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Case Report

Anterior retroperitoneal approach for removal of L5/S1 foraminal nerve sheath tumor—case report

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Abstract

BACKGROUND CONTEXT: Extradural lumbar schwannomas are a rare form of nerve sheath tumors (NSTs). The typical management approach for extradural foraminal NSTs is total gross resection, which involves a midline incision and muscle exposure, followed by laminectomy and facetectomy to access the tumor for resection. Following tumor removal, spinal fusion is often indicated to reduce postoperative deformity, pain, and neurologic deficits.
PURPOSE: We report the case of a 34-year-old woman who presented with a 2-year history of progressive dysesthesia and left foot drop. Magnetic resonance imaging revealed a lesion in the lateral L5/S1 foramen. A novel anterior-retroperitoneal approach was used to access the tumor, via muscle splitting, retraction of peritoneum medially and psoas muscle or iliac vessels laterally.
STUDY DESIGN/SETTING: This study is a case report of a novel approach for extradural lumbar schwannomas.
METHODS: The methods involve a description of the approach and reporting of clinical findings.
RESULTS: The schwannoma was successfully resected without requiring additional fusion surgery. The patient recovered uneventfully and was discharged on day 2 post operation.
CONCLUSION: We propose that the anterior-retroperitoneal approach is a viable technique for resection of lumbar foraminal NSTs without the need for fusion surgery.

Keywords: Anterior; Fusion; Laminectomy; Lumbar; Nerve sheath tumor; Retroperitoneal; Schwannoma

Introduction

Neoplasms of the spinal canal comprise a range of tumors which may involve the spinal cord, theca, and nerves. Nerve sheath tumors (NSTs) are the most frequent form, making up 25%–35% of primary spinal neoplasms in the Western population. These tumors can be classed according to their location, including intradural, combined intradural-extradural, and purely extradural [1]. In the intramedullary location, astrocytomas and ependymomas are more common tumors, compared with extramedullary tumors which are more likely NSTs such as schwannomas, neurofibromas, and meningiomas.

Spinal extradural foraminal NSTs, which are more likely found in the cervical and thoracic region compared with the lumbar spine, are a rare form of neoplasms [1]. The typical management approach for extradural foraminal NSTs is total gross resection, which involves a midline incision and muscle exposure, followed by laminectomy and facetectomy to access the tumor for resection. Following tumor removal, spinal fusion is often indicated to reduce postoperative deformity, pain, and neurologic deficits [2–4]. Various reports have demonstrated the safety and efficacy of mini-open tubular removal of these lesions, a posterior approach [3,5,6]. We report a case of removal of an L5/S1 foraminal schwannoma through an anterior, retroperitoneal exposure.

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Case report

A 34-year-old healthy woman presented with a 2-year history of progressive dysesthesia and foot drop on the left side. Magnetic resonance imaging (MRI) scan revealed a lesion located in the lateral aspect of the left L5/S1 foramen, with deflection of the exiting L5 nerve root laterally. Nerve conduction studies confirmed an L5 nerve root lesion, with normal conduction velocities of the common peroneal nerve.

The patient was initially booked for a posterior approach total facetectomy, resection of the lesion, and then transforaminal lumbar interbody fusion with pedicle screw fixation at an outside institution. The primary author (RJM) adopted a non-fusion approach of an anterior retroperitoneal approach to access the lesion for resection.

Under general anesthesia, a linear incision medial to the anterior superior iliac spine (Fig. 1) and lateral to the rectus abdominus was performed. Using a muscle splitting approach through the external and internal oblique muscles, the retroperitoneal plane was exposed. An Alexis retractor (Applied Medical Resources Corporation, Orange County, CA, USA) was used to open the corridor to the psoas muscle. A SynFrame retractor (SYNTHES Spine, Paoli, PA, USA) was inserted to retract the peritoneum medially and the psoas or common iliac vessels laterally to expose the L5/S1 foramen from an anterior direction (Fig. 2).

