



Biopsy: CT-guided fine needle aspiration is best? radiologist perspective

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Abstract: Availability of computed tomography (CT) and advances in lung screening techniques allowed the identification of growing number of pulmonary nodules. The ability to differentiate between benign and malignant lesions is a challenge. Cytological or tissue sampling of suspected nodules by percutaneous guided imaging, has increasingly been placed as an effective and safe alternative. Analysed cases of fine needle aspiration biopsy (FNAB) and core biopsy performed at the Intervention Center of our institution. As well, review of literature to compare indications, limitations and complications of techniques. FNAB is often used in a number of situations. Thyroid, breast nodules, and suspicious lymph nodes are examples. Percutaneous CT-guided FNAB is widely accepted as an accurate and safe procedure for pulmonary nodules. Core biopsy has gained space, with higher accuracy, low false negative indices, high positivity and similar complication. Interventionist practice is the first option in the diagnostic approach of suspected pulmonary nodules. Both strategies have a minimal morbi-mortality rate if compared to conventional surgical biopsy.

Keywords: Lung; nodules; biopsy; core needle; fine needle; radiologists; perspective

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Introduction

The recent and increasing availability of computed tomography (CT) and the advances in lung screening techniques, with high resolution images and multidetector devices, with faster exam acquisition time and more sensitive images, allowed the identification of a vertiginously growing number of pulmonary nodules, and ever smaller lesions (1).

Given the increasing array of identified nodules, the major challenge for radiologists, pulmonologists, and thoracic surgeons is the ability to differentiate between benign and malignant lesions, and then listing the patients that can be followed and the others that need to be treated (2,3). Early treatment is always the focus, and the characterization of a malignant nodule, when still small, greatly increases the chances of effective and curative treatment (2,3).

Some lung lesions may be considered benign when a previous imaging examination suggests stability. However, lesions with specific tomographic characteristics that suggest malignancy require further investigation. Follow-up is a possibility in many cases, especially of patients with small nodules, however, this approach can often generate anxiety in the patient and can also delay early-stage treatment of the disease. In addition, it is important to consider that the follow-up CT uses ionizing radiation and requires a longer period of time for a diagnostic conclusion, considering the necessary time interval (4-6).

In the above-mentioned context, cytological or tissue sampling of suspected nodules by percutaneous guided imaging, more frequently CT, has increasingly been placed as an effective and safe alternative in the solution of the doubt of the nodule composition.

Discussion

The two most frequently used options in the percutaneous diagnosis of suspicious pulmonary nodules are fine needle aspiration biopsy (FNAB) and core (thick needle) biopsies. Both mentioned techniques present indications, limitations and characteristic risks, and both the applicant and the interventional radiologist must know these factors when indicating or performing one or the other procedure.

With respect to FNAB, this technique is often used in a number of situations in which malignancy is suspected. Thyroid nodules are a classic and successful example of performing percutaneous aspiration biopsies. Surely, thyroid nodules are the ones in which are most often performed fine needle punctures. In the last years, a significant improvement in the parameters of classification of thyroid nodules, such as the TIRADS classification, captained with small methodological differences among themselves, but with the similar proposal, by some groups in the world literature, provided a precise indication of puncture for those nodules with a higher risk of malignancy. The recent development of TIRADS classification by American College of Radiologists (ACR) confirmed this increasing need for adequate classification of thyroid lesions for precise indication to FNAB.

Solid, cystic or mixed nodular mammary lesions are also frequent targets of FNAB, in this case following the older and consecrated BIRADS classification, which elutes the nodules to be biopsied, separating them from those that can simply be followed with clinical and imaging follow-up, most often by ultrasound (US).

Increased lymph nodes with suspicious characteristics are also frequent targets of FNAB, with cervical, inguinal and axillary lymph nodes being the most frequently punctured.

As far as pulmonary nodules are concerned, aspiration puncture also plays a role, although today the indication of this technique is increasingly restricted. About 10 years ago, fine needle biopsies were much more frequent, while the percutaneous access approach gained its place within the arsenal of diagnostic possibilities. At this time, when surgical biopsies were still dominant, the possibility of fine-needle CT-guided diagnosis, without the risks of a surgical intervention, began to gain form, and became well accepted (7-9).

Percutaneous CT-guided FNAB is widely accepted as an accurate and safe procedure for the characterization of pulmonary nodules. Diagnostic accuracy rates and sensitivity reaches approximately 95%, but several studies

reported a decrease in diagnostic accuracy for smaller lesions, ranging from 52% to 88%, with great variation between the studies (10) (*Figure 1*).

One inherent feature of the technique, which has limited it, is the small sampling of material that fine needle aspiration achieves. By its nature, samples obtained by FNAB are naturally cytological and, therefore, show high false negative indices. The need for more accurate sampling, with histological evaluation, was necessary (10).

Core biopsy has progressively gained space, as it presents higher accuracy, with low false negative indices, high positivity and similar complication indices, such as pneumothorax. The rates of parenchymal bleeding, in spite of larger needle calibers, did not represent a significant increase in the morbimortality of the procedure (11-18) (*Figure 2*).

