Malignant Renal Solitary Fibrous Tumor With Two Local Recurrences and Distant Pulmonary Metastasis

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CASE PRESENTATION

A 53-year-old man presented to our hospital with right upper quadrant pain alongside nausea and vomiting. Physical exam revealed right upper quadrant tenderness, Murphy sign, and fever. He otherwise had no significant past medical or surgical history. Subsequent abdominal ultrasound showed signs of cholecystitis and an incidental lobulated hypoechoic mass of the left kidney with heterogeneous echotexture and hypervascularity on Doppler. The patient had a cholecystectomy without complications during the postoperative period. Further investigation with contrast-enhanced computed tomography (CT) displayed a lobulated well-circumscribed mass along the lateral aspect of the mid-pole of the left kidney with heterogeneous enhancement and areas of necrosis measuring 13 cm. The tumor contained no calcifications, fat, or hemorrhages (Fig. 1A). The right kidney presented no abnormalities. Chest CT manifested no evidence of metastatic spread.

DIFFERENTIAL DIAGNOSIS

Based upon clinical and imaging data, we considered various differential diagnoses including renal cell carcinoma, oncocytoma, transitional cell carcinoma, infiltrating retroperitoneal sarcoma, metastasis, and xanthogranulomatous pyelonephritis.

DIAGNOSIS, MANAGEMENT, AND OUTCOME

The patient underwent an open left radical nephrectomy with retroperitoneal lymphadenectomy. The surgical margins were negative on the final pathology. There was no metastatic lymphadenopathy or renal vein involvement by the tumor. The aftermath of the surgery was uneventful.

The gross specimen displayed a large tumor measuring $13 \times 10 \times 8$ cm, partially encapsulated, lobulated, and firm, involving both the renal parenchyma and capsule. The cut section revealed tan-white colored tissue with areas of necrosis (Fig. 2). The microscopic study showed a fibrocellular proliferation with hyper- and hypocellular areas comprising spindle cells, with ill-defined and pale eosinophilic cytoplasm, round or oval-shaped nuclei, and barely perceptible nucleoli. The cells formed interlacing fascicles, with hemangiopericytoma-like patterns. Areas of myxoid degeneration and necrosis were present. Hypercellular areas contained nuclear atypia and high mitotic figures (7 mitoses/10 high-power fields; Fig. 3A,B). The cells were dissociated by thin strips of collagen in hypocellular areas. The tumor presented marked vascularization and infiltrated the adjacent renal parenchyma. We did not find any areas of dedifferentiation after extensive tumor sampling. Immunohistochemical studies revealed high reactivity for CD34, low reactivity for CD99 (Fig. 3C,D) and Bcl-2 protein, and focal reactivity for muscle markers, with negative staining for keratin. These findings were consistent with a malignant solitary fibrous tumor (SFT).

The patient had neither chemotherapy nor antiangiogenic therapy after the surgery. A follow-up CT in the third-month proved to be normal. However, the next 1 after 6 months displayed a mass of 6 cm with heterogeneous enhancement and central necrosis in the nephrectomy bed (Fig. 1B). He went through another open large surgical excision with negative surgical margins. The pathologic and immunohistochemical studies confirmed the diagnosis of dedifferentiated liposarcoma staining positive for MDM2 and CDK4. The multidisciplinary clinical committee envisaged preoperative radiation therapy treatment, but it was not carried out because of availability considerations.

Three months afterward the patient complained of left flank discomfort. A contrast-enhanced CT revealed a recurrent mass of 6 cm in the same previous location with

