

Laparoscopic excision for intrapelvic schwannoma of the sciatic nerve: A case report

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Abstract. Schwannoma is a benign tumor of the nerve sheath originating from Schwann cells. The tumor rarely occurs in the sciatic nerve. The patient in the present case report was a 58-year-old woman presenting with pain in the right hip and leg, as well as numbness of the right lower limb. Magnetic resonance imaging revealed a solid tumor of 2.9 cm in diameter in the right pelvic space. The mass was considered to be a neurogenic tumor originating from the right sciatic nerve. Total laparoscopic surgery was performed to safely separate the tumor from the surrounding tissues, with preservation of the right sciatic nerve. The pathological result suggested a schwannoma. The patient recovered well with a transient numbness in the right heel. The laparoscopic approach used for this intrapelvic schwannoma of the sciatic nerve was safe and feasible, with the advantages of a magnified surgical field and small skin incision. However, the specific surgical approach should be based on the detailed condition of each patient and the experience of the surgeon with regard to laparoscopic surgery on benign presacral tumors and rectal tumors.

Introduction

Schwannomas are rare and benign tumors of the nerve sheath originating from well-differentiated Schwann cells in the peripheral nervous system (1). The incidence of schwannoma has been reported to be 0.3-0.4 per 100,000 individuals per year (2). The condition is characterized by the slow growth of a solitary lesion encapsulated within a tumor envelope. For schwannomas with painful symptoms, surgical intervention is recommended if surgery is possible without causing neurological deficits (3).

Therefore, surgical resection is the main treatment for patients with schwannoma and a good prognosis can be achieved (4-6).

Although the sciatic nerve is the largest nerve of the human body, schwannomas localized in the sciatic nerve are very rare, <1% (7,8). During surgery, the sciatic nerve is usually exposed through a posterior median approach outside the pelvis. The resection of tumors with the posterior sciatic nerve approach usually requires a large incision with open exposure (9). However, in cases of intrapelvic lesions, a transabdominal approach might be required (10). To the best of our knowledge, there are few studies reporting the laparoscopic resection of intrapelvic sciatic schwannoma. The current report presents a case of intrapelvic sciatic schwannoma that was recently successfully resected with laparoscopic excision.

Case report

A 58-year-old woman presented with pain in the right hip and leg that had persisted for 2 years and had progressively worsened over time. The patient visited Peking Union Medical College Hospital (Beijing, China) in June 2022 for treatment. The pain was associated with numbness of the right lower limb. The patient had been treated with physiotherapy and acupuncture at other hospitals, but no benefit was observed. The patient presented without a previous history of trauma and no subcutaneous nodules had been noted. There was no family history of schwannomatosis or neurofibromatosis type 2.

On magnetic resonance imaging (MRI) scans of the abdomen and pelvis, there was a soft-tissue mass (2.6x2.9x2.3 cm) in the right pelvic cavity (Fig. 1A). MRI showed a rounded and nonhomogeneous high signal intensity on T2-weighted images (Fig. 1B and C). On neurological examination, there was no significant motor loss in the affected extremity. Before the operation, the patient was informed of the possibility of conversion to open surgery, as, due to degeneration, bleeding or cystic changes, it may be hard to divide the tumor from the normal nerve. In this case, it may be necessary to convert to open surgery to preserve neurological function. However, if the tumor was considered to be malignant and nerve invasion had occurred, radical surgery would be performed.

Based on the experience of the surgeons with regard to laparoscopic surgery for benign presacral tumors and rectal

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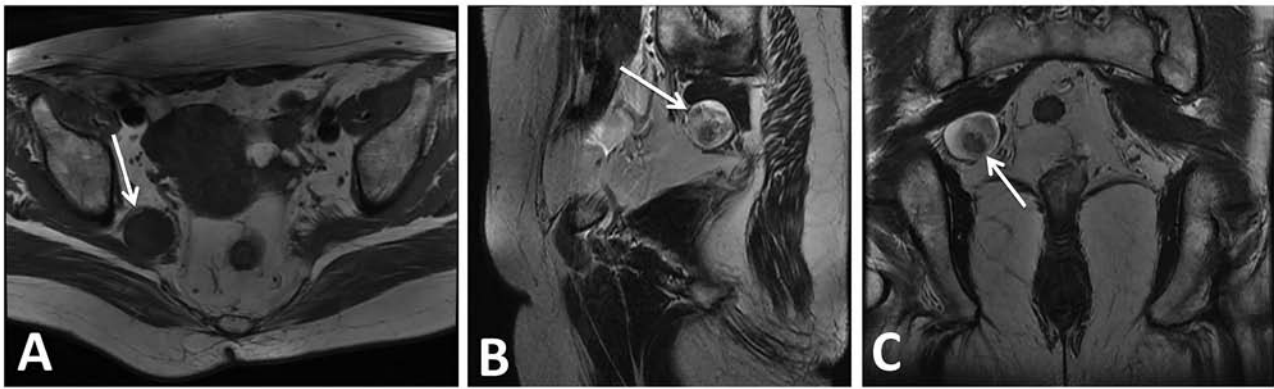


