

Robot-assisted laparoscopic resection of a pelvic solitary fibrous tumor

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Abstract

Solitary fibrous tumor (SFT) is a rare soft tissue neoplasm of mesenchymal origin. SFT is most commonly located in the thoracic cavity (in approximately 80% of cases), but can also develop rarely in the pelvis. A 47-year-old man presented to our hospital with a pelvic tumor that was discovered during a health checkup. We performed transperitoneal robotic resection of the pelvic tumor. Intraoperative blood loss and the console time were 100 mL and 2 hours 42 minutes, respectively, and no intraoperative or postoperative complications were recorded. Histologic analysis revealed a pelvic SFT with negative surgical margins. The patient was followed-up for 13 months with no evidence of tumor recurrence. To our knowledge, this is the first report of robot-assisted laparoscopic resection of a pelvic SFT.

Keywords

Pelvis, robotic, pathology, solitary fibrous tumor, surgery, follow-up

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Introduction

Solitary fibrous tumor (SFT) is a rare soft tissue neoplasm, and its incidence is 2.8 per 100,000 people.¹ Approximately 80% of cases of SFT are located in the thoracic cavity, but these tumors can also present rarely in extrathoracic sites, including the pelvis.² Surgical resection is the mainstay of treatment. Several studies of pelvic SFT have been reported; however, a robotic

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approach has never been described. Herein, we report a case of robot-assisted laparoscopic resection of a pelvic SFT.

Case presentation

A 47-year-old man presented to our hospital with a pelvic tumor that was discovered during a health checkup. Transabdominal ultrasonography revealed a solid pelvic mass (Figure 1a). His medical history included hypertension treated with irbesartan. He had a 20 pack-year history of smoking, and his family history was unremarkable. Urine and blood test results were normal, as were tumor marker measurements (prostate-specific antigen (PSA), carcinoembryonic antigen (CEA),

alpha-fetoprotein (AFP), carbohydrate antigen (CA)-125, and CA-19-9). Transrectal ultrasonography confirmed a hypoechoic pelvic mass of approximately 5.0 cm diameter (Figure 1b).

Computed tomography (CT) scan of the pelvis demonstrated a 6.0- × 5.0- × 4.0-cm tumor in the right pelvis. The enhancing solid tumor was adjacent to the right seminal vesicle and compressed the urinary bladder (Figure 1c, d). Pelvic magnetic resonance imaging (MRI) was performed to further evaluate the mass and its relationships with the neighboring structures (rectum, prostate, seminal vesicle, and bladder). MRI revealed a retrovesicular mass with heterogeneous low-intensity signals on T2-weighted sequences and

