

# A broad ligament solitary fibrous tumor with Doege–Potter syndrome

Sijing Chen, MS<sup>a,b</sup>, Ying Zheng, MD PhD<sup>a,b,\*</sup>, Lin Chen, MS<sup>a,b</sup>, Qihua Yi, MS<sup>a,b</sup>

## Abstract

**Introduction** Solitary fibrous tumors (SFTs) are uncommon mesenchymal neoplasms and are particularly rare in the female genital tract. Doege–Potter syndrome is a paraneoplastic syndrome involving SFT-associated hypoglycemia. We report, for the first time, on a broad ligament SFT with Doege–Potter syndrome; additionally, we review 30 cases of women with SFTs reported in the literature.

**Patient concerns** A 37-year-old woman who presented with life-threatening hypoglycemia and a pelvic mass (16 × 15 × 15 cm).

**Diagnoses** The patient was diagnosed with broad ligament SFT with Doege–Potter syndrome.

**Interventions** Tumor resection, sub-extensive hysterectomy, bilateral salpingo-oophorectomy, and pelvic lymphadenectomy were performed, and 6 cycles of adjuvant chemotherapy were administered.

**Outcomes** Serum glucose levels returned to normal as soon as the tumor was resected. Forty-3 months after operation, there was recurrence in the posterior peritoneal tissues. She underwent tumor resection and has remained tumor-free 28 months after this excision.

**Conclusion** Even though it is extremely rare, SFT should be quickly identified to prevent undue treatment delay and avoid unnecessary examination; surgery and long-term follow-up are recommended. SFT can be considered a highly invasive cancer, and intraoperative bleeding may occur. Although no correlation between adjuvant therapy and improved prognosis was found, further studies are required because of the small number of cases reported to date.

**Abbreviations:** CT = computed tomography, MRI = magnetic resonance imaging, SFTs = solitary fibrous tumors.

**Keywords:** broad ligament, Doege–Potter syndrome, female genital tract, solitary fibrous tumor

## 1. Introduction

Solitary fibrous tumors (SFTs) are an uncommon mesenchymal neoplasm with an incidence rate of 2.8 per 100,000.<sup>[1,2]</sup> Paraneoplastic syndrome of hypoglycemia (Doege–Potter syndrome) is observed in 5% to 10.4% of all patients.<sup>[3]</sup> While this tumor type can be found in any organ, its occurrence in the female genital tract is extremely rare. There were more than 2000 cases of SFTs reported in the English-language literature; approximately 80 of these cases involved hypoglycemia, and 30 originated in the female genital tract. We here reported for the first time a broad ligament SFT with Doege–Potter syndrome.

## 1.1. Case report

A previously healthy 37-year-old woman presented at our institution with an enormous pelvic mass and severe hypoglycemia. Beforehand, she had visited the Department of Sleep and Endocrinology complaining of occasional drowsiness and confusion for 1 month. She had never complained of any symptoms related to the gynecologic or gastrointestinal organs.

Laboratory data revealed persistent hypoglycemia (glucose 0.61–2.97 mmol/L [normal, 3.90–6.10]), insulin 0.20 μU/mL [normal, 1.50–15], C-peptide <0.01 nmol/L [normal, 0.48–0.78], and insulin-related growth factor-1 36 ng/mL [normal, 94–358]). Test results ruled out a functional islet cell tumor, thyroid dysfunction, or adrenal dysfunction. Computed tomography (CT) of the pelvis showed that the right iliac vessels were pressed against the congruous pelvic wall by an enormous pelvic mass, and intravenous blood flowed from the mass towards the womb (Fig. 1A, 1B). Meanwhile, CT scans of the brain, thorax, and stomach were normal. A mass as large as a 16-week “pregnant uterus” with no tenderness was found through bimanual examination on the right pelvis, and the patient’s actual uterus was pushed to the left. A presumptive diagnosis of a broad ligament leiomyoma was made.

A massive lesion covered by dense thumb-wide vasculum within the right broad ligament was observed under exploratory laparotomy, which was consistent with CT data. Tumor resection, sub-extensive hysterectomy, bilateral salpingo-oophorectomy, and pelvic lymphadenectomy were subsequently performed by the most experienced group at our institution since the tumor appeared to be a poorly differentiated endometrial stromal sarcoma (ESS) on frozen sectioning. The surgery lasted 400 min, and the volume of blood loss was 5000

Editor: N/A.

