Clinics in Surgery

Case Report
Published: 19 Sep, 2022

The Malignant Solitary Fibrous Tumor in Pelvic Cavity: A Case Report and Literature Review

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Abstract

Background: Solitary Fibrous Tumor (SFT) is a rare neoplasm which lacks many clinical reports and studies; the Malignant Solitary Fibrous Tumor (MSFT) is even rarer. The literature report is infrequent and symptoms are not obvious, so it is easy to misdiagnose and missed diagnosis. Pathology and immunohistochemical analysis are the main diagnostic methods for the disease, complete surgical excision is the preferred treatment. Molecular research is a hot spot in current research. Long-term follow-up is recommended after surgery.

Case Report: The patient, a 62-year-old woman, admission to hospital because of a large mass in the pelvic cavity. She had undergone partial right nephrectomy because of right kidney tumor in 1995. Total right nephrectomy was performed due to previous tumor was relapse in 2011. The tumor relapsed in posterior peritoneum one year later (The retroperitoneal tumor was surgically removed). The pathology of the tumor was later defined as the MSFT by pathological and immunohistochemical analysis. This time the tumor recurred in the pelvic cavity again and the patient was treated surgically in 2020. Six months later, the scapula recurred again, and surgery was performed in 2021 due to the insignificant effect of radiotherapy. She recovered and was discharged from the hospital. She is still being follow-up with no signs of recurrence now.

Conclusion: SFT is very rare and the clinical symptoms are not specific, early diagnosis is difficult. The possibility of SFT should be considered when the pathology suggests spindle cell tumor in clinical work, further auxiliary examination is necessary to develop individualized treatment plan, so that give the patient all opportunities to benefit from the best possible outcomes. Surgical resection was the first choice and the margin was negative. Since SFT is prone to recurrence and metastasis, it is necessary to follow up closely after operation. If there is any abnormality, timely treatment is required.

Keywords: Solitary Fibrous tumor; Operative treatment; Relapse and metastasis

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Received Date: *05 Sep 2022*
Accepted Date: *14 Sep 2022*
Published Date: *19 Sep 2022*

Citation:
Wang M, Wei M, Qin H, Wang B. The Malignant Solitary Fibrous Tumor in Pelvic Cavity: A Case Report and Literature Review. Clin Surg. 2022; 7: 3573.

Introduction

Solitary Fibrous Tumor (SFT) is a rare mesenchymal tumor with a low incidence. It is an unusual spindle cell neoplasm of adults generally arising from the pleura and was first described in 1931 in patients with a distinctive pleural lesion. This type of tumor usually occurs to the pleura regions including wall layer and visceral pleura. Also, it occurs to the other organs or regions of body which containing mesenchymal tissue. We report an infrequent case which will describe the MSFT in pelvic cavity, review the abnormal clinical features: Clinical symptoms, pathological features, immunohistochemistry and so on.

Case Presentation

A 62-year-old postmenopausal woman consulted a pelvic neoplasm in April 2020. She felt slight abdominal pain and frequent micturition nearly a month. In fact, she had discovered the pelvic mass seven months earlier, the mass at that time was 5.8 cm × 3.4 cm in size. She asked to be treated conservatively with temporary medication. Now, the gynecological ultrasound pointed out the 14.9 cm × 6.8 cm anechoic mass in the right adnexa. Plain Computed Tomography (CT) scan showed a solid cystic mixed mass shadow with clear boundary and multiple compartments. Contrast-enhanced CT scan revealed that the solid component of the mass was strongly enhanced. Magnetic Resonance Imaging (MRI) showed equal T1 and long T2 mass shadows with visible partitions. The solid component and compartment were enhanced obviously, but the cystic part had no obvious

Table 1: Risk stratification model.

Risk factor	Score
Age (year)	
<55	0
≥ 55	1
Tumor size (cm)	
<5	0
5-10	1
10-15 (contain 10)	2
≥ 15	3
Mitotic figures (/10 high power fields)	
0	0
1-3	1
≥ 4	2

Table 2: Total score and risk ranking.

Risk	Total score
Low	0-2
Moderate	3-4
High	5-6

Table 3: Prognosis.

Transfer rate	Survival rate	
	5/10 years (%)	5/10 years (%)
Low risk	0;0	100;100
Moderate risk	23;36	93;93
High risk	75;100	60;0

change.

