Technical Article

Accuracy of Endoscopic Ultrasound-guided Fine Needle Aspiration in Diagnosing Solid Pseudopapillary Tumor

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Abstract

Background: Solid pseudopapillary tumors are rare pancreatic tumors. Accurate preoperative diagnosis helps in planning of the surgery. **Aim:** This study was to evaluate accuracy of endoscopic ultrasound-guided fine needle aspiration and immunohistochemistry in diagnosing solid pseudopapillary tumors. **Materials and Methods:** A retrospective review was performed by reviewing medical records to identify patients treated for solid pseudopapillary tumors over a 5-year period. Patients who were noted to have pancreatic lesions by computer tomography abdomen underwent endoscopic ultrasound. Fine needle aspiration was obtained from each of these lesions and subjected to immunohistochemistry. **Results:** Five patients were identified. Endoscopic ultrasound was able to identify the pancreatic lesions in all five patients noted in computer tomography abdomen. Solid pseudopapillary tumors were diagnosed by immunohistochemistry. All five patients underwent surgery and the resected lesions confirmed solid pseudopapillary tumors in 80% patients. **Conclusion:** Endoscopic ultrasound-guided fine needle aspiration has a higher degree of accuracy in diagnosing solid pseudopapillary tumors.

Keywords: Endoscopic ultrasound, fine needle aspiration, immunohistochemistry, solid pseudopapillary tumor

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Introduction

Solid pseudopapillary tumors (SPT) are extremely rare, indolent, and low grade tumors. It has an incidence of 1–2% of exocrine tumors.[1] The differential diagnosis of SPT of the pancreas includes all solid or cystic pancreatic lesions. They can be benign lesions like pseudocysts, serous cystadenoma, hemangioma, pseudotumor, cystic lymphangioma, and cystic teratoma or malignant lesions like adenocarcinoma, mucinous cystadenoma, cystadenocarcinoma, and pancreatic neuroendocrine tumors. Treatment and subsequent care varies based on the diagnosis and hence accurate diagnosis is important.

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Percutaneous biopsy was used traditionally to diagnose SPT, which has higher risks and lower accuracy.[2,3]

A recent multicenter trial suggested that endoscopic ultrasound (EUS) is an emerging technique to diagnose SPT.[4] We looked at the accuracy of EUS in making a diagnosis of SPT in our tertiary care center. We perform about 800 EUS annually. We evaluated all cases of SPT, which were diagnosed by EUS in the last 5 years.

Materials and Methods

A retrospective review was performed to identify patients with SPT of the pancreas treated by a single physician at our tertiary care hospital over a 5-year period. The electronic medical record system was searched using the physician's name and the key term "solid pseudopapillary tumor." Medical records of resultant patients were reviewed to collect pertinent information to include demographics, symptoms, EUS findings, fine needle aspiration (FNA), complications, and immunohistochemistry. Long-term response to surgical

management postdiagnosis was assessed by review of clinical records. All patients were diagnosed with SPT after being confirmed by immunohistochemistry. All EUS were performed to evaluate patients suspected of pancreatic mass by computer tomography (CT) scan.

Endoscopy technique: All procedures were performed using monitored anesthesia care (MAC). EUS was used to identify the lesions noted by CT scan. The lesions were accurately measured and their morphology was noted. Lesions were described as hyper echoic, anechoic lesions, or mixed echoic based on hypo enhancement or hyper enhancement on the EUS.

Biopsy protocol: Two samples of FNA were taken from the suspected lesion and they were then subjected to immunohistochemistry and evaluated by a pathologist.

Surgical management: The standard surgical management followed in our institution after confirming the diagnosis. Lesions with head of pancreas underwent partial pancreatico-duodenectomy (Whipple's procedure) and lesions in body or tail of pancreas underwent partial pancreatectomy. The resected lesions were again evaluated by the pathologist to confirm the diagnosis of SPT.

Follow up: Patients were initially followed up in the clinic after their surgery in 1 month. They were assessed for recurrence of SPT in the form of symptoms like abdominal pain, weight loss, and jaundice. They also underwent repeat CT abdomen in 3 months to ensure there was no evidence of recurrence of the tumor.