Compliance with ethical standards

Informed consent was obtained from the patient reported in our study.

The authors have no conflicts of interest to disclose.

<sup>a</sup> Department of Gynecologic Oncology, West China Second Hospital, Sichuan University, <sup>b</sup> Key Laboratory of Birth Defects and Related Diseases of Women and Children (Sichuan University), Ministry of Education, China.

\* Correspondence: Ying Zheng, West China Second Hospital, Sichuan University, No. 17, Renmin South Road, Chengdu 610041, Sichuan, People’s Republic of China (e-mail: 3466151769@qq.com).

Copyright © 2018 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

Medicine (2018) 97:39(e12564)

Received: 29 May 2018 / Accepted: 5 September 2018

<http://dx.doi.org/10.1097/MD.00000000000012564>



**Figure 1.** Presurgical CT imaging of the pelvic mass in our patient with a solitary fibrous tumor. (A) The first presurgical CT image showed an enormous pelvic mass (arrow a) pressing against the iliac vessels (arrow b). (B) The venous return (arrow c) is demarcated. CT=computed tomography.

mL in total while that of the mass resection was 4900 mL; 12 units of packed red cells and 1000 mL of plasma were administered. Serum glucose levels soared to 17.10 mmol/L as soon as the tumor was resected. The patient subsequently recovered well and was discharged on day 5 post-surgery.

Macroscopically, the tumor measured 16 × 15 × 15 cm with clearly defined margins. It exhibited a rotten fish, meat-like, and jelly-like appearance and was grayish-white in color with multiple cystic components containing brown liquid. Microscopically, the atypical neoplastic tumor cells were in a poorly formed arrangement with approximately 14 mitotic figures per 10 high-power fields (Fig. 2A); branching vessels (Fig. 2B) and necrotic foci (Fig. 2C) were also observed. Immunohistochemically, the tumor was positive for CD34 (Fig. 2D), CD99 (Fig. 2E), vimentin, and CD10, and was negative for Bcl-2, smooth muscle actin, and S100. The uterus, adnexa, and lymph nodes were negative for tumor cells. These results strongly supported a diagnosis of malignant SFT of the broad ligament of the uterus and Doege–Potter syndrome with R0 resection.

Six cycles of adjuvant chemotherapy with azithromycin, decarbonize, and ifosfamide were administered. Owing to the

complete surgical resection, radiotherapy was not administered to this patient. Transvaginal ultrasonography was performed every 3 months and radiography was performed every 6 months for follow-up.