The lesion was easily located at the L5/S1 foramen with the L5 nerve deflected laterally (Fig. 3). Using microneurosurgical technique, the false capsule of the NST was incised and opened with complete resection of the lesion. Histopathology revealed a schwannoma with no atypical features.

The patient recovered uneventfully and was discharged on day 2 post operation. The patient re-commenced her teaching duties at 2 weeks following surgery. Imaging at 9 months' follow-up demonstrated complete resection of the NST (Fig. 4).

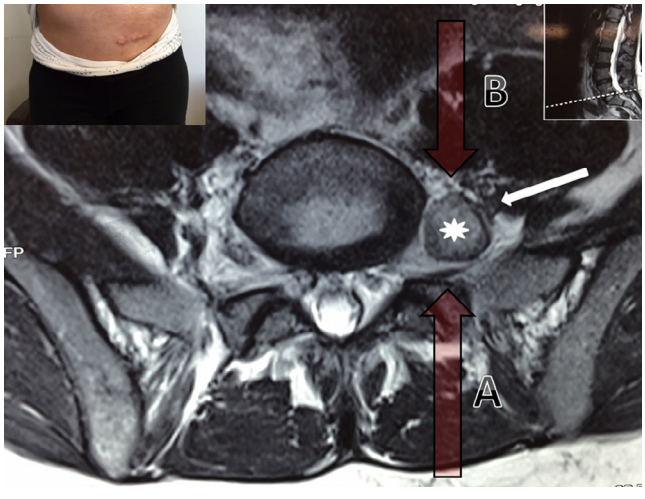

Fig. 1. Axial T2WI magnetic resonance imaging (MRI): Foraminal schwannoma (asterisk). L5 nerve pushed laterally by lesion (white arrow). (A) Potential posterior approach with facetectomy to resect lesion. (B) Potential anterior approach to resect lesion. Inset demonstrates location and size of incision for the described approach.

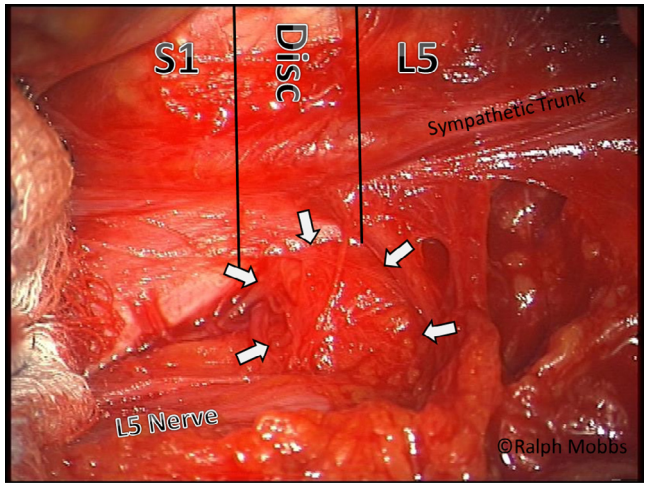

Fig. 2. Anatomy of the anterior exposure. The L5 nerve is positioned lateral to the nerve sheath tumor (white arrows).

Comment

Extradural foraminal schwannomas at the lumbar spine region are an exceptionally rare type of spinal NST. Prior studies have reported prevalence for lumbar extradural schwannomas of 0.7%–4.2% in all extradural schwannomas [1,3]. The mainstay treatment approach involves total resection of the lesion [1,7], via a midline incision, bilateral muscle retraction from posterior spinous structures, laminectomy, facectomy on the side of the tumor, followed by motion segment stabilization via fusion [1,8]. However, prior reports have used a posterior approach for tumor resection. To the best of our knowledge, this is the first case using an anterior retroperitoneal exposure for resection of a lumbar extradural foraminal schwannoma.