Figure 1. Preoperative MRI results. (A) T1-weighted axial MRI of the sciatic nerve schwannoma. (B) T2-weighted sagittal MRI of the sciatic nerve schwannoma. (C) T2-weighted coronal MRI of the sciatic nerve schwannoma. MRI, magnetic resonance imaging.

tumors, this operation was performed with a total laparoscopy. The patient was placed in the lithotomy position under general anesthesia. The space created by the induced pneumoperitoneum facilitated good vision in the confined pre-sacral space. The pelvic peritoneum was incised along the right ovarian vessel, and the ovary and ureter were pulled inwards. The right round ligament of the uterus was severed. The sciatic nerve was exposed by separating tissue along the internal iliac vascular space to the vicinity of the piriformis muscle, revealing a tumor 2.5 cm in diameter. The mass was suspected to be a neurogenic tumor originating from the right sciatic nerve. After the capsule was incised, the right sciatic nerve was pulled inwards to detach it from the surrounding tissue, the mass was removed from the capsule and the surgical specimen was removed in a specimen bag (Fig. 2). Finally, a drain was inserted into the space of the right pelvis and the pelvic peritoneum was sutured closed. The operation time was 70 min and the intraoperative blood loss was 15 ml.

Pathological examination showed a schwannoma, and immunohistochemistry was positive for S-100 and transcription factor SOX-10 (Fig. 3). Tumor tissues were immersed in 4% paraformaldehyde for 24 h and hydrated through a serial alcohol gradient before being embedded in paraffin wax blocks. Tissue sections (4 μ m) were dewaxed in xylene, rehydrated through decreasing concentrations of ethanol, and washed in phosphate buffered saline (PBS). Then, the tissues stained with hematoxylin and eosin for 5 min at room temperature. Antigens were unmasked in citrate buffer with pH 6.0. S-100 (Ready to use; cat. no. GA504; Dako; Agilent Technologies, Inc.) and SOX-10 (Dilution 1:50; cat. no. sc-374170; Santa Cruz; Biotechnology, Inc.) were immunohistochemically detected. Primary antibodies were incubated at 37°C for 2 h. Endogenous peroxidase was blocked by 3% hydrogen peroxide for 10 min at room temperature. The process of secondary antibody staining was based on the BOND-MAX Fully Automated IHC Stainer (Leica Biosystems). The tumor sections were observed by using an Olympus light microscopy (Olympus Corporation). The pathological diagnosis was a benign schwannoma. The postoperative course was uneventful. There were no neurological deficits except for transient numbness in the right heel. The patient recovered well and was discharged on postoperative day 4. The patient was satisfied with the recovery and is still being followed-up.

Discussion

Peripheral nerve tumors are rare, especially those originating from the sciatic nerve. Most of these tumors are exposed through a posterior median approach outside the pelvis (7). For extremely rare schwannoma cases originating from the intrapelvic sciatic nerve, a surgical approach to the lateral pelvic space is needed. However, surgical access to these tumors is difficult due to the narrow lateral pelvic spaces. In traditional open surgery, a large skin incision is required to remove the tumor from a lateral pelvic space.

Since the advent of the laparoscopic approach for benign retrorectal tumors, laparoscopic surgery has gradually entered the field of pelvic surgery (10). The advantage of the magnified vision of laparoscopy, as well as the convenience of the long instruments, enables access of the scope from the pelvis to the subcutaneous layer of the coccygeal region, facilitating the exposure and surgical removal of the tumor, which is rarely achieved by laparotomy and posterior approaches (11). However, extensive experience in laparoscopic rectal surgery is necessary for surgeons who decide to approach intrapelvic tumors by laparoscopy.

It has been reported that the laparoscopic approach for presacral tumors has the advantages of less intraoperative blood loss, less trauma, quicker recovery and a smaller skin incision (12). The laparoscopic approach could provide a feasible and safe alternative to the conventional approach for presacral tumors. To date, few cases of laparoscopic resection of sciatic schwannomas in the lateral pelvic space have been reported (10,13). Hidaka *et al* (10) reported that the laparoscopic resection of schwannoma in the lateral pelvic space was safe and feasible due to the magnified views on laparoscopy. This approach also avoids large skin incisions and can be useful in separating the schwannoma from the right sciatic nerve.