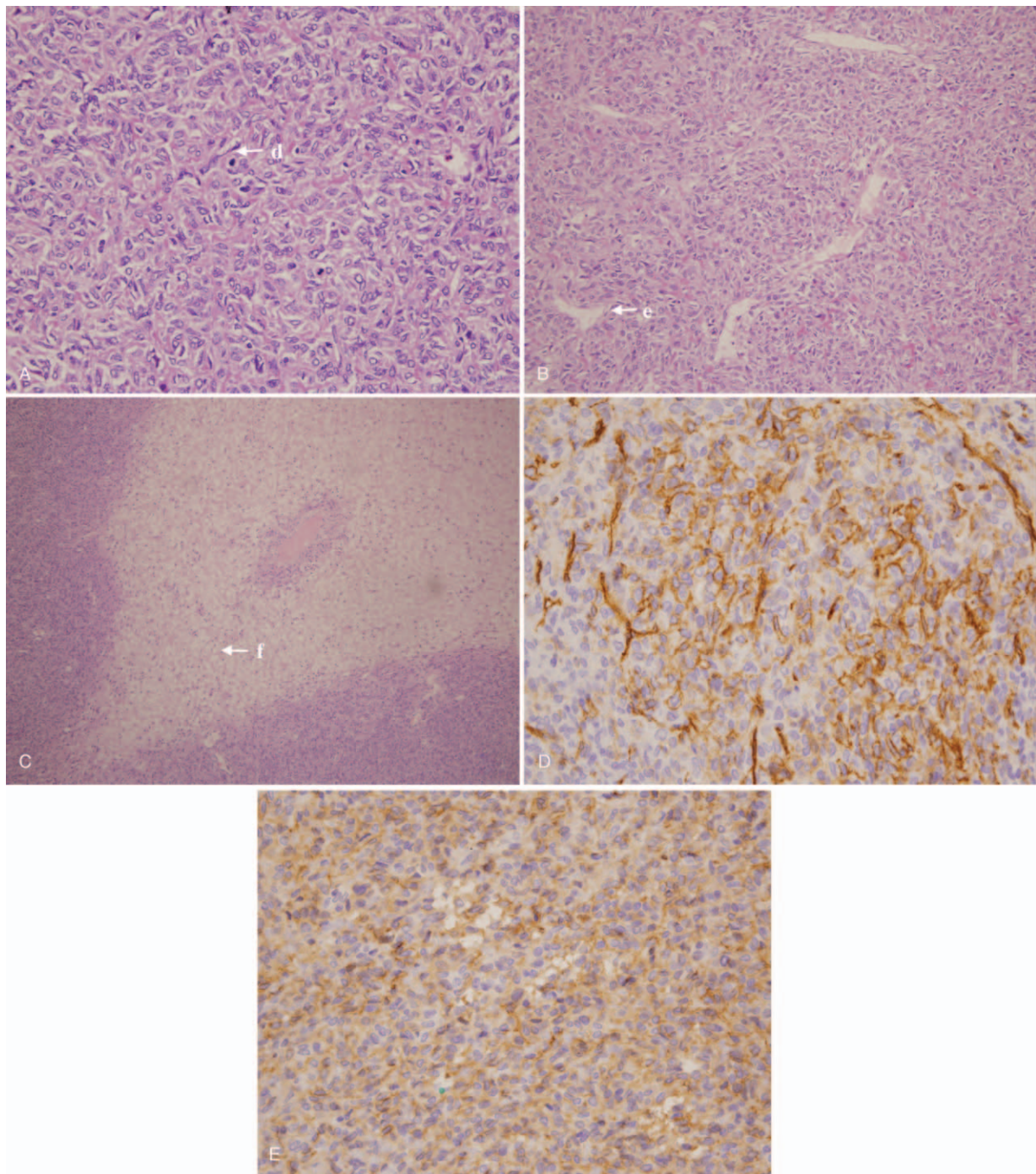
Forty-three months after surgery, CT scanning revealed a recurred right pelvic mass that was fundamentally different from the first. This was an intraperitoneal mass (7 × 6.5 × 4 cm) with the right iliac vessels pushed to the left side; moreover, the peritoneum was separated from the pelvic cavity by the tumor (Fig. 3). The tumor was excised with 80 mL of blood loss, and a recurrence of malignant SFT was confirmed.

Currently (67 months after the first surgery), the patient is alive and being followed; there have been no episodes of hypoglycemia and she has remained tumor-free 28 months after the second excision. (Table 1.)

## 2. Discussion

We searched the PubMed database using the search terms “solitary fibrous tumor,” “Doege–Potter syndrome,” “pelvic,” “uterus,” “cervix,” “fallopian tube,” “ovary,” “vagina,” and





**Figure 2.** Histochemical findings of the pelvic tumor (hematoxylin and eosin staining). (A) ( $\times 400$ ): atypical spindle neoplastic cells (arrow d). (B) ( $\times 200$ ): branching vessels (arrow e). (C) ( $\times 40$ ): Necrotic foci (arrow f). Immunohistochemical findings using EnViSion staining showed positivity for (D) ( $\times 400$ ): CD34 and (E) ( $\times 400$ ): CD99 (brown areas).

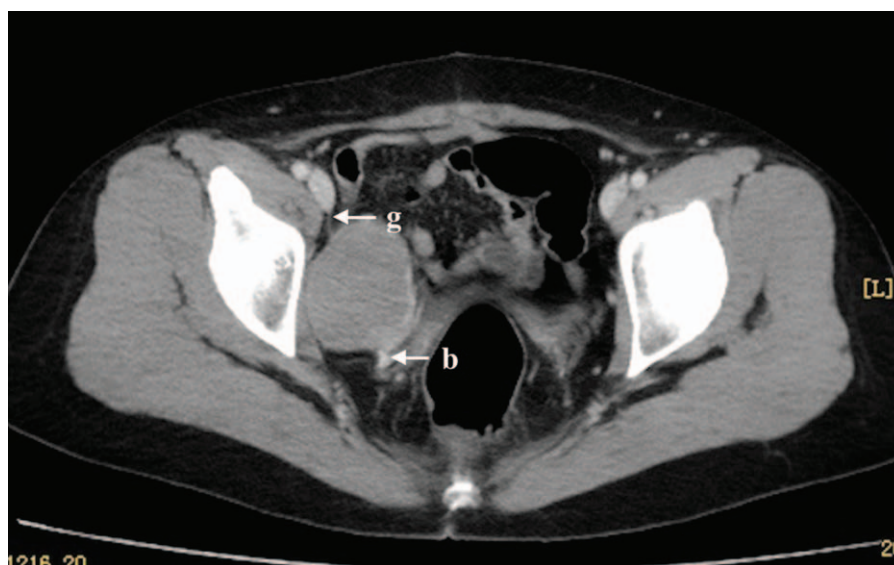
“vulva.” Patients without recorded details were excluded. A total of 30 patients with SFT were found described in reports published between 1998 and 2017; their characteristics are listed in Table 2.