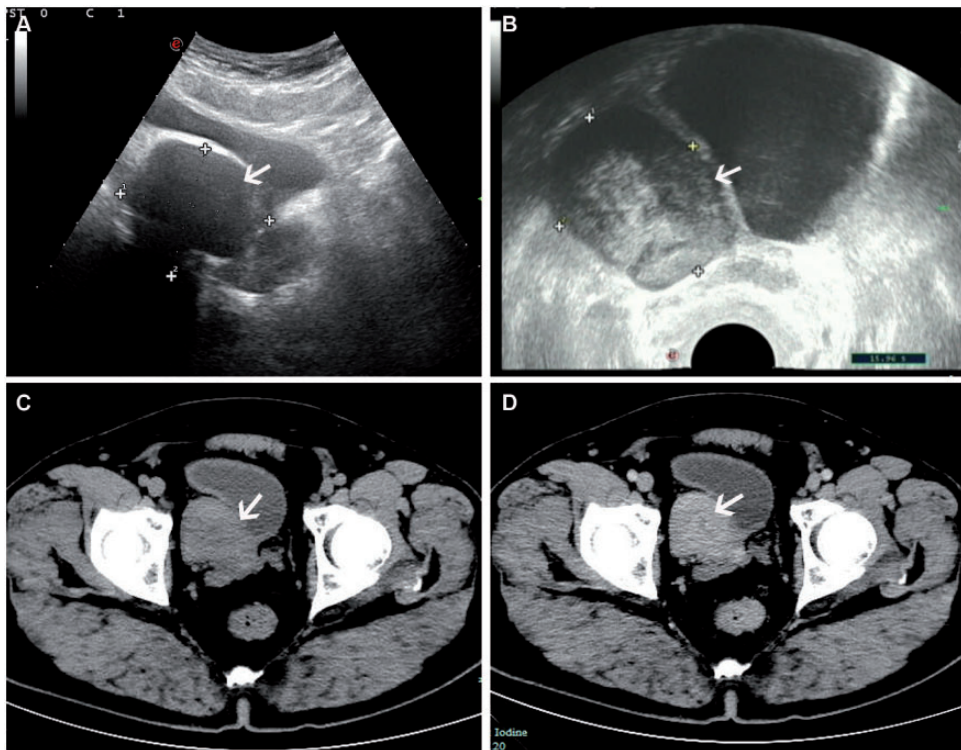


Figure 1. Ultrasonography and computed tomography (CT) revealed a pelvic mass (white arrows). (a) Transabdominal ultrasonographic image showing a solid pelvic mass. (b) Transrectal ultrasonography confirmed a hypoechoic pelvic mass. (c) Axial CT showing a solid pelvic mass. (d) Axial contrast-enhanced CT showing enhancement of the pelvic tumor.

iso-intensity on T1-weighted sequences (Figure 2). No direct invasion to the bladder and rectum was visible. Transrectal ultrasound-guided needle biopsy of the mass was performed to exclude malignancy, and the histologic report revealed a diagnosis of a benign tumor.

Robotic excision of the pelvic mass was performed after the biopsy. We used a four-arm robotic approach with five trocars and with the patient positioned in steep Trendelenburg on a split-leg table. The first small incision was made above the umbilicus and served as the 12-mm camera port. The three robotic ports and the 12-mm assistant port were arranged similarly to the placement used for

transperitoneal robotic radical prostatectomy. The retrovesicular peritoneum was incised, and the seminal vesicles were identified. After complete dissection of the plane between the right ureter, right seminal vesicle, urinary bladder, and rectum, we found a solid mass measuring 6.0 cm × 5.0 cm. No tumor invasion of the surrounding structures was identified. After the mass was released from the surrounding structures, the tumor was resected, and a rubber drain was placed in the pelvis. The tumor was retrieved en-bloc in an endoscopic bag through the camera port; intraoperative blood loss and the console time were 100 mL and 2 hours 42 minutes, respectively.

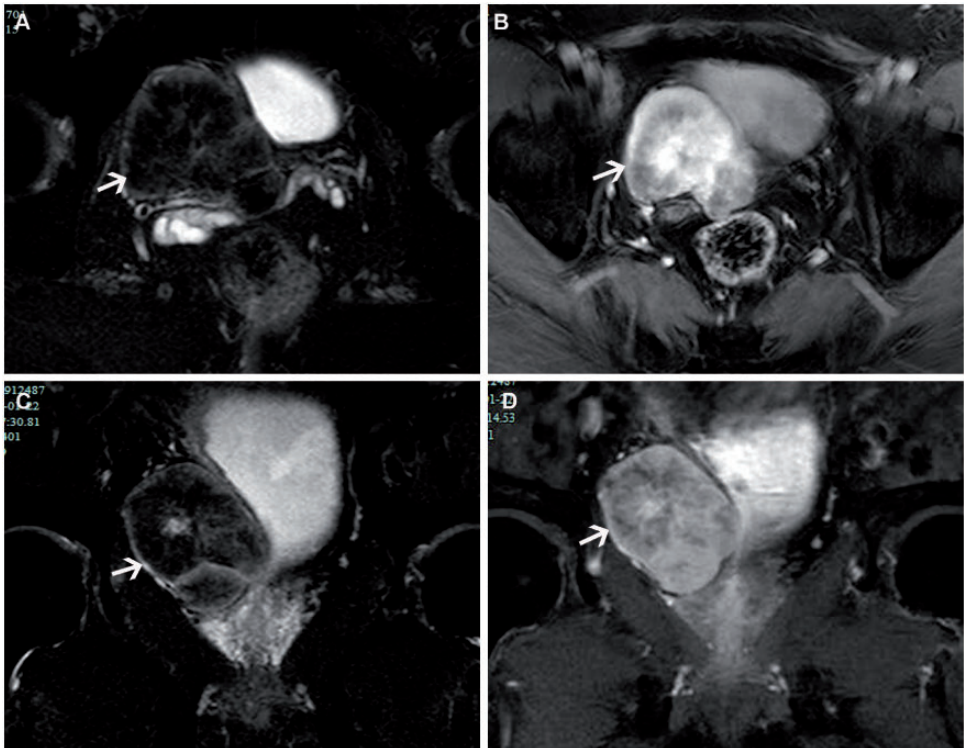


Figure 2. Magnetic resonance images (MRI) showing a pelvic mass (white arrows). (a) Axial T2 MRI pre-contrast showing a heterogeneous low-intensity pelvic tumor. (b) Axial T1 post-contrast MRI showing heterogeneous enhancement of the pelvic tumor. (c) Coronal T2 pre-contrast MRI showing heterogeneous iso-intensity of the pelvic tumor. (d) Coronal T1 post-contrast MRI showing heterogeneous enhancement of the pelvic tumor.