The patient had undergone partial right nephrectomy because of right kidney tumor (no pathology then) in 1995. Total right nephrectomy was performed due to previous tumor was relapse in 2011. The tumor relapsed in posterior peritoneum again only one year later. Postoperative pathological analysis the right kidney and retroperitoneal masses are Malignant Solitary Fibrous Tumor (MSFT), according to the pathological consultation advice of Beijing Cancer Hospital. And she has a history of hypertension for 10 years.

We carried out a comprehensive and systematic examination of the patient and decided to perform surgical resection. Because the patient's previous cervical biopsy pathology indicated CINII (Cervical Intraepithelial Neoplasia II) grade, cervical cold knife conical resection first was performed and intraoperative pathology suggested glandular involvement. We performed an exploratory laparotomy on the patient. After stripping the pelvic adhesions, a dark purple tumor closely adhered to the right appendage came into view. We subsequently found that the tumor originated from the right posterior peritoneum and measured 15.0 cm × 10.0 cm × 7.0 cm by closer inspection. Intraoperative pathological result showed the tumor stem from mesenchymal tissue, the distinct characteristic were short spindle cells and easy to see mitotic images, pathology department suspected the possibility of malignancy. Since the cervical lesion has involved the glands, we recommend continuing with total hysterectomy, thanks to the patient had only one kidney, the left ureter was very precious, the patient's family refused further surgery. All the tissues removed during the operation included tremendous adnexal mass, right uterine appendage and cervical tapered tissue. The volume of blood loss was 1500 mL in total, 6 units of packed red cells and 580 mL of plasma were replenished.

Macroscopically, the tumor, a cystic-solid mass, measured 15.0 cm × 10.0 cm × 7.0 cm; it was a deep purple bossing with smooth surface and clear edges. Microscopically, the tumor is derived from mesenchymal tissue, the cell resembles short spindle, about 14 mitotic figures per 10 high-power fields and the boundary of the tumor is infiltrative. Immunohistochemically, CD34, Bcl-2, STAT6, Vimentin and CD99 can be detected; Ki67 (positive rate 20%); CK (AE1/AE3), SMA, Desmin were negative. The clinical diagnosis was pelvic malignant solitary fibrous tumor.

Patients were followed up every three months. Six months later, the patient came back to our hospital again because of aggravation of pain in the left scapula for two months. In fact, her left shoulder joint got pain due to a fall as early as 14 months ago, it improved after conservative treatment but systematic treatment was not given because of her personal reasons.

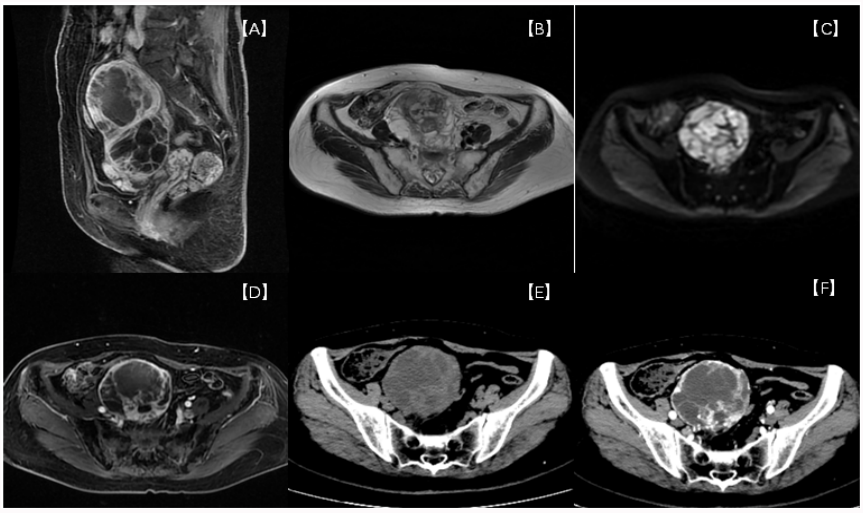

Figure 1: Preoperative imaging findings. MR (ABCD) and CT (EF) images showed an irregular mass in the pelvic cavity with a large cross section of about 86 mm × 76 mm × 129 mm, after intravenous injection of contrast iodine. The solid components and separation of the mass were significantly enhanced.

