

Ultrasound-Guided Intervention in the Abdomen and Pelvis

Review from A to Z



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KEYWORDS

• Ultrasound • Biopsy • Drainage • Procedure • Fusion • Complication • Lesion • Collection

KEY POINTS

- Ultrasound (US) guidance for invasive procedures is a necessary tool and should be considered the first-line modality for most procedures in the abdomen and pelvis.
- There are many steps in ensuring patient safety and optimal procedure environment, including setup of room and equipment, sonographer and nursing support, and comprehensive review of the patient history and imaging.
- US with fusion further increases the utility of US in the setting of invasive procedures.

 **Videos of Hydrodissection, liver biopsy-related hemorrhage, renal biopsy-related hemorrhage, and splenic biopsy accompany this article at <http://www.ultrasound.theclinics.com/>**

INTRODUCTION

Image-guided percutaneous biopsy and fluid collection drainage are commonly performed radiologic interventions in the abdomen. Both US and computed tomography (CT) guidance are used for image-guided procedures. Advantages of the sonographic approach include decreased procedure time, absence of radiation, low cost, portability, real-time visualization of needle placement, and real-time Doppler imaging to avoid vessel puncture or to rapidly confirm complications such as bleeding.^{1,2} US also allows for rapid, real-time guidance for aspirations and drainages, precluding the need for CT scanning and radiation to confirm needle or catheter placement in many patients.³

When deciding whether to use US or CT guidance, a good general rule is to consider US first.

If the lesion cannot be seen under US guidance or if a safe pathway is not identified, then CT may be considered. Occasionally, both modalities may need to be used. For example, the initial access may be easier under US guidance, with confirmation of the needle or catheter placement under CT. However, US alone is more than sufficient for most types of abdominal intervention.^{4,5}

Newer applications in procedures such as the use of US contrast, volume navigation, and fusion further expand the capabilities of US. US contrast helps visualize lesions that may be suboptimally seen by conventional sonography and also helps identify foci of residual or recurrent tumor after ablation.⁶ Volume navigation assists in selecting trajectories from various entry points based on the location of the target. Fusion technology allows for overlay of CT, magnetic resonance imaging (MRI), and positron emission tomography

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(PET)/PET-CT images, with the sonographic images to target biopsies and ablations.

IMAGING REVIEW

Before scheduling a procedure, it is important to review other imaging modalities such as CT, MRI, or PET to help localize or characterize the target lesion or fluid collection. Cross-sectional imaging may help identify other lesions that are more amenable to biopsy, such as supraclavicular lymph nodes or soft-tissue nodules. Additional lesions may upstage the diagnosis, which can affect which lesion is most appropriate to biopsy.

The radiologist can then review the patient's history, laboratory values, and allergy information. Interventional or surgical backup may be sought for high-risk cases. Patients who are at a higher risk of bleeding than the general population should be informed of their risk and consented accordingly.

SONOGRAPHER

The sonographer plays an important role both before and during the procedure. The sonographer should have all the appropriate supplies ready so there is no need to leave the room after the procedure has started. This preparation includes having

doubles of most supplies in case one is dropped or inadvertently contaminated. The sonographer should also coordinate with the imaging nurse for patient monitoring and review of preprocedure laboratory results.

The prescan is important to localize the respective lesion or fluid collection. Before the radiologist enters the room, the sonographer can identify the region of interest and help assess possible trajectories for needle entry. In cases in which changes in patient positioning may be necessary, the sonographer can also provide information of which position allows for optimal visualization of the target. Once the target is identified and patient position optimized, the distance from the skin to the target and/or from the top of the needle guide to the target can be estimated. The sonographer can look for impediments in the possible trajectories, such as bowel, lung, or large vessels. It is imperative that color Doppler imaging be performed, as large vessels should be avoided. The radiologist can then more expeditiously confirm the appropriate trajectory.

During the procedure, the sonographer should capture images demonstrating adequate placement of the needle within the target (**Fig. 1**). The sonographer can capture cine loops of the procedure when there is a question of whether the target was reached, especially in hard-to-visualize targets.

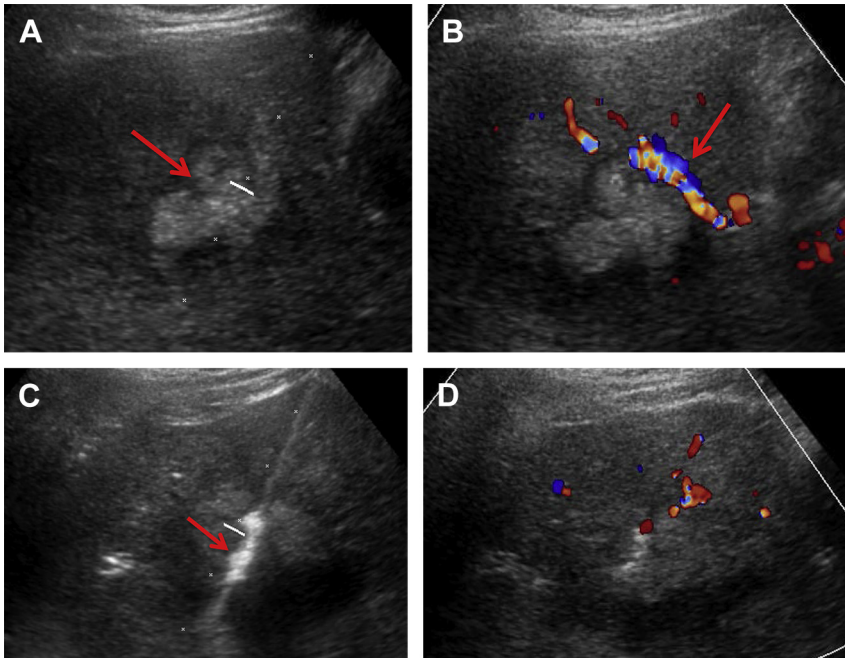


Fig. 1. Necessary steps during a biopsy. (A) Assess trajectory to lesion (echogenic liver mass, *arrow*). (B) Apply color Doppler and look for vessels in the path (*arrow*). (C) Record each pass showing needle location (*arrow*). (D) Postscan with and without color Doppler to look for bleeding (none detected).

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