Preoperative evaluation of ampullary neoplasm with EUS and transpapillary intraductal US: a prospective and histopathologically controlled study

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Background: Endoscopic papillectomy is performed in selected patients with ampullary neoplasm, and, thus, accurate preoperative tumor staging is indispensable for its application.

Design: Prospective and histopathologically controlled study.

Setting: Single center.

Patients and Interventions: EUS and transpapillary intraductal US (IDUS) were performed in 40 patients with ampullary neoplasm before surgery (n = 30) or endoscopic papillectomy (n = 10). Ductal infiltration by a tumor into the bile duct (BD) or the pancreatic duct (PD) was also evaluated. The indication for endoscopic papillectomy was determined by findings obtained by EUS and IDUS. These findings were compared with histologic features of the resected specimens.

Main Outcome Measurements and Results: Thirty-three patients had adenocarcinoma (14 pT1, 11 pT2, 8 pT3-4) and 7 had adenoma. Tumor depiction by EUS and IDUS was achieved in 95% and 100% of the patients, respectively. The diagnostic accuracy of EUS and IDUS in T staging was 62% and 86% in adenoma and pT1, 45% and 64% in pT2, and 88% and 75% in pT3-4, respectively. The overall accuracy by EUS and IDUS in T staging was 63% and 78%, respectively ($P = .14$). In 10 patients who underwent endoscopic papillectomy, the accuracy of IDUS in T staging with EUS and IDUS was 80% and 100%, respectively. Ductal infiltration into the BD and the PD was correctly assessed in 88% and 90% by EUS and in both BD and the PD in 90% by IDUS, respectively. Ductal infiltration was correctly diagnosed by EUS and IDUS in all patients who had a papillectomy.

Conclusion: Although IDUS had a tendency of overestimation in tumor staging for ampullary neoplasm, it can provide useful information for making therapeutic decisions, especially in cases appropriate for endoscopic papillectomy. (Gastrointest Endosc 2007;66:740-7.)

A Whipple resection has been considered to be the standard treatment for ampullary cancer. Since the early 1980s, use of endoscopic papillectomy for ampullary adenoma has been reported[1-3]; some reports suggest this technique as an alternative to surgery in the treatment of selected patients with ampullary cancer.[4-6] Although surgical transduodenal ampullectomy is regarded as a less-invasive treatment compared with a Whipple's resection, it has a high morbidity and high frequency of cancer-cell remnant at the resected margin.[7] Endoscopic papillectomy may possibly be the treatment of choice for selected cases of ampullary cancer. Accurate preoperative staging for ampullary neoplasm is mandatory for making therapeutic decisions. Although the utility of EUS and transpapillary intraductal US (IDUS) for such tumors has been reported,[8-16] the clinical significance of these procedures on making therapeutic decisions has not been well clarified. Furthermore, there have been few studies of IDUS.[11,14] We also evaluated the utility of EUS and IDUS in determining the resectability and methods of ampullary neoplasm.

Abbreviations: BD, bile duct; H&E, hematoxylin and eosin stain; IDUS, intraductal US; PD, pancreatic duct; Tis, in situ tumor.

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PATIENTS AND METHODS

Study population

Between January 1998 and October 2006, patients with ampullary neoplasm who underwent EUS and IDUS were

invited to participate in this study. Written informed consent was obtained from all patients. This study was approved by the institutional review board of Sendai City Medical Center. Patients not considered as surgical candidates, ie, those with distant metastasis or advanced age, as well as those who refused consent, were excluded from the study. The indication for endoscopic papillectomy was determined based on the following findings: (1) no infiltration of tumor into the bile duct (BD) or the pancreatic duct (PD); (2) adenoma or cancer invasion confined to the mucosa. Tumor staging and ductal infiltration estimated by EUS and IDUS were recorded before a therapeutic decision was made. The resected specimens were fixed by formalin and sliced into 4- to 6-mm-thick sections. Those specimens obtained by endoscopic papillectomy were handled meticulously to achieve detailed examination, ie, soft thin tubes were inserted into the BD and the PD to facilitate recognition of those structures before fixation by formalin. All resected specimens were stained with hematoxylin and eosin stain (H&E) for histologic evaluation. Preoperative staging by EUS and IDUS were compared with histologic features of the resected specimens.

