



# Large Paraspinal Schwannoma Removal via the Retroperitoneal Approach: A Case Report

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Schwannomas are benign tumors originating from the Schwann cells of the peripheral nerve sheath; these tumors usually occur in the head, neck, and extremities and account for almost 40% of extra-medullary tumors occurring in the human spine. The general consensus for the treatment of these tumors is gross total resection. However, due to differences in volume and the complex location involving both the spinal canal and the para-spinal area including the foramen, no consensus exists regarding the choice of a surgical approach. The classic surgical method is usually through the posterior or posterior-lateral approach. Here, we present a case of paraspinal schwannoma removed via the retroperitoneal approach.

**Keywords:** Lumbar vertebrae; Psoas muscles; Retroperitoneal space

## INTRODUCTION

Peripheral nerve sheath tumors (PNSTs) such as neurofibromas or schwannomas are mostly benign and can occur in most places in the human body including the spine. The most common PNSTs are schwannomas which account for almost 85% of all PNSTs<sup>3)</sup>. Schwannomas, although rare malignant forms exist, are commonly known for their slow growth rate and benign features. The tumor can occur in all parts of the spine usually involving the dorsal sensory spinal roots and only sporadically from the ventral motor roots. The location of the tumor can vary but only 13% are found

to be extradural. Of the extradural type schwannomas, less than 5% occur in the retroperitoneal area<sup>3,6,13,15,17)</sup>.

Like most treatment goals regarding tumors, gross total resection (GTR) is associated with successful outcomes<sup>4,16)</sup>. However, although it is ideal to completely remove the tumor if possible, due to the complex location when it infiltrates the spine anatomy, it is often challenging to reach the ultimate goal of GTR. Previous studies have suggested many different methods for GTR but each surgical approach is still controversial<sup>16)</sup>.

The location of the tumor, which mostly decides the surgical approach, varies but purely extraforaminal lesions

are less common. Furthermore, retroperitoneal tumors are rare and represent less than 5% of all schwannomas<sup>9,15</sup>. The classic surgical approach is usually through the posterior or posterior-lateral area of the spine. This approach is the most commonly used surgical method since it is familiar to most spine surgeons. However, with this method, long incisions and the possibility of extensive muscle and bone damage, which could lead to the instability of the spine, are inevitable<sup>19</sup>. Persistent back pain may also occur due to atrophy of the back muscle after injury.

A number of alternative surgical strategies can be used to avoid complications from the posterior approach including minimally invasive surgical procedures<sup>8</sup> and the retroperitoneal approach, which is similar to oblique lumbar interbody fusion (OLIF)<sup>11,13,15</sup>.

We present the case of a patient with a paraspinal extradural schwannoma who experienced no neurologic symptoms except back pain. The tumor was incidentally detected during the evaluation for back pain and the tumor was removed via the retroperitoneal approach. We anticipated that the retroperitoneal approach could give us more direct access to the paraspinal area and prevent complications from back surgery conducted in a classic manner.

## CASE REPORT

A 42-year-old female with no underlying disease was admitted to the hospital for excruciating right-side back pain and right lower extremity radiating pain in the L3 dermatome. She had been diagnosed with a mass in the right psoas area (4 x 2 x 3-cm) 6 years earlier (Fig.1) during an evaluation for her back pain but did not receive any treatment because the pain was moderate and intermittent. However, on the day of admission, she expressed continuous excruciating back pain with a visual analog scale (VAS) score of 9. Compared to the initial magnetic resonance imaging (MRI) her imaging workup revealed an enlarged para-spinal dumbbell-shaped mass (4 x 3 x 6-cm) with partial intraforaminal invasion, displacing the psoas muscle at the L3-4 disc level (Fig.2). Due to the change in size and exacerbated symptoms, the patient underwent surgery for tumor removal via the retroperitoneal approach.