### 2.1. Clinical findings

The median age of female patients was 51 years (range, 14–78 years). The most common location was the vulva (11/30), followed by the vagina (6/30), uterine corpus (6/30), uterine

cervix (4/30), fallopian tube (1/30), round ligament (1/30), and broad ligament (1/30). The maximum tumor diameter ranged from 1 to 23 cm (median, 6 cm).

The clinical presentations of SFTs vary according to the tumors’ locations, sizes, and features. There are usually no symptoms (14/30), especially at an early stage. Therefore, they tend to be large when discovered, and may also be found incidentally during imaging tests performed for other reasons. Large tumors may be accompanied by symptoms of regional pain



**Figure 3.** The second presurgical CT revealed squeezed right iliac vessels (arrow b) and a separated peritoneum (arrowg). CT= computed tomography.

(7/30) or abnormal vaginal bleeding (5/30). SFTs of the vulva and vagina always present with a palpable mass (3/30).<sup>[4,5]</sup> The paraneoplastic syndromes seborrheic keratosis (the Leser–Trélat sign), acromegaly (Pierre-Marie-Bamberg), and hypoglycemia (Doege–Potter) can rarely occur as a secondary effect of the tumor. Among the 30 patients investigated, only 1 was admitted to the hospital because of hypoglycemia with uterine corpus SFT; to our knowledge, ours is the first reported case of broad ligament SFT presenting with Doege–Potter syndrome.<sup>[6]</sup>

## 2.2. Clinical diagnosis

Laboratory findings of SFTs are always unremarkable. In previous reports, 5 patients were described as having undergone B ultrasonography examination, 7 underwent CT, and 2 underwent magnetic resonance imaging (MRI), 1 underwent both CT and MRI; imaging studies were not mentioned for 15 patients. However, imaging examination alone is insufficient for differential diagnosis, as it lacks the ability to detect certain features typical of SFTs. CT scanning and MRI show tumors with a clear boundary and heterogeneous density that push against surrounding organs, but never with invasion. On the other hand, imaging is very effective for assessing the links between tumors and adjacent organs, and for determining whether a distant metastasis is present. Thus, once the diagnosis is established, the patient is recommended for re-evaluation with imaging to rule

out a concurrent tumor, especially in the chest.<sup>[7,8]</sup> Regular imaging examinations are also especially useful for follow-up examination.

Experienced pathologists are critical for the diagnosis of SFTs. Core needle biopsy of the superficial tumor is necessary for accurate disease diagnosis and prompt treatment; however, this has not been broadly applied in gynecological settings. Only 4 patients underwent fine-needle aspiration biopsy and were accurately diagnosed with SFTs preoperatively. A possible reason for the absence of fine-needle aspiration biopsy is that gynecologists do not consider this rare disease and instead assume uterine leiomyoma, ovarian cysts, cervical polyps, and even abscesses. Since the bulky lesion may have a rich blood supply (as was the case in our patient), the possibility of life-threatening hemorrhage ought to be considered. Additionally, the unpredictable biological behavior combined with the exceedingly rapid growth of these tumors may lead to needle-core biopsies and surgical specimens yielding discordant data.<sup>[9,10]</sup>

Grossly, the reported tumors ranged from 1 to 23 cm in maximum diameter (median: 6 cm) and generally comprised of firm lesions with well-demarcated margins and smooth surfaces. The cut face showed a mixture of solid and cystic components; some also exhibited mucinous areas. Microscopically, typical SFTs presented as both hypercellular and hypocellular lesions, with fibroblast-like cells in “patternless” patterns and “staghorn vascular cavity” formations. The definitive diagnosis required immunohistochemical analysis. In the 30 cases reviewed, all of the spindle cells (100%) expressed CD34; positivity for CD34 is reportedly a characteristic presentation observed in 90% to 95% of all SFTs.<sup>[11]</sup> Recently, Robinson et al<sup>[12]</sup> proposed a genetic diagnosis criterion, reporting that the *NAB2-STAT6* fusion gene is specific to SFTs and can lead to STAT6 immunoreexpression. Indeed, STAT6 is a biomarker with high sensitivity and specificity for distinguishing and diagnosing SFTs.