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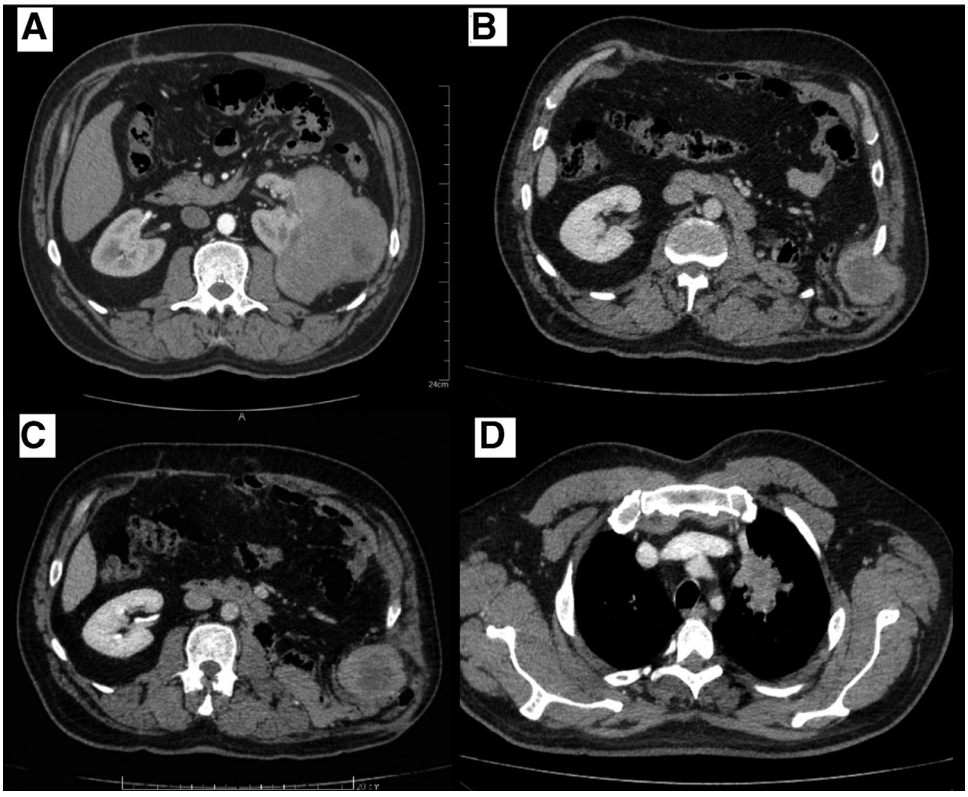

Figure 1. Axial contrast-enhanced computed tomography images. (A) Primary tumor: a lobulated well-circumscribed mass along the lateral aspect of the mid-pole of the left kidney with heterogeneous enhancement and areas of necrosis measuring 13 cm. (B) First local recurrence: a mass of 6 cm with heterogeneous enhancement and central necrosis in the nephrectomy lodge. (C) Second local recurrence: another mass of 6 cm in the same previous location with heterogeneous enhancement and central necrosis. (D) Pulmonary metastasis: a left lung apex soft-tissue mass with irregular margins measuring 6 cm.

heterogeneous enhancement and central necrosis, and a left lung apex soft-tissue mass with irregular margins measuring 6 cm (Fig. 1C,D). A percutaneous biopsy by interventional radiology was performed while the pathologic studies established the diagnosis of another malignant SFT with high reactivity for CD34. He underwent an open surgical resection of the retroperitoneal mass alongside with preoperative radiation therapy. Based on the local recurrences and the distant pulmonary metastasis a chemotherapy treatment with doxorubicin and gemcitabine was carried out. The follow-up CT showed a partial response of the pulmonary metastasis and no local recurrence.

DISCUSSION BY FERJANI, M.D.

Solitary fibrous tumors are neoplasms of mesenchymal origin that stem mainly from the pleura, though, occurrences

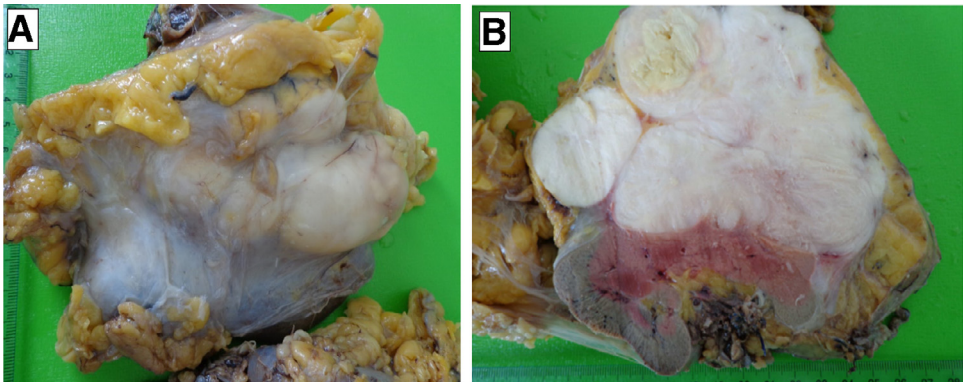

Figure 2. Macroscopic findings. (A) Gross specimen showing pseudoencapsulated, lobulated tumor. (B) Cut section revealing tan-white colored tissue with areas of necrosis involving both the renal parenchyma and the renal capsule. (Color version available online.)

