A Rare Case of Undifferentiated Pleomorphic Sarcoma of the Pancreas and Literature Review

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Abstract

Background

Primary undifferentiated pleomorphic sarcoma (UPS) of the pancreas is an exceedingly rare malignant tumor, with only 15 cases have been reported in the medical literature. At present, clinicians have poor recognition of the tumor, the epidemiology, diagnosis and treatment of this disease have yet not been established.

Case presentation

In this report, we depict the clinical and imaging characteristics of a 37-year-old man presenting with a primarily cystic UPS. The patient complained of epigastric pain and distention over 20 days. Abdominal CT and pancreatic magnetic resonance imaging revealed cystic and cystic solid masses in the pancreatic body and tail. An abdominal ultrasound echogram revealed the mass in the body of the pancreas to be cystic with separation echo inside, and the wall was thick, not smooth. Besides, a hypoechoic mass was seen in the tail area of the pancreas with an inhomogeneous echoic pattern, containing small patches of no echo zone in the central. Microscopically, spindle fibroblast-like cells are arranged in a characteristic storiform pattern with pleomorphic and multinucleated cells. Immunohistochemically, tumor cells were positive for CD68 and vimentin. Seven months postoperatively, he was diagnosed with pulmonary lymph node metastasis and died five months later. Combined with this case report, we also reviewed the literature regarding UPS of the pancreas.

Conclusions

As we know, this is the first report on ultrasonography findings of pancreatic UPS. Despite there are no distinctive manifestation of UPS, a solid cystic lesion on ultrasonography or a hypodense area in the lesion on T2-weighted imaging, should be considered for differential diagnosis with pancreatic UPS. We believe this article may add some ideas into the diagnosis and therapy of patients with this tumor.

Background

Undifferentiated pleomorphic sarcoma (UPS) or previously known malignant fibrous histiocytoma (MFH) is considered the most common type of soft tissue sarcoma. It often occurs in the limbs, trunk, and retroperitoneal tissues. However, it has been rarely observed in the digestive organ[1]. Primary pancreatic UPS is an extremely uncommon type of malignant tumor, with only 15 cases have been demonstrated in the medical literature so far. At present, clinicians have poor recognition of the tumor, the epidemiology, diagnosis and treatment of this disease have yet not been established. Herein, we present a 37-year-old man with UPS of the pancreas with clinical, radiologic, and pathological manifestations. As far as we know, this is the first detailed description of the ultrasonography features of pancreatic UPS.

Case Presentation

A 37-year-old man was admitted to our hospital for further evaluation and treatment of pancreatic body and tail masses. He had been suffering from epigastric pain and distention for more than 20 days. The patient had no history of weight loss. The routine hematological laboratory values including tumor markers, hematocrit and liver function tests were within normal limits. He was evaluated by abdominal ultrasonography (US), computed tomography (CT), and pancreatic magnetic resonance imaging (MRI). The abdominal CT scanning revealed two hypodense masses in the body and tail of the pancreas (Fig. 1A). MRI scan of the pancreas confirmed the presence of two rounded cystic mass approximately 4.5×4.9 cm and 2.5×2.0 cm involving the body and tail of the pancreas respectively, the cystic wall were not smooth. The lesion located in the body appeared as inhomogeneous hyperintensity on T2-weighted images with low intensity septations inside (Fig. 1B). The other mass in the tail whose edge appeared as ring-like low intensity with high intensity in the central part on T2 images. No obvious enhancement in enhanced scanning. An abdominal ultrasound echogram showed the mass in the body of the pancreas to be cystic with separation echo inside, and the wall was thick, not smooth. Besides, a hypoechoic mass was seen in the tail area of the pancreas with an inhomogeneous echoic pattern, containing small patches of no echo zone in the central. No obvious blood flow signal was detected. (Fig. 1C-D)