The patient was placed in the full lateral position with the right side on a regular bed. The hips and knees were flexed to release the psoas muscle tension. All pressure pads were

placed at the dependent position and the body was secured to the bed with knee bands. The L3,4 vertebral bodies and disc space were identified with C-arm fluoroscopy and then marked on the patient's skin. Intraoperative monitoring was applied to confirm neurologic changes perioperatively. A longitudinal incision was made 2 inches anterior from the L3-4 disc space level. This was carried down to the subcutaneous level and muscle dissection was performed to identify the peritoneum. The external oblique, internal oblique, and transverse abdominis muscles were identified and split along the muscle lining. After identifying the peritoneum, blunt dissection with a sponge stick was performed down to the retroperitoneal space. The psoas muscle was identified, and the lumbar level was confirmed by C-arm fluoroscopy. Then, a tubular retractor system was inserted and expanded directly over the psoas muscle.

A microscope was introduced, and the tumor was clearly visualized when the psoas muscle was carefully split (Fig. 3A). It was well-defined, with two lobes showing a yellowish color. Also, it was soft and movable. Once the safety margins of the tumor were defined using a stimulator probe, the tumor capsule was incised and removed with meticulous bleeding control and careful retraction. The tumor was re-

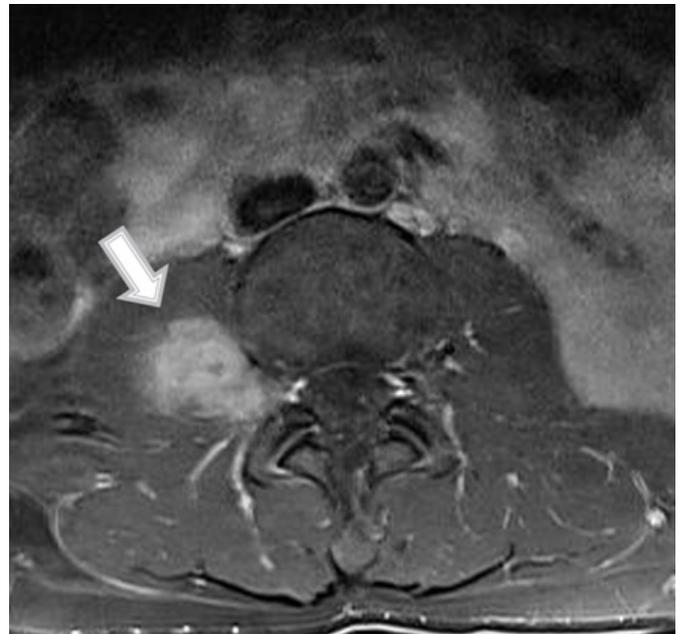
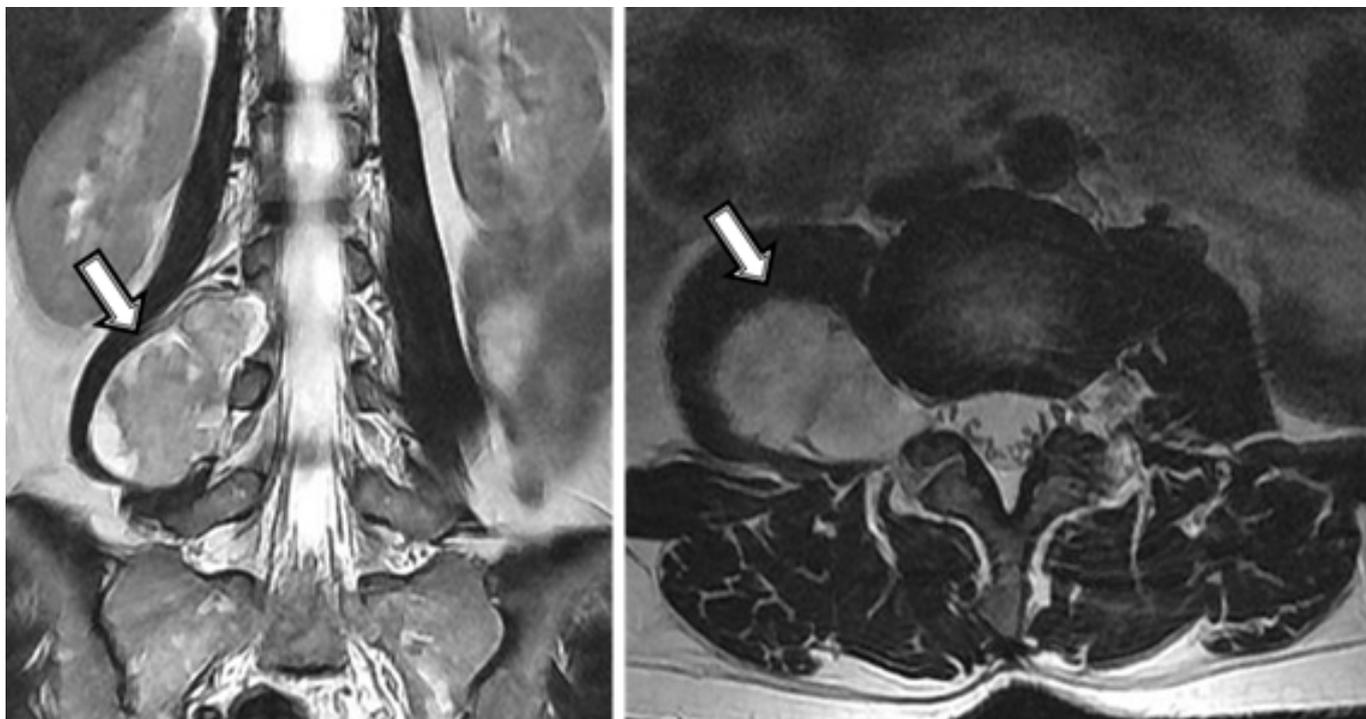
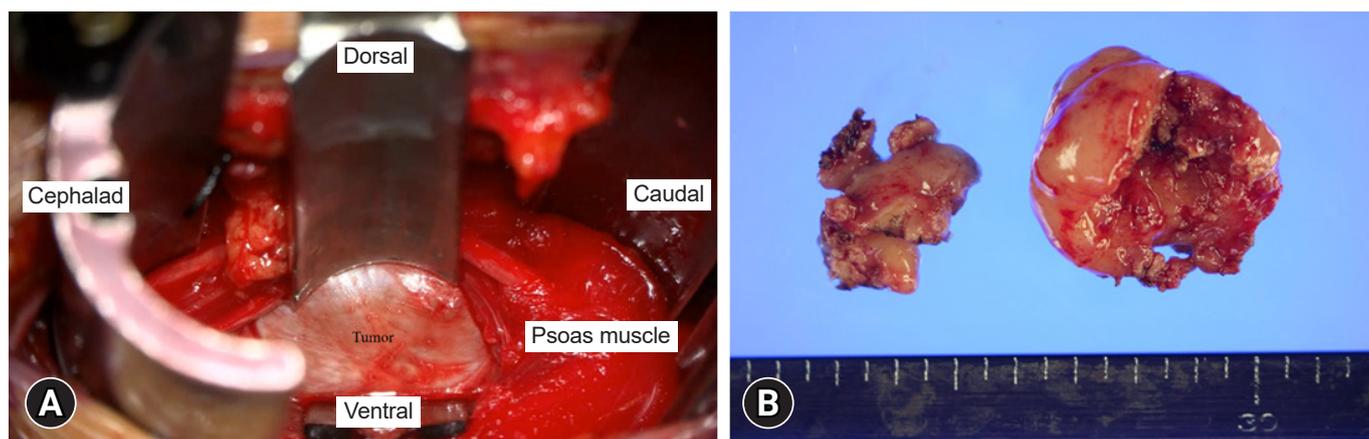


Fig. 1. Initial lumbar magnetic resonance imaging, revealing a large mass (4 x 2 x 3 cm) originating from the L3 nerve root (white arrow).



