Ultrasound-Guided Visceral Biopsies: Renal and Hepatic

Nirvikar Dahiya, MD, William D. Middleton, MD, Christine O. Menias, MD*

KEYWORDS
- Ultrasound • Biopsy • Renal • Hepatic • Perivascular • Pseudoaneurysm

KEY POINTS
- The basic approach to planning an ultrasound-guided biopsy is similar to performing any other interventional procedure.
- Visceral organ biopsies are being routinely done these days with excellent diagnostic results.
- Ultrasound is a safe and reliable imaging modality to provide guidance for the vast majority of biopsies.
- With good technique, these procedures have a very low complication rate.

LIVER BIOPSY

Ultrasound-guided percutaneous biopsy of visceral organs in the abdomen has been in effect for many years. Paul Ehrlich is credited with performing the first percutaneous liver biopsy in 1883 in Germany.¹ Schüper² in 1907 published the first liver biopsy series. Huard and Baron popularized liver biopsy for general purposes in the 1930s. Some of the more contemporary articles reporting ultrasound-guided procedures were written in 1972 by Goldberg and Pollack.³ The basic approach to planning an ultrasound-guided biopsy is similar to performing any other interventional procedure. However, there are certain complexities specific to biopsy of the liver and kidney that are addressed in this article.

Indications for a Liver Biopsy

The indications for doing a liver biopsy are outlined in Box 1. A liver biopsy gives invaluable information regarding the staging, prognosis, and management even if clinical, laboratory, or imaging tests point to a specific focal or diffuse liver disease. Serial liver biopsies may help to monitor effects of specific therapy or to identify recurrence of disease.⁴

Preparation for a Liver Biopsy

The preparation of a liver biopsy constitutes the major portion of the work needed to execute a successful biopsy. The actual act of directing the needle to the target region and collecting the specimen only constitutes a small component of the procedure itself. A thorough history taking is imperative before the initiation of the biopsy. With this, the exact clinical question can be understood and the correct biopsy technique (fine-needle aspiration [FNA] vs core needle biopsy) determined; accordingly, the proper needle type and gauge can be selected. For instance, in patients with diffuse liver disease and a coexisting mass, it may be necessary to biopsy the mass (for diagnosis), the liver parenchyma (as part of preoperative surgical workup), or both depending...
on the clinical situation. In patients with multiple liver masses, prior workup may point to specific lesions that are worrisome and others that are clearly benign. If the patient had undergone positron emission tomography/computed tomography (PET-CT) as part of the workup, it is important to make a good anatomic correlation between the hypermetabolic lesion seen on the PET-CT and ultrasound examination. Some of the newer ultrasound equipments allow for fusion imaging, whereby an overlaying of the CT, magnetic resonance imaging, or PET can be done with the ultrasound examination to accurately identify the target.5

Once the clinical question has been understood, the prebiopsy workup includes evaluation of the bleeding profile of the patient and a detailed review of current medications taken by the patient. At our institution, we routinely obtain international normalized ratio (INR), platelet count, prothrombin time, and partial thromboplastin time (PTT). Some of the newer ultrasound equipments allow for fusion imaging, whereby an overlaying of the CT, magnetic resonance imaging, or PET can be done with the ultrasound examination to accurately identify the target.5

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### Box 1
**Indications for liver biopsy**

**Diffuse hepatocellular disease**
- Alcoholic liver disease
- Nonalcoholic hepatic steatosis
- Autoimmune hepatitis
- Grading and staging of chronic hepatitis C or chronic hepatitis B
- Heavy metal storage disorders such as hemochromatosis and Wilson disease
- Cholestatic liver diseases such as primary biliary cirrhosis and primary sclerosing cholangitis
- Abnormal liver function tests
- Evaluation of efficacy or adverse effects of drugs such as methotrexate
- Fever of unknown origin
- Hepatosplenomegaly of unknown origin
- Liver transplant rejection

**Focal liver disease**
- Primary hepatocellular carcinoma,
- Cholangiocarcinoma
- Metastatic disease
- Indeterminate mass

Table 1 provides guidelines for management of anticoagulants before a visceral organ biopsy.

