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Endoscopic Ultrasound-Fine-Needle Aspiration Overview

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Endoscopic ultrasound (EUS) was originally attempted in the 1980s with the attachment of high-frequency ultrasound probes to endoscopes. This development improved visualization of the gastrointestinal wall and adjacent organs, allowing the capture of high-resolution images of target lesions. Most lesions in close proximity to the gut lumen can be sampled with fine-needle aspiration (FNA) for diagnosis using this modality, with the pancreas and lymph nodes (both intrathoracic and intraabdominal) as the most common organs targeted.[1, 2] EUS-FNA provides the ability to obtain cytologic material through direct visualization, promising immediate and accurate diagnosis for a variety of lesions, including benign, malignant, and metastatic. The effective use of EUS-FNA requires direct collaboration between the endoscopist and pathologist, not only to minimize the number of nondiagnostic samples, but also to determine the usefulness of obtaining more tissue for additional ancillary studies.

EUS-FNA of solid pancreatic masses has a sensitivity ranging from 85% to 90% and a specificity of almost 100% for malignancy.[3] The sensitivity of pancreatic EUS-FNA diminishes as the size of the solid lesion increases to over 4 cm, possibly due to tumor necrosis as the lesion gets bigger.[4] In order to overcome this limitation, it has been suggested to aspirate mass lesions in multiple locations at their periphery. And although EUS features alone are unable to differentiate between benign and malignant pancreatic cysts, the addition of FNA greatly increases the accuracy of diagnosing cystic lesions.

EUS-FNA of mediastinal and intraabdominal lesions and lymphadenopathy has been utilized in staging primary lung and esophageal malignancies; the diagnosis of benign lesions, such as sarcoidosis, and the detection and identification of primary mediastinal lesions, such as paraesophageal bronchogenic cysts. In addition to identification of mediastinal nodal metastases, EUS-FNA has also been used to evaluate deep-seated lymhpadenopathy in the diagnosis of lymphoma. Significantly, EUS-FNA has the advantage of being able to reach the paraesophageal lymph nodes, the aortapulmonary window, and the posterior mediastinal lymph nodes, areas that are difficult to reach by other modalities.

The overall complication rate of EUS-FNA appears to be 1% to 2%.[3] The major complications reported with EUS-FNA include bleeding, pancreatitis, duodenal perforation, and infection after incomplete aspiration of pancreatic cysts.

When indicated, the mechanical advantages of EUS-FNA can be supplemented by obtaining samples for additional tissue-based studies. These aspirate samples often will require special processing in addition to alcohol-fixation and air-drying methods used for conventional cytologic evaluation. For example, paraffin-embedded cellblocks can be made from blood clots obtained from slide

scraping or rinse solution. This potential tissue containing blood coagulum is fixed in 10% buffered formalin and can undergo routine histology processing, similar to conventional surgical pathology tissue obtained from core biopsy. Cell blocks can then be microsectioned and submitted for routine hematoxylin and eosin (H&E), special stains or immunohistochemical stains.[6] To evaluate lymphoid populations, place aspirate samples in RPMI media for preservation prior to flow cytometric evaluation. For aspirate samples that indicate a reactive or inflammatory process, prepare bacterial cultures. As advanced molecular analyses become routine, the EUS-FNA team will need to pay special attention as to which media are necessary to use to maintain the integrity of the molecular components of the sample.

In summary, not only are the cytologic samples obtained by EUS-FNA highly accurate for diagnostic purposes, but they also provide material for additional laboratory tests, including molecular analyses, which potentially eliminates the need for further invasive procedures. It is important to note that the assessment of a preliminary diagnosis obtained by EUS-FNA is not complete until judged in concert with impressions determined from permanent material. Future developments in EUS-FNA include tissue-guided localized brachytherapy/chemotherapy, alcohol ablation of unresectable pancreatic malignancies, and EUS-FNA-guided endoscopic surgery.

References

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