After consulting with our hospital's multiple disciplinary team, the patient was initially diagnosed as benign pancreatic mass and underwent a resection of pancreatic body and tail to relieve the symptom. At laparotomy, two cystic masses were seen in the body and tail of the pancreas measured 5×4cm and 2.5×2cm respectively. The mass was completely resected and the specimen was submitted
for pathology evaluation. On pathology, the resected lesion was macroscopically a cystic structure containing sanguineous fluid, the cyst wall was approximately 3 mm wide, and no signs of malignancy were seen. However, microscopic examination demonstrated a malignant neoplasm predominantly consisted of spindle fibroblast-like cells are arranged in a characteristic storiform pattern with pleomorphic and multinucleated cells (Fig. 2). The tumor was 1 cm from the closest pancreas resection margin and the cutting edges of the tumor were negative.

On immunostaining, part of the epithelial component was positive for HepPar-1 (Fig. 3H), CKpan, arginase-1 and focally positive for glypican 3 suggestive of HCC, while the other part of the epithelial components with glandular architecture was positive for CK7 (Fig. 3I) and CK19 (Fig. 3J), and negative for arginase-1 and glypican 3 suggesting cholangiocarcinoma.

On immunostaining, the tumor was positive for CD68, vimentin and p53 protein, and negative for EMA, CEA, S-100 protein, cytokeratin, Desmin, CD34, CD99, CD117, SMA, MDM2, and CDK4. The tumor Ki-67 expression was about 30%. Based on morphology and immunohistochemical staining, The tumor was diagnosed as UPS. The patient refused to perform further surgery and was discharged 11 days later. Unfortunately, during the follow-up visit at seven months, a chest CT scan revealed abnormally enlarged lymph nodes. After comparing the preoperative CT scans, those nodes were suspected of being metastatic lesions. The patient died of the metastasis 12 months after surgery.

Discussion

Pancreatic UPS is one of the rarest primary non-epithelial neoplasms in the pancreas, previously known as MFH [2]. The cells of origin of UPS are believed to be derived from undifferentiated mesenchymocytes, which have the capacity to differentiate into fibroblasts and tissue cells [3]. The pathological characteristics of UPS originating in the pancreas are the same as those in other parts of the body. The majority of cases compose of polymorphy tumors, characterized by cytological and nuclear pleomorphism, mixed with different ratios of spindle cells [4]. They were previously divided into storiform-pleomorphic, inflammatory, giant cell, myxoid, and angiomatoid subtypes [5–6]. However, in the most recent version of the World Health Organization (WHO) classification, UPS only represents the correct label for the prototypical storiform and pleomorphic variant of MFH [7]. We searched PubMed from the establishment of the database to August 2021, and finally only enrolled 16 cases, including the present case. Therefore, it is important to report the type of tumor morphology for this relatively unknown malignancy.

The clinicopathological profiles of these patients are summarized in Table 1. Among these 16 cases, the ratio of male to female was 12:4. The median age at diagnosis was 57 years. Primary UPS happens to different parts of the pancreas. Nine cases of tumors were located in the body of the pancreas and/or tail of the pancreas, and underwent left pancreatectomy and splenectomy. In 6 cases, it occurred at the pancreatic head and pancreaticoduodenectomy was performed. The preoperative diagnosis of all patients was not clear. Of the 16 cases reported, 11 patients had no further adjuvant therapy. Two patients received adjuvant radiotherapy and chemotherapy and three patients received adjuvant chemotherapy. The longest postoperative follow-up survival time was 48 months.
Table 1
Clinical data of the 16 patients with pancreatic UPS

