Solitary Fibrous Tumor of the Liver from Development to Resection

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Abstract

A 55-year-old man was annually followed up for a large hepatic cyst. In 2006, a 20-mm nodule was detected in contact with the cyst that gradually grew thereafter. By 2013, the mass had expanded to 90 mm, and a percutaneous biopsy revealed a solitary fibrous tumor (SFT). Surgical resection was subsequently performed, and the patient has since been doing well for 11 months, without recurrence. SFT of the liver is a rare neoplasm; only 44 cases have been reported to date. This is the first report to describe the long-term progression of hepatic SFT from the time of its development.

Key words: solitary fibrous tumor, liver tumor, doubling time, dynamic CT, Gd-EOB-DTPA-enhanced MRI


Introduction

Solitary fibrous tumor (SFT), first reported in 1931, is a rare soft tissue neoplasm originating from the mesenchymal tissue, with an incidence of approximately 0.2/100,000 person-years (1, 2). Most SFTs are benign, with only approximately 12% to 22% of lesions exhibiting malignant behavior (3). Because SFT is generally pleural in origin, it occurs in the thoracic cavity in most cases. Although SFT has also been reported to originate in organs external to the thoracic cavity, such as the retroperitoneum, deep soft tissues of the proximal extremities, abdominal cavity, trunk, and head and neck, the liver is rarely involved (4-14). In addition, histopathological and immunohistochemical examinations are required to confirm the diagnosis of SFT (1-15). Because hepatic SFT is usually asymptomatic until the lesion becomes extremely large, most previously reported cases have been diagnosed based on the presence of physical symptoms resulting from very large tumors (4). We herein present a rare case of SFT of the liver in which the long-term progression of a mass was observed from the time of development to resection.

Case Report

A 55-year-old man first visited Osaka University Hospital for an evaluation of a large hepatic cyst in 2005. He had no other medical history, such as viral hepatitis, excess alcohol intake, fatty liver or other chronic liver diseases. Laboratory tests of routine biochemical parameters, liver function parameters and tumor markers, including carcinoembryonic antigen, carbohydrate antigen 19-9 and α-fetoprotein, were all within their respective normal ranges. The patient underwent annual follow-up imaging examinations.

During the first examination in 2005, a 10-cm-diameter cyst occupying the right hepatic lobe was identified on computed tomography (CT) (Fig. 1a); no solid components were
Figure 1. Chronological progression of SFT of the liver. Arterial phase images of dynamic CT performed in (a) 2005, (b) 2006, (c) 2007, (d) 2008, (e) 2009, (f) 2010 and (g) 2011 and (h) Gd-EOB-DTPA-enhanced MRI conducted in 2012. The arrowheads indicate the tumor.

Figure 2. Longitudinal transition of the doubling time of the hepatic SFT.

The patient remained asymptomatic throughout the observation period. However, further enlargement may have caused sudden bleeding, as hepatic hemangiomas measuring more than 10 cm are at high risk of spontaneous rupture (18). Therefore, surgical resection was considered at that time. Moreover, because the lesion had exhibited gradual but constant growth, its clinical course was not typical of a benign hemangioma. Although the differential diagnosis included hepatocellular carcinoma, liver cell adenoma, metastatic liver cancer, solitary fibrous tumor, malignant lymphoma, angiomylipoma and so on, it was difficult to distinguish between these conditions based only on imaging examinations. Therefore, a fine-needle biopsy was conducted to confirm the diagnosis in 2013. Consequently, the histological findings revealed diffuse proliferation of spindle-like cells randomly arranged within collagen bundles (a so-called patternless pattern) (1-15). Immunohistochemically, the cells were positive for CD34, Bcl-2 and CD99 and negative for S100, desmin and CD117; these findings were diagnostic for SFT.

Furthermore, the hepatobiliary phase revealed a well-demarcated, homogeneously hypointense mass contiguous with the thickened cyst wall (Fig. 3f), while the lesion appeared to be obviously hyperintense on diffusion-weighted images (Fig. 3g). In contrast, the mass showed a low uptake (maximum standardized uptake value of 1.7), the same degree as that of the surrounding normal liver parenchyma, on fluorodeoxyglucose-positron emission tomography, and no abnormal uptake was observed in the thoracic cavity (Fig. 4).