### Procedure of Doing the Liver Biopsy

A critical component of the procedure is choosing an approach for a liver biopsy. The ideal approach would be to find the shortest course to the target, avoiding lung, diaphragm, and all the vascular structures. However, this is not always possible. For a random liver biopsy, we prefer targeting the peripheral right hepatic lobe. This region is

### Table 1
**Guidelines for management of anticoagulants before a visceral organ biopsy**

<table>
<thead>
<tr>
<th>Suggested Period of Discontinuity</th>
<th>Suggested Time Frame for Restarting Medication</th>
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<tbody>
<tr>
<td>Coumadin: 5–7 d</td>
<td>Resume the day of the procedure</td>
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<tr>
<td>Plavix: 7 d</td>
<td>Resume the next day</td>
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<tr>
<td>Ticlid: 10 d</td>
<td>Resume the next day</td>
</tr>
<tr>
<td>Heparin Drip: 6 h</td>
<td>Resume drip 12 h after procedure</td>
</tr>
<tr>
<td>Lovenox: 12 h</td>
<td>Resume 12 h after procedure</td>
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</table>
remote from the central hilar vasculature, and a tamponade effect can be achieved on completion of the biopsy by having the patient lie in right lateral decubitus position. If a good subcostal window is available, it is our first preference. However, in most cases an intercostal approach is performed, in which the needle traverses the diaphragm and pleural space. Care should be taken to avoid the aerated lung. For this reason, we generally position the needle inferior to the transducer, so that shadowing from the lung can be visualized and avoided before the needle is advanced into the liver. When using the intercostal approach, the needle is directed over the ribs as the vascular bundle courses along the inferior edge of the ribs (Fig. 1).

A random biopsy of the left hepatic lobe is performed when the right hepatic lobe is not feasible. In most cases, the lateral section of the left lobe is targeted in a manner such that the left portal vein and artery can be avoided. Color Doppler is used as a mapping tool for all our biopsies.

Care is taken to minimize the risk of bleeding by trying to take the maximum length of the core tissue in the first pass. In cases in which the biopsy is of a target lesion within the liver, many have suggested choosing a biopsy path that courses through a part of the normal liver before reaching the target. Although there are no studies to prove it, this approach presumably helps with the tamponade effect if there is any bleeding from the target lesion after the biopsy (Fig. 2). It also may have a role in preventing seeding. We believe that there may be some justification to this approach, but we do not hesitate to biopsy lesions on the surface of the liver if they are substantially easier to reach than the deeper lesions.

Needles are categorized as aspiration- or suction-type needles (Menghini needle, Klatskin needle, Chiba needle, and Jamshidi needle) and cutting-type needles (Vim-Silverman needle and Tru-cut needle). The cutting-type needles can also be spring loaded. Most visceral core biopsies are now performed with spring-loaded needles. These needles can be further classified as side notch or end cutting (Figs. 3–6).

They can also be classified as automatic or semiautomatic. The semiautomatic needles allow one to manually advance the side-notch needle into the target. The biopsy is performed if the operator is satisfied with the placement of the notch in the target. The automatic needle obtains the core without providing the option of manual advancement. With this type of needle, it is critical to make accurate measurements of the target size to select an appropriate predefined length for core biopsy. The end-cutting needles used in our department yield full core specimens at lengths of 1.3, 2.3, or 3.3 cm, whereas the semiautomatic side-notch needle yields a partial core specimen at a length of 1 or 2 cm. This can vary depending on the biopsy device manufacturers. If the biopsy device that is chosen has a loud clicking sound while performing the procedure, it is best to make patients aware of this so that they do not get startled during the procedure when they hear the sound. In terms of guidance, the choice is between using a mechanical guide attached to the transducer and freehand guidance. The freehand technique requires more experience but has the distinct advantage of maneuverability, especially when subtle changes are required in direction or angle.