The drain was removed on postoperative day 5. The patient had an uneventful postoperative course and was discharged home on the sixth postoperative day. Grossly, the resected specimen was a solid, well-demarcated tumor measuring $6.0 \times 5.0 \times 4.0$ cm (Figure 3a). The cut surface was hard, elastic, and grayish-white, with a fibrous capsule (Figure 3b). Microscopically, the tumor contained spindle cells arranged in a random pattern in a randomly-oriented collagen matrix (Figure 3c). Immunohistochemically, the specimen was diffusely positive for cluster of differentiation (CD) 34 (Figure 3d) and signal transducers and activators of transcription (STAT) 6 (Figure 3e), but negative for

S-100, CD117, discovered on gastrointestinal stromal tumors 1 (DOG-1), HMB45, anaplastic lymphoma kinase (ALK), desmin, and smooth muscle actin (SMA). According to these characteristics, we diagnosed primary SFT of the pelvis. Surgical margins were negative, and there was no clinical or radiological evidence of tumor recurrence in the 13-month follow-up.

Discussion

SFT is a rare soft tissue neoplasm that originates from the mesenchyme, and which was first described by Klemperer and Rabin in 1931.³ SFT is most commonly located in the thoracic cavity (in

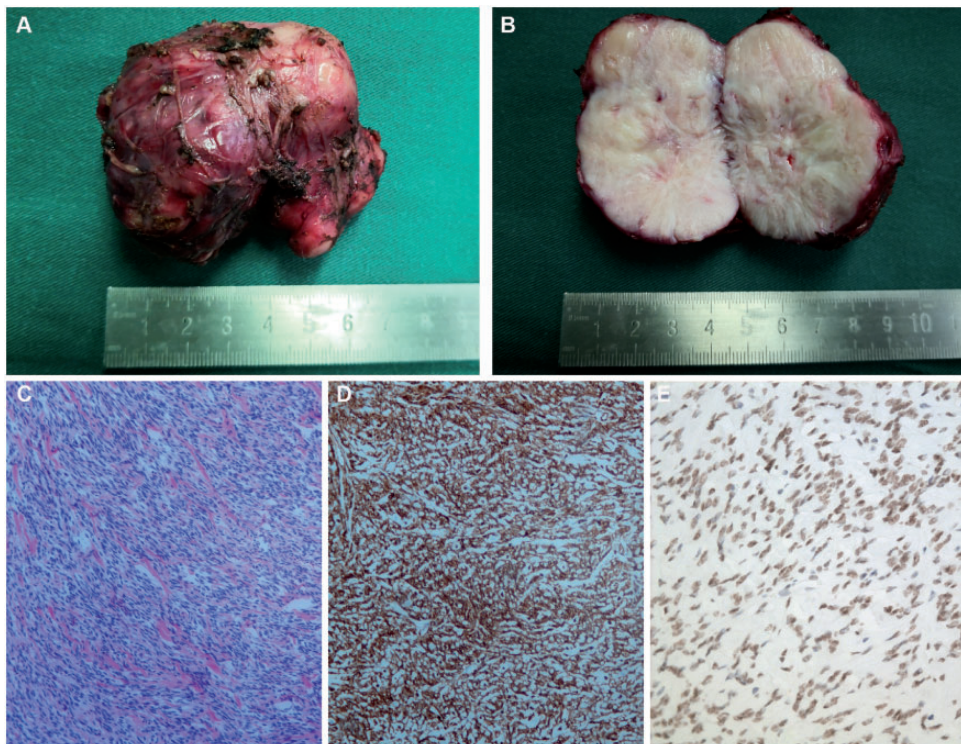


Figure 3. Surgical specimen and histopathologic analysis. (a) (b) Gross view and the cut surface of the resected pelvic tumor. (c) Photomicrograph of a histological section stained with hematoxylin and eosin showing spindle cells arranged in a random pattern in a randomly-arranged collagen matrix. (d) (e) Immunohistochemical staining revealed that the specimen was diffusely positive for cluster of differentiation 34 (CD34) and signal transducers and activators of transcription (STAT) 6.

approximately 80% of cases), but can also present rarely in various extrathoracic sites, such as the extremities, abdominal cavity, and intracranial region. SFT may be diagnosed in a wide age range and has an equal frequency between men and women. The etiology is unknown. Most SFTs in the pelvic cavity are asymptomatic, and they are found incidentally through imaging examinations. Some cases are diagnosed with abdominal fullness or with other symptoms that may be associated with compression of adjacent organs. In the present case, pelvic SFT was detected during a health checkup; the patient had no symptoms.

