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Review

Endoscopic ultrasound-guided tissue sampling: How can we improve the results?

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ABSTRACT

Endoscopic ultrasound (EUS) enables a gastroenterologist to sample the masses of the middle and inferior mediastinum, which are adjacent to the esophagus; cystic or solid lesions of the pancreas, which are adjacent to the stomach and duodenum; and perirectal lesions. Needles used for EUS sampling include aspiration (19, 20, and 22 Gauge) or core biopsy needles (ProCore and Trucut) (19, 20, and 22 Gauge). The type and size of EUS needles do not alter the diagnostic results. Rapid on-site cytopathological evaluation will increase the diagnostic efficacy to 100% without prolonging the procedure time. Diagnostic efficacy of EUS-guided fine-needle aspiration or core biopsy depends on the experience of an endoscopist and a cytopathologist. In the presence of an experienced endoscopist and cytopathologist, the size of the needle does not have any significant impact on the diagnostic success.

Keywords: Endoscopic ultrasound, fine-needle aspiration, cytopathology, EUS biopsy neddles

INTRODUCTION

With endoscopic ultrasound (EUS) guidance, it is possible to obtain tissue or fluid samples from all lesions at a distance of not more than 5–6 cm, which is the distance the echoendoscope can reach. EUS enables a gastroenterologist to sample the masses of the middle and inferior mediastinum, which are adjacent to the esophagus; cystic or solid lesions of the pancreas, which are adjacent to the stomach and duodenum; perirectal lesions; subepithelial lesions of the upper gastrointestinal tract; upper abdominal masses; and lesions located in the left kidney, left adrenal gland, and left lobe of the liver by fine-needle aspiration (FNA) or core biopsy.

Needles used for EUS sampling include aspiration (19, 20, and 22 Gauge) or core biopsy needles (ProCore and Trucut) (Boston Scientific; Natick, MA, USA and Echotip II; Cook Endoscopy, Winston-Salem, NC, USA) (19, 20, and 22 Gauge). The tissue samples obtained by EUS-FNA or ProCore needle can be handled in two different ways. Either the aspirated cells are smeared on a slide for cytopathological analysis or a cell block is prepared by fixing the tissue in formalin for histopathological examination. The quantity and quality of the obtained samples determine the preference of the method. Both methods are complementary and improve the diagnostic value of EUS-FNA, and if possible, should be applied by every EUS-FNA of solid tumors (1,2). Cell block histological sections enable the study of tissue architecture, special stains, immunohistochemistry, or molecular analyses. The samples obtained by Trucut needles are only used for histopathological evaluation. The choice of the needle depends on the type of lesion (solid–cystic), location of lesion (mediastinum, pancreatic, subepithelial, etc.), and preliminary diagnosis (lymphoma, neuroendocrine tumor, metastasis, etc.).

Which EUS needle is more effective?

In a meta-analysis of 17 studies assessing the diagnostic efficacy of EUS needle sampling for upper gastrointestinal subepithelial lesions, it was observed that the choice of FNA, Trucut biopsy, or 19 G/22 G/25 G did not change the overall diagnostic rate (3). In the study of Na et al. (4), 19 G Trucut core biopsy needle was found to be more effective in the diagnosis of

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gastric subepithelial tumors. In another study comparing the diagnostic efficacy of 22 G FNA and 22 G Trucut biopsy in subepithelial tumors of the gastrointestinal tract, it was indicated that 22 G Trucut biopsy had a higher diagnostic efficacy rate (5). Nagula et al. (6) and De La Mora-Levy et al. (7) demonstrated that the efficacy of ProCore and FNA needles were similar in the diagnosis of solid masses. While Strand et al. (8) found FNA to be superior to the ProCore needle in the diagnosis of pancreatic masses, Choi et al. (9) reported the opposite. In the retrospective study of Ramay et al. (10), the diagnostic yields of both needles for EUS-guided sampling of abnormal lymph nodes were found to be similar. O'Connor et al. (11) reported that the diagnostic yield of gastrointestinal EUS-FNA was 98% in their series. On the basis of the abovementioned studies, it can be concluded that the type and size of EUS needles do not alter the diagnostic yield.