Choice of transducer used to guide the needle is also important. Provided visualization of the target and adjacent vessels is adequate, phased array transducers have many advantages because they are small and easy to maneuver, especially when using an intercostal approach. Linear array transducers provide the advantage of better
Fig. 2. Liver biopsy technique. (A) Transverse view of the right lobe of the liver showing a large liver metastasis. (B) Magnified high-resolution view of the medial aspect of the lesion showing a preferred needle trajectory to traverse normal liver parenchyma before entering the mass.

Fig. 3. Side-notch needle. (A) Side-notch needle in cocked position before biopsy of a focal lesion, (B) partially deployed position, and (C) fully deployed position.

Fig. 4. Side-notch needles. (A) Side-notch needle in cocked position and (B) deployed position.

Fig. 5. Full-core needle. (A) Full-core needle in cocked position, (B) partially deployed position, and (C) fully deployed position.

Fig. 6. Full-core needle. (A) Full-core needle in cocked position and (B) fully deployed position.
visualization if the target is superficial (ie, within approximately 5 cm of the skin surface). Curved array transducers provide an intermediate choice when lesions are too deep for a linear array, and visualization is inadequate with a phased array. The major disadvantage of curved arrays is their larger size, which makes them more clumsy to maneuver. Generally, we prefer lining up our biopsy needle along the side of the transducer, so that we can see the entire shaft of the needle as we approach the target (Fig. 7).

The sterile biopsy tray we use for a biopsy procedure includes

1. 10 mL of 1% lidocaine buffered with 8.4% sodium bicarbonate
2. 25-gauge × 30-mm needle
3. 4 × 4 gauze pack
4. Scalpel #11 blade
5. 5-mL syringe
6. 25-gauge × 5/8-in needle for superficial anesthesia
7. Applicator prep, gloves, and sterile drapes.

We perform most of our biopsies under local anesthesia, using 1% lidocaine mixed with sodium bicarbonate. The shorter 25-gauge × 5/8-in needle is used to inject lidocaine for superficial intradermal anesthesia after the patient has been cleaned and draped in a sterile manner. For deeper anesthesia, we use the 25-gauge × 30-mm needles to introduce more lidocaine. Deeper anesthesia is injected under ultrasound guidance to determine the proper trajectory for the biopsy and to ensure that the anesthesia is injected deep enough to numb the capsule of the viscera, be it the liver or the kidney.

Moderate sedation or conscious sedation is usually not necessary for routine liver biopsies; however, there are institutions that may typically use fentanyl (Sublimaze) and midazolam (Versed). If moderate sedation is used, special credentialing and privileging to perform sedation may be required.7

It helps to give a little extra 1% lidocaine at the capsule (Fig. 8). At times, it helps to inject enough so as to cause a slight bump in the contour of the parietal peritoneum; this serves as a landmark for the entry point of the biopsy needle.

Once the local anesthesia has been satisfactorily injected, we observe the relation between the biopsy target and the patient’s breathing to determine if the biopsy will be done with the patient holding his/her breath in normal or deep inspiration or normal expiration. We usually ask the patient to practice a couple of breath-holds at this time to ascertain the best position of the target lesion for the biopsy. When possible, we prefer normal expiration because this is more reproducible than deep inspiration and it raises the location of lung parenchyma. However, this expiration may not be possible in patients who are short of breath.

For core biopsies, local anesthesia is followed by a small nick in the skin with a surgical blade. This is important because it can sometimes be difficult to advance core needles through the skin. The core needle we like to use is usually the spring-loaded 18-gauge needle. For liver biopsies, we most often use the end-cutting needle that yields a full core specimen at lengths of 1.3, 2.3, or 3.3 cm. When a focal lesion is near major vessels, a semiautomatic side-notch needle that yields a partial core specimen at a length of 1 or 2 cm may be preferable. In both cases, the needle is introduced to the capsule surface; patients are then asked to hold their breath and the needle is

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**Fig. 7.** Freehand biopsy technique. Biopsy needle is positioned in the plane of the image, immediately next to the side of the transducer. This allows for visualization of the needle tip and shaft throughout the procedure.