Diagnosing SFTs is a complex process; our patient serves as a reminder that, although extremely rare, Doege–Potter syndrome in the female reproductive organs should be quickly ruled out. If diagnosed, a multidisciplinary treatment effort is necessary.

**Table 1**

**The milestones of diagnose and interventions. ESS=endometrial stromal sarcoma, SFT=solitary fibrous tumors.**

Date	Events
September, 2012	Hypoglycemia occurred
October, 2012	Surgery with frozen diagnoses as ESS
December, 2012	Pathological diagnosis was modified as SFT
December, 2012	Adjuvant Chemotherapy
May, 2016	Recurrence and surgery therapy
May, 2018	Follow-up every 6 months



**Table 2****The characteristics of patients with solitary fibrous tumor in female genital tract.**

References	Age (yr)	Location	Pathology	Adjuvant Treatments	Recurrence/Metastases	Follow-up (months)
[18] (Fukunaga, 2000)	70	Vulva	Benign	No	No	9-mo, AWOD
[20] (Biedrzycki, 2007)	45	Vulva	Benign	No	No	6-mo, AWOD
[21] (He, 2010)	39	Vulva	Benign	No	No	10m, AWOD
[22] (Lee, 2011)	75	Vulva	Benign	No	No	NA
[8] (Vaysse, 2011)	37	Vulva	Malignant	No	No	16m, AWOD
[23] (Burnett, 2012)	60	Vulva	Malignant	No	No	30m, AWOD
[24] (Taki, 2012)	56	Vulva	Benign	No	No	18m, AWOD
[25] (Nag, 2015)	57	Vulva	NA	No	No	24m, AWOD
[15] (Pearre, 2017)	64	Vulva	Malignant	Radiotherapy	Pleura, bone	5-mo, DOD
[5] (Tardio, 2017)	59	Vulva	Benign	No	No	44-mo, AWOD
[5] (Tardio, 2017)	25	Vulva	Malignant	Radiotherapy	vulva	23-mo, AWOD
[6] (Wakami, 2005)	78	Uterine	Benign	No	No	24-mo, AWOD
[26] (Thaung, 2006)	47	Uterine	Benign	No	No	NA
[27] (Chu, 2006)	78	Uterine	Benign	No	No	12-mo, AWOD
[28] (Casanova, 2012)	30	Uterine	Malignant	No	No	50-mo, AWOD
[29] (Dvorak, 2013)	57	Uterine	NA	No	NA	NA
[13] (Strickland, 2016)	81	Uterine	Benign	No	Pleura	6-mo, AWD
[30] (Akiyama, 2000)	34	Vagina	Benign	No	NA	NA
[31] (Vadmal & Pellegrini, 2000)	66	Vagina	Benign	No	NA	NA
[33] (Iyengar, 2007)	52	Vagina	Benign	No	vagina	29-mo, AWOD
[4] (Placide & Robert, 2012)	48	Vagina	Benign	No	No	72-mo, AWOD
[7] (Reyhan, 2017)	21	Vagina	Malignant	No	No	90-mo, AWOD
[32] (Turkistani, 2002)	37	Paravaginal	Benign	No	NA	NA
[34] (Hasegawa, 1998)	78	Cervix	Benign	No	No	132-mo, AWOD
[1] (Sidebotham, 2009)	14	Cervix	Benign	No	NA	NA
[35] (Rahimi, 2010)	68	Cervix	Benign	Radiotherapy, chemotherapy	NA	NA
[2] (Nowakowski, 2014)	45	Cervix	Benign	No	NA	8-mo, AWOD
[17] (Berzal-Cantalejo, 2005)	32	Fallopian pain	Benign	No	NA	NA
[36] (Porter, 2008)	42	Round ligament	Benign	No	NA	NA
[11] (Zubor, 2007)	50	Broad ligament	Benign	No	No	72-mo, AWOD
Present case	37	Broad ligament	Malignant	Chemotherapy	Peritoneum	71-mo, AWOD

AWD = alive with disease, AWOD = indicates alive without disease, DOD = died of disease, NA = data not available.