EUS and IDUS examinations

EUS was performed before IDUS and biliary drainage. Transpapillary IDUS was performed 1 to 14 days after EUS. The endoscopists were not blinded to the results of previously performed imaging techniques. All patients underwent surgical or endoscopic treatment within 4 weeks of the diagnostic procedures. EUS was performed with mechanical radial echoendoscopes, with a frequency of 7.5 MHz (UM 2000, GF-UMP 230, GF-UMP 240; Olympus Optical Co, Ltd, Tokyo, Japan), or with an electronic radial echoendoscope, with frequencies of 7, 8, and 10 MHz (GF-UE260-AL5; Olympus). After an echoendoscope was inserted into the second portion of the duodenum, the balloon at the tip of the scope was filled with deaerated water, some of which was instilled into the duodenum through the channel of the scope. Scanning was performed with slow withdrawal of the scope. Great care was given so as not to press the ampullary lesion with the scope. EUS-guided FNA cytology was not performed.

IDUS was carried out with an IDUS probe, with a frequency of 20 MHz (UM-G20-29R; Olympus), inserted into the BD via the channel of a side-viewing duodenoscope (JF200, 230, 240; Olympus) after cholangiopancreatography. The IDUS probe was inserted with guidance of a 0.025-inch or 0.035-inch Jagwire (Microvasive Endoscopy, Boston Scientific Corp, Natick, Mass). After the second portion of the duodenum was filled with deaerated water, scanning was performed by withdrawing the probe slowly toward the duodenum. Scanning from the PD was not performed. A biliary stent was placed in the BD when necessary after biopsy specimens were taken. All procedures were performed by operators with experience in more than 1000 ERCP/EUS cases or under the supervision of such experts.

Capsule Summary

What is already known on this topic

- Endoscopic papillectomy may be the treatment of choice for selected cases of ampullary cancer, so, accurate preoperative staging is necessary for therapeutic decisions.

What this study adds to our knowledge

- In 40 patients with ampullary neoplasms, tumor depiction by EUS and intraductal US was achieved in 95% and 100% of the patients, with an overall accuracy in T staging of 63% and 78%, respectively.

A hypoechoic mass at the ampulla of Vater depicted by EUS or IDUS was regarded as being the image of the ampullary tumor. A differential diagnosis between benign and malignant tumors was not considered. The image of the sphincter of Oddi was defined as a thin hypoechoic layer surrounding the pancreatobiliary duct. The tumor detection rates by EUS and IDUS were investigated. Based on the correlation between the tumor echo and the muscularis propria layer of the duodenum or the pancreatic parenchyma, the tumor stage by EUS or IDUS was classified as follows according to the TNM classification[17]: T1, tumor echo limited to the main duodenal papilla; T2, tumor echo invades the duodenal muscularis propria layer; T3-4, tumor echo invades the pancreatic parenchyma (Figs. 1 and 2). In situ tumor (Tis) was included in pT1. Ductal infiltration of the tumor into the BD or the PD was also evaluated with EUS and IDUS. Ductal infiltration of tumor was defined as a hypoechoic mass or localized wall thickening in the BD or the PD continuous to the tumor echo in the ampullary region. EUS/IDUS staging was based only on EUS/IDUS findings.

Statistical analysis

The Fisher exact probability test was used for statistical analysis. A P value less than .05 was regarded as significant. Statistical analysis was performed with StatMate III (ATMS Co Ltd, Tokyo, Japan).

RESULTS

A total of 40 patients with ampullary neoplasms were included in this study. Twenty patients were men, and 20 were women. The mean age of the patients was 65 years (range 43-82 years). The presenting symptoms included abdominal pain (17 patients), fever (3), jaundice (4), pruritus (2), heartburn (2), loss of appetite (1), general fatigue (1), and others (2). In the remaining 8 patients, the tumor was revealed by duodenoscopy during a health checkup. One patient had a history of familial adenomatous polyposis. EUS and IDUS were performed with no procedure-related complications in all patients.