**Fig. 8.** Liver capsule numbing. Needle shaft and tip (arrows) are positioned such that anesthesia administered is at the level of the liver capsule (arrowheads).
introduced into the liver. In most cases, if the trajectory has been well planned and the needle is well visualized, the needle can be advanced to the lesion and a sample can be obtained on a single breath-hold.

The throw of the needle depends on the location and size of the lesion and the distribution of adjacent vessels. It is important, however, to remember that a throw setting of 10 or 13 mm typically results in a sample that is several millimeters shorter. So, if safe, it is best to avoid these short throws. For random liver biopsies, we mostly use the 3.3-cm throw.

For FNA, we use either a 25-gauge spinal needle or a 23-gauge Chiba needle. In both cases, we prefer introducing the needle with the stylet inside to avoid contaminating the lumen with extraneous cells and to ensure that the needle has some tensile strength to maneuver. Once the needle tip has reached the target, the stylet can be removed and the process of taking the FNA sample can begin (Fig. 9). Typically, we do the first aspiration without suction. Subsequent aspirations are performed with or without suction depending on the yield of the initial pass. Although we prefer making multiple separate passes, sometimes successful and consistent needle placement may be very difficult.

In these cases, coaxial technique can be performed, wherein an introducer is initially deployed into the target area and subsequent sampling can be done coaxially through it. Although a distinct advantage of the coaxial technique is the single puncture through the liver capsule, it is somewhat offset by the increased risk of capsule shearing or tearing as the needle stays in for a longer period while the patient breathes.

The choice of performing an FNA biopsy or a core biopsy depends on the clinical scenario. In a patient with a known extrahepatic primary cancer in whom the only reason to perform a liver biopsy is to prove the presence of metastatic disease, we would do an FNA. If immediate on-site cytologic analysis is possible, aspirations are performed until a diagnostic sample is obtained. If the initial aspiration result is positive for malignancy and correlates with the primary tumor, no additional aspirations are required. If the initial specimens are negative for malignancy or suggest an alternative primary, then additional aspirations or core biopsies are obtained. If only semi-immediate off-site cytologic analysis is possible or if there is no cytologic support, several passes (3–6) should be obtained before terminating the procedure.

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**Fig. 9.** FNA. A 55-year-old woman with a history of pancreatic cancer. Small liver mass in the patient with a history of pancreatic cancer and a suspicious lesion seen on CT. (A) Contrast-enhanced CT scan of the liver showing a small low-attenuation lesion in the liver (arrow). (B) Transverse sonogram of the liver shows a 9-mm solid hypoechogenic lesion (cursors) corresponding to the lesion seen on CT. (C) Image obtained from a real-time cine clip taken during FNA shows the tip of a 25-gauge spinal needle (arrow) within the lesion. Needle shaft location (arrowheads) was more apparent during real-time imaging.
Despite the presence of a known extrahepatic primary tumor, if immunohistochemical studies are anticipated, we typically do a core biopsy rather than an FNA. A core biopsy provides enough tissue for hematoxylin-eosin as well as immunohistochemical staining. Additional sections can be taken from the paraffin block of the core biopsy to stain for immunohistochemistry markers such as estrogen receptor, progesterone receptor, and HER2/neu.

If the clinical history or prior imaging results suggest a primary malignant or benign liver tumor, we generally perform core biopsies with an 18-gauge needle (Fig. 10).

