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How to Maximize the Diagnostic Yield of Endoscopic Ultrasound-Guided Fine Needle Aspiration Biopsy

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The first endoscopic ultrasound-guided fine needle aspiration biopsy (EUS-FNA) was performed in 1991 for the diagnosis of mucinous cystadenoma of the pancreas.[1] Since then, endoscopic ultrasound imaging has advanced with regard to the diagnosis of pancreatic lesions, as well as other organs, providing the possibility of collecting materials for cytologic and/or anatomopathologic analysis with low risk of adverse events,[2,3] with an estimated sensitivity of 85%–93%.[4] However, the diagnostic yield of EUS-FNA continues to be a challenge and is influenced by variables such as lesion characteristics, endosonographer experience, needle properties, ability to puncture the lesion, technique and number of punctures, immediate cytologic evaluation, sample preparation, and pathologist interpretation.[5]

The current article outlines the indications and technical aspects of performing echo-guided fine needle aspirations, highlighting details that can be used to optimize EUS-FNA performance.

How to Master the Technical Aspects of Echo-Puncture

The best position for EUS-FNA is achieved when the path from the needle to the lesion does not require the aid of the elevator, decreasing the puncture angle. Tumors adjacent to the gastrointestinal tract, such as mediastinal masses or lymph nodes, are easier to assess, because minimal adjustment of the scope is needed to reach the ideal puncture position and the device is straightened. Transgastric punctures may be more difficult than transesophageal EUS-FNA, owing to the greater force required to push the needle through the thick stomach wall, causing scope displacement.

Samples can be taken from 1 or several areas of the lesion. To obtain samples from the 1 area, the needle is always inserted through the same path. To collect samples from different areas of a lesion, 2 techniques can be used. The so-called fanning technique (Figure 1), in which, after the insertion of the needle into the lesion, to-and-fro movements are performed in different routes without removing the needle[5]; and the "multipass technique," which is similar to the previous technique, but the needle is withdrawn from the lesion before puncturing again through a new path.[6] Regardless the technique selected, there is an important technical detail when puncturing a large mass: both the lesion center should be avoided, because some tumors and lymph nodes may have a necrotic center (limiting the diagnosis), as well as the lesion periphery (owing to the intense fibrosis, reactive desmoplasia and peritumoral inflammatory process).[6]

In each puncture, the needle should move in oscillatory and periodic back-and-forth fashion within the lesion called a "to-and-fro" motion. These movements simulate a "knock on a door," with a quick entry and a slow exit from the lesion. This can be justified because the material is inserted into the needle exactly at the time of the entry of a "to" movement. The number of to-and-fro movements performed in each puncture varies from 5 to 20, according to the preference and experience of the endosonographer. Additional oscillations do not increase the diagnostic yield because they may lead to needle occlusion and may increase the chance of complications and infiltration of red blood cells in the sample.[7]

The recommendation for the number of punctures performed on solid pancreatic masses is variable. The European Society of Gastrointestinal Endoscopy recommends 5 punctures for solid lesions, especially when an immediate pathologist evaluation is not available during the procedure called rapid on-site evaluation (ROSE).[8]

Negative pressure or needle aspiration has the purpose of keeping the tissue close to the cutting tip of the needle during oscillatory movements, causing greater detachment and retention of cells inside the needle channel. Negative pressure can be produced by the vacuum of 5-, 10-, or 20-mL syringes connected to the needle after it is introduced into the lesion. However, this suctioning maneuver may cause unwanted blood aspiration, which prevents

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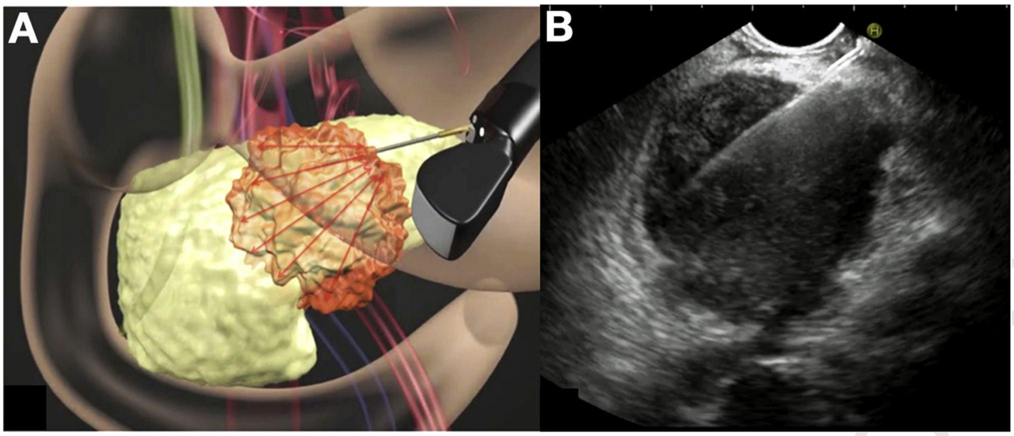