Ultrasonography of pelvic SFT usually shows a well-delineated tumor with heterogeneous echotexture. In our case, ultrasonography (transabdominal and transrectal) confirmed a hypoechoic solid mass. CT imaging of pelvic SFT also typically shows a well-defined, occasionally lobulated hypervascular mass of variable size. On T1-weighted (T1WI) and T2-weighted (T2WI) images, pelvic SFTs usually appear as a well-defined mass with heterogeneous signal intensity.^{4,5} Although the MRI features of pelvic SFT are nonspecific, most pelvic SFTs demonstrate enhancement on both CT and MRI following contrast administration. The SFT described in our case report showed heterogeneous low-intensity signals on T2WI and iso-intensity on T1WI on MRI. Contrast enhancement of the SFT was identified with both CT and MRI.

The standard preoperative workup for pelvic SFT is similar to that for other soft tissue masses and consists of obtaining a medical history and performing laboratory and imaging examinations. Because of its rarity, pelvic SFT is not easily diagnosed preoperatively by imaging examinations. We performed preoperative transrectal ultrasound-guided needle biopsy of the mass, in our patient, and histopathological

examination revealed a diagnosis of benign tumor.

Most pelvic SFTs are benign, but a significant fraction of these tumors show malignant behavior. Approximately 6% to 23% of extrapleural SFTs show aggressive behavior, and some studies have suggested multiple tumor features associated with a more aggressive clinical behavior.^{6,7} In a large study, Demicco et al.⁷ proposed a risk stratification according to patient age, mitotic count, tumor necrosis, and tumor size. Our case presented with a low risk of metastasis: age <55 years, tumor size between 5 cm and 10 cm, mitotic count 0/high power field (hpf), and tumor necrosis <10%.

Because of the extreme rarity of cases, there is no ideal treatment strategy for pelvic SFT; surgical resection is the optimal treatment. Complete en bloc surgical resection of the SFT and negative margins are the most important factors determining a good prognosis. Owing to the variable location of pelvic SFT, different surgical approaches have been proposed. In the present case, the tumor was located in the right retrovesicular region adjacent to the right seminal vesicle. It is very difficult to access retrovesicular tumors in open surgery owing to the anatomical structures. Significant morbidity and incisional pain are also limiting factors associated with open resection of retrovesicular tumors. Transperitoneal laparoscopic resection of retrovesicular tumors has been described in several studies;^{8,9} laparoscopic surgery provides better access to the retrovesicular structures. Passerotti et al.¹⁰ reported that minimally invasive surgery (pure laparoscopic and robot-assisted laparoscopic surgery) provides better visualization and lower morbidity compared with open surgery. However, laparoscopic resection of retrovesicular tumors remains unpopular because of its steep learning curve. Because of the superior ergonomics, three-dimensional visualization, and seven

degrees of freedom, robotic surgery has replaced many laparoscopic urological procedures. However, the cost of robotic resection of pelvic SFT is significant, with mean hospital billing amounts of \$10,100 (USD). Several studies of pelvic SFT have been reported;^{11–16} however, to the best of our knowledge, a robotic approach has never been described. In our case, we performed transperitoneal robotic resection of the pelvic SFT, which provides a more direct approach to retrovesicular SFT. In our case, the intraoperative blood loss and the console time were 100 mL and 2 hours 42 minutes, respectively, and no intraoperative or postoperative complications were recorded. The histologic report revealed a diagnosis of pelvic SFT with negative surgical margins. According to Demicco et al's risk stratification, our case presented with a low risk of metastasis. Adjuvant treatment with radiotherapy, chemotherapy, and targeted therapies for pelvic SFT has not been defined owing to the low incidence of SFT. However, patients still require long-term regular follow-up visits. Our patient was followed-up for 13 months with no evidence of tumor recurrence.

Conclusion

Primary SFT arising from the pelvis is extremely rare, and no standard treatment strategy has been established. Surgical resection is the mainstay of treatment, and complete en bloc surgical resection of pelvic SFT and negative margins are the most important factors associated with a good prognosis. To our knowledge, we reported the first case of robotic pelvic tumorectomy for the treatment of pelvic SFT.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.


Ethics statement

This study was approved by the Ethics Committee of the First Affiliated Hospital, Zhejiang University School of Medicine. The patient provided written informed consent for the procedures and to publish the details of his case.

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