Journal of the American Society of Cytopathology (2014) 3, 227–235

Available online at www.sciencedirect.com

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journal homepage: www.jascyto.org/

ORIGINAL ARTICLE

Endoscopic ultrasound-guided fine-needle aspiration of the pancreas: a retrospective study of 1000 cases

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Received 17 December 2013; received in revised form 14 April 2014; accepted 15 April 2014

KEYWORDS
Pancreas;
Endoscopic ultrasound;
Fine-needle aspiration;
Solid neoplasms;
Cystic neoplasms

Introduction Endoscopic ultrasound (EUS)-guided fine-needle aspiration (FNA) has emerged as a superior method for the diagnosis of pancreatic tumors. Very few large studies have been published. We retrospectively examined 1000 cases to determine the sensitivity and specificity of EUS-guided FNA for solid and cystic lesions.

Materials and methods EUS-guided FNA was performed in 1000 patients. Air-dried aspirates were reviewed immediately to ensure adequacy, and ethanol-fixed aspirates were reviewed the following day. The rendered diagnoses were placed into various categories and compared to subsequent histologic and clinical follow-up data.

Results Of the 1000 cases, 579 were solid lesions. The FNA diagnoses of the solid lesions were benign (B) 229 (39.5%), atypia (A) 22 (3.8%), suspicious (S) 27 (4.7%), malignant (M) 260 (44.9%), tumor (T) 1 (0.2%), and nondiagnostic (ND) 40 (6.9%). The sensitivity, specificity, positive predictive value, and negative predictive value for solid lesions were 97%, 97%, 99%, and 94%, respectively. There were 421 cystic lesions. The FNAs of the cystic lesions were classified as follows: B 342 (81.2%), A 5 (1.2%), S 4 (1%), M 7 (1.7%), T 46 (10.9%), and ND 17 (4.0%). The sensitivity, specificity, positive predictive value, and negative predictive value to identify mucinous tumors and malignancy for cystic lesions were 46%, 98%, 94%, and 87%, respectively.

Conclusions At our institution, EUS-guided FNA of solid pancreatic lesions is both sensitive and specific for the diagnosis of both primary and metastatic tumors. For cystic lesions, FNA is not as sensitive, but its specificity remains high.

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2213-2945/$36
http://dx.doi.org/10.1016/j.jasc.2014.04.005

Introduction

Pancreatic cancer is the fourth leading cause of cancer-related death in the United States among both men and women.[1] Within the past decade, fine-needle aspiration (FNA) has emerged as an important diagnostic tool for the evaluation of patients with suspicious pancreatic lesions. Surgical resection remains the only treatment that provides patients with pancreatic carcinoma any possibility of cure. The 5-year survival rate for patients with pancreatic carcinoma undergoing surgical resection is 19% compared to 0% for patients who are not operative candidates.[2] FNA also plays an important role in the diagnosis of patients with cystic lesions of the pancreas because some cystic lesions also harbor carcinomas that cannot be detected by any other means. The risk of carcinoma in main duct intraductal papillary mucinous neoplasm (IPMN) approaches 70%.[3] Mucinous cystic neoplasms (MCN) also have a significant malignant potential with up to 38% harboring either in situ or invasive carcinoma.[4,5]

Endoscopic ultrasound (EUS)-guided FNA has emerged as a superior method for the diagnosis of pancreatic tumors. While many small studies have appeared in the cytology literature, there have been surprisingly very few large studies that have been published that evaluate the performance of this diagnostic technique. In this retrospective study, we examined 1000 consecutive EUS-guided FNAs of the pancreas performed at our institution to determine the sensitivity and specificity of this diagnostic modality for the evaluation of patients presenting with both solid and cystic pancreatic lesions.

Materials and methods

This study was approved by the Institutional Review Board of Indiana University (#1307011938). A computerized search of our pathology laboratory information system was performed to identify all EUS-guided FNAs of the pancreas at our institution for the 7-year period extending from 2004 through 2011. Demographic information, the type of lesion (solid versus cystic), and the cytologic diagnosis were extracted from the FNA reports.

Standard EUS was performed for evaluation of the pancreatic lesions. Once a lesion was identified, an FNA biopsy was performed under EUS guidance. The needle aspirate was placed on glass slides and both air-dried and ethanol-fixed smears were prepared. The air-dried smears were stained with a modified Wright−Giemsa stain (Protoco Hema 3 stain, Fisher Scientific, Kalamazoo, Mich) and immediately reviewed by a cytopathologist, cytopathology fellow, or cytotechnologist to ensure the adequacy of the specimen and to determine whether additional passes were necessary for ancillary studies. Ethanol-fixed direct smears were stained with the Papanicolaou stain and reviewed the next working day. Any residual aspirate material was collected in preservative and used to prepare a cell block. Sections prepared from the cell block were stained with hematoxylin and eosin. When indicated, the cell block material was used for ancillary immunocytochemical studies.

Lesions were characterized as solid or cystic based on their EUS characteristics. Lesions containing any cystic component were placed into the cystic category. Based on available EUS reports, cystic lesions were further characterized as unilocular (cysts without septations), microcystic (collections of small cysts), macrocystic (collections of larger cysts), or cysts with solid components. Any cyst having a solid component was placed into the solid category regardless of the size of the solid component or architecture other than the solid component. Further, the distinction of microcystic versus macrocystic was based solely on EUS impression given in the report.

Each cytologic diagnosis was placed into 1 of 6 categories: benign (B), atypical (A), suspicious (S), malignant (M), tumor (T), and nondiagnostic (ND). Aspirates in which cellularity was low or the material was not representative of the lesion were considered ND. For the purpose of statistical calculations only, all nondiagnostic cases were excluded from consideration; benign cases were considered negative; and atypical, suspicious, malignant, and tumor diagnoses were aggregated together as being positive.

For follow-up, a complementary search for all related surgical pathology reports was also performed, and these histologic diagnoses were stratified in the same manner. Additionally, clinical follow-up was assessed by review of the patients' electronic medical records for a minimum of 6 months following FNA biopsy. Proof of malignancy for those cases in which surgery was not performed was based on evidence of clinical and/or radiologic progression of disease or death. The outcome was considered benign if there was stability or resolution of the lesion or if the patient experienced long-term survival.

Results

A total of 1000 consecutive EUS-guided FNAs of the pancreas were identified. Of the 1000 cases, 579 were solid lesions obtained from 301 female and 278 male patients with an age range of 19 to 95 years (mean: 63). The FNA diagnoses of the solid lesions were as follows: B 229 (39.5%), A 22 (3.8%), S 27 (4.7%), M 260 (44.9%), T 1 (0.2%), and ND 40 (6.9%). The malignant FNA diagnoses included 219 adenocarcinomas; 21 metastases; 10 pancreatic neuroendocrine tumors (PanNET); 6 solid pseudopapillary tumors; 2 lymphomas; and 1 case each of malignant giant cell tumor, anaplastic carcinoma, and squamous cell carcinoma. One case of perivascular epithelioid cell tumor, which was also diagnosed by preoperative FNA, was confirmed on subsequent histopathologic evaluation of the pancreatic resection. Of the 579 FNAs of solid pancreatic