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Case Report

Transbiliary intravascular ultrasound-guided diagnostic biopsy of an inaccessible pancreatic head mass

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ABSTRACT

Percutaneous image-guided biopsies of pancreatic malignancies may prove challenging and nondiagnostic due to a variety of anatomic considerations. For patients with complex post-surgical anatomy, such as a Roux-en-Y gastric bypass, diagnosis via endoscopic ultrasound with fine-needle aspiration may not be possible because of an inability to reach the proximal duodenum. This report describes the first diagnostic case of transbiliary intravascular ultrasound-guided biopsy of a pancreatic head mass in a patient with prior Roux-en-Y gastric bypass for which a diagnosis could not be achieved via percutaneous and endoscopic approaches. Transbiliary intravascular ultrasound-guided biopsy resulted in a diagnosis of pancreatic adenocarcinoma, allowing the initiation of chemotherapy.

Introduction

Pancreatic cancer is the fourth leading cause of cancer death in the United States, and its high mortality is related to the late stage of diagnosis for the majority of patients [1]. Tissue samples are often obtained via endoscopic retrograde cholangiopancreatography, percutaneous image-guided fine-needle aspiration biopsy or core biopsy sampling, or endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA).

While brushing cytology and intraductal forcep biopsies with endoscopic retrograde cholangiopancreatography have a low sensitivity of 45% and 48.1%, the diagnostic sensitivity of fine-needle aspiration biopsy and EUS-FNA has been reported to be 98.4% and 88.8%, respectively [2–5]. For some patients with complex postsurgical anatomy, such as a Roux-en-Y gastric bypass, diagnosis via EUS-FNA is not possible because of an inability to reach the proximal duodenum.

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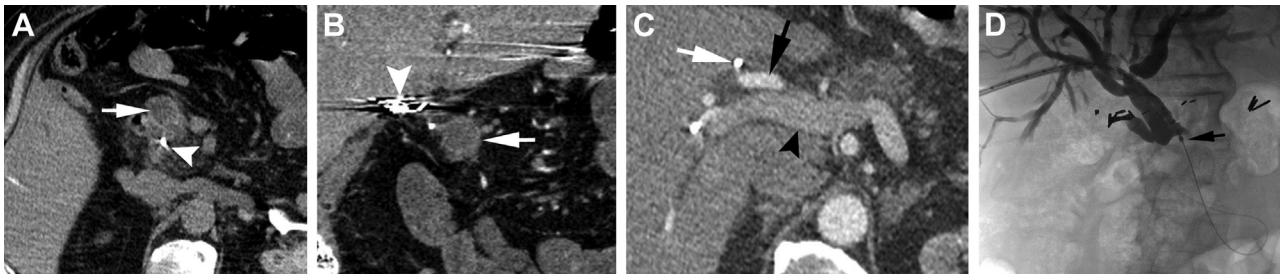

Fig. 1 – (A) Axial image from computed tomography with contrast demonstrating a hypodense, enhancing mass in the head of the pancreas (white arrow). A biliary tube is noted within the common bile duct, posterior to the pancreatic head mass (white arrowhead). (B) Coronal image from computed tomography with contrast showing the pancreatic head mass (white arrow) and biliary tube (white arrowhead). (C) Magnified axial image illustrating relationship of anterior biliary tube (white arrow), hepatic artery (black arrow), and posterior portal vein (black arrowhead). This relationship was utilized when identifying structures on IVUS. (D) Radiograph from cholangiography showing dilated biliary tree with abrupt cutoff of the common bile duct at the tip of the IVUS probe, correlating to the mass (black arrow). IVUS, intravascular ultrasound.

This report describes the first diagnostic case of transbiliary intravascular ultrasound (IVUS)-guided biopsy of a pancreatic head mass in a patient with prior Roux-en-Y gastric bypass for which a diagnosis could not be achieved via percutaneous and endoscopic approaches.

Case report

Institutional review board approval was not required for preparation of this report. Informed consent was obtained prior to this procedure. Signed consent was obtained from the patient for preparation and publication of this manuscript. A 61-year-old male with history of obesity and Roux-en-Y gastric bypass presented to an outside institution with painless jaundice. Total bilirubin was 19 mg/dL (normal range: 0.3–1.9 mg/dL). Computed tomography (CT) of the abdomen and pelvis with intravenous contrast material demonstrated a 2.4 × 1.9 cm pancreatic head mass (Fig. 1) as well as moderate extrahepatic and intrahepatic biliary ductal dilation. Three prior percutaneous CT-guided biopsies were performed at the outside institution, including multiple 18-gauge core samples and 21-gauge FNAs, which were all nondiagnostic due to narrow window of access and proximity of adjacent critical structures.