On gadolinium-ethoxybenzyl-diethylenetriamine pentaacetic acid (Gd-EOB-DTPA)-enhanced MRI performed in 2013, the mass was found to have grown to 90 mm in diameter. In addition, it presented as a uniformly hypointense and hyperintense lesion on T1- and T2-weighted images, respectively (Fig. 3a and b), and heterogeneous enhancement was observed on arterial, portal and late-phase images (Fig. 3c-e).
Figure 3. Imaging appearance of the hepatic SFT on Gd-EOB-DTPA-enhanced MRI at the time of resection in 2013. The arrowheads indicate the tumor depicted on (a) T1-weighted image, (b) T2-weighted image, (c) arterial phase image, (d) portal phase image, (e) late-phase image, (f) hepatobiliary phase image and (g) diffusion-weighted image.

Figure 4. Imaging appearance of whole-body fluorodeoxyglucose positron-emission tomography.

Moreover, Bcl-2 was strongly expressed in the tumor, but not in the surrounding normal liver parenchyma. These results were almost identical to those of the preoperative needle-sample biopsy. Meanwhile, Ki-67 antigen staining was 2% positive, no tumor cells were observed in the adjacent cyst wall and the cytological findings of the cyst fluid were negative. Finally, neither cirrhosis nor fibrosis were identified in the peripheral non-tumorous liver parenchyma.

The patient’s postoperative course was uneventful, and he was discharged 18 days after the operation. He has since been doing well for 11 months, with no evidence of recurrence.

Discussion

SFT is a rare mesenchymal neoplasm characterized by the proliferation of fibroblast-like spindle tumor cells within thick collagen bundles (1-15). SFT primarily originates from the thoracic cavity; SFT of the liver is quite uncommon (4-14). A search for “solitary fibrous tumor of the liver” or “hepatic solitary fibrous tumor” in PubMed/Medline revealed only 44 cases in the English-language literature. The characteristics of these 44 cases are summarized in Table. The median patient age was 60 (23-85) years, with a female:male predominance of approximately 2:1 (28 women and 16 men). The median tumor size was 17.0 (0.5-32.0) cm, and most patients had some physical symptoms.

No specific laboratory parameters or imaging examination findings for hepatic SFT are currently available. Heterogeneous enhancement on arterial and portal phase images and homogeneous hypointensity on hepatobiliary phase images were observed in this case on Gd-EOB-DTPA-enhanced MRI, a novel imaging modality used to assess hepatic tumors (19); however, these findings are not specific for SFT.
Figure 5. Histological findings of the resected specimen. (a) Macroscopic appearance. (b) Microscopic appearance [Hematoxylin and Eosin (H&E) staining, ×40]. (c) Microscopic appearance (H&E staining, ×200). The arrowheads indicate a hemangiopericytoma-like pattern. (d) Immunohistochemistry for CD34 (×100). (e) Immunohistochemistry for Bcl-2 (×100).

Table. Summary of 44 Previously Reported Cases of SFT of the Liver

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Age (years)</td>
<td>60 (23-85)†</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>16/28</td>
</tr>
<tr>
<td>Region (North America/South America/Europe/Asia)</td>
<td>19/2/14/9</td>
</tr>
<tr>
<td>Symptoms (symptomatic/asymptomatic/NA)</td>
<td>36/7/1</td>
</tr>
<tr>
<td>Number of tumors per case (1/2/multiple)</td>
<td>42/1/1</td>
</tr>
<tr>
<td>Tumor diameter (cm)</td>
<td>17 (0.5-32)</td>
</tr>
<tr>
<td>Tumor main location (left lobe/right lobe/round ligament/NA)</td>
<td>15/22/1/6</td>
</tr>
<tr>
<td>Treatment (resection/resection and other treatments/transarterial chemoembolization/observation/discovered at the time of autopsy)</td>
<td>37/3/1/2/1</td>
</tr>
<tr>
<td>Follow-up period after treatment (months) (n=25)</td>
<td>12 (3-72)</td>
</tr>
<tr>
<td>Number of tumors which showed clinically malignant behaviors</td>
<td>3</td>
</tr>
<tr>
<td>Prognosis (alive without tumor/alive with stable disease/alive with tumor progression/died of tumor progression/died just after surgery/discovered at the time of autopsy/NA)</td>
<td>23/2/2/1/2/1/13</td>
</tr>
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</table>

