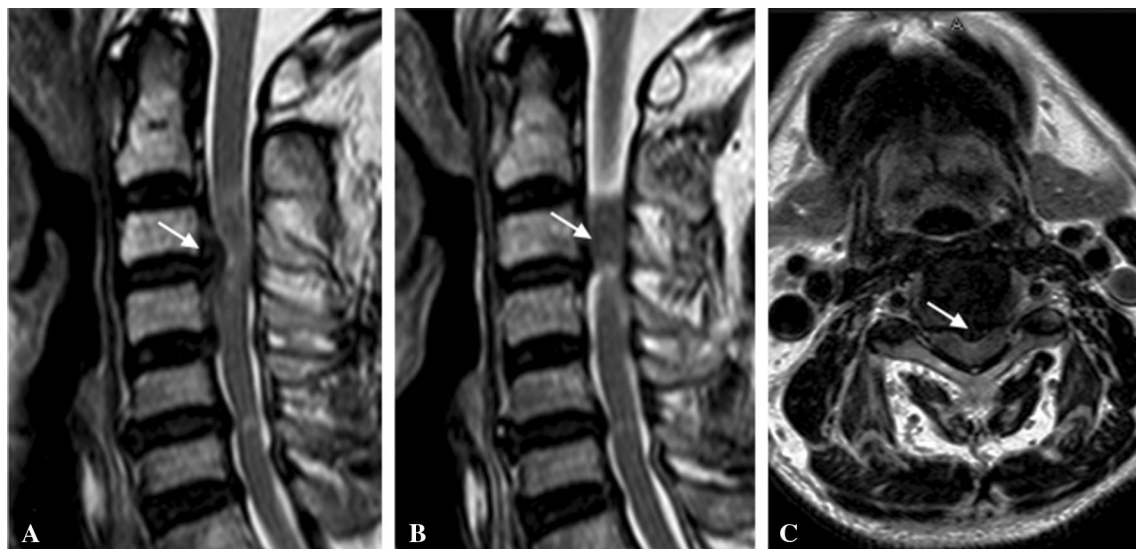
On physical examination, there were tenderness in his upper neck. He had positive Spurling sign and Eaton sign at the left side. There was a generally decreased muscle power in bilateral upper and lower extremities (manual muscle test grade III–IV). Reflexes at biceps, triceps, patellar and Achilles tendons were hyperactive. Pathological reflexes, including Hoffman sign, Babinski sign, and dynamic Romberg sign, were positive. His Japanese Orthopedic Association (JOA) score was rated as 9 points out of 17.

On routine MR images, the C3/4 intervertebral disc herniated posteriorly and dural sac compression was apparent. Moreover, there was heterogeneous signal in the context of C3 spinal cord. In addition, it seems that the cerebrospinal fluid flow was discontinued there (Fig. 1). The patient was suspected to have cervical intradural mass and, thus, further underwent gadolinium contrast MR imaging. Contrast MR imaging revealed a hyperintense intradural lesion at the right portion of C3 canal. Axial MR images demonstrated that the cervical spinal canal behind C3/4 disc was occupied by a herniated disc in the center and left side and an intradural lesion at the right. Spinal cord compression and left foramen narrowing were remarkable (Fig. 2).

A one-stage posterior surgery, including C3/4 laminectomy, intradural tumor resection, transdural C3/4 discectomy, and C3/4 lateral mass instrumentation and fusion, was performed to treat two distinct pathologies simultaneously. After C3/4 laminectomy, the dorsal dura sac was opened to find an intradural lesion (approximately  $10 \times 15 \text{ mm}^2$ ) at the right side of the dural sac. Under microscopy, the mass was carefully removed from the dura matter. At the left portion of the canal, there was a hump compressing the ventral dural sac. The spinal cord was thus gently pushed to the right side of the canal and protected. Then, a needle was inserted into the hump, and intra-operative X-ray confirmed that the hump was at C3/4 disc level (Fig. 3). Under microscopy, a 0.5 cm longitudinal incision was made at the ventral dura mater through which the herniated nucleus tissue was removed. Due to the limited exposure, the ventral dura mater incision was difficult to suture and, thus, was glued with gelfoam and human fibrin adhesive. The dorsal dural sac was sutured, followed with C3/4 lateral mass screw instrumentation and fusion.

