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Case Report

Robot-assisted excision of multiple retroperitoneal schwannomas: a case and literature review

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Abstract: Recently, the robotic surgery system has ushered in a new era of minimally invasive surgery, which has been widely practiced in many fields of medicine. However, few cases have been reported using robotic techniques for retroperitoneal tumor resection. Here, we report the case of a 46-year-old man with multiple retroperitoneal schwannomas (RSs). Magnetic resonance imaging (MRI) showed a well-defined mass, 1.7 cm in diameter, at the L5/S1 level and another round encapsulated mass, 3.2 cm in diameter, at the S1/S2 level. After discussion, the patient received a robot-assisted tumor resection. The patient underwent an uneventful postoperative course and was discharged to home six days after surgery without complications. Histopathologic examination of both tumors revealed benign schwannomas and immunohistochemistry for S-100 was positive. To our knowledge, this is the first reported case of a robot-assisted laparoscopic excision of multiple RSs. This case demonstrates the robotic surgery can offer a new technical option for minimally invasive multiple retroperitoneal tumors resections.

Keywords: Schwannomas, retroperitoneal, robot-assisted, da Vinci robotic surgical system

Introduction

Schwannomas, also known as neurilemmomas, are tumors arising from Schwann cells of the peripheral nerves or cranial nerves [1]. These tumors are typically solitary, well circumscribed and encapsulated benign tumors characterized by slow growth [2]. Patients' ages were mainly between 20 to 50 years of age, among which women are more common [3]. Schwannomas may occur in any location but most commonly arise in the head and neck, or flexor surfaces of the extremities [4], while retroperitoneal localization is extremely rare, accounting for only 0.3-3% of total schwannomas [5]. Because schwannomas are not sensitive to radiation and chemotherapy, complete surgical excision may be the most appropriate treatment for RSs.

Since the emergence of the da Vinci robotic surgical system, more delicate operations have been completed with excellent 3D visualization, 7 degrees of freedom, breakthrough accuracy, and accessibility to surgery [6]. A surgical procedure like retroperitoneal tumor resection, which requires delicate operation, is ideal for applying the da Vinci robotic surgical system. Using the robotic system, we performed minimally invasive surgery for patients who presented with multiple RSs in different position and achieved satisfactory surgical results.

Case presentation

A 46-year-old man presented at our hospital following the accidental discovery of two cystic mass located in the retroperitoneal region, detected during a computed tomography (CT) to the abdomen. When questioned, the patient complained of no symptoms. His physical and neurological examination was unremarkable, and blood tests including urea and electrolytes were normal. MRI scans revealed a well-defined mass, 1.7 cm in diameter, at the L5/S1 level (**Figure 1A** and **1B**) and another round encapsulated mass, 3.2 cm in diameter, at the S1/S2 level (**Figure 1C** and **1D**). Several options such as observation, tissue biopsy or surgery were suggested, and the patient decided to operate

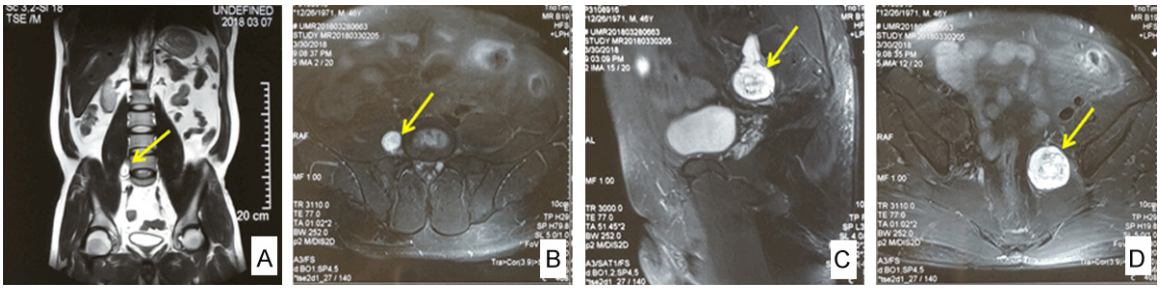

Figure 1. Preoperative coronal (A) and axial (B) MRI scans showing a well-defined, rounded right paravertebral mass at the L5-S1 level. Preoperative sagittal (C) and axial (D) MRI scans showing a round encapsulated mass at the left-sided S1-S2 level.

