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Case Report

ABDOMINAL WALL PARALYSIS AFTER REMOVAL OF THORACIC SCHWANNOMA ORIGINATING FROM ANTERIOR NERVE ROOT

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ABSTRACT
A 30-year-old woman presented with a chief complaint of right lower back pain and numbness of the left lower extremity. Spinal magnetic resonance imaging (MRI) demonstrated an intradural extramedullary enhancing mass on the right anterolateral side at the T10 level. Total removal of the tumor was performed. It was diagnosed as a schwannoma originating from the anterior nerve root. Initial symptoms disappeared immediately after surgery, but right lower abdominal wall numbness with slight bulging appeared. Abdominal CT showed slight atrophy of the right lower rectus abdominis muscle, which might have been induced by the T12 anterior nerve (subcostal nerve) root involved in the resected tumor.

Keywords: *Thoracic Schwannoma, Anterior Nerve Root, Subcostal Nerve, Rectus Abdominis Muscle Atrophy*

INTRODUCTION
Spinal schwannomas typically arise from the intradural sensory root and grow dorsally toward the spinal cord. Occasionally, they arise from the motor root and grow ventrally toward the cord (Hori *et al.*, 1984; Kim *et al.*, 2005). Some have said that nerve roots generating tumors are frequently nonfunctional at the time of surgery, and total resection does not cause serious neurological deficit. However, it is still important to carefully follow the patient throughout the postoperative course. We describe a rare case of a patient with unilateral abdominal wall paralysis after thoracic ventral nerve root resection.

CASES
A 30-year-old woman presented with right low back pain and numbness of the left lower extremity. She felt numbness on the anterior part of her left thigh and lateral part of the lower leg. No motor weakness was observed in her extremities, and her Achilles and patellar tendon reflexes were normal.
She had a past history of spinal schwannoma removal at the L1 level in another hospital about 15 years prior. Spinal magnetic resonance imaging (MRI) showed no recurrence of the tumor. However, an intradural extramedullary mass measuring 9×12×13 mm on the right anterolateral side at the T10 level with low intensity on T1-weighted images, high intensity on T2-weighted images, and enhancement with gadolinium was confirmed (Figure 1). Her brain MRI showed no abnormal lesions. Because we thought her symptoms were caused by compression of the right dorsal funiculus and right lateral spinothalamic tract, innervating her left leg near the tumor, its removal was performed. Under general anesthesia, the patient was put in the prone position. T10 and 11 hemilaminectomy and T9 partial hemilaminectomy were performed. After opening the dura and arachnoid, the tumor was found anterior to the dentate ligament. The tumor was obvious after the dentate ligament was cut. It was milky white and soft. Internal decompression was done with an ultrasonic surgical aspirator. One nerve root was adherent to the tumor, and it was carefully detached. The proximal and distal nerve roots generating the tumor were cauterized and cut (Figure 2). The postoperative histopathological diagnosis was schwannoma (World Health Organization grade I). Postoperative MRI demonstrated total removal of the tumor (Figures 3A, 3B).
Immediately after the operation, her right back pain and numbness in her left leg disappeared. However, a few days later, right low abdominal wall numbness with slight bulging appeared. Abdominal CT showed slight atrophy of the right lower rectus abdominis muscle (Figure 3C). She was discharged about three weeks later with no major complaints.

DISCUSSION

Spinal schwannomas, which account for approximately 30% of primary spinal tumors (Seppala *et al.*, 1995), originate predominantly from the spinal nerve sensory root, but occasionally from the motor root. They usually cause radiating pain as a result of dorsal funiculus compression, or they induce numbness or motor weakness in the area of nerve innervation. Sometimes abnormal sensation or motor paralysis is also caused by the compression of lateral spinothalamic tract or corticospinal tract by tumors.

The anterior T12 nerve, or subcostal nerve, innervates both motor and sensory function of the lower part of the rectus abdominis muscle. On the other hand, the T11 nerve, or intercostal nerve, innervates both motor and sensory function of the rectus abdominis and oblique abdominis muscles beneath the umbilicus. In our case, the tumor was thought to have generated from the T12 right anterior nerve root because of the surgical appearance, postoperative atrophy, and numbness of the right low abdominal wall.

Sometimes the paralyzed portion of the anterior abdominal wall protrudes because of pressure exerted by a combination of the diaphragm, the functioning portion of the abdominal wall, and the abdominal contents and is referred to a pseudohernia, because there is no actual abdominal wall defect. To the best of our knowledge, there has been only one abdominal pseudohernia case following spinal cord tumor surgery (Choudhury and Rajshekhar, 1998) reported, though there were some cases after laparoscopic cholecystectomy (Korenkov *et al.*, 1999). Choudhury *et al.*, presented a 44-year-old man with a large right abdominal pseudohernia after thoracic intradural tumor excision. Unlike our case, the patient was obese, which might have contributed to higher abdominal pressure. Our patient showed only slight right abdominal bulging with numbness. Even with the small risk of such a complication, we should consider carefully whether schwannomas are totally resected or not. According to Kim *et al.,* (2005), the spinal roots giving rise to schwannomas are frequently nonfunctional at the time of surgery, and the risks of causing disabling neurological deficits after sacrificing these roots are small. Compensatory mechanisms by neighboring nerve roots have been suggested by Saiki *et al.,* (2003), and surgical compound muscle action potential measurements are useful in analyzing nerve root compensation. According to Kaneko *et al.,* (2006), the degree of neurological deficits after transection of the involved nerve roots depends on the residual functions of the nerve roots that are involved in the schwannoma, the functions of adjacent nerve roots, and the surgical procedure. In our patient's surgery, we carefully detached the adjacent nerve root to be preserved. We propose that it would be most beneficial to perform intraoperative nerve monitoring of the abdominal muscles in order to confirm the functioning of the involved nerve as well as the adjacent one, thus enabling total resection and improved postoperative outcomes.

