



Adequacy of Fine Needle Aspiration Biopsies by Rapid On-Site Evaluation: An update

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Abstract

Fine needle aspiration biopsy (TAB) of thyroid nodules is a highly informative method for diagnosing thyroid neoplasms. TAB makes it possible to establish whether the thyroid nodule is benign or malignant. Currently, the biopsy is considered the most accurate preoperative method to determine the nodule's nature. In the manipulation process, the doctor, using a thin needle, aspirates cellular material from the thyroid gland's nodule based on the contents, diagnoses, and determines the tactics of treatment (conservative therapy or surgery). The procedure is unpleasant but practically painless. It feels like an intramuscular injection. Therefore, it is performed without anesthesia.

Adequacy of Fine Needle Aspiration Biopsies by Rapid On-Site Evaluation: An update

Aspiration biopsy is the method of research which is not highly traumatic. It involves performing a transdermal puncture. A hollow needle with a given diameter is inserted directly into the pathological focus and then removed. Almost all tissue sections through which it passed (layer) remain in the cavity. Despite its simplicity, the aspiration biopsy technique requires some skill from the person performing it. The method includes two diagnostic procedures: a histological and cytological examination. The first process has the following steps: performing a section from the damaged organ, staining it, and microscopy. During the cytological examination, a smear from the biopsy specimen's surface is taken, and the solid material is sent for microscopy. In 90% of cases, the procedure allows obtaining cytological material and resolving the presence of a tumor process. The advantages of the aspiration method include the absence of incisions on the skin, the procedure's painlessness, the possibility of performing on an outpatient basis, and the speed of implementation. It can be performed using special instruments or an ordinary thin needle used for injection in general practice. The main disadvantage is the small amount of material obtained for further research (immunohistochemical analysis).

The TAB technique is quite simple and fast. As a rule, it does not require anesthesia; for aggressive animals, sedation with a rapid elimination phase can be used. The puncture area is

shaved off and twice treated with 70-degree alcohol or iodine. The procedure is carried out with a thin needle put on a disposable syringe (the needle's size depends on the type and size of the animal) or with a spinal injection needle. An ultrasound probe is attached to the site to display the screen's biopsy site. It is not recommended to use the gel. After imaging, a puncture is done through the skin, and the contents are aspirated. Most often, 2-3 punctures occur in different areas of the formation to obtain enough biopsy. Then the contents are applied to glass slides and stained with universal dyes. A physician cytologist assesses the TAB. The reliability score of an experienced cytologist is 70-80 percent. If the obtained material contains an insufficient number of cells for making a diagnosis, then the biopsy is considered uninformative (the percentage of occurrence is 2-3 percent). In this case, it is recommended to perform a second fine-needle aspiration biopsy after 7-14 days.

Complications such as the formation of hematomas and bleeding are infrequent. In the puncture of different types of animals, the age category does not matter. The differences are only in the diameter of the needle used. Fine needle aspiration biopsy can be performed without using an ultrasound machine. When carrying out diagnostic laparoscopy using an endoscope, manipulations can be performed if there is a TAB indication³. This manipulation will not be the main goal, but an accompanying one, along with diagnostic laparoscopy. With an endoscope, the surgeon finds the puncture site and the point where the needle passes through the abdominal wall. The entry point of the needle is determined by tapping the skin and the abdominal wall with a finger. The center of the formed funnel will be the needle's point of entry. After the puncture of the animal tissue, fluid is aspirated⁵. The contents are then transferred to a glass slide. In this situation, it is easy to visualize and prevent possible bleeding. TAB for diagnostic laparoscopy is preferable to a conventional biopsy when it is necessary to obtain a quick result, as well as a biopsy sample of neoplasms (especially if malignant neoplasia is suspected).

Review on Fine Needle Aspiration Biopsies

Pathological and histological studies are used to diagnose malignant, inflammatory, and infectious processes. The articles selected for this study indicate that, as a rule, a biopsy during an endoscopic examination is performed when any areas suspicious of pathological changes are detected. Even with a typical endoscopic picture, the histological examination can provide useful information. Sometimes biopsy is carried out to assess the results of previous endoscopic or drug treatments. If the endoscopic picture is typical for any specific pathology and the biopsy results do not affect the tactics of further treatment, there is no need to perform it. Biopsy sampling should not be used if there is an increased risk of bleeding, such as in patients with coagulopathy.

Padmanabhan et al. indicate that numerous methods of obtaining an adequate amount of biopsy material exist. Multiple biopsies increase the diagnostic value of the study. Authors mention that aspects such as the size of the pieces, the location of the collection, orientation, fixation, and staining of the preparations are also essential. With the pinch method, only the mucous membrane usually gets into the biopsy. Sometimes large biopsy forceps will also grasp the submucosal layer². However, such forceps require a biopsy canal of at least 3.6 mm in diameter, while the material they collect is usually 2-3 times larger on the surface but not in-depth. Cytological examination of brush biopsy preparations can help pinch biopsy in diagnosing several malignant and infectious processes. Loop excision is used to remove large polyps. A combination of techniques can enhance diagnostic capabilities. Aspiration biopsy using a thin needle under the control of endoscopic ultrasound allows medics to take a biopsy from subepithelial foci and objects located outside the gastrointestinal tract (lymph nodes, pancreatic tumors).