After surgery, the patient's left arm pain disappeared and numbness of limbs substantially alleviated. His walking ability improved quickly and he can walk on his own at postoperative day 10 when he was discharged. Pathological studies confirmed a herniated disc and a meningioma.

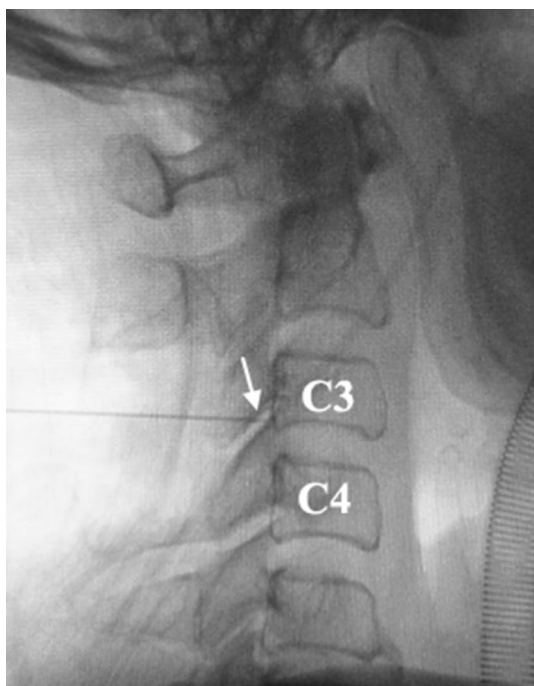
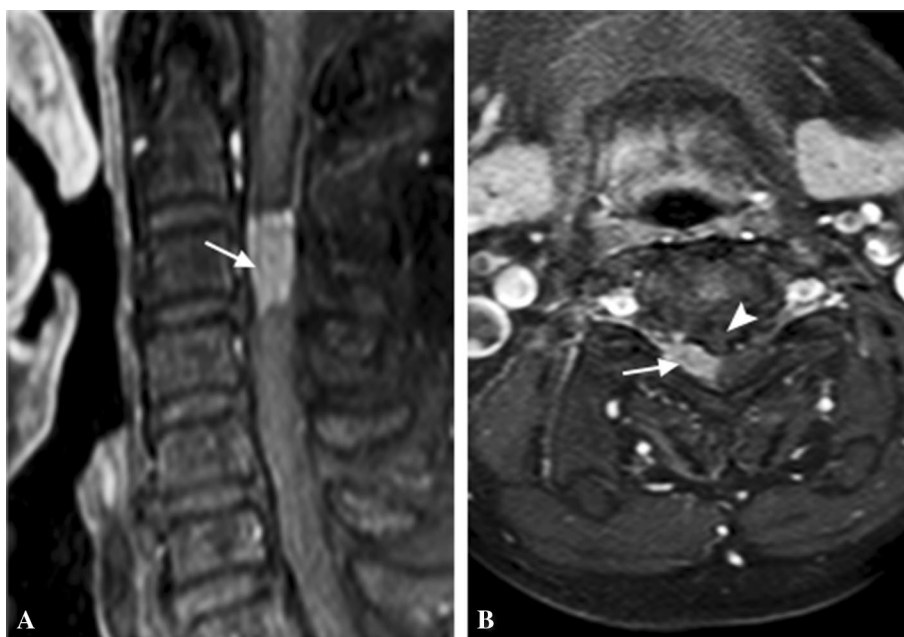
At 6-month follow-up, the patient walked independently in normal gait. He had no pain and no numbness in his arms and legs. His JOA score increased to 16 points. X-ray revealed a solid C3/4 posterior fusion and MR images