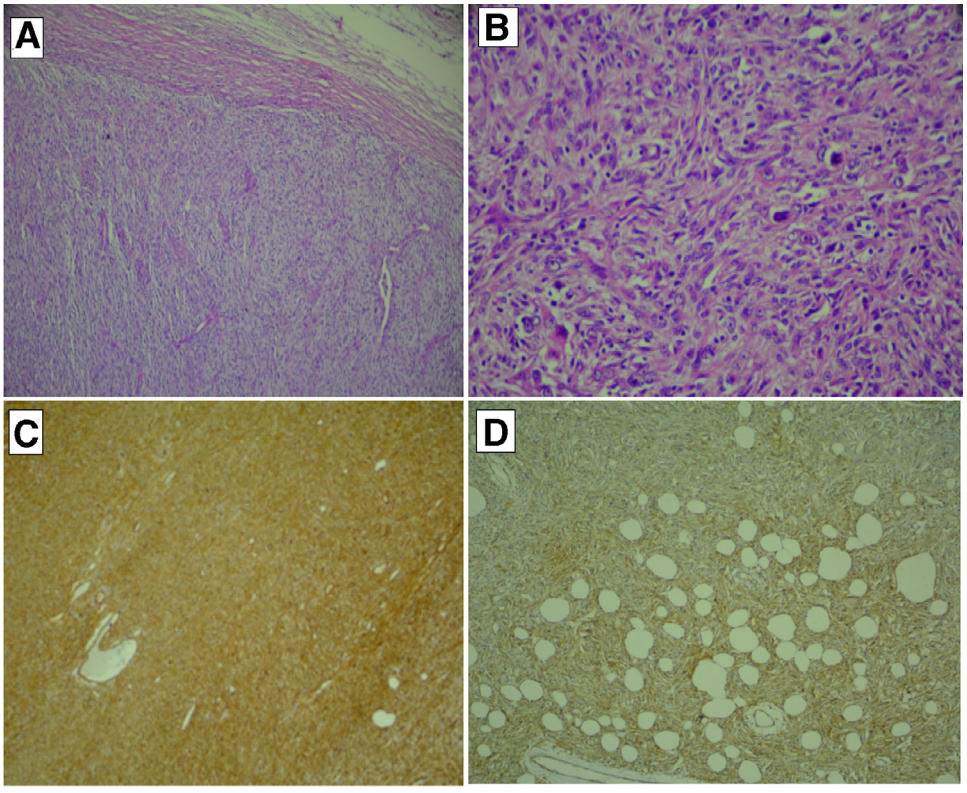

Figure 3. Microscopic and immunohistochemical findings. (A) Hematoxylin and eosin (H&E) stain, ×40 magnification, showing cells arranged in interlacing fascicles with hemangiopericytoma-like patterns. (B) H&E stain, ×400 magnification, showing spindle cells, with ill-defined and palely eosinophilic cytoplasm, round or oval-shaped nuclei with numerous mitotic figures. (C) ×40 magnification, positive staining for CD 34 marker. (D) ×100 magnification, positive staining for CD 99 marker. (Color version available online.)

in extrapleural sites have been described in recent years: upper respiratory tract, lung, nasal cavity, paranasal sinuses, orbits, mediastinum, major salivary glands, breast, meninges, liver, and urogenital organs.[1] Around 50 cases of renal SFTs have been reported in the literature. Most of these tumors were benign, and only a few revealed malignant histologic features.[2] SFTs are usually solitary, well-circumscribed, nonencapsulated or partially encapsulated and lobulated masses with white and firm cut surface.[3]

Multiple microscopic architectural patterns exist. The most common being the patternless pattern characterized by the intermingling of tumoral cells and collagen in a random disposal.[4,5] The second most frequent pattern presents with hypo- and hypercellular areas separated by thick, hyalinized collagen with hemangiopericytoma-like appearance.[4,6] Tumoral cells present minimal cytoplasm, small elongated nuclei, and indistinct nucleoli dispersed along thin parallel collagen strips with minimal pleomorphism, no atypia and no or rare mitotic figures.[4] We can find myxoid change, adipose tissue, or multinucleated giant cells.[7] Malignant SFTs show moderate to marked atypia and nuclear pleomorphism, hyperchromasia, and tumor necrosis. Mitotic index is commonly higher than 4 per 10 high-power fields with atypical mitoses and infiltrative borders.[7] These features were present in this case.