| First author          | Age | Sex | Histologic type | Location          | Treatment                                      | Preoperative diagnosis                          | Postoperative therapy       | Follow-up (months) |
|-----------------------|-----|-----|-----------------|-------------------|-----------------------------------------------|------------------------------------------------|-----------------------------|--------------------|
| Ishiguchi, et al. [8] | 44  | M   | Pleomorphic     | Body-tail         | Left pancreatectomy, splenectomy             | Pancreatic neoplasms                            | NA                          | 15, NED            |
| Garvey, et al. [9]    | 77  | M   | Storiform-pleomorphic | Uncinate lobe    | Enucleation                                   | Pancreatic head mass                           | NA                          | 48, NED            |
| Pascal, et al. [3]    | 39  | M   | Storiform-pleomorphic | Head             | Pancreatectoduodenectomy                      | Mesenchymal tumor                              | NA                          | 0, DOC             |
| Allen, et al. [10]    | 46  | M   | Storiform-pleomorphic | Body-tail, local invasion |                                        | Preoperative diagnosis                          |                            |                    |
| Tsujimura, et al. [11]| 43  | F   | Storiform-pleomorphic | Tail             | Pancreatectomy, splenectomy                   | Pancreatic cystadenoma                         | Chemotherapy                | 5, NED             |
| Ben Jilani, et al. [12]| 72  | M   | Storiform-pleomorphic | Body-tail         | Left pancreatectomy, splenectomy             | Pancreatic mass                                | NA                          | 12, DOD            |
| Balen, et al. [13]    | 37  | M   | Pleomorphic     | Body-tail         | Extended left pancreatectomy                  | Pancreatic mass                                | Radiation therapy and chemotherapy | 7, DOD             |
| Haba, et al. [14]     | 70  | M   | Storiform-pleomorphic | Head             | Pancreatectoduodenectomy                      | Tumor of pancreatic head                       | Chemotherapy                | 22, NED            |
| Bastian, et al. [15]  | 67  | M   | Storiform-pleomorphic | Body             | Left pancreatectomy, splenectomy, transverse colectomy, subtotal gastrectomy | Pancreatic cancer                              | NA                          | 34, NED            |
| Darvishian, et al. [16]| 74  | M   | Storiform-pleomorphic | Head             | Pancreatectoduodenectomy                      | Pancreatic head cancer                         | NA                          | 4, NED             |
| Akatsu, et al. [17]   | 67  | M   | Storiform-pleomorphic | Body-tail         | Left pancreatectomy, splenectomy, transverse colectomy, total gastrectomy | Pancreatic cancer                              | NA                          | 35, NED            |
| Mizukami, et al. [18] | 44  | F   | Pleomorphic     | Body-tail         | Total gastrectomy, left pancreatectomy        | Pancreatic tumor                               | NA                          | 20, NED            |
| Yu, et al. [19]       | 67  | M   | Storiform-pleomorphic | Head             | Pancreatectoduodenectomy                      | Pancreatic head cyst                           | NA                          | 11, DOD            |
| Jarry, et al. [4]     | 45  | M   | Storiform-pleomorphic | Head             | Pancreatectoduodenectomy                      | Pancreatic cancer                              | Radiotherapy and chemotherapy | 36, NED            |
| Sanei, et al. [1]     | 72  | F   | Pleomorphic     | Head and neck    | Pancreatectoduodenectomy                      | Pancreatic head cancer                         | NA                          | 22, NED            |
| Own case              | 37  | F   | Pleomorphic     | Body-tail         | Distal pancreatectomy                         | Pancreatic mass                                | NA                          | 12, DOD            |

