Klinichna khirurhiia. 2021 Jule/August; 88(7-8):69-73.
DOI: 10.26779/2522-1396.2021.7-8.69

Солідна псевдопапілярна пухлина підшлункової залози (пухлина Франца)

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Solid pseudopapillary tumor of the pancreas (Frantz's tumor)

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Introduction

Solid pseudopapillary tumor of the pancreas (SPTP) or Solid pseudopapillary neoplasm (SPN) of the pancreas, also known as Frantz's tumor, is a rare phenomenon, and it accounts for 1–3% of all neoplasms of the exocrine pancreas. It mainly occurs in younger individuals, predominantly women; SPNs have a female predilection, with a ratio of female to male of 10:1 [1]. They are typically seen in females in their 20s–30s, but can also be seen in the pediatric population with an incidence of 0.005–0.01 cases per 100,000 [2].

Non–specific symptomatology is often present, such as abdominal pain or sporadic manifestations of nausea, vomiting, and a sense of heaviness in the abdomen. In rare cases, at physical examination, a palpable mass may be present in the abdomen [3]. Frantz's tumor may be localized in any part of the pancreas. There are rarely metastases, and when they do occur, they are most commonly localized in the liver [1, 3]. Ultrasonography (USG) of the abdomen is the initial diagnostic method; nevertheless, computerized tomography (CT) and magnetic resonance imaging (MRI) of the abdomen is much more precise and superior methods. Frequently, CT and MRI can indicate the presence of a mass in the pancreas, which has the characteristics of cystic degeneration, bleeding within the cyst, and the presence of a capsule [4]. Differential diagnoses include pancreatic ductal adenocarcinoma, cystadenoma, cystadenocarcinoma, or a pancreatic neuroendocrine tumor [5].

The present study was designed to delineate the current perspectives on Solid pseudopapillary tumor of the pancreas, also known as Frantz's tumor, a rare pancreatic tumor.

Brief history

Frantz's tumor was first termed by Dr. Virginia Franz in 1959 as a "papillary tumor of the pancreas with solid and cystic components" in the Armed Forces Institute of Pathology, questioning its nature to be either benign or malignant. The patient was a 2–year–old boy who died during an attempted pancreaticoduodenectomy [6, 7]. In 1970, Hamoudi described the ultrastructural features of the tumor, which led to its acceptance as a separate clinic pathological entity [8]. Next, the tumor has been named using different terminologies until the World Health Organization (WHO) adopted the term "solid pseudopapillary tumor or neoplasm" in 1996 [9]. It was finally defined as a "low–grade malignant neoplasm of the exocrine pancreas" in the current WHO classification in 2010 [10].

Clinical manifestations

The most clinical presentations in patients presented with SPTP were upper abdominal pain, abdominal distention, abdominal mass, incidental detection, nausea and vomiting, back pain, and hematuria. The symptoms were non–specific, and the coexistence of two or more symptoms was often found [11].

Pathological and immunohistochemical characteristics

An original research study conducted by Song et al. revealed that the typical gross appearance of SPTP is well capsulated and demarcated from the pancreas with a mixture of solid, cystic component in various proportions. Microscopically, tumor cells arranged around fibrovascular stalk forming a pseudopapillary pattern, focal areas of haemorrhage and necrosis could usually be found. Furthermore, Immunohistochemical staining delineated that alpha 1–antichymotrypsin (AACT), Vimentin, alpha 1–Antitrypsin (AAT), Neuron–Specific Enolase (NSE), Progesterone Receptor (PR), Synaptophysin, and so forth appear to have positive expression mostly and the positive rates for them were 95.7% (45/47), 88.1% (37/42), 82.5% (33/40), 70% (28/40), 63.9% (23/36), and 55.3% (21/38), respectively as is shown in *Table 1* [11].