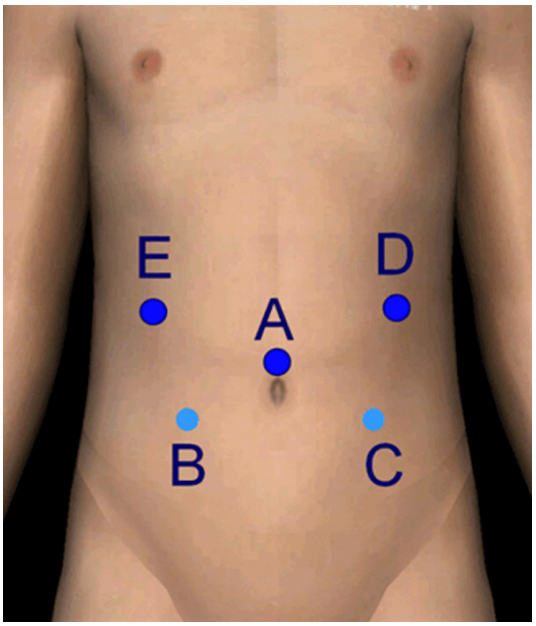

Figure 2. Diagram shows port placements for robot-assisted tumors resection (A: Camera port, B and C: Robotic arms port, D: Suction port, E: Assistance port).

after full consideration. Taking into consideration the specific location of the tumors, the patient was recommended to perform a robotic-assisted laparoscopic surgery on April 10, 2018.

The patient was maintained at trendelenburg position. The da Vinci surgical system was used.

Insufflation of the abdominal cavity was performed using a veress needle to 12 mmHg. Once the abdomen had been insufflated, a 12 mm disposable trocar (**Figure 2A**) for camera was placed above the umbilicus. Then all remaining trocars could be placed under direct vision. Two 8 mm trocars (**Figure 2B** and **2C**) for robotic arms were placed 10 cm lateral to, and 4 cm inferior to, the camera port. Two 12 mm trocars (**Figure 2D** and **2E**) were then placed in the midaxillary line two fingerbreadths above the camera port. The left side trocar (**Figure 2D**) was used for suction-irrigation. Another 12 mm trocar (**Figure 2E**) was made for assistance. The distance between the two trocars were determined enough to avoid the collision of the instruments. After trocars insertion, the big mass was dissected first until the left ureter and the iliac vessels were identified (**Figure 3A**). Once completely dissected, the tumor was carefully excised. After adjusting the direction of the arm, the right psoas muscle and ureter were then noted beneath the transparent posterior peritoneum. By tracing the right psoas muscle, another mass was noticed. After the dissection was completed, the tumor was excised with minimal traction of the originating nerve (**Figure 3B**). Finally, the two specimens (**Figure 4A**) were placed in the retrieval bag and removed through the assistant port. During the operation, the bleeding of small vessels was coagulated with bipolar forceps. The total operation time was 160 minutes, and the estimated blood loss was less than 80 ml. Although the bleeding was minimal, a drainage tube was placed for delayed bleeding.

The patient underwent an uneventful postoperative course. The patient began to take food three days after the operation, while the drainage tube was removed, and he was discharged to home six days after surgery without complications. Histopathologic examination of both tumors revealed benign schwannomas (**Figure 4B** and **4C**) and immunohistochemistry for S-100 was positive. The patient did not have any complaints during follow-up at about two months.

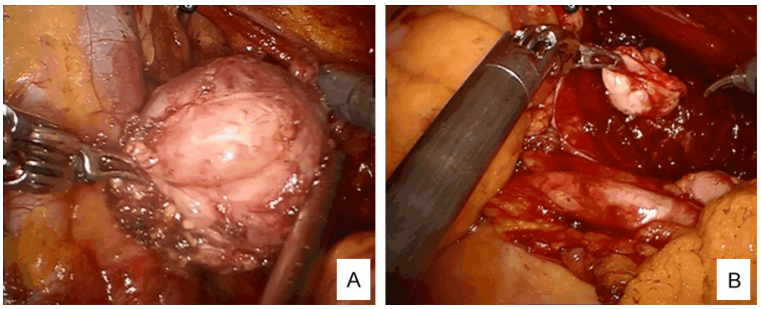

Figure 3. A. The intraoperative image of the excision of the first tumor. B. The intraoperative image of the excision of the last tumor.

Discussion

RSs are extremely rare, accounting for only 4% of retroperitoneal tumors [7]. The proportion of schwannomas in all RSs was reported to be about 0.3-3% [5]. Grossly, schwannomas are generally solitary, well-circumscribed, firm, and smooth-surfaced tumors [8]. However, few cases of multiple schwannoma have been reported [9-12]. Li et al. [10] reported 82 cases of RSs, of which only 2 were multiple schwannomas (2.4%). Our patient is a rare case of synchronous multiple schwannomas located in the retroperitoneal region. The symptoms of RSs are non-specific and often associated with the location and size of the lesion [13]. Most RSs are generally asymptomatic, therefore, it seems difficult to determine the diagnosis before surgery [14]. Abdominal pain and distention are the most common symptoms [13, 15], while other symptoms include secondary hypertension, hematuria, and recurrent renal colic pain [8]. Numerous patients, including the present case, may not show any abnormalities before routine examination.