The posterior approach has traditionally been used for surgical access of the spine, particularly in fusion, discectomy, and pedicle screw instrumentation cases. The posterior approach allows access to posterior structures such as the lamina, ligamentum flavum, and facet joints. It also facilitates simultaneous fusion and posterior instrumentation if required in the same exposure, thereby reducing surgical trauma and dissection of soft tissues and paraspinal structures [9–12]. However, multiple studies have also emphasized several disadvantages associated with the posterior approach for spinal canal or foraminal access and tumor resection. First, the posterior or transforaminal approach may be associated with longer operation duration, because of the requirement of dissection of paraspinous structures, laminectomy, and facectomy [13]. Second, the posterior approach may require prolonged retraction of nerve roots and opening of neural foramen for schwannoma access. Excess retraction force may lead to exacerbated dural injury and nerve root pain [9–12,14]. Third, another major concern is that the posterior approach inherently

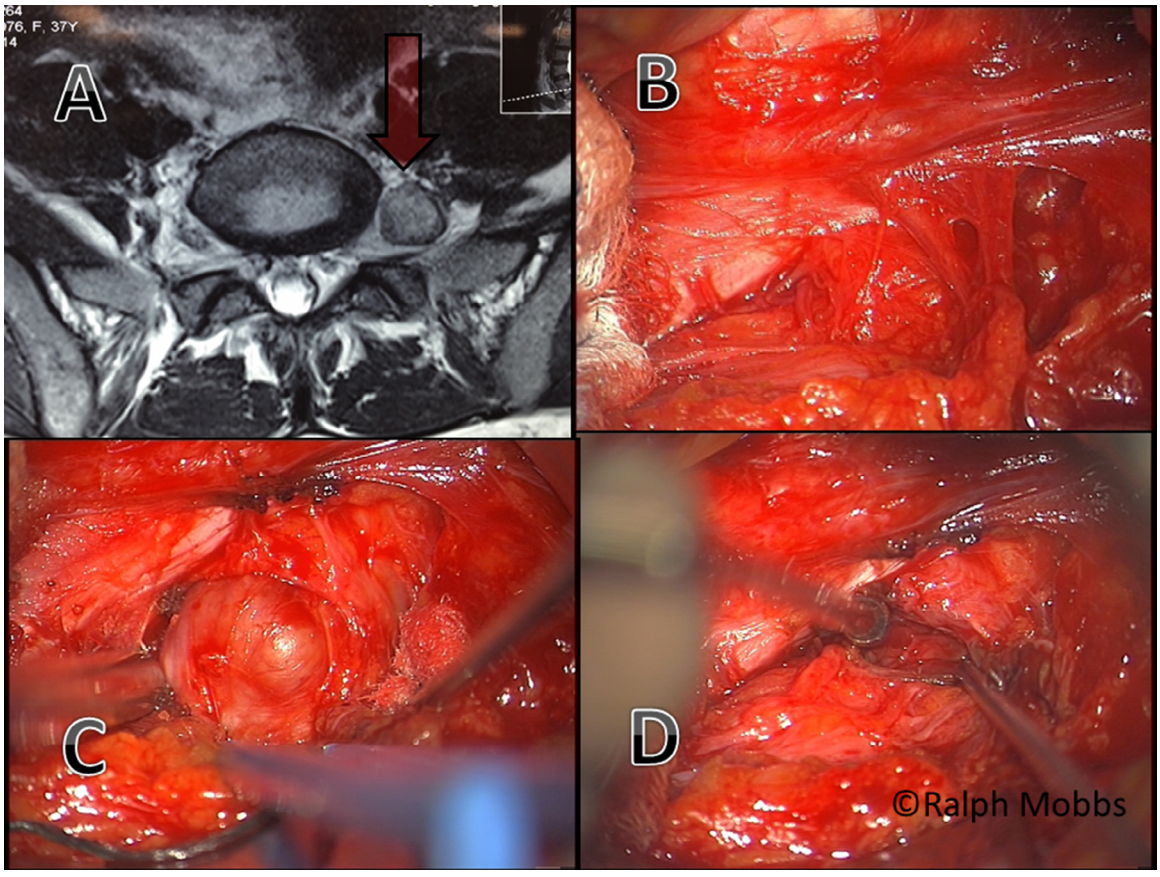

Fig. 3. Overview of anterior-retroperitoneal approach for extradural schwannoma resection. (A) Magnetic resonance imaging (MRI) T2WI axial. (B) Initial exposure. (C) Exposure of tumor capsule before incision. (D) Complete resection of schwannoma.