†Values are expressed as median (range). NA: not available

Histopathological examinations are currently the gold standard diagnostic modality for detecting SFT. The characteristic microscopic finding is a patternless architecture comprising hypo- and hypercellular areas of spindle tumor cells separated by thick collagenous stroma (patternless pattern) that contains interspersed angulated hemangiopericytic
staghorn-shaped vessels (hemangiopericytoma-like pattern) (1-15). The presence of positive immunohistochemical reactions for CD34, Bcl-2 and vimentin and negative reactions for S100 protein, cytokeratins, CD31, CD117, epithelial membrane antigen, smooth muscle actin, muscle-specific actin and desmin is also diagnostic (1-15). Indeed, these findings were decisive for making the diagnosis of SFT in the present case.

Although surgical resection is recommended in cases of symptomatic hepatic SFT (4, 5, 7-14), whether extensive resection is required in asymptomatic patients remains uncertain (6). In order to better evaluate this problem, the natural disease course of hepatic SFT should be clarified in a long-term follow-up study of affected patients. In this case report, the course of progression of SFT was observed for up to seven years due to the incidental detection of the tumor during regular follow-up of a large hepatic cyst. After its appearance, the lesion expanded slowly but steadily, with a doubling time of approximately one year, without rapid enlargement or cessation of growth throughout the observation period. To our knowledge, this is the first report to describe the long-term progression of hepatic SFT from the time of its development.

Although our patient remained asymptomatic during the follow-up period, we considered surgical resection to be indicated in this case for the following two reasons. First, the continuous enlargement of the tumor was expected to result in physical manifestations at some point. Symptoms associated with hepatic SFT are primarily due to the mass effect and include abdominal pain and distension as well as weight loss. Hypoglycemic attacks may also be caused by abnormal hormone secretion from hepatic SFTs (5, 7). Moreover, such large hypervascular tumors are likely to be at risk of sudden bleeding or rupture. Excluding a case of a 3-cm-diameter hepatic SFT with cholecystitis (20), the minimum reported diameter of symptomatic hepatic SFT is 6 cm (8). Accordingly, patients bearing tumors that exceed this diameter may display symptoms.

Second, hepatic SFT may exhibit a malignant potential. Although most of the 44 reported cases (see Table) were clinically benign, malignant behaviors, such as recurrence or metastasis, were observed in three patients (6.8%) (7, 9-11). In addition, two cases of malignant SFT of the liver have been reported in the Japanese-language literature (21, 22). The median reported diameter of malignant SFTs is 28 (4-32) cm, and most lesions are larger than the current SFT. However, there is one reported case of a malignant SFT measuring only 4 cm in diameter (21). Moreover, in another previously reported case in which the SFT was almost the same size as the present lesion, the tumor increased from 8.5 to 30 cm within two years and showed malignant histopathological features (12), namely, hypercellularity, cytological atypia, a high mitotic rate (4 or more mitotic figures per 10 high-power fields) and tumor necrosis (11-13). Accordingly, malignancy appeared to be undeniable in the current case, even if the mass was smaller than most malignant SFTs. Furthermore, despite the lack of histological findings suggesting malignancy, the possibility that malignant foci were overlooked in the small biopsy specimen due to sampling error cannot be excluded (14). The doubling time of our SFT (see Fig. 2) was longer than that of hepatocellular carcinoma and cholangiocellular carcinoma (23, 24) and shorter than that of hemangioma (25), the most common benign liver tumor. This finding suggests that the present SFT may have had an “intermediate” malignant potential and supports the validity of performing hepatic resection in this case. Surgical resection was eventually conducted, achieving complete tumor resection without recurrence for the subsequent 11 months.

In summary, based on the findings of the current and previously reported cases, although cautious observation may be justified to some extent, surgical resection should be recommended in patients with extremely large SFTs of the liver, considering the risk of urgent symptoms and a malignant potential. However, further clinical studies including a greater number of patients with hepatic SFT, as well as the establishment of laboratory markers and imaging findings to better evaluate the disease, are needed in order to formulate effective management guidelines for treating hepatic SFT. The appropriate timing for resection should also be investigated by accumulating additional cases.

The authors state that they have no Conflict of Interest (COI).

References