Figure 1. *A*, Oscillations of the puncture needle inside the lesion ("fanning technique"). *B*, Solid heterogeneous pancreatic lesion and ultrasound-guided fine needle aspiration biopsy.

collection owing to needle obstruction by clots and red blood cells infiltration within the sample, and thus decreasing the diagnostic yield. To avoid this, 2 techniques may be used: (1) capillarity, in which after entering the lesion, the stylet is progressively pulled during each oscillatory movement, and (2) performing the technique without the suction maneuver, where the procedure is performed without stylet or vacuum. Regarding capillarity, a randomized clinical trial showed that reinsertion of the stylet in each puncture did not improve significantly the diagnostic results for EUS-FNA in malignancies, resulting only in an unnecessary increase in procedure time.[9]

Regarding the EUS-FNA diagnostic yield, there are 2 scenarios: if ROSE is available during the procedure, the number of needle punctures is determined by the pathologist after evaluation of the obtained material. In the absence of an on-site pathologist, the better decision is to perform 4–5 punctures, with cytologic analysis by smearing and embedding.

How to Select the Needle

Currently, there are 3 EUS-FNA needles available: 19, 22, and 25 guage.[10] The 19-G needle is less used than 22- or 25-G needles for the duodenum owing to its low flexibility and the technical difficulty experienced while handling the device during the introduction; in contrast, the 25-G needle is more flexible, which makes it easier to handle the scope; however, it has a lesser capacity for material retention. Most of the studies reporting good results were related to the use of the 22-G needle[11]; however, there is no scientific evidence to date to support its superiority over the 25-G needle.[12]

The use a specific needle gauge involves possible risks and benefits. Needles with 19 gauge, the larger available, have the potential to obtain more sample quality, thus, allowing the opportunity for supplementary tests, including histopathologic examination. However, they are more difficult to use when the echoendoscope needs to be flexed, for example, in tumors affecting the uncinate process of the pancreas. The larger the needle, the greater the risk of postpuncture bleeding infiltrating the sample, compromising the quality of the procedure and reducing the diagnostic yield.[13]

Smaller needle calibers are technically easier to handle, especially in anatomic areas where the position of the echoendoscope is not straight, such as in the duodenum (where the head of the pancreas is assessed). It is suggested that the 25-G needle, thanks to its flexibility, may present some benefit when compared to larger needles for EUS-FNA in sites of difficult access such as: pancreatic head, uncinate process, and distal segment of the bile duct.[14]

In an attempt to standardize EUS-FNAs, Bang et al[15] proposed an algorithm for needle selection. We suggest a standardization based on the intended procedure (Figure 2). New research and devices are being developed aiming a

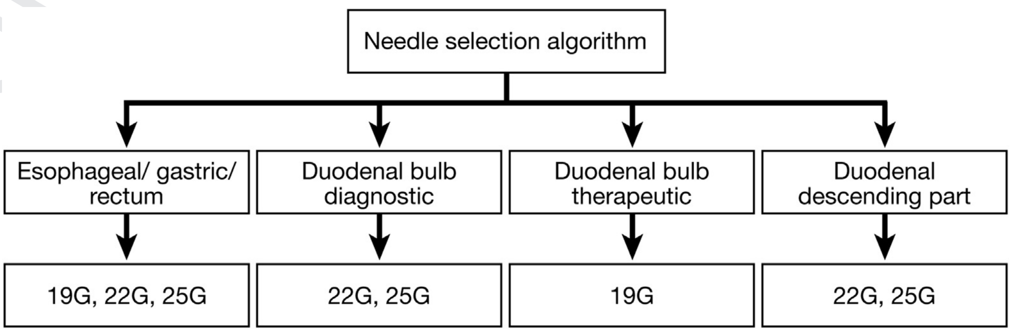

Figure 2. Algorithm proposed for needle selection.