The immunohistochemical study is the key to diagnosis. Most cases stain positive for CD34, CD99, and Bcl2,[8-10] and negative for CD31, desmin, h-caldesmon, S100 protein, and cytokeratins.[9,10]

Recent studies highlighted the importance of Nuclear STAT6 (Signal Transducer and Activator of Transcription 6) immunoreactivity as a substitute marker for the NAB2-STAT6 gene fusion, which is the pivotal mutation associated with SFT.[11,12]

SFTs have a wide variety of differential diagnoses between other mesenchymal tumors such as sarcomatoid renal cell carcinoma,[2,13,14] angiomyolipoma, fibroma, fibrosarcoma, leiomyoma, leiomyosarcoma, hemangioma, angiosarcoma, and gastrointestinal stromal tumor because these tumors typically show hemangiopericytomatous patterns.[14]

The most difficult differential diagnosis of SFT is dedifferentiated liposarcoma. The latter comprises a classic atypical lipomatous tumor/well-differentiated liposarcoma component and a nonlipogenic sarcoma of variable histologic grade.[15] Creytens et al recently described a dedifferentiated liposarcoma with SFT-like growth pattern, staining positive for CD34 and STAT6, thus creating a potential diagnostic pitfall with SFT. The discrimination between these tumors in dubious cases is based on MDM2/CDK4 staining and/or fluorescence in situ hybridization for amplification of MDM2.[12,15] In our patient, we suggest that the surrounding normal adipose tissue contained small foci of cellular atypia that presumably dedifferentiated later in the first recurrence.

Malignant transformation of SFT may result from 2 physiopathologic mechanisms according to literature (1) de novo occurrence and (2) dedifferentiation from pre-existing benign SFT. In our patient, we did not find areas of dedifferentiation after extensive tumor sampling, suggesting de novo occurrence.[2,14,16]

Local and metastatic recurrences of SFTs are uncommon occurring respectively at a rate of 12% and 16%.[17]

New studies proposed multiple prognostic factors for SFTs but, the lack of large-scale studies worldwide fall short to assess their significance. A recent study in a multicenter cohort from the French Sarcoma Group database developed a risk stratification model. Three prognostic groups for overall survival (good, fair, and poor prognosis) based on the number of unfavorable factors (age ≥60; mitotic count >4), 4 prognostic groups for local recurrence according to the number of unfavorable prognostic factors (age <60, viscera localization, no additional radiotherapy), and 4 prognostic groups for metastatic recurrence (very low, low, moderate, or high) depending on age (<60 or ≥60), mitotic count (≤4 or >4), and tumor localization (limb vs others).[17] For instance, our patient had a 19.26% risk of local recurrence at 10 years and a 32.11% risk of metastatic recurrence at 5 years, thus justifying adjuvant treatment with radiation therapy and a long-term follow-up.

The core idea of risk assessment models is the standardization of the treatment protocol by allocating patients in different subgroups in which therapeutic lines depend on the calculated risk of local and metastatic recurrences.[17]

The main treatment for SFTs remains a large surgical excision with a histologic evaluation of surgical margins.[10,17] Increasing number of studies suggest that radiation therapy may reduce local recurrence.[17] Metastatic spread or local recurrence should set up a second line treatment comprising chemotherapy with an anthracycline-containing regimen.[10]

CONCLUSION

SFTs are tumors of mesenchymal origin often arising from the pleura. Renal localization is rare and histologic malignant features are even more uncommon. The high aggressiveness potential of this tumor suggests that monitoring with a long-term follow-up is essential.