If hepatocellular cancer is confirmed, it is permissible to start with FNA and get preliminary analysis from the respective cytopathologist. If the diagnosis of hepatocellular cancer is confirmed after 1 to 3 passes, no further aspirations are necessary. But if the initial aspiration results are negative or nondiagnostic, cores become necessary. In patients with suspected hepatocellular cancer and tumor thrombus of the portal or hepatic vein, it is possible to confirm the diagnosis and assist with staging by performing FNA of the tumor thrombus. At times, referring hepatologists do not require a tissue diagnosis to confirm the presence of hepatocellular carcinoma if the cross-sectional imaging is consistent with hepatocellular carcinoma and there is a correlative elevation of α-fetoprotein level.

The diagnostic accuracy of percutaneous needle biopsy in lesions 1 cm or smaller has increased from 79% (n = 24) in 1987 to 87.5% (n = 24) in 1993 and 99% (n = 74) in 1999. The use of a free-hand biopsy technique under ultrasound guidance is a common feature of all the series.

**Complications**

Liver biopsies are relatively safe, with a complication rate of 0.2% to 0.3%. Hemorrhage is the most common complication and is more likely to occur in patients with underlying cirrhosis or malignancy or bleeding diathesis. Most complications occur soon after completion of the biopsy. A linear color flow signal may at times be seen along the needle track immediately after the biopsy. Kim and colleagues evaluated the predictive role this signal played in the detection of postbiopsy complications.

Fig. 10. A 61-year-old woman with a history of breast cancer. (A) Contrast-enhanced CT scan shows a small superficial low-attenuation lesion in the right lobe of the liver (arrow). (B) Oblique ultrasound image shows an 18-gauge core needle (arrows) in position to obtain a core biopsy. (C) The needle is deployed (arrows) and traverses the entire diameter of the lesion. Note that the throw in this case was selected at 20 mm to ensure sampling of the entire lesion.
bleeding and referred to it as patent track sign. The investigators suggested that the postbiopsy bleeding events were significantly more likely when a patent track sign persisted on scans obtained 5 minutes after the biopsy (Fig. 11).

Ascites should not be considered a contraindication to liver biopsy; however, in cases of moderate to large ascites, we prefer to have a paracentesis done before the biopsy. In cases in which patients are affected by significant coagulopathy, we recommend a transjugular hepatic biopsy.

**RENAI BIOPSY**

Percutaneous renal biopsy using an aspiration needle and with the patient in sitting position was first described by Iversen and Brun in 1951. In 1954, Kark and Muehrcke described the use of the cutting Vim-Silverman needle in patients in the prone position, with a substantial improvement in the rate of success. The 1961 Ciba Foundation Symposium on renal biopsy marked the coming of age of this technique. Recent advances in imaging, interventional, and cytologic techniques have enhanced the role of percutaneous biopsy in the diagnosis of renal masses. The incidental detection of benign and malignant renal masses has increased with increase in use of multidetector CT and magnetic resonance imaging.

In one study, 25% of masses smaller than 3 cm were benign. This factor has led to an increased demand for percutaneous renal biopsies for smaller masses. Biopsy of oncocytoma has been controversial. The reason lies in the difficulty presented to differentiate benign cells from malignant cells on pathologic examination. Oncocytic cells can exist in various renal neoplasms, including renal oncocytoma and oncycytic renal cell carcinomas, many of which are renal cell carcinomas of low metastatic potential. These include granular cell carcinoma, chromophobe renal cell carcinoma, and eosinophilic variant of papillary renal cell carcinoma. In some cases, a diagnosis of oncocytoma can be strongly suggested on the basis of histochemical, immunocytochemical, and ultrastructural studies. Oncocytomas could
be confidently distinguished from oncocytic renal cell carcinoma using immunocytochemical analysis. In a study done by Liu and Fanning, all oncocytomas were negative for vimentin, whereas only granular cell carcinoma and eosinophilic variant of papillary renal cell carcinoma were positive for vimentin. Also, the 2 vimentin-negative neoplasms, oncocytoma and chromophobe renal cell carcinoma, could be distinguished by Hale colloidal iron stain, which was present in all chromophobe renal cancers but only focally or not at all in oncocytomas.