Characteristics of malignant sptp

Vascular infiltration, pancreatic parenchymal invasion concurrent with peripancreatic fat tissue infiltration, adjacent organ invasion, perineural invasion, and pancreatic parenchy-

Table 1. **Immunohistochemical staining [11].**

Parameters	Positive	Total	%
AACT	45	47	95.70
Vimentin	37	42	88.10
AAT	33	40	82.50
NSE	28	40	70.00
PR	23	36	63.90
Synaptophysin	21	38	55.30
Ki-67	5	8	62.50

ma invasion are the most characteristics of malignant SPTP reported in the literature [11]. Furthermore, Song et al. compared and summarized the characteristics/predictive factors between patients with benign and malignant tumor are as represented in *Table 2*.

Case studies

Calvin Khaba et al. reported a case of a 38 years old African male patient with abdominal pain for 5 years that worsened in the preceding 5 months. Radiology showed pancreatic and liver lesions, which were thought to be malignant and benign, respectively. However, an intra–operative and histopathological assessment confirmed SPTP and intrahepatic cholangiocarcinoma (iCCA), which were contrary to radiological findings. Whilst surgery was uneventful, and the patient died after 15 days. The abdominal CT images were represented in *Figure 1* [12].

Eric et al. describe a 32–year–old female patient in whom a preoperative imaging diagnosis confirmed a mass in the junction of the pancreas' body and tail (*Figure 2A*). Based on the anamnesis, the preoperative diagnosis, and the patient's general status, the decision was made to performed laparoscopic enucleation of the pancreatic tumor. The operation and postoperative recovery passed without complications. Definitive histopathological and Immunohistochemical findings confirmed a SPTP of the pancreas. Depending on the localization and the size of the tumor, surgical options range from typical and atypical resections of the pancreas to minimally invasive surgical procedures, such as local excision and enucleation. However, laparoscopic procedures have a comparative advantage in cases of enucleation and resection of the pancreas (*Figure 2B*). The low frequency of recidivation and a favorable prognosis, even after repeated surgery, are additional reasons for favouring the laparoscopic approach over the classical surgical approach. Based on the experience of this case study authors recommended that a minimally invasive surgical approach should be applied whenever the dimensions and the localization of the tumor permit it, bearing in mind all the benefits and advantages that this surgical technique offers [13].

Table 2. **Characteristics of malignant SPTP [11].**

Factors	Benign	Malignant	p-value
Average age	34.1 ± 12.00	41.0 ± 17.80	NS
Average BMI	23.6 ± 2.50	24.1 ± 1.90	NS
Gender			NS
Male	6	1	
Female	37	9	
Symptoms			NS
Present	27	4	
Absent	16	6	
Serum tumor marker			NS
Elevated	37	10	
Normal	6	0	NS
Average tumor size (cm)			
<5 cm	20	2	
>5 cm	23	8	
Tumor location			NS
Head	12	3	
Body and tail	27	5	
Neck	4	1	
Extrapancreatic site	0	1	
Calcification condition			NS
Calcification	11	4	
Non-calcification	32	6	
Component of tumor			NS
Solid and cystic	13	5	
Solid	19	4	
Cystic	11	1	
Pattern of capsule			p<0.001
Complete capsule	42	3	
Incomplete capsule	1	7	
NS-Non-significant			