Since there is no gold standard diagnostic method for RSs, it is difficult to have a definitive diagnosis of RSs before surgery [16]. Although numerous advanced imaging techniques are available, varying from ultrasound (US) and CT to MRI, there is a lack of special imaging features [17]. Preoperative biopsy is usually not recommended as a diagnostic tool due to the risk of bleeding, infection, and tumor seeding [18, 19]. Furthermore, the presence of cellular pleomorphism in degenerated areas may be misdiagnosed as a malignant tumor [20]. The differential diagnosis for RS includes appendicitis, adrenal adenoma [3], pancreatic tumor, mesenteric tumor [21], fibrosarcoma, liposarcoma, ganglioneuroma, haematoma, and connective tissue diseases [22]. Definitive diagnosis of schwannomas is based on pathological, histological, and immunohistochemical findings [16]. Characteristic histopathological change is that schwannomas are composed of dense cell lesions (Antoni A) and less cells and more abundant myxoid lesions with microcystic spaces (Antoni B) [23, 24]. The typical immunohistochemical manifestations of schwannomas is that S100 protein is strongly positive in most of the patients [25]. Antoni A and B areas, and S100 positivity with cystic degeneration were seen in the results of the present patient.

Because schwannomas are not sensitive to radiation and chemotherapy, complete surgical resection is considered to be the effective treatment for schwannomas [26]. The prognosis of benign RSs is usually good. Recurrence, 5% of cases reported, is the most common complication, mainly with incomplete resection [27]. The robot-assisted complete resection was performed in our case and the patient experienced no complications during about two months follow-up.

The traditional treatment of retroperitoneal schwannoma involves open surgery and conventional laparoscopic resection. In contrast to the open resection, robotic surgery has the advantage of limited damage to patients, shorter operative time, and meticulous bleeding control. Moreover, using the robotic techniques has similar clinical outcomes and shorter postoperative hospital stays compared to open resection. Although using the laparoscopic approach to tackle the RSs is feasible, the conventional laparoscopic techniques have the limitations of two-dimensional vision, low dexterity and cannot allow flexible bending [28]. The Da Vinci surgical system seems to have overcome many shortcomings of laparoscopic surgery, ensuring good operational flexibility, 3D visuals, and surgical safety [29]. Few cases have been reported using robotic techniques for RS resection [30-33]. To our knowledge, this is the first reported case of a robot-assisted laparoscopic excision of multiple RSs.

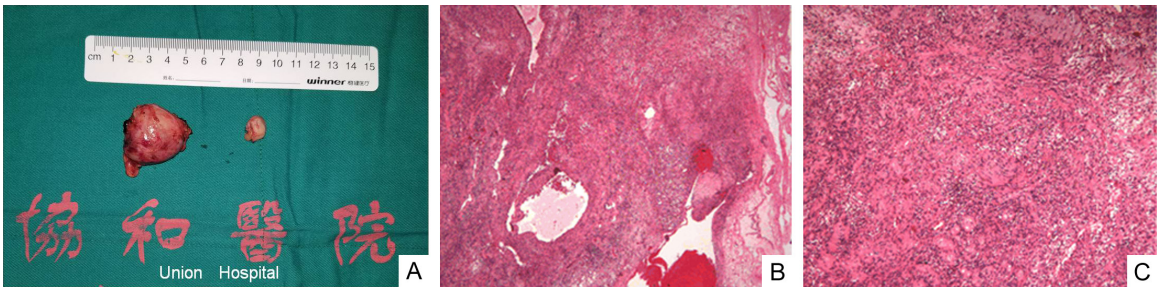

Figure 4. A. Tumor specimens (4.5×3×2.5 cm, 1.2×1×0.6 cm) were removed successfully with robot assisted resection. B. Histologic image of specimen at 40×. C. Histologic image of specimen at 100×.

In conclusion, for multiple retroperitoneal tumors, the use of Da Vinci robotic surgery can provide minimally invasive access to good exposure and good short-term results. This is entirely possible because the system provides excellent 3D visualization of the surgical site, tremor filtration and improved dexterity.

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Disclosure of conflict of interest

None.

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