**Fig. 1** T2-weighted sagittal image (a) revealed C3/4 disc herniation, with dural sac and spinal cord compression. There are heterogeneous signals in the context of spinal cord. One slice apart, behind C3 vertebra it seemed that there was an isolated mass with isointense signal

to the spinal cord and cerebrospinal fluid flow was discontinued there (b). T2-weighted axial image (c) revealed C3/4 disc herniation and dural sac compression

**Fig. 2** Contrast-enhanced T1-weighted sagittal (a) and axial (b) MR images revealed a well-defined lesion at the right side (arrows) and a centrally herniated disc with foramen involvement (arrowhead) in C3/4 canal. The spinal cord was squeezed to the left posterior portion of the canal



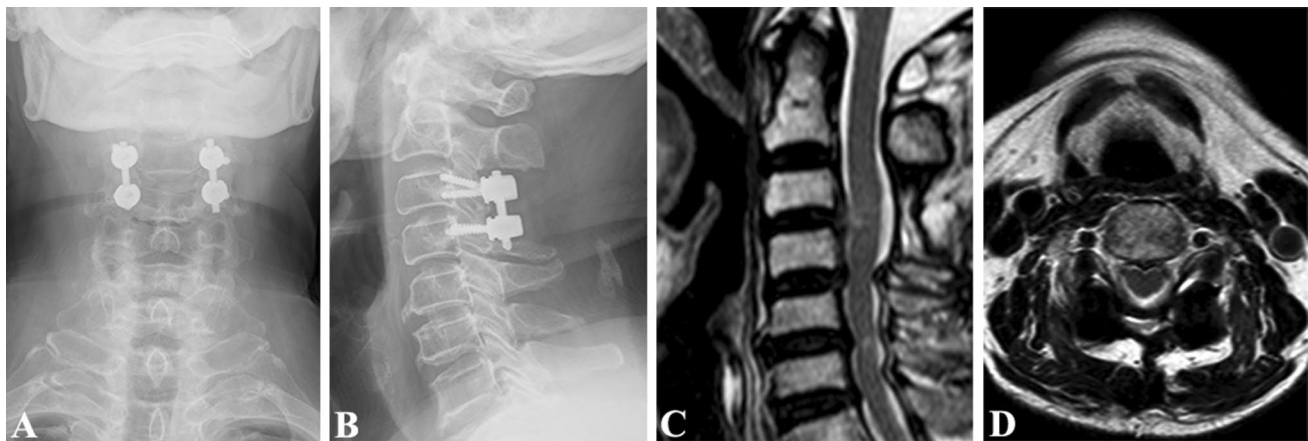
**Fig. 3** After tumor resection, a needle (arrow) was inserted into the bulging mass which compressed the ventral dura matter and intraoperative X-ray confirmed the hump was at C3/4 disc level (herniated disc)

demonstrated that the spinal canal was enlarged without dural sac or nerve root compression (Fig. 4).

## Discussion

Coexistence of symptomatic disc herniation and intra-spinal tumor in the same cervical segment is extremely rare. In the few cases reported, spinal tumor usually is an asymptomatic incidental finding when MR study was conducted for cervical disc herniation [5, 6]. In the current case, C3/4 disc herniation was mainly responsible for left arm radiculopathy, as evidenced by C3/4 foramen involvement on MR images. Yet, both the herniated disc and the meningioma contributed to cervical myelopathy. As both pathologies are symptomatic, treating one pathology may not be able to relieve all symptoms. Although cervical discectomy was routinely performed through an anterior approach and cervical intradural tumor resection typically requires a posterior approach, we designed a one-stage surgery of posterior intradural resection and transdural discectomy to treat both pathologies simultaneously. As the spinal cord was compressed by the tumor from the right and a herniated disc from the left, and the patient had severe pain on the left arm and corresponding signs of narrowed C3/4 foramen on MR images, we performed a full laminectomy to achieve sufficient decompression. Although both pathologies could be removed through a right hemilaminectomy and posterior instrumentation and fusion may be avoidable, discectomy through a contralateral window of hemilaminectomy is risky [7] and such procedure is dependent on surgical experience on hand. Even though, this strategy is with far less surgical trauma and costs, as compared with two-stage surgery. As a result, the patient achieved a full recovery.