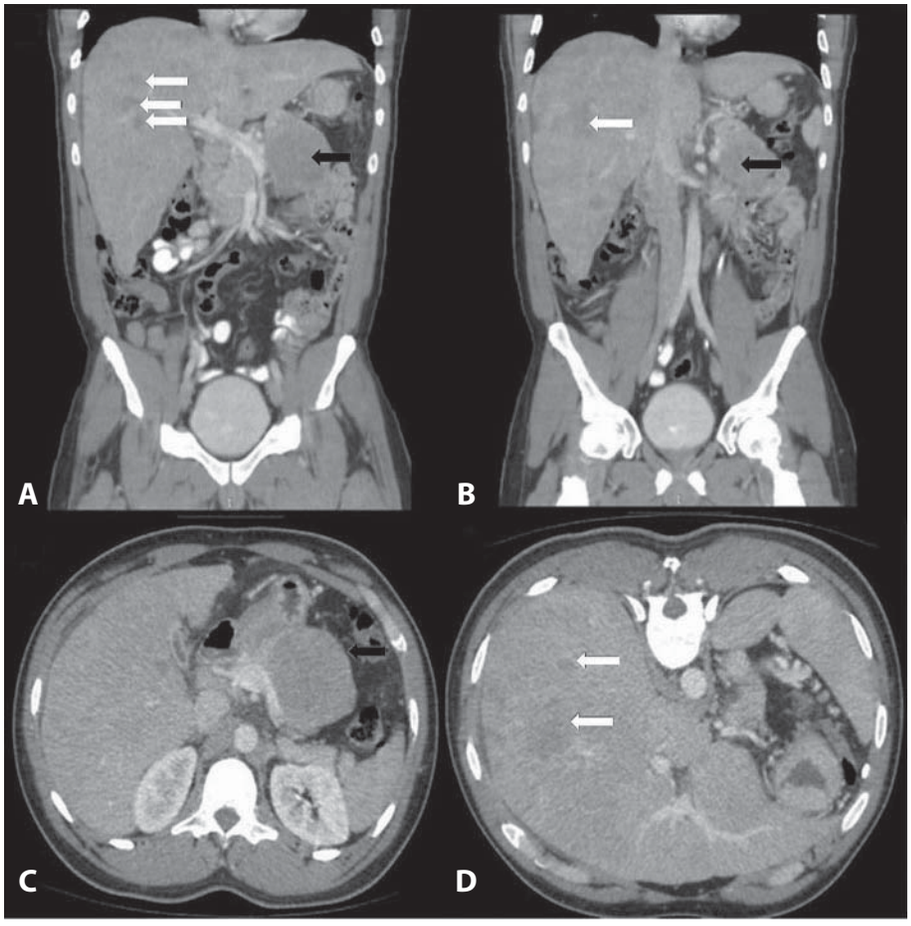

Fig. 1.
Abdominal CT Images.
A and B: Coronal images: Hepatomegaly with vague rim–enhancement of the hepatic lesions (arrows). The complex cystic lesion in the pancreas (arrow). No suspicious metastatic bony lesions were visualized.
C and D: Axial plane (contrast): C – well–defined hypodense lesion (arrow) in the pancreatic body; D – poorly circumscribed hypodense liver lesions of variable sizes throughout the liver parenchyma (arrow) that do not follow any particular enhancement pattern. There is no dilatation of the biliary ducts.
(Source: Khaba et al. 2021 [12]).

AlQattan et al. reported a case of a 19–year–old female patient who initially presented with abdominal pain, which was started 6 years ago. A contrast–enhanced CT scan of the abdomen showed a large mass measuring 15.6 cm × 11.6 cm × 11 cm, arising from the pancreas with an enhancing cystic component (*Figure 3*). The patient was operated with exploratory laparotomy, which revealed a huge mass occupying most of the abdominal cavity. Hence, it was proceeded with distal pancreatectomy and splenectomy. Intraoperatively, the frozen section showed that the mass had features of a solid pseudopapillary tumor of the pancreas with negative resection margins. The SPTP diagnosis was confirmed by histopathology and immunohistochemistry. The pathophysiology behind the development of SPTP and its cellular origin is still a matter of debate with multiple proposed hypotheses. SPTPs are asymptomatic in almost 70% of all cases and usually discovered incidentally. The preoperative diagnosis of SPTPs remains a clinical challenge despite all the current advances in diagnostic modalities. Surgical management with negative resection margins is the mainstay of treatment; even with metastasis and vascular invasion, surgical excision should be performed whenever feasible. The recurrence rate after surgical resection