Results and Discussion

Five patients were identified. Abdominal pain was present in all. All five patients initially suspected to be having pancreatic lesions on CT abdomen underwent EUS. EUS was able to identify the pancreatic lesions noted in CT abdomen. Average size of the lesions was 2.9 cm. Specific patient characteristics and EUS findings are described in Table 1. Figure 1 to 5 depicts immunohistochemistry and EUS findings of all patients. Two patients had lesions in pancreatic head, two patients had in pancreatic body, and one patient had a lesion in pancreatic tail. Two FNAs were obtained from each of these lesions and subjected to immunohistochemistry [Table 2].

SPT was first described in 1959 by Frantz[5] and was known as Frantz tumor. It was renamed as SPT by World Health Organization in 1996. SPT is a rare pancreatic tumor of unknown origin. Santini *et al*.[6] described them as cells originating from multipotent primordial cells or from genital ridge-/ovarian anlage-related cells, which were adherent to pancreatic tissue during embryogenesis. SPT predominantly occurs in females (90%) with a mean age of 29.4 years.[7] The mean age of patients in our cohort was 27 years and all of them were females. They present with symptoms of acute or chronic abdominal pain, vague abdominal discomfort, nausea, vomiting, and jaundice. SPT is confined to pancreas in 85% of cases while 15% may have metastasis at the time of presentation.[7,8] All our patients had lesions confined to pancreas with no metastases. Metastases can occur in older individuals (more than 36 years) at a mean interval of 8.5 years.[9]

Table 1: Patient characteristics and EUS findings

Age	Symptoms	CT scan findings	EUS findings of pancreas	Type of surgery	Resected pathology	Follow up (months)	Recurrence	Figure
27	Chronic Epigastric pain	Mass in head of pancreas	3.8×2.3 cm hypoechoic lesion in the head	Partialpancreatico-duodenectomy	SPT	70	No	-
38	Chronic abdominal pain	Mass in tail of pancreas	3.3×2.8 cm anechoic lesion in the tail	Partial pancreatectomy	Mucinous cyst neoplasm	58	No	2A
24	Chronic abdominal pain and weight loss	Mass in body of pancreas	0.85×0.65 cm anechoic lesion in the body	Distal pancreatectomy	SPT	59	No	3A
28	Acute right upper quadrant pain and jaundice	Mass in tail of pancreas	3×2 cm mixed echoic lesion in the tail	Distal pancreatectomy	SPT	36	No	4A
18	Acute right lower quadrant pain and fever	Mass in head of pancreas	4.5×4.2 cm hypoechoic mass in the head	Pancreatico-duodenectomy	SPT	8	No	5A

EUS: Endoscopic ultrasound; CT: Computer tomography; SPT: Solid pseudopapillary tumors

Table 2: The immunohistochemical stains

Vimentin	β-catenin	CD-56	Chromogranin A	Synaptophysin	CD-10	PR	ER	Figure
+	NA	+	-	NA	+	+	-	1
NA	NA	NA	+	NA	+	NA	NA	2B
NA	NA	+	-	-	+	NA	NA	3B
NA	+	+	-	NA	NA	NA	NA	4B
+	+	NA	-	NA	+	NA	NA	5B

PR: Progesterone receptor; ER: Estrogen receptor; NA: Not done; +: Positive; -: Negative

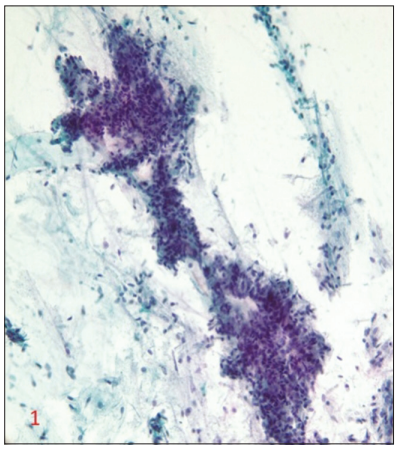

Figure 1: Case 1- The EUS-FNA smear shows a highly cellular specimen with branching papillary-like fronds lined by multiple layers of tumor cells. (Pap stain, ×400)