**Fig. 2.** Preoperative magnetic resonance imaging (MRI) taken 6 years after initial MRI, showing an enlarged mass (4 × 3 × 6 cm) in the right retroperitoneal area (white arrow).



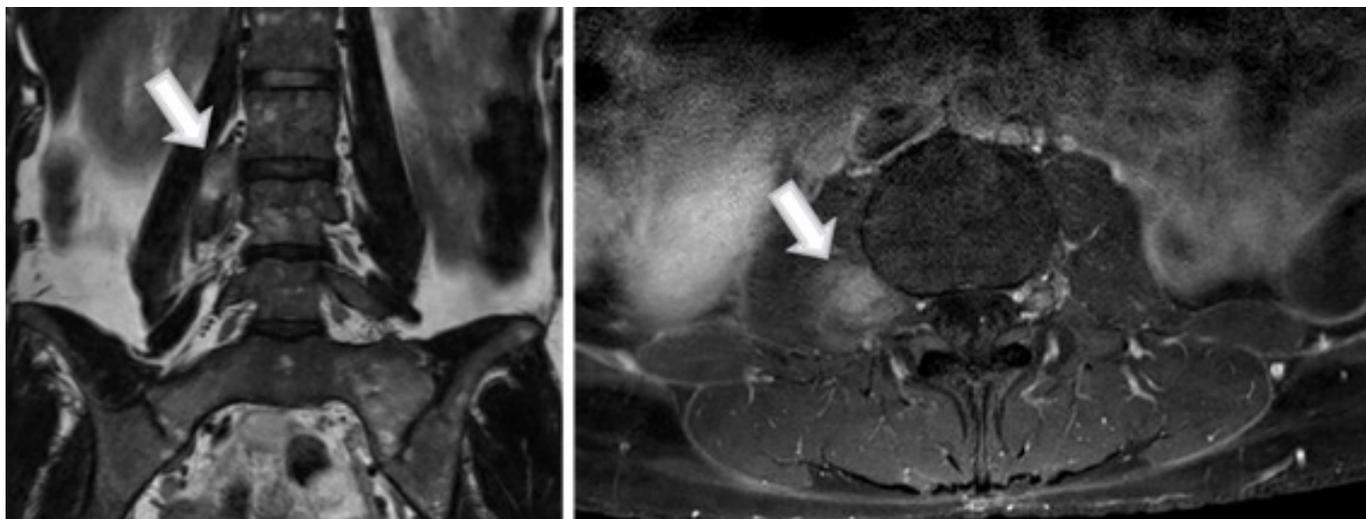
**Fig. 3.** (A) Surgical image showing the round, capsulated mass clearly visualized after careful splitting of the psoas muscle. (B) Gross image of the removed tumor.

moved in a near gross total manner without any complications (**Fig. 3B**). A small residual tumor could not be removed since it was tightly invading the neural foramen, which has a high possibility of causing permanent nerve root injury when surgically removed. Electrocauterization was performed to control bleeding and suturing was performed by anatomical layer. The patient did not show any form of

new neurologic deficit and her back pain decreased to a VAS score of 2. The follow-up MRI taken before discharge showed a small residual tumor at the neural foramina (**Fig. 4**).

## DISCUSSION

The treatment goal of a nerve sheath tumor is GTR with the



**Fig. 4.** Follow-up magnetic resonance imaging was taken before discharge, showing a small remnant mass around the foramen of the lumbar spine.