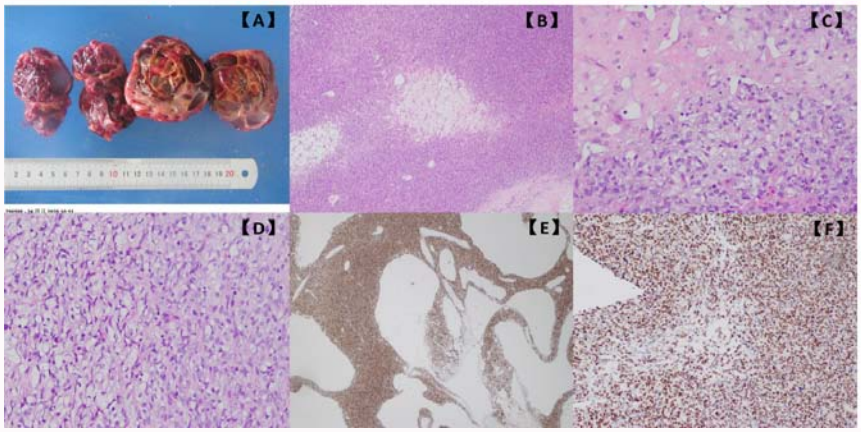

Figure 2: General image of tumor: A: The cut surface of the tumor is cystic-solid with hemorrhage, measured 15 cm × 10 cm × 7 cm. B; The arrangement of tumor cells is solid, associated with bleeding (hematoxylin and eosin, x100). C; There were more blood vessels in the mesenchyme, some of which were antler-like (hematoxylin and eosin, x200). D; Some tumor cells are fusiform with vacuoles (hematoxylin and eosin, x200). E; CD34 immunohistochemical staining was diffusely positive (x60). F; STAT6 Immunohistochemical staining showed strong diffuse positivity (x100).

CT of shoulder joint showed irregular soft tissue density shadow in the muscle space of left shoulder joint, with a size of about 8.0 cm × 5.7 cm. Osteolytic destruction was found locally at the left scapula, the boundary between the lesion and adjacent tissue was not clear. We conducted a needle biopsy on the scapula mass, and the pathological results confirmed the metastasis of the malignant solitary fibroma. After comprehensive consideration, we decided to provide radiotherapy for the patient. The total dose in the target section was 70 Gy/35 f. After 59 days of hospitalization, our patient's symptom improved and out of hospital.

In May 2021, the patient was again hospitalized to our joint Surgery Department due to swelling and pain in the left shoulder. After comprehensive evaluation, we finally decided to remove the tumor surgically. The operation went smoothly and the tumor was completely removed, our patient left hospital after recovery. Up to now, we are still following up the patient. There has been no recurrence so far.

Discussion

Solitary Fibrous Tumor (SFT) was regarded as hemangiopericytoma also, it was rare and heterogeneous mesenchymal spindle cell tumors with a morbidity of 2.8 per 100,000 people and it account for less than 2% of all soft tissue tumors [1-3]. Later, "Hemangiopericytoma" has been eliminated and the solitary fibrous tumor is used for diagnosis [4]. The occurrence of SFT in body is unusual, and there is no distinct gender and race tendency [4,5]. The common age ranges from 56 to 60 years [6].

SFT was first described in patients in 1931 and the authors try to explore the possible origin of it. Further research found that ultrastructural and immunohistochemical examinations of these cells show fibroblastic-like rather than mesothelial-like features. The mesenchymal origin has been further substantiated by immunohistochemistry for typical mesenchymal cell markers, thus it can happen in any organ with mesenchymal tissue [6-9].

This type of neoplasm often develops in the pleura-based regions, such as the visceral and parietal pleura. Kalebi et al. [10] report that if SFT happens in the pleural, two rare paraneoplastic symptoms are likely occurs: Hypoglycemia (Doege-Potter syndrome) and finger clubbing (Pierre-Marie-Bamberg syndrome) [10]. The staging system about Solitary fibrous tumors of the pleura established by De Perrot et al. [11] is widely recognized, it is formulated based on the morphological characteristics of tumor tissue and whether metastasis tendency [11]. Except for the pleura, it can also occur in the meninges, orbit, upper respiratory tract, salivary glands, thyroid, peritoneum, liver, retroperitoneum and pelvis, adrenal gland, kidney, spermatic cord, urinary bladder, prostate, uterine cervix, spinal cord, periosteum and soft tissue [8]. The kidneys are an uncommon site and malignant cases are relatively rare [2]. What's more, the female genital system is much less common, SFT can occur in various parts of the female genital tract, among which the vulva is the most common site of disease [12]. It is remained unknown whether SFT originating at diverse sites such as the pleura, kidney and female genital tract share a common pathogenesis [13]. Before this, we have not found any literature reports of malignant solitary fibroma of the kidney metastasizing to the female reproductive system.