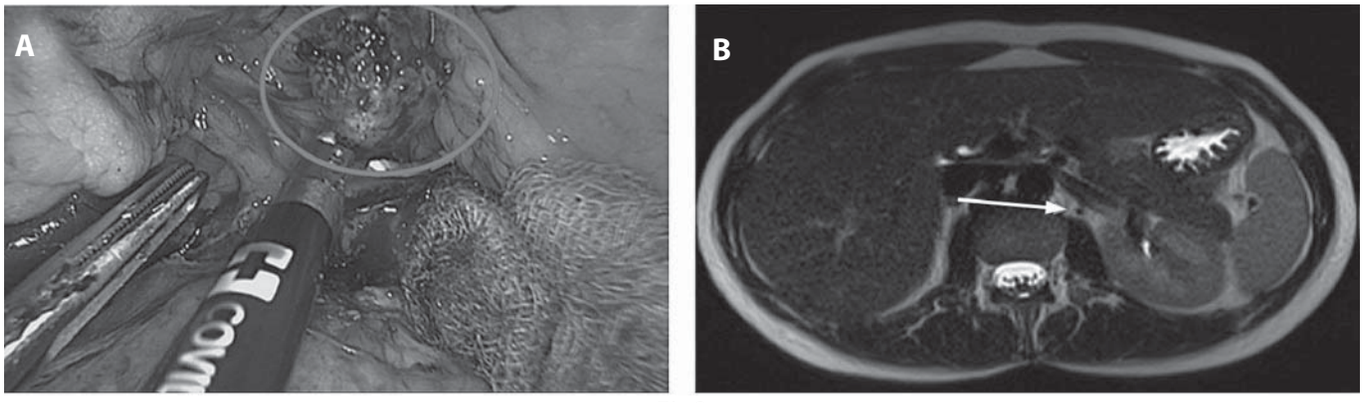

Fig. 2.
A – Enucleation of pancreatic mass (circle); B – MRI image showing 18 mm pancreatic mass (arrow).
(Source: Eric et al. 2021 [13].

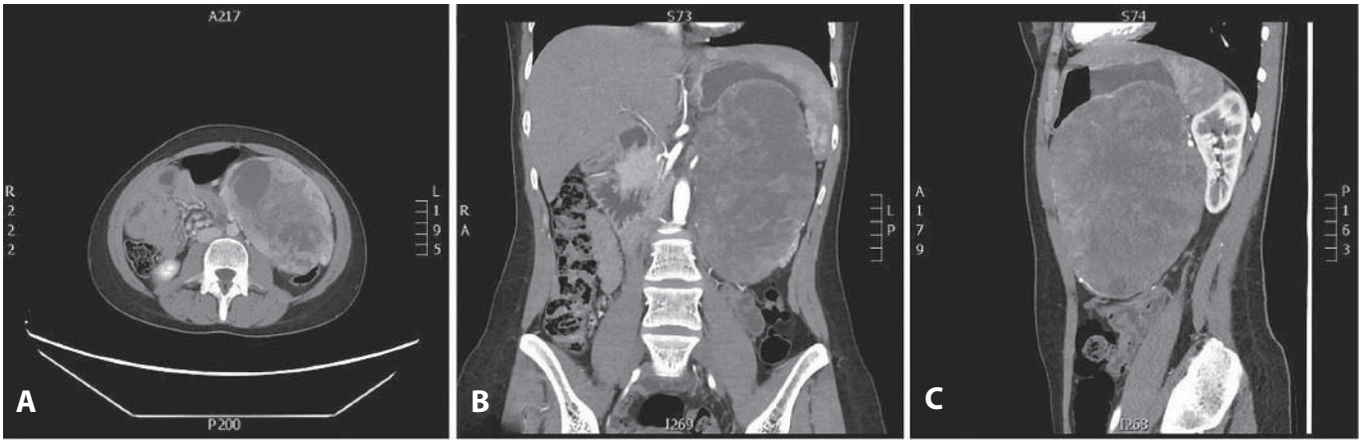

Fig. 3.
A contrast–enhanced computed tomography scans of the abdomen showing a large, well–defined, and heterogeneous tumor measuring 15.6 cm × 11.6 cm × 11 cm, arising from the pancreas with an enhancing cystic component.
(Source: AlQattan et al 2020 [14]).

has been reported to be 3–9%. The prognosis of SPTP limited to the pancreas is generally excellent, with over 95% cure rate following complete surgical resection. SPTP is a rare entity of a controversial origin but is considered as a low–grade malignancy. Surgical resection to achieve complete excision constitutes the mainstay of treatment, which mostly results in an excellent prognosis [14].