References

1. Hasegawa T, Matsuno Y, Shimoda T, Hasegawa F, Sano T, Hirohashi S. Extrathoracic solitary fibrous tumors: their histological variability and potentially aggressive behavior. *Hum Pathol.* 1999; 30:1464–1473. https://doi.org/10.1016/S0046-8177.
2. Cheung F, Talanki VR, Liu J, et al. Metachronous malignant solitary fibrous tumor of kidney: case report and review of literature. *Urol Case Rep.* 2016;4:45–47. https://doi.org/10.1016/j.eucr.2015.09.004.
3. Wang J, Arber DA, Frankel K, Weiss LM. Large solitary fibrous tumor of the kidney: report of two cases and review of the literature. *Am J Surg Pathol.* 2001;25:1194–1199.
4. Khater N, Khauli R, Shahait M. Solitary fibrous tumors of the kidneys: presentation, evaluation, and treatment. *Urol Int.* 2013;91:373–383. https://doi.org/10.1159/000354394.
5. Park SB, Park YS, Kim JK, et al. Solitary fibrous tumor of the genitourinary tract. *AJR Am J Roentgenol.* 2011;196:W132–W137. https://doi.org/10.2214/AJR.09.3787.
6. Rosado-de-Christenson ML, Abbott GF, McAdams HP, Franks TJ, Galvin JR. From the archives of the AFIP: localized fibrous tumor of the pleura. *Radiographics.* 2003;23:759–783. https://doi.org/10.1148/rg.233025165.
7. Solitary fibrous tumor (extrapleural). PathologyOutlines.com http://www.pathologyoutlines.com/topic/softtissuesft.html.
8. Sasaki H, Kurihara T, Katsuoka Y, et al. Distant metastasis from benign solitary fibrous tumor of the kidney. Case Rep. Nephrol. Urol. 2013;3:1–8. https://doi.org/10.1159/000346850.
9. Thway K, Ng W, Noujaim J, Jones RL, Fisher C. The current status of solitary fibrous tumor: diagnostic features, variants, and genetics. *Int J Surg Pathol.* 2016;24:281–292. https://doi.org/10.1177/1066896915627485.
10. Prunty MC, Gaballah A, Ellis L, Murray KS. Solitary fibrous tumor of the pelvis involving the urinary bladder. *Urology.* 2018;117:27–30. https://doi.org/10.1016/j.urology.2018.01.004.
11. Schweizer L, Koelsche C, Sahm F, et al. Meningeal hemangiopericytoma and solitary fibrous tumors carry the NAB2-STAT6 fusion and can be diagnosed by nuclear expression of STAT6 protein. *Acta Neuropathol.* 2013;125:651. https://doi.org/10.1007/s00401-013-1117-6.
12. Creytens D, Libbrecht L, Ferdinande L. Nuclear expression of STAT6 in dedifferentiated liposarcomas with a solitary fibrous tumor-like morphology: a diagnostic pitfall. *Appl Immunohistochem Mol Morphol.* 2015;23:462–463. https://doi.org/10.1097/PAI.0000000000000081.
13. Fine SW, McCarthy DM, Chan TY, Epstein JI, Argani P. Malignant solitary fibrous tumor of the kidney: report of a case and comprehensive review of the literature. Arch Pathol Lab Med. 2006;130:857–861.
14. Abeygunasekera AM, Ginige AP, Liyanage IS, Hareendra K. A solitary fibrous tumor of the kidney. J Cancer Res Ther. 2015;11:662. https://doi.org/10.4103/0973-1482.138128.
15. Yang Y, Miller CR, Clement C, et al. Malignant solitary fibrous tumour of the kidney with lymph node and liver metastases: beware of STAT6 expression in dedifferentiated liposarcoma with a solitary fibrous tumour-like morphology: author reply. *Pathology.* 2017;49:671–672. https://doi.org/10.1016/j.pathol.2017.07.005.
16. Hsieh TY, Chang Chien YC, Chen WH, et al. De novo malignant solitary fibrous tumor of the kidney. *Diagn Pathol.* 2011;6:96. https://doi.org/10.1186/1746-1596-6-96.
17. Salas S, Resseguier N, Blay JY, et al. Prediction of local and metastatic recurrence in solitary fibrous tumor: construction of a risk calculator in a multicenter cohort from the French Sarcoma Group (FSG) database. Ann Oncol. 2017;28:8. 1979-87; https://doi.org/10.1093/annonc/mdx250.