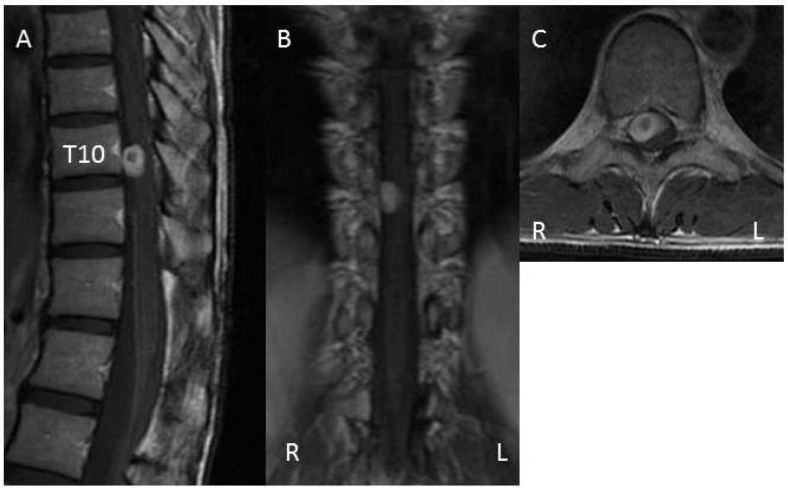

Figure 1: Preoperative magnetic resonance imaging of the thoracic spine showing an intradural extramedullary mass on the right anterolateral side at the T10 level (A) sagittal T1-weighted and contrast-enhanced image, (B) coronal T1-weighted and contrast-enhanced image, (C) axial T1-weighted and contrast-enhanced image

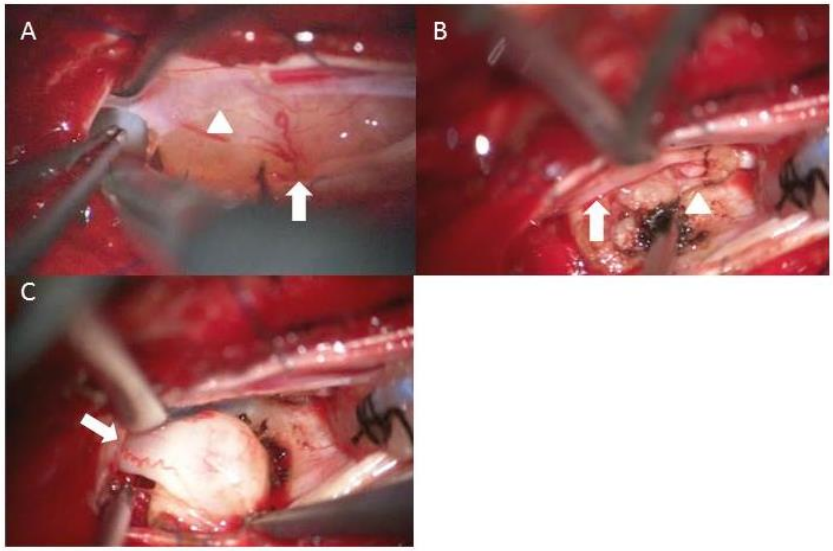

Figure 2: Intraoperative microscopic imaging (A) tumor (arrow) is seen anterior to the dentate ligament (arrowhead), (B) carefully detached nerve root (arrow) and proximal nerve root end (arrowhead) generating the tumor, (C) distal nerve root end (arrow) of the tumor

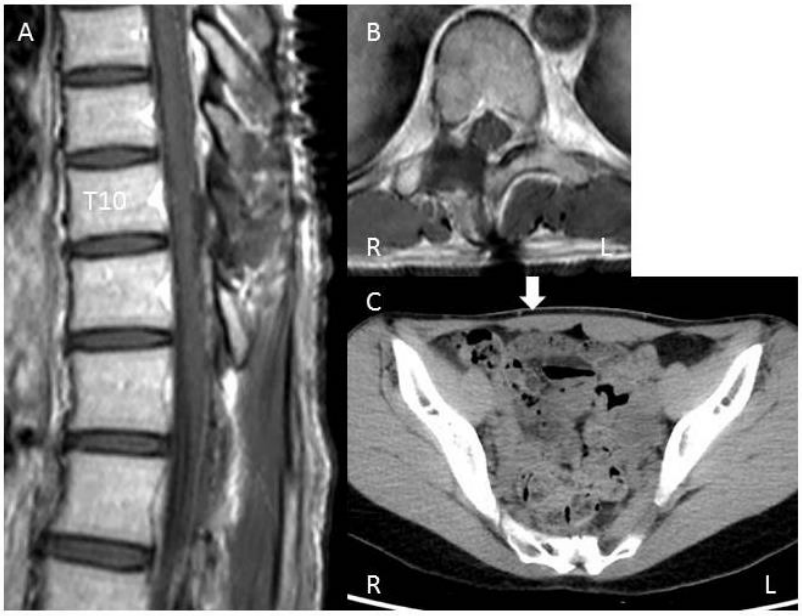

Figure 3: (A, B) Postoperative magnetic resonance imaging of the thoracic spine showing total removal of the tumor at the T10 level, (A) sagittal T1-weighted and contrast-enhanced image (B) axial T1-weighted and contrast-enhanced image, (C) postoperative computed tomography of the abdomen demonstrating atrophy of the right lower rectus abdominis muscle (arrow)

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