Pneumothorax is the most frequently complication in core biopsies of pulmonary nodules, with an incidence between 21% and 43% in the literature (19,20). Higher rates of pneumothorax, up to 65% in the literature, are observed for lesions of 10 mm or less. The percentage, however, of pneumothorax requiring percutaneous drainage varies from 4% to 35%. Fatal complications, like systemic arterial embolism and pulmonary hemorrhage, have been reported but are extremely rare (14,15,18,21,22).

Given the two percutaneous diagnostic possibilities listed, an issue that applies both to those who indicate the procedure—clinicians and surgeons, and who performs it—especially interventionists, is when to indicate one or another technique.

Main advantages of FNAB are the lowest cost of the material and complications indices. In contrast, the accuracy of the method is quite variable, attending frequently with high false negative indices or insufficient samplings.

Core biopsy, on the other hand, shows greater material sampling, with higher accuracy and less false negatives. In contrast, complication rates are higher, in despite of not leading to a significant increase in morbidity and mortality of the procedure. The cost is slightly higher if compared to FNAB, because of the material and the possible need of sedation or even general anesthesia (21,23,24).

It is a consensus between the majority of interventional radiologists who actually perform percutaneous biopsies, that the procedure should be made using thick needles, given the safety and accuracy of the core biopsy, with similar complications indices in relation to FNAB. Nowadays, this method is already well established, accepted as effective and safe by most services, with good acceptance even by more enlightened patients. The aspiration puncture may still be

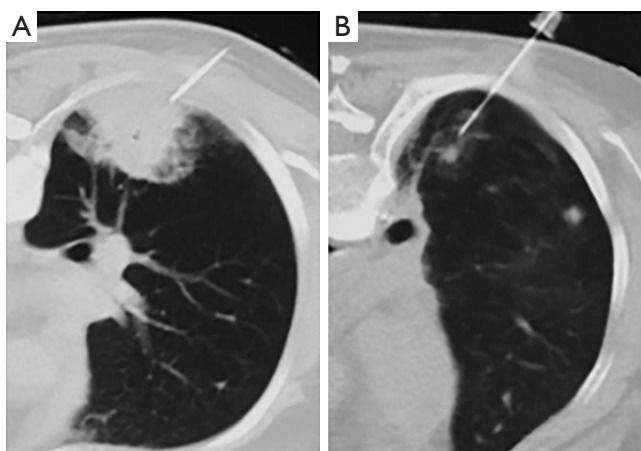


Figure 1 Two examples of pulmonary nodules FNAB. (A) It shows a lung mass in the lower lobe, with negative puncture result for malignancy. The histopathological evaluation of subsequent core biopsy showed a mucosal bronchioloalveolar carcinoma of mucinous lineage; (B) shows the opposite. Cytology obtained by FNAB with true positive for adenocarcinoma, while histopathology showed an infectious process (pneumonia), with no signs of atypia or malignancy. This is unusual, but can also occur. FNAB, fine needle aspiration biopsy.

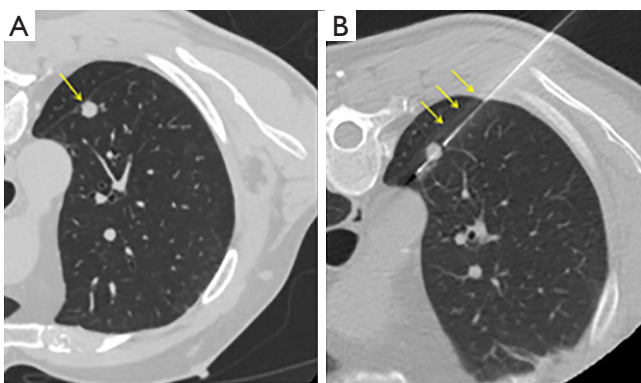


Figure 2 Percutaneous CT-guided lung biopsy. (A) It shows a justa-fissural nodule (arrow). An oblique access, parallel to the fissure, was opted (arrows at B). CT, computed tomography.

used, especially in larger nodules, with a higher risk of false negative samples, and in a group of patients at high risk of bleeding.

Conclusions

Most important, however, at the end of the above-

mentioned considerations, is the consolidation currently tried by the interventionist practice as the first option in the diagnostic approach of suspected pulmonary nodules. Given the differences in techniques and outcomes between FNAB and core biopsy, both strategies have a minimal morbi-mortality rate if compared to conventional surgical biopsy, allowing rapid recovery after the procedure, with the majority of patients discharged asymptomatic at the same day, and also with lower overall costs. In addition, knowledge of the histological type of the malignant nodule before surgery allows a safer planning of the best surgical strategy, better access and the need of surgery extension.

In the understanding of the interventionist radiologists, the multidisciplinary practice, the exchange of information among the clinical teams that conduct the patient evaluation, brings unequivocal benefits, adding efforts for the earlier and more accurate diagnosis, and for an increasingly less invasive and resolute treatment.

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