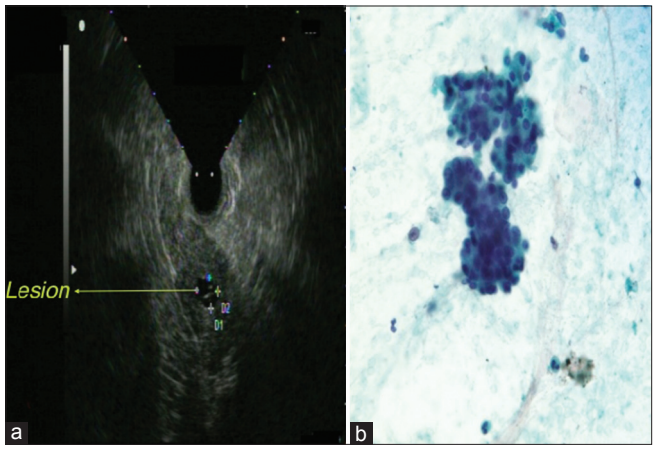

Figure 2: (a) Case 2- EUS showing 3.3 × 2.8 cm anechoic lesion in pancreatic tail. (b) Case 2- Tumor cells are bland and uniform, forming gland-like acinar structures. (Pap stain, ×600)

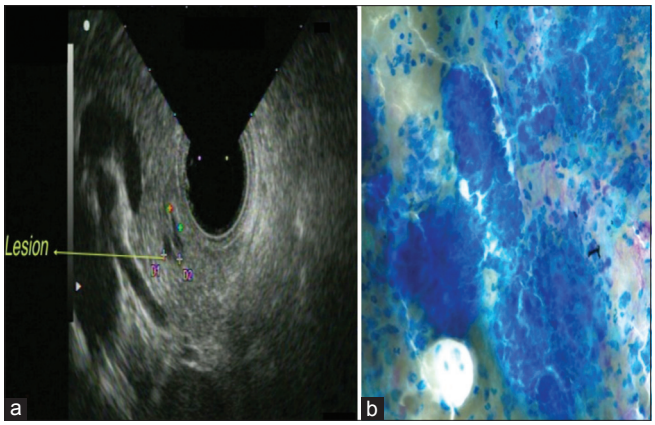

Figure 3: (a) Case 3-EUS showing 0.85 × 0.65 cm anechoic lesion in pancreatic body. (b) Case 3- EUS-FNA smear shows pseudopapillae structures lined by multiple layers of tumor cells. (Diff-Quik stain, ×400)

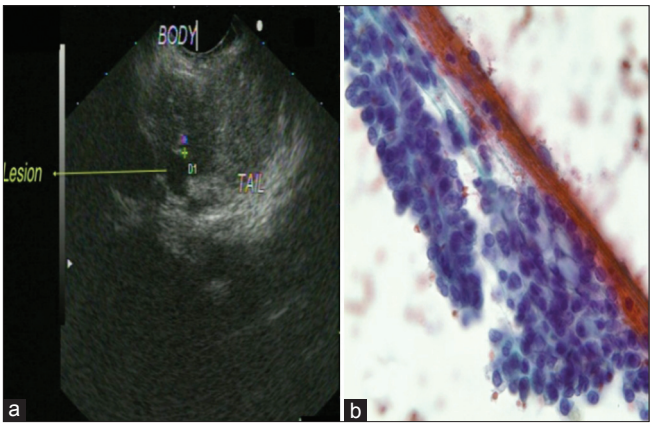

Figure 4: (a) Case 4- EUS showing 3 × 2 cm mixed echoic lesion with specks of calcification in pancreatic tail. (b) Case 4- This high power image demonstrates tumor cells with round to oval nuclei, fine chromatin and nuclear grooves. (Pap stain, ×600)

SPT is usually an incidental finding on CT scan. Imaging studies will suggest a pancreatic mass, which needs a definitive diagnosis by accurate tissue diagnosis prior to further treatment. SPT can be predominantly solid, mixed solid-cystic, or cystic pancreatic lesions with hemorrhage in the imaging studies.[10] These features can mimic findings of other pancreatic neoplasm. Preoperative diagnosis is confirmed by cytology of the sampled lesions, which is obtained by less invasive methods like endoscopic ultrasound-fine needle aspiration (EUS-FNA), CT-guided percutaneous biopsy or laparoscopy. Traditionally, CT-guided percutaneous biopsy was used to obtain the biopsy for cytology. However, CT-guided biopsy can cause seeding of the tumor by peritoneal or cutaneous contamination during sampling.[3] The risk of needle tract seeding by EUS-FNA is negligible due to short needle path.[11] Laparoscopy can be tedious, as it requires operation rooms and is more invasive technique compared with the imaging-guided biopsy.