The patient was transferred to this institution for management of jaundice, pruritus, and possible biopsy of pancreatic head mass. Upon presentation, total bilirubin was 21 mg/dL (normal range: 0.3–1.9 mg/dL). Interventions were performed under general anesthesia administered by an attending anesthesiologist. All procedures were performed by an attending interventional radiologist. Procedures were

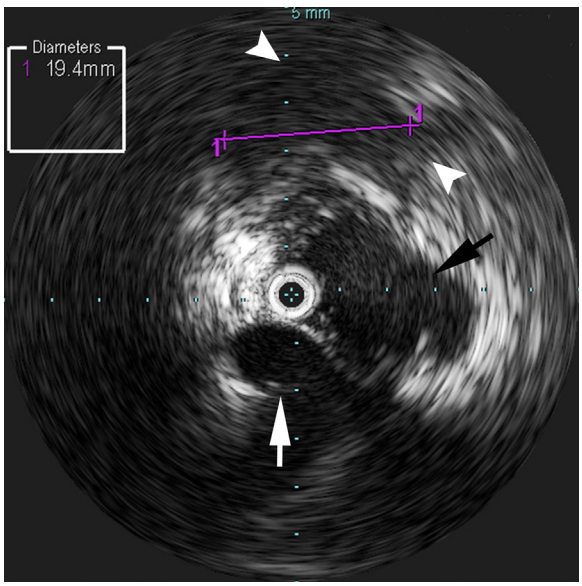

Fig. 2 – Axial image from IVUS at same position as Figure 1D revealing a hypoechoic mass (between white arrowheads) anterior to the common bile duct (black arrow). Also noted is the hepatic artery (white arrow), which was used for orientation of the IVUS. IVUS, intravascular ultrasound.

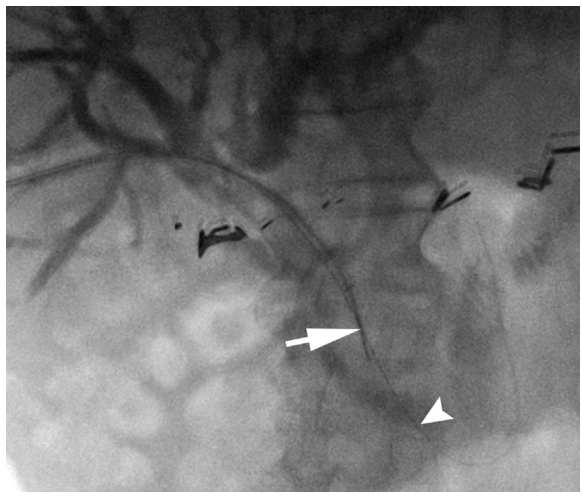

Fig. 3 – Fluoroscopic image during transbiliary biopsy demonstrating location of the core biopsy needle (white arrow) which was directed by IVUS reference. Note a safety wire within the proximal bowel (white arrowhead). IVUS, intravascular ultrasound.

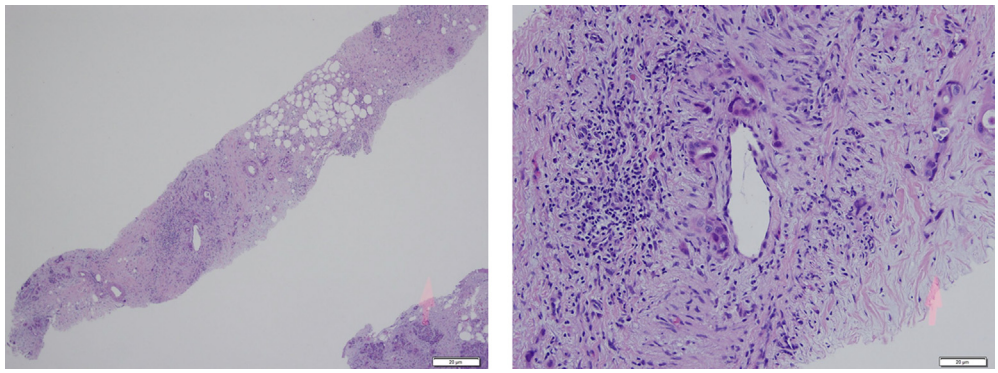

Fig. 4 – Gross and microscopic images of the specimen demonstrating pancreatic ductal adenocarcinoma.

