Endoscopic ultrasound-guided gold fiducial marker placement for intraoperative identification of insulinoma

Insulinomas are the most common functioning pancreatic neuroendocrine neoplasm, comprising 30%–45% of these tumors. Although laparoscopic resection is safe, minimally invasive, and is associated with shorter length of hospital stay, tumor localization at surgery can be challenging. We describe endoscopic ultrasound (EUS)-guided fiducial placement as a new technique for intraoperative localization of pancreatic insulinoma.

A 36-year-old woman with episodes of confusion that resolved with intake of glucose and whose laboratory tests were suggestive of insulinoma was referred for laparoscopic distal pancreatectomy. Linear-array EUS (GF-UCT 240; Olympus Corp., Center Valley, Pennsylvania, USA) confirmed a tail mass (► Fig. 1). After retracting the stylet of the fine-needle aspiration (FNA) needle (Expect 19-gauge Flex needle; Boston Scientific Corp., Natick, Massachusetts, USA) by 2 cm, one gold fiducial (3×0.8 mm; Best Medical International, Springfield, Virginia, USA) was back-loaded into the lumen of the needle and sealed with bone wax. At EUS, the fiducials were deployed within the tumor by advancing the stylet forward (► Fig. 2). Overall, two fiducials were deployed (► Fig. 3), and a preoperative computed tomography (CT) scan confirmed their position. At laparoscopy, the fiducials were identified using cross-table fluoroscopy (► Fig. 4), and distal pancreatectomy with splenectomy was performed. A frozen section confirmed negative tumor margins, and the explant specimen revealed the tumor with fiducials in place (► Fig. 5). Final pathological analysis revealed T1 N0 grade II pancreatic neuroendocrine neoplasm (► Fig. 6).

Preoperative injection of India ink [1] or indocyanine green [2] under EUS guidance was developed to facilitate quick tumor localization and to decrease operative time and blood transfusion requirements [3]. However, the disadvantages of dyes include peritonitis, infection, allergic reactions, and reabsorption within tissue planes [4]. In this report, we have de-

Fig. 1 Linear-array endoscopic ultrasound (EUS) image of the iso-echoic mass lesion in the tail of pancreas, superior to the left kidney.

Fig. 2 Fluoroscopic image showing the linear-array echoendoscope with the 19-gauge fine-needle aspiration (FNA) needle and the first fiducial.

Fig. 3 Endoscopic ultrasound (EUS) image showing the markers within the lesion casting an acoustic shadow (arrow).

Fig. 4 Intraoperative fluoroscopic image with the stapler gun in place. The two fiducial markers can be easily visualized.

scribed the use of fiducials as an alternative technique for this indication. The fiducials are inexpensive (\$80 for five fiducials), easy to deploy, can be identified readily using fluoroscopy or intraoperative ultrasound, and (unlike dyes) do not extravasate into surrounding tissue.

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Fig. 5 Postoperative specimen of the pancreas, showing the fiducial marker within the lesion.

Fig. 6 Postoperative histological specimen showing uniform sheets of polyhedral cells with hyperchromatic nuclei and abundant eosinophilic cytoplasm, consistent with a neuroendocrine neoplasm (hematoxylin and eosin stain, ×40).

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