**Indications for a Renal Biopsy**

As with the liver, kidney biopsies may be done either to evaluate an indeterminate focal lesion/mass or to evaluate the cortex for a parenchymal disease process. A list of the more important indications is presented in Box 2.

**Preparation for Renal Biopsy**

The issues related to preparation for the biopsy have already been discussed in the liver biopsy section and are essentially the same. The coagulation workup and the assessment for medications that interfere with clotting mechanisms are also similar. The fundamental difference comes in the approach to a kidney biopsy and the associated complications. As with hepatic biopsies, renal biopsies, whether focal or nonfocal, can be performed as outpatient procedures under ultrasound guidance.

**Box 2**

**Indications for renal biopsy**

<table>
<thead>
<tr>
<th>Parenchymal renal disease</th>
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<tr>
<td>Nephrotic syndrome</td>
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<td>Isolated glomerular hematuria</td>
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<tr>
<td>Systemic disease with renal dysfunction</td>
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<tr>
<td>Acute nephritic syndrome</td>
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<tr>
<td>Unexplained acute renal failure</td>
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<tr>
<td>Goodpasture syndrome</td>
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<tr>
<td>Wegener granulomatosis</td>
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<tr>
<td>Suspected renal transplant rejection</td>
</tr>
<tr>
<td>Solitary renal mass for which partial nephrectomy may be considered</td>
</tr>
<tr>
<td>Multiple renal masses</td>
</tr>
<tr>
<td>Renal mass in a patient with a known primary malignancy or metastatic disease or lymphoma</td>
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<tr>
<td>Renal mass in a patient with potential focal infection/abscess</td>
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</tbody>
</table>

**Focal mass lesion biopsy**

For focal biopsies of a mass lesion, FNA and core biopsy can both be performed. Some institutions may perform both in the same sitting because a combination of the two may produce higher diagnostic yield. Whereas FNA may be performed using a 22- or 25-gauge needle, 18-gauge needles are used for core biopsies. We do 4 to 6 passes for our FNA samples and 2 or more samples for our core biopsies. The patient is put in a posterior oblique or lateral decubitus position for most biopsies. A towel or pillow may be put between the body and the bed to enhance the kyphosis. This helps in pushing the rib cage up and increasing the space available for doing the biopsy. We try to use the posterior axillary line as the point of entry. This posterolateral approach avoids the potential inadvertent injury to the colon. Sometimes the location of the mass may prompt a more posterior approach in prone position (Fig. 12). Once the mass has been visualized using ultrasound, anesthesia is administered in a manner similar to that described for liver biopsies.

**Nonfocal renal cortex (cortical) biopsy**

Nonfocal parenchymal biopsies are performed in whatever position provides optimal visualization of the kidney and avoids critical overlying structures. The lower pole of either kidney is the preferred site. Usually the left kidney is the first choice because it is lower in location than the right. The target is the cortical tissue from the lower pole of the kidney. Care is taken to avoid the medulla and the collecting system by directing the needle into the superficial cortex in a relatively tangential manner. An onsite pathology service determines the adequacy of the sample (Fig. 13).

**Complications**

Renal biopsy is a relatively safe procedure, with loss of life extremely rare and major complications, mostly related to bleeding, occurring in only 1% to 6% of procedures. Renal biopsies have an overall low mortality rate of 0.031%. Postbiopsy complications include hemorrhage, pseudoaneurysm, arteriovenous fistula, infection, pneumothorax, adjacent bowel or liver/spleen injury, and tumor seeding. Postbiopsy bleeding can occur in several places: into the collecting system, leading to microscopic or gross hematuria and possible ureteral obstruction; in a subcapsular location, leading to pressure tamponade and pain; or into the perinephric space, leading to retroperitoneal hematoma and possibly a drop in the serum hematocrit level (Fig. 14). Most clinically
significant bleedings are recognized within 12 to 24 hours of the biopsy.\textsuperscript{25} Mild perinephric hemorrhage is self-limiting and seen in 44\% of the cases.\textsuperscript{26} If there is a large retroperitoneal hematoma, the patient will have to be closely monitored and may even need other imaging modalities to assess the extent of bleed.