From the case that we presented, the patient underwent right kidney partial resection for the first time due to right kidney tumor, and the tumor recurred after 16 years. However, only one year after the total right kidney resection, the tumor relapsed in posterior peritoneum. We speculate that the reason for the rapid recurrence of the tumor is related to the destruction of the integrity of the retroperitoneum, and the real tumor free resection of the right kidney was not achieved in the second operation. Tumor cells implant metastasis of incision cannot be ruled out. Eight years later, the malignant solitary fibroma recurred, and the retroperitoneal tumor had broken through posterior peritoneum and was closely attached to the right uterine appendage, an inter-peritoneal organ. Concerning the metastases to the scapula, we cannot determine whether the tumor metastasizes through blood or lymph, or both.

In the great majority of cases, SFT's clinical manifestations are relatively good, but at least 10% to 15% of SFT show a more aggressive outcome (including local recurrences or metastases) [14]. Malignancy should be considered if 3 of the following 6 criteria are identified: parietal pleura location, dimensions ≥ 10 cm, hypercellular, nuclear atypia, ≥ 4 mitoses/10 high-power fields, and/or necrosis [5,15]. It should be emphasized that these predictors of recurrence discussed above are best evaluated by the thorough examination of the completely resected tumor, not just through a needle biopsy sample [15]. Some authors think that Ki-67 can reflect the degree of

cell proliferation as a nuclear protein, so it plays an important role in the judgment of benign and malignant tumors. The level of Ki-67 <1% suggests that a benign outcome is more probable [16]. The malignant change of the isolated fibroma may have the following two ways: One is *de novo*; the other is the original benign tumor cell to dedifferentiate [17]. In our case, we did not find any dedifferentiated regions through extensive studies of the neoplasm tissue, suggesting a high likelihood of *de novo*.

The early stage of the SFT, particularly in nonvascular soft tissue, is often asymptomatic. Elderly individuals have presented with painless masses for several years, its existence is found during routine imagological examination in most patients [18]. As the tumor grows, there are symptoms of compression and pain in the corresponding area. Our patient suffered from hypertension and High cervical Squamous Intraepithelial Lesion/Cervical Intraepithelial Neoplasia grade 2 (HSIL/CIN2), and we did not find a certain correlation between hypertension and SFT. However, Wang et al. [19] expounded relationship between SFT and local high pressure (portal hypertension): The presence of arteriovenous shunts in the tumor leads to the increased pressure of the reflux vein, and the venous flow directly returns into the portal vein leading to the portal hypertension [19]. As for HSIL/CIN2, we did not find its correlation with SFT through literature review. Cervical intraepithelial neoplasia is a disease caused by the HPV (Human Papilloma Virus), which may testify that HSIL/CIN2 and SFT are two separate diseases.

Macroscopically, the mass is usually well-defined and the possibility of cystic or necrotic change on cut surface will increase when the tumor is large enough [18]. Microscopically, the tumor is derived from mesenchymal tissue and the cells are short spindle. The most common microstructure pattern is no pattern, which is featured by the random arrangement of tumor cells and collagen [17]. Immunohistochemically, CD34, Bcl-2, STAT6, Vimentin, and CD99 can be detected in our patient. Formerly, strong and diffuse CD34 and bcl-2 expression is a feature of this tumor type, however, their specificity is low, and the absence of CD34 does not rule out SFT [20]. CD99 is also positive and there is sporadic focal positivity for actin, S-100 protein, and (exceptionally) cytokeratin [21]. Some authors hold that most cases of SFT are negative for cytokeratin, but there are strong positive expressions of cytokeratin AE1/AE3 in malignant cases in normal conditions, some may be partially expressed. Positive cytokeratin indicates the high malignant potential of tumors [22]. There's certain evidence to support that *NAB2-STAT6* gene fusion (characterized by a recurrent intra-chromosomal paracentric inversion involving the long arm of chromosome 12) is pathognomonic for SFT and the spectra of SFT characteristics and morphology has a common genetic origin [23,24]. NAB2 and STAT6 have different mechanisms of action in the pathogenesis of SFT; the former encodes a transcriptional repressor of the early phase, which regulates cell differentiation and proliferation by inhibiting zinc finger transcription. However, the effect of the latter is antagonistic to the former, as a transcriptional activator, STAT6 plays a crucial role in the immune system by mediating signal transduction. Keigo Murakami et al. emphasize the fusion gene has carcinogenic effects; it can be detected in both benign and malignant and regardless of the primary site [25]. The genetic variants may differ in different age groups. For example, NAB2 exon 4-STAT6 exon 3 fusion is more common among the elderly, while NAB2 exon 6-STAT6 exon 16/17 is easier to be found in young patients and it is strongly associated with metastatic and malignant SFT [26,27]. There are other fusion genes, such as STAT6-TRAPPC5 and NAB2 exon 4-STAT6 exon 2. NAB2-STAT6 fusion gene is a relatively specific molecular feature of SFT [20]. Up to now, STAT6 immunohistochemistry has been used to accurately diagnose this type of tumor by pathologists [28]. According to the relevant literatures report, the sensitivity of strong nuclear STAT6 staining in SFT is more than 95% [29]. Recently, some scholars have proposed that ISG15 and BCL2 are significantly related to prognosis. At the molecular level, ISG15 expression has been confirmed to be the only independent prognostic factor for overall and progression-free survival [30].