In English literature, only two similar cases were reported and both of them were treated with two-stage



**Fig. 4** Six-month follow-up X-ray (a, b) and T2-weighted MR images (c, d) demonstrated C3/4 spinal canal was enlarged and there was no neurological compression there

surgeries [5, 6]. Bapat et al. reported a case of concomitant disc herniation and intradural schwannoma at C5/6 level [5]. In that case, however, the intradural lesion was overlooked in the first hospitalization and C5/6 ACDF was performed. Only when the patient returned for recurrent myelopathy did the physicians retrospectively identified a coexistent intradural lesion at C5/6 level on the previous MR images. The patient received a second surgery to remove the intradural tumor from posterior and histological study revealed a schwannoma. Similarly, a coexistent meningioma was also overlooked in Gandolfi's case and the patient had to receive a second surgery for cervical tumor resection [6].

Among many spinal tumors, meningioma and schwannoma constitute approximately 90% of extramedullary intradural tumors [8]. Although typically benign [9], intradural meningiomas can lead to symptoms similar to those of disc herniation. Meningiomas usually present isointense signal similar to spinal cord on both T1- and T2-weighted MR images, which clouds the detection of meningiomas sometimes. This particularly is the case in middle-aged adults whose MR signs of cervical disc bulging or herniation are common and clinical symptoms of neurological compression are subsequently attributed to disc herniation, as is in Bapat's case [5]. When heterogenous signal inside the spinal cord was noticed on conventional MR images, or no clear diagnosis was made, or pain exacerbated by the recumbent position, or pain continued after further treatment, or neurological symptoms cannot be explained by slight compression resulting from disc herniation, suspicion of tumor should be raised and contrast MR imaging is indicated [10, 11]. Strong and homogeneous enhancement with gadolinium, as in our case, are characteristic findings for meningiomas [9]. Posterior approach can provide adequate surgical exposure and is routinely used to remove cervical meningiomas [4].

Although ACDF is the standard surgical procedure for symptomatic cervical disc herniation, attempt to remove the herniated disc was first tried through the posterior approach. As early as in 1910, Taylor introduced laminectomy and transdural approach to remove lesions at the ventral side of the dural sac [12]. Due to high incidence of spinal cord injury, however, this procedure has not been widely used afterwards [13]. After the anterior Smith-Robinson incision was introduced in 1958, posterior transdural discectomy was almost abandoned in clinical practice [14]. With the advances of surgical techniques and microscopy, transdural discectomy was not as risky as previously thought. In a report of 30 cases of cervical spondylosis treated with microscopic transdural discectomy, no spinal cord injury or cerebrospinal fluid leakage occurred [15]. Instead, such procedure can preserve the cervical segment as it does not require fusion [15]. Despite the intrinsic advantage, transdural discectomy was not familiar to most spine surgeons, and was recommended as an alternative surgery option for selected patients of paracentral cervical disc herniation associated with multilevel canal stenosis [13]. In the current case, however, the intradural meningioma requires posterior laminectomy and dura sac opening, and the herniated disc is exactly in front of the ventral dura matter. As such, transdural discectomy was handy and the patient was exempt from a second anterior surgery.

## Conclusions

In rare case, intradural tumor coexists with cervical disc herniation. In such case, neurological symptoms may be attributable to the herniated disc and thus, intradural tumor may be overlooked. When suspicious findings were noticed, or clinical symptoms cannot be fully explained, contrast



MR imaging is helpful in differential diagnosis. One-stage posterior surgery, including laminectomy, intradural tumor resection, and transdural discectomy, can be used to treat two pathologies simultaneously, for less surgical trauma and medical costs. Transdural discectomy is an optional surgery for cervical disc herniation in some patients with other concomitant spine disorders.

### Compliance with ethical standards

**Funding** This work was partially supported by the National Natural Science Foundation of China (NSFC 81772382).

**Conflict of interest** All authors declare that they have no conflict of interest.

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