![Image of kidney biopsy](image1)

**Fig. 12.** A 24-year-old man with a history of lymphoma. (A) Contrast-enhanced CT scan shows a low-attenuation lesion in the anterior aspect of the left kidney (arrows). Other similar lesions were seen in both kidneys. (B) Transverse sonogram showing an 18-gauge core needle (arrowheads) within a hypoechoic solid renal mass (arrows) corresponding to the lesion shown on CT. Pathology from this biopsy was consistent with lymphoma.

![Image of kidney transplant](image2)

**Fig. 13.** Status after renal transplant in a 45-year-old woman with elevated creatinine levels and concern for rejection. (A) Longitudinal view of the lower pole of the transplant. Identification of cortex without calyces and medullary components is important. (B) Transverse view of the lower pole of the transplant (arrowheads) shows the relationship of the transplant with the external iliac artery (arrow). (C) Transverse view with needle in position showing the eccentric oblique orientation of the needle (arrows) used to obtain cortical tissue with little or no medullary component.
Pseudoaneurysm and arteriovenous fistula formation are also well-recognized complications of percutaneous renal biopsy (Fig. 15). They can be clinically silent, or the patient may present with hematuria or retroperitoneal bleeding. Color duplex Doppler and CT angiography are both sensitive for making the diagnosis. In some cases arterial embolization may be required. Tumor seeding is always a theoretical possibility; however, only 7 cases have been reported in the literature.

Fig. 14. A 60-year-old woman with parenchymal renal disease referred for a percutaneous biopsy. (A) Transverse view of the lower pole of the kidney obtained during performance of a second core biopsy shows a hypoechoic perinephric hematoma (H). The core needle is shown within the lower pole of the more echogenic kidney (arrows). (B) Longitudinal view following both biopsies again shows the perinephric hematoma (H). (C) Color Doppler view of the lower pole of the left kidney shows extensive perivascular tissue vibration (arrows) consistent with an arteriovenous fistula.

Fig. 15. A 66-year-old man, 8 months after renal transplant with pain one day after renal biopsy. (A) Longitudinal view of the lower pole of the transplant shows a hypoechoic perinephric lesion (arrows). (B) Color Doppler image confirms internal vascular flow. An arterial signal was documented on waveform analysis consistent with a perinephric pseudoaneurysm (arrow).
POSTBIOPSY CARE

We observe patients after a liver or renal biopsy for at least 4 hours. After a baseline assessment of vital signs in the department, the patients are observed in the postanesthesia care unit. Pulse rate, blood pressure, and oxygen saturation are monitored. Some patients will have local tenderness once the effect of lidocaine wears off, which can be symptomatically treated with a variety of analgesics. Some patients complain of right shoulder pain after a liver biopsy. This is likely a visceral-somatic referred pain and is self-limiting. Right shoulder pain does not seem to be an indication of a severe complication such as intra-abdominal bleeding.

If the patients complain of severe pain at the site of the biopsy or if the blood pressure falls, they are brought back to the department to assess the biopsy site by ultrasonography. Rarely a patient may need a CT scan if concerns for a more severe hepatic or renal injury are high. Patients without complaints are discharged with instructions to avoid strenuous activity for the remaining day.

SUMMARY

Visceral organ biopsies are being routinely done these days with excellent diagnostic results. Ultrasonography is a safe and reliable imaging modality to provide guidance for the vast majority of biopsy. With good technique, these procedures have a very low complication rate.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at doi:10.1016/j.cult.2012.03.004.

REFERENCES