### 2.3. Clinical treatment

All 30 patients retrieved in our study were treated with en bloc excision; additionally, 9 (30%) underwent hysterectomy, and 4 (13.3%) underwent pelvic lymphadenectomy. As for adjuvant therapy, 3 women (10%) received radiation therapy and 1 (3.3%) received chemotherapy. Complete surgical resection with a clear margin is currently the most effective treatment modality, and surgery remains the best option for recurred tumors.<sup>[7,13]</sup> Nevertheless, owing to these tumors' anatomical locations (e.g. the vagina, uterus, or cervix), adhesiveness and bulk present serious challenges to complete excision, therefore, the scope of surgery should be expanded appropriately to be manageable. Sidebotham et al<sup>[1]</sup> described a 14-year-old girl in whom a large cervical, deep SFT was discovered with a narrow vaginal anatomy; en bloc excision was performed with margins as close to negative as possible. To avoid metastasis or recurrence due to residual tumor tissue, trachelectomy, and pelvic sentinel lymphadenectomy were performed following the primary tumor excision.

Discriminating between benign and malignant SFTs is challenging, as their biological behaviors are difficult to predict. Hence, it is reasonable to treat all SFTs under the assumption that they are highly invasive. Mearini et al<sup>[14]</sup> reported a patient with a renal SFT that was difficult to diagnose definitively during the surgery; therefore, lymphadenectomy was performed after which lymph node metastases were discovered after the operation. A 64-year-old patient underwent mass resection, hysterectomy,

bilateral salpingo-oophorectomy, and supplementary surgery involving inguinal lymph node dissection for malignant vulval SFT; however, she died of cancer metastasis.<sup>[15]</sup> In our patient described herein, we extended the scope of surgery owing to her tumor status and her own family's wishes; despite this, she experienced a recurrence.

In terms of surgical approaches, the use of holoscopic imaging during surgery is highly favored for pleural SFT lesions less than 5 cm to ensure R0 resection.<sup>[16]</sup> In the 30 patients researched in our study, most underwent some type of surgical approach, while only 2 underwent laparoscopic interventions to excise the fallopian tube SFT that was 6 cm in maximum diameter<sup>[17]</sup> and a cervical SFT lesion in the vagina combined with a metastatic lymph node,<sup>[1]</sup> respectively. Seven pelvic tumors were removed through laparotomy as their volumes were huge and their natures were unknown, thus necessitating a clean margin.

Furthermore, previous case studies strongly emphasize the importance of controlling intraoperative hemorrhaging instead of merely ensuring an adequate blood supply during surgery. In a patient with a 9.8 cm vulval SFT, 75 mL of blood was lost owing to a hysterectomy, while 500 mL was lost during tumor resection.<sup>[15]</sup> Noeakowski et al<sup>[2]</sup> described an operation for a cervical SFT (16 × 10.9 × 9.8 cm) that caused 2200 mL of blood loss. Other reports also described failed surgeries in which preoperative evaluation was not adequately performed because of massive bleeding. Pelvic SFTs usually have multiple feeder vessels and always arise from the internal iliac and inferior

mesenteric arteries,<sup>[2,18]</sup> particularly in giant and deep pelvic tumors. Hence, the blood loss can be massive upon lesion resection, as was the case in our patient. Soda et al<sup>[19]</sup> described a pelvic tumor (16 × 14 × 9 cm) whose excision with the aid of an aortic balloon caused 13660 mL of blood loss. Another patient had a pre-rectal SFT (24 × 13.2 × 16 cm) that underwent embolization, causing the tumor to decrease in volume while central necrosis increased.<sup>[19]</sup> Taken together, preoperative observation, angiography, and embolization or insertion of an aortic balloon catheter should be considered to facilitate the surgery and avoid life-threatening bleeding while visualizing the surgical area as clearly as possible.

