

Examining Core-Needle Biopsy Devices: A Comprehensive Summary

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Perspective

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DESCRIPTION

Core-Needle Biopsy (CNB) is a minimally invasive procedure widely used for obtaining tissue samples from suspicious lesions. This technique plays a critical role in the diagnosis of various conditions, particularly cancer. The use of core-needle biopsy devices has revolutionized the way pathologists gather tissue samples, offering a balance between diagnostic accuracy and patient comfort.

Understanding core-needle biopsy

A core-needle biopsy involves the use of a hollow needle to extract a cylindrical core of tissue. This method is often preferred over Fine-Needle Aspiration (FNA) because it retrieves larger samples that provide more information about the cellular architecture, which is essential for accurate diagnosis. The procedure can be performed on various tissues, including breast, liver, kidney and lung.

Types of core-needle biopsy devices

Core-needle biopsy devices vary in design and mechanism, catering to different clinical needs. The two primary categories include:

Spring-loaded devices: These devices use a spring mechanism to quickly deploy the needle into the target tissue. They are easy to use and allow for rapid sample acquisition, making them popular in outpatient settings.

Vacuum-Assisted Biopsy (VAB) devices: VAB devices utilize suction to draw tissue into the needle. This method is particularly advantageous for larger lesions or those located deep within the tissue. VAB devices can collect multiple samples in a single insertion, minimizing the number of passes needed.

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Advantages of core-needle biopsy

The advantages of core-needle biopsy devices are numerous:

Minimally invasive: Compared to traditional surgical biopsies, CNB is less invasive, resulting in reduced recovery times and lower complication rates. Most patients can resume their daily activities shortly after the procedure.

Increased diagnostic yield: The larger samples obtained from CNB devices allow for better histological evaluation. This can lead to more accurate diagnoses and staging of cancer, which is important for determining the appropriate treatment.

Real-time imaging guidance: Many core-needle biopsies are performed using imaging techniques such as ultrasound, Computed Tomography (CT), or Magnetic Resonance Imaging (MRI). This real-time guidance enhances the accuracy of needle placement and increases the likelihood of targeting the correct lesion.

Despite their advantages, core-needle biopsy devices are not without challenges. One significant concern is the risk of complications, including bleeding, infection, and damage to surrounding tissues. While these risks are generally low, they can vary based on the location of the biopsy and the patient's overall health.

Another challenge lies in the potential for sampling error. In cases where a lesion is heterogeneous, there is a risk that the needle may miss the most significant areas of abnormality, leading to false-negative results. As a result, careful consideration of the biopsy technique and the use of imaging guidance are essential.

Future developments

The field of core-needle biopsy is evolving rapidly, with ongoing advancements aimed at improving both safety and efficacy. Innovations in device technology are focusing on enhancing the precision of needle placement and minimizing patient discomfort. For example, developments in robotic-assisted biopsy systems may provide even greater accuracy in targeting lesions.

Moreover, the integration of Artificial Intelligence (AI) in imaging and diagnostic processes is expected to play a significant role in future core-needle biopsy procedures. AI algorithms can assist in identifying suspicious areas for biopsy, potentially improving diagnostic outcomes.

Core-needle biopsy devices have become indispensable tools in modern medical practice, particularly in oncology. They provide a means to obtain vital tissue samples with minimal invasiveness, leading to timely and accurate diagnoses. While challenges remain, ongoing advancements in technology and technique promise to further enhance the effectiveness of this essential procedure. As the field progresses, core-needle biopsy will continue to play an important role in patient care, particularly in the early detection and treatment of cancer.