There are no published guidelines describing indications for laparoscopic surgery for pelvic schwannomas. Based on the literature and the surgical experience of the present medical center, laparoscopic surgery could be safely performed for benign intrapelvic schwannoma (10). Recurrence seems to be rare for benign schwannomas, so some surgeons consider a partial resection to be feasible (14). Therefore, there is no strict limit on the tumor size. For a large

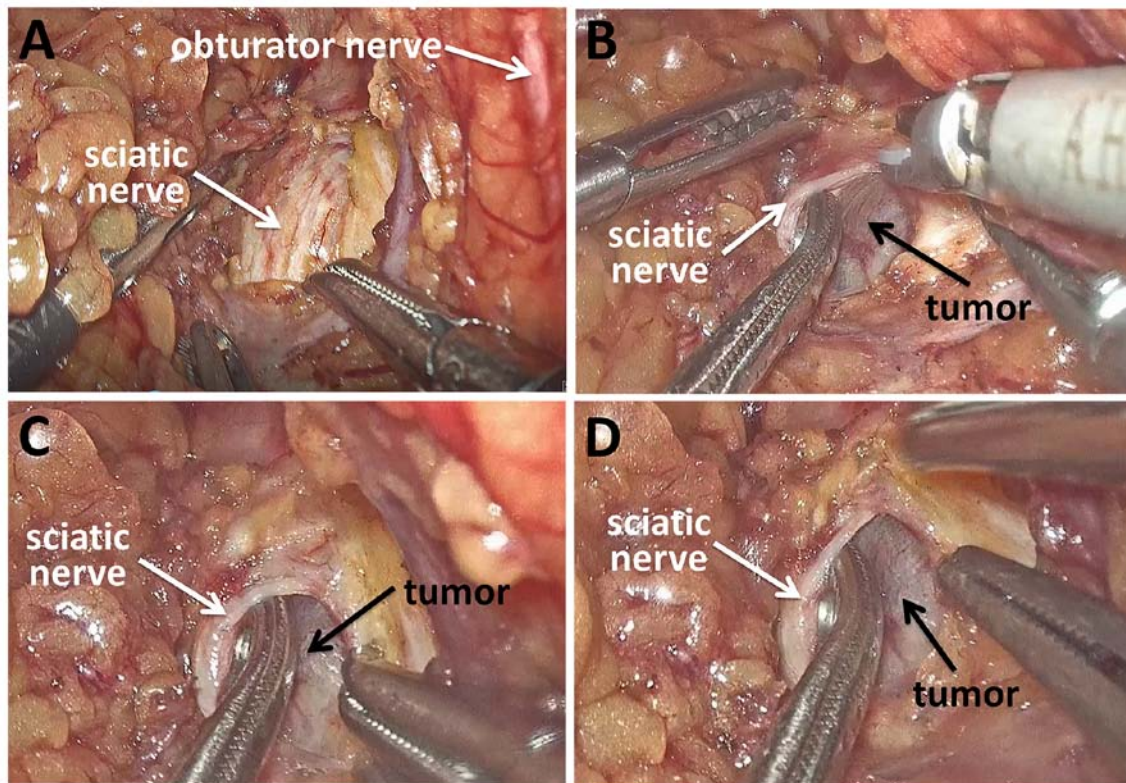


Figure 2. Surgical view of the tumor and nerve. (A) The sciatic nerve was exposed by separating tissues. (B) Exposure of the tumor. (C and D) Images of the tumor located at the dorsal side of the right sciatic nerve.