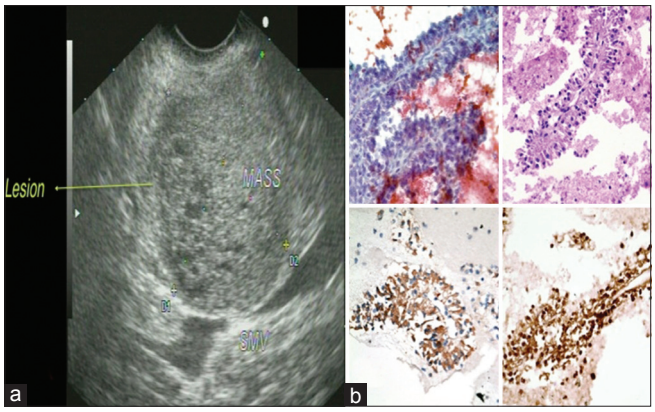

Figure 5: (a) Case 5- EUS showing 4.5 cm x 4.2 cm hypo echoic lesion in uncinate process. (b) Case 5- A. EUS-FNA smear shows a long pseudopapillary structure characteristic of solid-pseudopapillary neoplasm. (Pap stain, ×400) B. The cellblock section shows a tumor cell group in a cystic background. (H and E stain, ×400) C. Immunohistochemical (IHC) stain for synaptophysin is positive in the tumor cells (IHC stain, ×400). D. Immunohistochemical stain for beta-catenin shows positive nuclear staining in the tumor cells. (IHC stain, ×400)

EUS-FNA was first described in 1994.[12] EUS is helpful in diagnosis, staging, and evaluating internal cyst structure.[13] It also gives us information like pancreatic or peri-pancreatic lesions, exact size of the tumor, locally advanced lesion, metastasis to liver, lymph nodes, and vascular invasion. All of this information is vital in planning for the surgery. The lesions can be accurately sampled as the location of the lesions will guide the route of FNA thereby enabling a short needle tract.[14,15] Transgastric approach is adopted for lesions in tail or body of pancreas while head or uncinate process will be approached by duodenum.[14] The EUS will have a characteristic appearance of a heterogeneous solid, mixed solid, or cystic hypoechoic lesion.[16] All five patients underwent EUS-FNA. Three patients had anechoic lesions, one patient had hypo echoic lesion, and one patient had mixed echoic lesion findings in EUS. The EUS finding were even accurate in mentioning the size and the extent of the tumor spread, which was essential for planning of surgery. This was confirmed intraoperatively and subsequently by histology of postoperative surgical specimens. Nearly 80% of our patients had an accurate preoperative diagnosis of SPT by EUS-FNA. This was confirmed by comparing the histology of postoperative specimens. One patient had an accurate diagnosis with a lesion of less than 1 cm size suggesting the accuracy of EUS technique in diagnosing smaller lesions.

The aspirated fluid from FNA will have cytopathological features of branching papillae with myxoid stroma.[16] SPT is strongly immunoreactive for β-catenin vimentin, CD10, α1-antitrypsin, and progesterone receptor.[17,18] Immunoreactivity to chromogranin A, synaptophysin, CD56, and progesterone receptor suggests pancreatic endocrine neoplasm.[11] All five patients had immunohistochemical studies of the resected specimen. We started to use immunostains for FNA in the last 3 years in our institution and hence, the first three patients were diagnosed preoperatively by cytopathological features of EUS-FNA findings alone.

Complete surgical resection of SPT is recommended.[19,20] Surgical debulking can prolong survival even if there is metastasis at the time of presentation.[1] SPT has an excellent prognosis, with a 5-year survival of 95%.[2]

All patients in our cohort had complete surgical resections and have been followed up for a mean period of 46.2 months after surgical resection. None of them required chemotherapy or radiation therapy. There has been no evidence of recurrence. We had one patient who had a preoperative diagnosis of SPT but final diagnosis came back as mucinous cyst neoplasm. This was because immunostaining was not used for the cytology due to its unavailability. Based on our institutional experience, we conclude that EUS-FNA is a reliable means and has a higher degree of accuracy in diagnosing SPT. The accuracy tends to increase when combined with cytohistological FNA. Also, it gives vital information like accurate size and location of the lesion prior to surgery.

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