**Table 1.** Previous reports regarding retroperitoneal approach in paraspinal schwannomas

References	Year	Tumor location	Gross total removal	Patient neurology	Postoperative neurology	Complication
Lee and Srikantha <sup>7)</sup>	2015	Rt. EF of L4-5	Yes	Back pain, radiculopathy	Full recovery	Transient weakness
Phan and Mobbs <sup>13)</sup>	2016	Lt. EF of L5/S1	Yes	Foot drop, dysesthesia	No aggravation	None
Shi et al. <sup>18)</sup>	2016	PS of lumbar	Yes	Back pain, dysesthesia	Improved	None
Boah and Perin <sup>1)</sup>	2016	Lt. L4 nerve root	Yes	Radiculopathy	Full recovery	None
Rapport et al. <sup>14)</sup>	2021	Rt. L1-2 foramen	Yes	Back pain, dysesthesia	Improved	None
Handa et al. <sup>5)</sup>	2019	PS of lumbar	No	Back pain	Improved	None

EF: extra foraminal; PS: paraspinal area; RT: right; LT: left.

minimization of complications regardless of the approach method. Therefore, the surgical method has to be chosen carefully since it can change the entire outcome of the surgery. However, if the tumor presents itself in the retroperitoneal area, as in the case shown here, it is very challenging to achieve this goal. Due to its deep positioning, a clear view over the entire tumor is often difficult and could lead to a remnant mass or possible spinal instability.

The most common surgical method for tumors occurring in the spine is the classic posterior approach and the outcome data are already well-established. Through this method, it is convenient to directly explore the regions around the foramen through destructive procedures such as facetectomy and laminectomy<sup>11,13)</sup>. Therefore, if the main portion of the tumor is located within the spinal canal or foramen, the posterior approach may be the appropriate strategy<sup>15)</sup>. Nevertheless, although successful surgery can be expected, extensive muscle injury and bone destruction

are inevitable. This could lead to possible instability of the spine and post-spinal surgery syndrome due to atrophy of the back muscles by damage during dissection<sup>18)</sup>. Also, if patients are obese, prolonged surgery time and a large incision are unavoidable, which could lead to an increased risk of postoperative infection.

To minimize the complications of the posterior approach, minimally invasive surgery such as using a retractor system through Wiltse's approach was introduced. This approach provides a similar intraoperative view with less injury to adjacent structures than the posterior approach<sup>3,11)</sup>. However, one of its weaknesses is that it cannot visualize the critical structures including vessels and nerves adjacent to the tumor<sup>8,20)</sup>. Another alternative is the paraspinal approach. However, this approach, similar to the posterior approach, is not free from tissue disruption during surgery and there are limits to completely visualizing the tumor if it is found in the extraforaminal area.

Anterior laparoscopic-assisted surgery can be another surgical approach option<sup>11</sup>. There are advantages to the magnified view of the endoscope, which can help to avoid important structures near the tumor such as the ureter and vessels and nerves. The retroperitoneal space can be used as an operative field during laparoscopy, but it still has limitations when the main portion of the tumor is located within the foramen<sup>18</sup>. Also, with this method, the stimulator probe cannot be applied during the operation.

A minimally invasive lateral retroperitoneal approach provides minimal disruption and direct access to the psoas muscle. This approach has numerous advantages over the classic approach if the mass is mainly in the extraforaminal area of the lumbar region. It is similar to the OLIF method where the operative time window is shorter than the classic methods. Also, the surgical damage to the anatomical structure of the spine is minimized, resulting in faster recovery with less injury to the adjacent structures compared to other approaches<sup>10-12</sup>. Case reports regarding the use of the retroperitoneal approach in PNSTs occurring in the paraspinal area are unique and only a hand full of cases were reported so far (Table 1). Although the retroperitoneal approach carries few risks of nerve injury and retraction injury of the psoas muscle, these injuries seldom occur and resolve spontaneously in most cases. Vascular and intestinal injury is also a risk but rarely occurs<sup>2</sup>.

## CONCLUSION

The choice of the surgical approach is often the key to a successful surgery. Numerous options must be considered before initiating surgery. In cases of spinal schwannomas where the main mass is in the extraforaminal area extending to the retroperitoneal space, the retroperitoneal approach should not be neglected.

## CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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