Because of the rarity of malignant SFTs and the good outcomes observed following complete surgical resection, there are no recommendations for adjuvant treatment. Although radiotherapy and chemotherapy were performed in our patient as well as another with a vulvar SFT, both subsequently experienced recurrences.<sup>[15]</sup>

#### 2.4. Clinical prognosis

While most SFTs are benign, approximately 10% to 20% are malignant and display an aggressive phenotype with local recurrence or distant metastasis.<sup>[11,13]</sup> Among the 30 patients found in the literature, 6 (20%) were diagnosed with malignant tumors; 2 had metastases to the lung and bone as well as local recurrence; 1 of whom was alive with disease and the other died 5 months after undergoing surgery and radiation therapy. Nine of the remaining 30 patients were lost to follow up, while the remaining 19 (including 4 of the patients with malignant tumors mentioned before) were alive without disease; the median follow-up time for these patients was 23.5 months (range, 5–132 months). It was previously suggested that SFT prognosis is dependent on the histological type; malignancy should be considered if 3 of the following 6 criteria are identified: parietal pleura location, dimensions ≥10 cm, hypercellularity, nuclear atypia, ≥4 mitoses/10 high-power fields, and/or necrosis.<sup>[10]</sup> Recently, other investigators also described older age (≥55 years), paraneoplastic syndrome, and incomplete tumor resection as indicators of poor outcome.<sup>[3,11]</sup>

Therefore, close long-term follow-up is recommended for achieving the best clinical outcomes; such follow-up should include abdominal ultrasonography and radiography of high-risk areas like the chest. Moreover, MRI or CT scans can be performed as necessitated by the clinical symptoms.<sup>[1]</sup>

#### Acknowledgments

We would like to acknowledge the patient for allowing this case to be published.