The esophagus' malignant tumors can be diagnosed by biopsy in 95% of cases unless the obstruction prevents adequate imaging and biopsy from the pathological focus. 8 to 10 biopsies

should be collected. Additionally, brush cytology can improve diagnostic capabilities. Erosive changes detected by endoscopic examination correlate well with the histological picture, but solitary erythema is an unreliable criterion for esophagitis diagnosis. In contrast, histological abnormalities (inflammatory cell infiltration, including neutrophilic and eosinophilic leukocytes) can be detected in biopsies from patients with GERD with a typical endoscopic mucosal picture². Biopsy and taking material for cytological examination from the pathologically looking mucous membrane are necessary to exclude malignant, infectious processes, some autoimmune diseases, and Barrett's esophagus.

Barrett's esophagus can be observed when the metaplastic specialized intestinal epithelium replaces the normal lining squamous epithelium. Diagnosis requires biopsy during endoscopic examination. Based on the detection of metaplasia of the esophageal mucosa patients are included in national cancer programs (registered and periodically examined). Histological examination reveals the lining of the mucous membrane with a cylindrical epithelium devoid of a brush border. The latter differs from the gastric epithelium by the presence of goblet cells, which can be recognized by additional staining with blue³. Endoscopic mucosal resection is used to remove material from the thickened folds of the gastric mucosa to exclude gastric cancer and treat its early forms. This method removes foci of early gastric cancer less than 20 mm in size that does not extend beyond the mucous membrane, confirmed by endoscopic ultrasound or based on endoscopic criteria¹. The pathological focus is raised above the submucosal layer by endoscopic injection of fluid and then resected using one technique.

In patients with peptic ulcer disease and an increased risk of developing stomach cancer (history of stomach cancer in relatives), Hp infection should be excluded or confirmed using methods based on the biopsy study obtained during endoscopy. The methods include testing for urease activity (rapid urease test), identifying typical coiled bacteria by histological examination, and isolating bacteria in culture. In untreated patients, the material should be taken from the antrum's lesser curvature near the corner of the stomach. The rapid urease test is inexpensive, highly specific, and can be performed in the endoscopy unit, giving a result within 1 hour. The sensitivity of detecting HP in tissue samples can be reduced in patients receiving proton pump inhibitors or antibiotics, those who have recently undergone anti-Helicobacter pylori therapy (but the infection persists), or in the presence of gastrointestinal bleeding. In such patients, the material should be taken from many areas of the antrum's mucous membrane and the stomach's body, and a negative rapid urease test should be supplemented with other diagnostic methods. If possible, patients should be asked to discontinue proton pump inhibitors one week before diagnostic testing for Hp.

The biopsy is essential in diagnosing diseases of the small intestine. Oral biopsies have traditionally been taken in the ligamentous tract. Endoscopic biopsy is currently the most used technique as it allows several targeted biopsies to be performed in a short time in a more comfortable environment for the patient. The volume of pieces obtained with a pinch biopsy is usually sufficient to diagnose diffuse lesions of the small intestine mucosa if at least three biopsies are taken from areas distal to the duodenal bulb (to exclude misinterpretation of the morphological picture associated with Brunner's glands)¹. In diseases with a segmental nature of the lesion, several biopsies are taken from more distant parts of the small intestine, which requires a longer endoscope with a smaller diameter. A histological examination can help establish a diagnosis even with normal gross findings.

Small bowel biopsy is the standard test to confirm malabsorption syndrome diagnosis. When diagnosing celiac disease, histological examination of the small intestine biopsies is extremely necessary, even with a positive test for the presence of endomysia antibodies or tissue transglutaminase in the blood⁴. A biopsy should be performed before treatment is prescribed, as the above tests may be falsely positive. Infectious lesions of the small intestine can also be

established by histological examination. Giardia and several other protozoan pathogens can cause inflammatory changes in the small intestine's mucous membrane. Typing of mature adult pathogens, their trophozoites, or intermediate forms of the life cycle in the epithelium or on its surface can help establish an accurate diagnosis. In some patients, morphological manifestations are like eosinophilic gastroenteritis. The latter's diagnosis can be established only after the exclusion of parasitic invasion.

Conclusion

Fine needle aspiration biopsy is a relatively fast, safe, and accurate adjunct diagnosis. The manipulation should be carried out using either an ultrasound machine or endoscopic equipment and with the presence of a cytologist. Under all these conditions, it is possible to obtain a reasonably good express technique for determining and assessing small unproductive animals' neoplasms. Performing a biopsy requires a lot of interaction, technical intervention, human participation, and decision-making. Studies show that improper preparation of a patient for a biopsy and an incorrect choice of the sampling site are frequent causes of errors in oncological practice, leading to possible negative therapeutic consequences and the choice of the wrong treatment tactics. Informing the surgeon about the optimal biopsy sampling site helps prevent errors. Sometimes individual errors arise due to negligence, but they are more often associated with non-compliance with the manipulation methodology, which should serve as a guarantor of the morphological conclusion's correctness. The likelihood of errors should be reduced by establishing these processes in each clinic engaged in the diagnosis of oncological diseases.