performed in a single hybrid angiography suite using EPIQ ultrasound (Philips; Amsterdam, the Netherlands), Artis Zee interventional angiography system (Siemens; Munich, Germany), and SOMATOM Definition AS CT (Siemens). A 10.2-French right internal/external biliary drainage catheter (Cook Medical; Bloomington, IN) was initially placed for management of painless jaundice and pruritus with subsequent decrease in total bilirubin to 5 mg/dL. Outside imaging was reviewed for possible additional percutaneous image-guided pancreatic biopsy, but no adequate access was identified. EUS-FNA was considered impractical in the setting of prior Roux-en-Y gastric bypass.

One week after placement of the internal/external biliary drainage catheter, an unconventional pancreatic biopsy approach was developed. In order to biopsy the pancreatic mass, the existing 10.2-French right internal/external biliary drainage was exchanged over an Amplatz Super Stiff guidewire (Boston Scientific; Marlborough, MA) for a 9-French × 25 cm vascular sheath. An 8-French IVUS catheter (Visions PV; Volcano Corp; San Diego, CA) was advanced over the wire into the biliary tree. The pancreatic mass was identified using IVUS and used to identify corresponding fluoroscopic landmarks (Fig. 2). The IVUS catheter was then exchanged for a transjugular liver biopsy set (Argon Dextera TLAB Patel Set; US Biopsy; Franklin, IN), selected as it allowed for directionality, and positioned based on the fluoroscopic landmarks (Fig. 3). Three 18-gauge core biopsy samples were obtained, all with samples diagnostic of pancreatic adenocarcinoma (Fig. 4). The transjugular liver biopsy set was replaced with a new 10.2-French internal/external biliary drainage catheter, and patient was discharged from the hospital in the following day.

The patient was seen in the interventional radiology clinic in 2 weeks at which time he had already begun chemotherapy. No complications were observed at 3-month follow-up.

Discussion

Percutaneous biopsies may prove challenging due to a variety of anatomic considerations. While often successful, the percutaneous approach to abdominal targets may be impeded by poor access windows, adjacent critical structures, target mobility, small lesion size, and large skin-to-target distances [6]. Several techniques, including the use of external compression devices, CT fluoroscopy, and instillation of artificial ascites or pneumoperitoneum, have been utilized to facilitate percutaneous image-guided biopsies [7–9].

The creation of novel image-guidance systems, specifically IVUS, has led to its use for imaging of the arterial and venous systems as well as for transjugular intrahepatic portosystemic shunt placement, transcaval puncture for endoleak embolization, and endovascular-guided biopsies [10–12]. Cardiac and transcaval IVUS-guided biopsies have been described [13,14].

To our knowledge, IVUS has not been used to identify and guide biopsy via a percutaneous biliary access port. With the increasing availability and operator comfort associated with IVUS, this technique is not only feasible, but also facilitates transluminal biopsies of difficult-to-access masses adjacent to the biliary tree with accuracy and minimal difficulty. Such a technique requires a standard 9-French vascular access sheath which may easily accommodate current 6- and 8-French IVUS systems. While this case demonstrated the use of unilateral biliary access as the patient had only a single internal/external biliary drain at the time of the procedure, real-time visualization of the biopsy could potentially be achieved using bilateral biliary access. In such instances, IVUS may be passed through one vascular sheath and the transjugular biopsy device through the other, allowing for real-time lesional biopsy. Alternatively, a larger unilateral access sheath could be used to accommodate both IVUS and the transjugular biopsy set and allow for real-time visualization.

These are several limitations to this report. It was performed at a single institution on a single patient. Moreover, unilateral biliary access IVUS-guided biopsy was not compared, in direct fashion, with percutaneous image-guided biopsy or bilateral biliary access IVUS-guided biopsy.

Conclusion

Although additional studies are needed to validate this technique, this case demonstrates that transbiliary IVUS-guided biopsy may provide an alternative approach to obtaining tissue from seemingly inaccessible lesions adjacent to the biliary tree.

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