#### Author contributions

**Data curation:** Sijing Chen, Lin Chen.

**Investigation:** Ying Zheng.

**Writing – original draft:** Sijing Chen, Qihua Yi.

**Writing – review & editing:** Sijing Chen.

ZHENG Ying orcid: 0000-0002-9008-9525

#### References

- [1] Sidebotham EL, DeLair D, Comerci JT, et al. Pediatric radical abdominal trachelectomy for solitary fibrous tumor of the uterine cervix. *Gynecol Oncol* 2009;115:302–5.
- [2] Nowakowski A, Kozłowski W, Włodarczyk D, et al. A case of a large solitary fibrous tumour of the uterine cervix. *Bmc Womens Health* 2014;14.
- [3] Han G, Zhang Z, Shen X, et al. Doege–Potter syndrome: a review of the literature including a new case report. *Medicine (Baltimore)* 2017;96:e7417.
- [4] Placide N, Robert S. Solitary fibrous tumor of the vagina: a case report with review of the literature. *Int J Surg Pathol* 2012;20:101–4.
- [5] Tardio JC, Machado I, Alemany I, et al. Solitary fibrous tumor of the vulva: report of 2 cases, including a de novo dedifferentiated solitary fibrous tumor diagnosed after molecular demonstration of NAB2-STAT6 gene fusion. *Int J Gynecol Pathol* 2017.
- [6] Wakami K, Tateyama H, Kawashima H, et al. Solitary fibrous tumor of the uterus producing high-molecular-weight insulin-like growth factor II and associated with hypoglycemia. *Int J Gynecol Pathol* 2005;24:79–84.
- [7] Reyhan A. Solitary fibrous tumor of the vagina with potentially malignant features: a case report and review of the literature. *Turk Patoloji Derg* 2017.
- [8] Vaysse C, Escourrou G, Motton S, et al. Solitary fibrous tumor of the vulva: a case report. *Gynecol Obstet Fertil* 2011;39:e49–51.
- [9] Ronchi A, La Mantia E, Gigantino V, et al. A rare case of malignant solitary fibrous tumor in prostate with review of the literature. *Diagn Pathol* 2017;12:50.
- [10] Scrimgeour LA, Grada Z, Aswad BI, et al. Lessons learned from an untreated “benign” thoracic tumor. *Ann Thorac Surg* 2017;103:e135–7.
- [11] Zubor P, Kajo K, Szunyogh N, et al. A solitary fibrous tumor in the broad ligament of the uterus. *Pathol Res Pract* 2007;203:555–60.
- [12] Robinson DR, Wu YM, Kalyana-Sundaram S, et al. Identification of recurrent NAB2-STAT6 gene fusions in solitary fibrous tumor by integrative sequencing. *Nat Genet* 2013;45:180–5.
- [13] Strickland KC, Nucci MR, Esselen KM, et al. Solitary fibrous tumor of the uterus presenting with lung metastases: a case report. *Int J Gynecol Pathol* 2016;35:25–9.
- [14] Mearini E, Cochetti G, Barillaro F, et al. Renal malignant solitary fibrous tumor with single lymph node involvement: report of unusual metastasis and review of the literature. *Oncol Targets Ther* 2014;7:679–85.
- [15] Pearre DC, Federspiel JJ, Grumbine FC. Solitary fibrous tumor of the vulva resulting in spinal metastasis: a case report. *Gynecol Oncol Rep* 2017;22:97–9.
- [16] Ricciuti B, Metro G, Leonardi GC, et al. Malignant giant solitary fibrous tumor of the pleura metastatic to the thyroid gland. *Tumori* 2016;102 (suppl. 2):
- [17] Berzal-Cantalejo F, Montesinos-Carbonell M, Montesinos-Carbonell ML, et al. Solitary fibrous tumor arising in the fallopian tube. *Gynecol Oncol* 2005;96:880–2.
- [18] Fukunaga M. Atypical solitary fibrous tumor of the vulva. *Int J Gynecol Pathol* 2000;19:164–8.
- [19] Soda H, Kainuma O, Yamamoto H, et al. Giant intrapelvic solitary fibrous tumor arising from mesorectum. *Clin J Gastroenterol* 2010; 3:136–9.
- [20] Biedrzycki OJ, Singh N, Habeeb H, et al. Solitary fibrous tumor of the female genital tract a case report and review of the literature. *Int J Gynecol Pathol* 2007;26:259–64.
- [21] He Y, Yang KX, Yang F, et al. Primary solitary fibrous tumor of the vulva: a case report. *J Reprod Med* 2010;55:452–6.
- [22] Lee JC, Fletcher CD. Malignant fat-forming solitary fibrous tumor (so-called “lipomatous hemangiopericytoma”): clinicopathologic analysis of 14 cases. *Am J Surg Pathol* 2011;35:1177–85.
- [23] Burnett LA, Christopherson WA, Olawaiye AB. Vulvar hemangiopericytoma: a case report and literature review. *Gynecol Oncol Case Rep* 2012;2:146–9.
- [24] Taki M, Baba T, Mandai M, et al. Solitary fibrous tumor arising slowly in the vulva over 10 years: case report and review. *J Obstet Gynaecol Res* 2012;38:884–8.
- [25] Nag G, Rao SR. A rare mesenchymal neoplasm at unusual location: solitary fibrous tumor of vulva. *Gynecol Oncol Rep* 2015;12:52–4.
- [26] Thaug C, Shanks J, Eyden B, et al. Solitary fibrous tumour of the uterus. *Histopathology* 2006;49:199–201.
- [27] Chu PW, Liu JY, Peng YJ, et al. Solitary fibrous tumor of the uterus. *Taiwan J Obstet Gynecol* 2006;45:350–2.
- [28] Casanova J, Vizcaino JR, Pinto F, et al. Abdominal mass mimicking a leiomyoma: malignant uterine solitary fibrous tumor. *Gynecol Oncol Case Rep* 2012;2:143–5.
- [29] Dvorak O, Dvorakova E, Laco J, et al. Solitary fibrous tumor of endometrium—a case report. *Ceska Gynecol* 2013;78:302–5.
- [30] Akiyama Y, Nabeshima K, Koita H, et al. Solitary fibrous tumor of the vagina. *Pathol Int* 2000;50:327–31.

- [31] Vadmal MS, Pellegrini AE. Solitary fibrous tumor of the vagina. *Am J Dermatopathol* 2000;22:83–6.
- [32] Turkistani I, Ghourab S, Al-Rikabi A, et al. Large paravaginal solitary fibrous tumor with secondary schistosoma hematobium infestation. *Acta Obstet Gynecol Scand* 2002;81:88–90.
- [33] Iyengar P, Ismiil ND, Gerber D, et al. Vaginal solitary fibrous tumor: a case report with recurrence after incomplete excision. *J Low Genit Tract Dis* 2007;11:50–4.
- [34] Hasegawa T, Matsuno Y, Shimoda T, et al. Frequent expression of bcl-2 protein in solitary fibrous tumors. *Jpn J Clin Oncol* 1998;28:86–91.
- [35] Rahimi K, Shaw PA, Chetty R. Solitary fibrous tumor of the uterine cervix. *Int J Gynecol Pathol* 2010;29:189–92.
- [36] Porter E, McGregor A, Brown L, et al. Solitary fibrous tumour of round ligament mimicking a leiomyoma. *J Obstet Gynaecol* 2008;28:463–4.