Pancreatic UPS grows fast, and its clinical features described in literature are varied, but upper abdominal discomfort are the most common presentation. At present, there is no reliable laboratory test contributing to diagnosis, and the preoperative tumor markers in this case are negative. In the previous reports, pancreatic UPS presented a large, nonhomogeneous, hypointense or multinodular lesion with possible intratumoral calcification [20] and massive liquefactive necrosis in CT plain scan [15,17]. Enhanced modalities showed a non-homogeneously enhancing mass with enhancing peripheral pseudocapsular [19]. The case reported by Yu et al. [19] showed a huge multilocular cystic lesion on abdominal CT and MRI, which contained a large amount of liquefactive necrosis, and the cyst wall, fibrous...
Primary pancreatic UPS appears to parallel the biological behavior of retroperitoneal UPS. Thus, the therapy of pancreatic UPS can follow the treatment principles of the latter. Radical resection is the mainstay method and the choice of surgical method depends on the location of the tumor. Due to the short follow-up period of previous studies, the final prognosis after surgical excision is hard to evaluate. In the case here described, the preoperative laboratory examination and intraoperative gross specimens revealed benign lesions. Considering that the patient was young, pancreatic body and tail resection was performed to preserve pancreatic function. However, postoperative pathological examination and immunohistochemistry confirmed the diagnosis of pancreatic primary UPS. The poor outcome of the current case may be due to incomplete resection as well as to the biological malignant potential. Through the diagnosis and treatment of this patient, we have learned many lessons: (1) Although rare, UPS of pancreas is essential to consider when making a differential diagnosis in a patient with a cystic solid pancreatic lesion. (2) For patients who fail to obtain histological examination before operation, an intraoperative frozen examination should be carried out as much as possible to reduce the missed diagnosis of pancreatic malignant tumors. (3) If the initial surgery is not complete, radical surgery should be performed again in time to achieve an R0 situation.

In addition to surgery, radiotherapy may have a certain effect on pancreatic UPS. Study have found that when the tumor cannot be completely removed, radiotherapy is an important adjuvant treatment for UPS in other parts.[27] However, due to the limited number, the role of adjuvant radiotherapy on these tumors has not been determined. Chemotherapy has been reported to effectively prolong survival for patients with UPS in the soft tissue. Doxorubicin and ifosfamide are usually recommended as the first-line chemotherapy regimen for soft tissue sarcoma [28], but based on the existing literature, which regimen should be adopted for pancreatic UPS are still being explored. Jarry et al[4] report a case of resected pancreatic UPS who recurred 11 months later presenting as pulmonary and hepatic metastasis. The patient underwent a multidisciplinary therapy of radiofrequency ablation, chemotherapy, and a right hepatectomy. Then, The patient recovered completely and was disease-free for 3 years after the operation. It seems that such treatment could improve the survival rates of recurring patients.

**Conclusion**

In summary, primary UPS is an exceptionally rare but distinct malignant neoplasm of pancreas. Despite there are no distinctive manifestation of UPS, a solid cystic lesion on ultrasonography or a hypodense area in the lesion on T2-weighted imaging, should be considered for differential diagnosis with pancreatic UPS. Radical resection is the most effective treatment at present. Postoperative radiotherapy and chemotherapy may improve the survival of patients, which needs to be verified by more clinical cases. This case emphasizes the clinicopathological, imaging, and immunohistochemical finding of pancreatic UPS. Long-term follow-up researches are required to know the exact biological behavior of these neoplasms.
**Abbreviations**

UPS  undifferentiated pleomorphic sarcoma  
MFH  malignant fibrous histiocytoma  
CT  computed tomography  
US  ultrasonography  
MRI  pancreatic magnetic resonance imaging  
WHO  World Health Organization

**Declarations**

**Authors' contributions**

ZL and JZH participated in the acquisition of clinical data and drafted the manuscript. HFT, DDX, and HXY carried out the pathological examination and interpretation. HFT and YHP revised the manuscript. All authors have read and approved the final manuscript.

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**Availability of data and materials**

All data generated during this study are included in this published article.

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Written informed consent for publication was obtained from the patient’s relatives.

**Competing interests**

The authors declare that they have no conflict of interest.

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Figures

Figure 1

Image of pleomorphic sarcoma of the pancreas A. The abdominal CT scan showed two hypointense lesions in the pancreas body and tail; B. MRI revealed two round cystic abnormal signal involving the body and tail of the pancreas; C~D. Ultrasound imaging exhibited a cystic echo in the body of the pancreas with separation and hypoecho in the tail. (the red arrow indicates the masses)

Figure 2

Microscopic section reveals spindle cells arranged in a storiform pattern, with polymorphic neoplastic cells (Hematoxylin&Eosin, ×40×100 original magnification) (a-b) . The cells exhibit the diffuse positive reaction to vimentin (c) . The cells are positive for p53 (d) .