Meckmongkol et al. reported the case of a 14–year old female who presented with a two–day history of abdominal pain. A contrast–enhanced computed CT scan of the abdomen and pelvis demonstrated a characteristic solid–cystic mass in the pancreatic tail, which was concerning for a SPTP of the pancreas. The patient underwent an uneventful laparoscopic subtotal pancreatectomy with splenic preservation. Whereas, Terrin et al. demonstrated that laparoscopic pancreatic resection with splenic preservation could be performed safely for SPTP in a child. The authors also used two techniques that are useful to accomplish this safely (i). lateral to medial dissection, which assists in the identification of the splenic vein and artery, and (ii). slow staple compression of the pancreas, which may decrease pancreatic leak rates. Based on this case study experience, the authors concluded that laparoscopic pancreatic resection with splenic preservation could be safely performed in the pediatric population in whom the benefit of splenic preservation is maximum. The lateral to medial dissection is helpful in clearly defining the splenic vasculature for splenic preservation. Gradual and slow compression of the pancreas during pancreatic transection with the 45 mm endoscopic stapler may decrease the risk of postoperative pancreatic leaks [15].

Furthermore, Pantiora et al. presented a treatment of 2 cases of SPTP of the pancreas. Both patients were females with a mean tumor size of 5 cm. Preoperative diagnosis was based on distinctive features of the neoplasm in fine–needle aspiration cytology in one patient. The two procedures performed were enucleation of the tumor and a distal pancreaticosplenectomy. Both the patients are on a regular follow–up, and no recurrence has been detected 2 years after surgery. Based on the experience of this case series study, Pantiora et al. recommended that It is important to differentiate solid pseudopapillary neoplasms from other pancreatic neoplasms because of the low potential for malignancy and a favorable prognosis. Fine needle aspiration cytology is the most valuable tool for diagnosis and surgical planning. Surgery is the primary therapeutic modality, and in patients with distant metastasis or adjacent organ invasion aggressive approach should be considered. Local resection or enucleation can be performed for small tumors in selected cases. However, despite the excellent prognosis, the inability to predict malignant behavior mandates a long–term follow–up post–surgery [16].

With its mainly non–specific symptomatology, Frantz's tumor represents a diagnostic challenge and is usually detected as a coincidental finding during other examination procedures. As it mostly occurs in the younger population, especially in younger women between 18 and 35 years old, one must consider the best therapeutic approach to treat this tumor. A laparoscopic enucleation is a feasible option for the treatment of these masses. Moreover, the presence of multiple primary tumours is a known concept in medicine for decades, with various combinations reported. This review study discovered the importance of a multi–disciplinary team and collaboration of surgeons, radiologists, histopathologists and oncologist in the optimal management of cases of SPTP with clinical challenges.

Conclusions

This review study delineated that SPTP is a low grade potential malignant tumor. Clinical manifestations had no specificity, imaging examinations are contributed to tumor location, and diagnosis relies on pathology. Surgery is the mainstay of treatment. For the patient of recurrence or metastasis, aggressive surgery and comprehensive treatment are entitled to receive a satisfactory prognosis.

Funding. There were no external sources of funding and support. No fees or other compensation were paid.

Authors' contribution. All authors made the same contribution to this article.

Competing interests. The authors have no conflict of interest.

Consent for publication. All authors approved the paper to be published.

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Надійшла 23.04.2021