



# Fluoroscopy CT versus Cone-Beam CT for Imaging-Guided Percutaneous Transthoracic Needle Biopsy of Lung Base Nodules

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## Abstract

Cone biopsy, also known as conisation, is a surgical procedure that involves the removal of a cone-shaped piece of tissue from the cervix. This procedure is often used to diagnose or treat cervical abnormalities, such as precancerous or cancerous cells.

Imaging-guided cone biopsy involves the use of imaging techniques, such as ultrasound or MRI, to guide the placement of instruments during the procedure. This allows for more precise removal of the targeted tissue and can help minimize damage to surrounding healthy tissue.

The use of imaging-guided cone biopsy has been shown to improve the accuracy and safety of the procedure, particularly in cases where the abnormalities are located deep within the cervix or close to critical structures such as blood vessels or the urinary bladder.

**Keywords:** Biopsy; Cone-Beam CT; Fluoroscopy; Lung Base Nodules

**Introduction**

Cervical cancer is a leading cause of cancer-related death among women worldwide. Early diagnosis and treatment are crucial for improving survival outcomes.

Imaging-guided percutaneous transthoracic needle biopsy (PTNB) is a minimally invasive procedure used to obtain tissue samples from lung nodules.

Two primary imaging modalities used for PTNB are Cone-Beam CT (CBCT) and Fluoroscopy.

CBCT provides high-resolution, three-dimensional (3D) images of the thorax, allowing for precise localization of the target nodule and the biopsy needle. Fluoroscopy, on the other hand, provides real-time, two-dimensional (2D) images.

Fluoroscopy-guided PTNB has been shown to be effective for diagnosing lung cancer, particularly for peripheral nodules. However, CBCT-guided PTNB offers several advantages, including improved visualization of the target nodule and the surrounding anatomy, reduced radiation exposure, and the ability to perform multiple biopsies in a single session (1, 2).  
Fluoroscopy-guided PTNB is a well-established technique for diagnosing lung cancer. It involves real-time imaging of the needle's position relative to the target nodule. This method is particularly useful for peripheral nodules and for patients who are unable to hold their breath for extended periods. However, fluoroscopy-guided PTNB has several limitations, including limited visualization of the target nodule and the surrounding anatomy, increased radiation exposure, and the need for multiple biopsies in some cases (3, 4, 5).

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3D CT scan provides a more comprehensive view of the lung base nodules compared to 2D fluoroscopy. The 3D reconstruction allows for better visualization of the nodule's location and size, which is crucial for accurate needle placement during percutaneous transthoracic needle biopsy (PTNB).

Fluoroscopy, while useful for real-time guidance, may not provide the same level of detail as 3D CT. The 2D images can be limited by overlapping structures, making it difficult to precisely identify the nodule's location. This can lead to increased risk of complications or incomplete sampling of the nodule.

However, fluoroscopy has the advantage of being a real-time imaging modality, allowing for immediate adjustments to the needle trajectory. This can be particularly beneficial in cases where the nodule is located in a difficult-to-access area or if there are anatomical variations.

In conclusion, while both modalities have their strengths, 3D CT scan appears to offer superior accuracy and safety for PTNB of lung base nodules. The detailed 3D reconstruction provides a clear roadmap for the procedure, reducing the risk of misplacement and ensuring a more representative sample is obtained.

Future studies should focus on comparing the two modalities in a randomized controlled trial, evaluating the impact on biopsy success rates, complication rates, and patient outcomes. Additionally, the use of hybrid imaging techniques, combining the strengths of both modalities, may offer a promising approach for improved PTNB guidance.

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