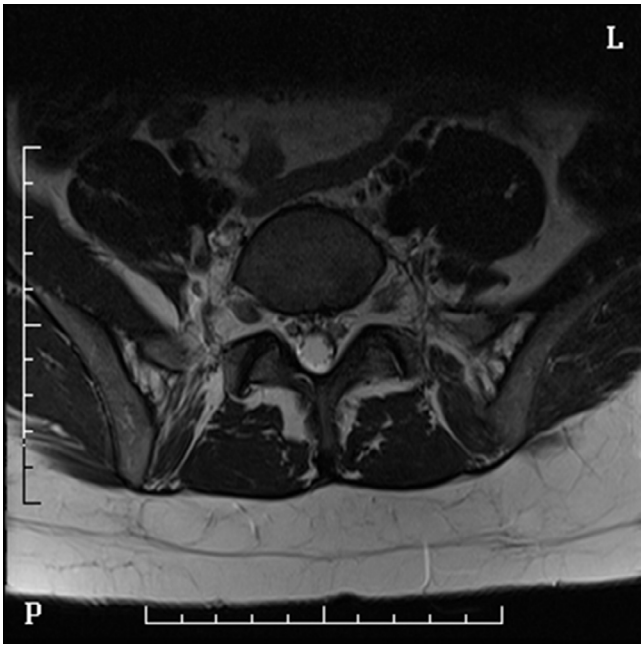

Fig. 4. Postoperative axial sequence at 9 months' follow-up demonstrating complete resection of the nerve sheath tumor.

involves multilevel laminectomy and radical facectomy, which may increase instability of the spinous structures. As such, additional fusion surgery has been recommended by several studies, to reduce iatrogenic instability and deformity [15–17]. Although minimalist approaches have been introduced recently to reduce surgical trauma [18–20], such as minimally invasive hemilaminar techniques with tubular retractions [3,21], this approach is not suitable for all cases of extradural schwannomas, particularly if they extend over the side of the intervertebral foramen.

To overcome the above-listed caveats, we have reported a case of extradural schwannoma surgically resected using an anterior retroperitoneal approach. Similar to other minimally invasive approaches, a muscle splitting technique is used through the external and internal oblique muscles to reach the retroperitoneal plane. There are several advantages for using this approach [9,22]. First, an anterior retroperitoneal approach allows direct access to the intervertebral foramen, without requiring laminectomy or facectomy that is usually indicated using a posterior approach [4,13,23,24]. Subsequently, there is significantly reduced risk of iatrogenic instability and deformity and, as such, adjunct fusion procedures are not required during the resection of the tumor. Secondly, reduced surgical trauma is also achieved since there

is no muscle dissection involved. Instead, the peritoneum is retracted medially, and the psoas and common iliac vessels are retracted laterally to reveal a direct corridor to the L5/S1 foramen, without any dissection required. By not dissecting paraspinous structures, this may translate into less blood loss, reduced postoperative pain, faster recovery, and shorter hospitalization [11,12,14].

There are several potential risks associated with the anterior-retroperitoneal technique. Abdominal ileus is a known complication following overmanipulation of the retroperitoneal space. Approach-related complications include injury or over-retraction of the psoas and iliac vessels, which can result in thigh weakness or bleeding [25,26]. Given the risk of vascular injury, vascular surgical support should be readily available when using this approach. Furthermore, an alternative approach to the presented technique is a far lateral extraforaminal approach, which can be performed with minimal bone removal and without the requirement of fusion, which may be particularly useful for far lateral tumors.

Conclusion

In summary, we propose that anterior retroperitoneal access represents a viable alternative to traditional posterior approaches for removal of lumbar extradural schwannomas, without requiring additional fusion surgery.

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