Another question that comes to mind is "What size of needle provides higher diagnostic efficacy?" The working channels of recent endosonographic echoscopes permit the insertion of 19 G needles. Many companies have 19, 22, and 25 G aspiration; 19, 20, and 22 G ProCore biopsy; and 19G Trucut biopsy needles. Although it may be considered that a larger-sized needle provides higher diagnostic yield, it is observed that the size of the needle does not affect the diagnostic yield in many studies. Vilmann et al. (12) did not determine any difference in the diagnostic accuracy of 22 G vs. 25 G needles in the diagnosis of intra-abdominal solid masses. Likewise, in the study of Camellini et al. (13), no significant difference was determined between the efficacy of 22 G and 25 G needles. The diagnostic yield of EUS-guided FNA using 19 G and 22 G aspiration needles in patients with mediastinal lesions of unknown origin was demonstrated to be similar (14). According to the abovementioned studies, the size of the needle that is independent of the location and type of lesion is not a determining factor in the diagnostic yield. However, using a 25 G needle, particularly for sampling pancreatic head and uncinate process from the duodenum, provides user convenience and device safety. In particular, FNA of the lymph nodes using a 19 G needle will increase the blood that obscures cellular detail.

Do aspiration techniques affect sampling success?

"Which needle aspiration technique (slow pull technique–standard vacuum aspiration) will provide more material?" is another important question. In the standard vacuum aspiration technique after inserting the needle into the tissue, the needle stylet is withdrawn and a 10- or 20-mL vacuum syringe is attached to the proximal part of the needle and suction is applied. In a slow pull technique, the stylet is slowly removed during the to and fro movement of the needle and sampling is conducted through capillary action (non-aspiration). Three studies indicated that the slow pull technique increases the diagnostic yield without blood contamination (15-17). Furthermore, in the technique, pulling back the stylet for 10 cm after each pass of the needle is an important point. In the vacuum aspiration technique, suction should be discontinued before removing the needle from the tissue.

Rapid on-site cytopathological evaluation increases diagnostic efficacy

Is on-site cytopathological evaluation important during EUS-guided aspiration? What should we pay attention to in the absence of on-site cytopathological evaluation? Rapid on-site cytopathological evaluation will increase the diagnostic efficacy to 100% without prolonging the procedure time (18). To evaluate the adequacy, a cytopathologist examines the rapidly stained air-dried smears for the quantity of lesional cells and quality of cell preservation. Diff-Quik stain is commonly used for this purpose. Hypocellular smears, those with poor cellular preservation or obscuring blood and clotting artifact are considered "not adequate." The needle rinse is triaged for ancillary testing and cell block preparation. If the material obtained on the first pass is not adequate, a second pass is performed. In the absence of an on-site cytopathological evaluation, performing 4–6 passes will increase the diagnostic efficacy (19). However, using a second needle will increase the cost (16). Extended anesthesia times impart a greater risk for complications. In the absence of a cytopathologist, it is important to know that even and thin smears should be prepared. Care must be exercised not to use too much pressure in preparing smears so that the cells are not crushed. Some of the slides should be air-dried, and some of them should be immediately fixed in 95% ethanol. The material for cell block or the tissue obtained by Trucut should be placed in formalin.

Samples should be obtained from multiple sites of the lesion rather than repeatedly from a single spot by the endosonographer. Sampling necrotic areas of the lesion will decrease diagnostic adequacy, whereas sampling both central and peripheral areas of the lesion significantly enhances it.

CONCLUSION

In conclusion, it must be kept in mind that the most important factor that determines the diagnostic efficacy of EUS-FNA or core biopsy is the experience of the endoscopist and cytopathologist. In the presence of an experienced endoscopist and cytopathologist, the size of the needle does not have any significant impact on the diagnostic success. The choice of the needle size should be based on the type of lesion, location of lesion, and preliminary diagnosis. If possible, sampling should be conducted in the presence of on-site cytopathological evaluation. If on-site cytopathology is not available, 4–6 passes should be performed. The samples should be properly prepared and immediately sent to the cytopathology laboratory.

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