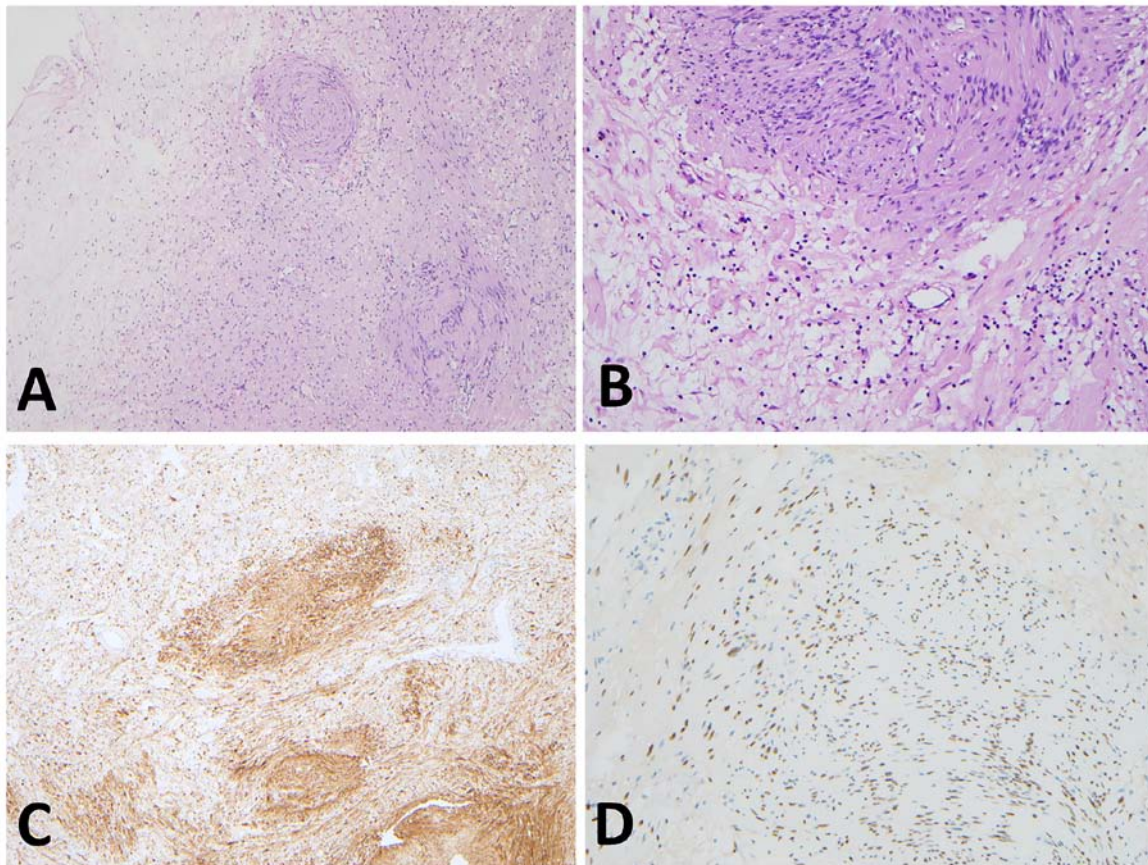


Figure 3. Results of pathological and immunohistochemical examination. (A and B) Pathology examination showing schwannoma [(A) x40 magnification; (B) x100 magnification]. (C) Immunohistochemical analysis showing S-100-positive Schwann cells (magnification, x40). (D) Immunohistochemical analysis showing SOX-10-positive Schwann cells (magnification, x100).

pelvic schwannoma that affects the exposure to the surgical field, preoperative embolization could be performed (15). However, if the tumor is >10 cm with no significant change after embolization, open surgery is recommended by the present study. If imaging is accompanied by malignant signs or the biopsy pathology suggests a malignancy, a complete resection should be performed. Laparoscopic resection of malignant pelvic schwannoma may have a risk of recurrence and metastasis (16,17).

Robotic systems have been gradually applied to the removal of benign presacral tumors, as they can provide improved three-dimensional visualization and more flexible and stable manipulation. It has also been suggested that robotic laparoscopic resection of pelvic schwannomas may have advantages in preserving the function of the nerves (18,19). Due to the learning curve, robotic laparoscopic resection should be limited to experienced surgeons in high-volume centers, which somewhat limits the progress of these systems. To the best of our knowledge, no evidence of superiority between laparoscopic resection and robotic laparoscopic resection of pelvic schwannoma exists. It is believed that with the increasing popularity of robotic surgery, its advantages will gradually become prominent.

Surgical resection of schwannomas aims to preserve the associated nerves. On the premise of tumor resection, damage to the nerve should be minimized. During the operation, the tumor capsule should be dissected layer by layer and carefully explored to avoid nerve injury. We recommended that this procedure should be performed with assistance from laparoscopic surgeons who are also able to perform the same surgery. Good cooperation of surgeons is beneficial to expose the surgical field and reduce the possibility of nerve injury. Adjunctive electrophysiological monitoring can also be applied to prevent nerve damage during robotic-assisted or laparoscopic surgery (11,20).

The present study demonstrated the safety and feasibility of laparoscopic excision for intrapelvic schwannomas of the sciatic nerve. The detailed surgical approach should be based on patient factors such as previous surgery, tumor characteristics and the expertise of the surgeon. Although the prognosis for most of these tumors is good, long-term follow-up is still necessary. In the future, more delicate and minimally invasive surgical techniques will be used to reduce the damage to patients and accelerate recovery.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

RW was responsible for the writing of the manuscript. BW conceived the original idea, supervised the study and was the primary physician of the patient. RW and SL collected pathological and immunohistochemical data. SL performed the literature search and performed the revisions. RW and BW confirm the authenticity of all the raw data. CL and FG acquired data from the patient, and investigated the patient history and clinical data. XX and BN participated in the surgery. XX, BN and BW reviewed the literature and revised the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

Not applicable.

Patient consent for publication

Written informed consent was obtained for the publication of the patient's data and images in this case report.

Competing interests

The authors declare that they have no competing interests.

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