SFT needs to be differentiated from the following types of tumors: Angiomyolipoma, fibroma, fibrosarcoma, leiomyoma, leiomyosarcoma, hemangioma, and angiosarcoma and gastrointestinal stromal, because these cells are also derived from mesenchymal tissue. The most difficult differential diagnosis of SFT is dedifferentiated liposarcoma, some authors discover the grow pattern of some certain type of this tumor is like SFT and staining positive for CD34 and STAT6. Undoubtedly, this will cause new difficulties to the diagnosis of SFT [17]. Beyond that, in our patient, mucinous cystadenoma of the ovary is also a tumor prone to misdiagnosis. After all, medical imaging alone can't rule out one of them. For SFT, pathology and immunohistochemistry are the main methods of diagnosis and antidiastole, that's what we need to emphasize.

About age tumor size and mitotic figures, lizabeth et al. [31] developed a risk stratification model by studying and summarizing 110 cases, the model is used as a standard for accessing prognosis (Tables 1-3) [31]. According to this model, our case scored 6 points, ranking high risk category, which would mean the five-year relapse rate close to 75%. The metastases to scapular were an interpretable clinical manifestation of this risk grading model.

In most cases, surgical resection is the primary treatment for SFT, whether benign or malignant. In the treatment of our patient, we should preserve the function of the original organ as much as possible, it is important to ensure the negative histological margin for the success of the operation [32]. We note that 1,500 ml blood was loss during the operation. From literature, we know that when the tumor invasion is deep, it may lead to excessive intraoperative bleeding, and some scholars suggest that preoperative arterial embolization can be considered in this case, especially for tumors in the abdominal cavity [33]. Supportive therapeutic efficacy is uncertain, for patients who have high risk of recurrence or not suitable for surgical management, also chemotherapy drugs are generally not recommended because of limited efficacy, postoperative radiotherapy can be taken into consideration [33]. However, some reports about new drugs that offer hope for the SFT's chemotherapy: Temozolomide, bevacizumab, Tyrosine kinase inhibitors, sunitinib, imatinib, sorafenib, trabectedin and so on. The temozolomide and bevacizumab show a Choi partial response of 79% and a median progression free survival of 6 months; the remaining drugs have been tested to provide long-term stable efficacy [34].

SFT is not uncommon for it to recur and metastasize years later, the tumor maybe recurred in situ, near invasion and even distant metastasis, long term follow-up is significant. Some scholars suggest a follow-up of at least 15 years. During the follow-up period, we must pay attention to any suspicious clinical findings. If there are abnormalities, we should conduct further examination and even hospitalization if necessary [16,35].

Conclusion

Solitary fibroma is very rare clinically, and malignant is even rare. The lack of specificity of clinical symptoms and conventional imaging examination increases the difficulty of early diagnosis. When ultrasound examination indicates solid or cystic solid tumor occupying space and the pathology suggests spindle cell tumor, the possibility of SFT should be considered. Further imaging examination and preoperative biopsy should be recommended. Combined with the results of histopathological examination and immunohistochemical analysis, the molecular analysis and clinical symptoms were combined to make a comprehensive judgment and implement the best treatment plan, reduce the recurrence rate and improve the long-term survival rate and quality of life of patients.

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