*Procedures in Practice*RICHARD MCGONIGLE
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KIDNEY BIOPSY

Indications

Patients with renal glomerular disease may present with similar clinical features yet have conditions ranging from the trivial to the life-threatening. Their prognosis and treatment depend on the renal pathology, and histological examination of the kidney is often the only way to make the diagnosis. Needle biopsy, however, provides a sample of only about 20 of the 2 000 000 glomeruli, so is unhelpful and may give misleading results in patchy conditions such as chronic pyelonephritis. It is most valuable in assessing and, in particular, indicating the prognosis of patients with diffuse glomerular disease. The table summarises the principal indications for its use.

Principal indications for kidney biopsy

Clinical syndrome					Indications for biopsy
Asymptomatic proteinuria	..	..	..	..	Protein excretion more than 1 g/24 h Red blood cells in urine Impaired renal function
Recurrent isolated haematuria	..	..	..	..	Intravenous urography and cystoscopy do not show source Proteinuria also present
Acute nephritic syndrome	..	..	..	..	Persisting oliguria
Nephrotic syndrome	..	..	..	..	Adults: unless cause is apparent from extrarenal manifestations Children: only if haematuria also present, or if proteinuria persists after trial of corticosteroid
Acute renal failure	..	..	..	..	No obvious precipitating cause Renal-tract obstruction excluded
Chronic renal failure	..	..	..	..	Radiographically normal kidneys

Contraindications

Contralateral kidney inadequate
Only one kidney
Haemorrhagic tendency
Platelet count $<10 \times 10^9/l$
Prothrombin time $\leq 16s$
Kidneys shrunken

Laceration of the kidney may cause haemorrhage, which may lead to nephrectomy. The risk is small but should always be kept in mind, and biopsy should be done only if the other kidney is adequate. A single kidney or major abnormality of the contralateral kidney are contraindications, as is any haemorrhagic tendency, including advanced uraemia. The platelet count should be over $10 \times 10^9/l$ ($100\,000/mm^3$) and the prothrombin time less than 16 seconds. Biopsy should not be done on shrunken kidneys because they are difficult to locate, the histology is often non-specific, and, in any case, the result is unlikely to provide information of any therapeutic relevance.

Technique

Premedication with intravenous diazepam makes the procedure less unpleasant for the patient; general anaesthesia is required only for infants and young children. A firm surface is needed, so have bed boards under the mattress. Place the patient prone with his head turned away (most patients do not want to watch), his arms abducted, and his forearms beside his head. Put a rolled-up towel (about 10 cm in diameter) under the patient's abdomen between the rib cage and pelvis.

The preferred site is the centre of the lower pole of the left kidney. This avoids the major renal vessels and is likely to contain more cortex than medulla. On an intravenous urogram film measure the distance (A) of this point from the lumbar spinous processes. The bony landmarks are the tips of the dorsal processes of the lumbar spine and lower border of the 12th rib. Palpate and mark these on the patient's skin. Then draw a line (B) vertically downwards from the 12th rib at distance A from the spine. Measuring the length of B on the x-ray film is unreliable because of radiological distortion, so simply choose a site along B 2 cm below the lower border of the 12th rib. If you fail to locate the kidney there, go higher still. Ultrasound examination gives more accurate localisation of the kidney but is unnecessary in most cases.

Wear sterile gloves and stand at the left side of the patient. Prepare the skin and locally anaesthetise the skin and subcutaneous tissues, then use a 17 cm, 1.1 mm (19 G) exploring needle to find the kidney. Insert it into the lumbar muscles and then advance it 5 mm at a time until a definite swing with respiration shows that the point is within the kidney. Ask the patient to hold his breath in inspiration each time you move the needle and to take a deep breath out and in after each advance. Do not restrict movement of the needle while the patient is breathing—handle it only while he is holding his breath. The kidney is about 5-8 cm deep; after locating it, inject local anaesthetic along the track while withdrawing the needle.

To take the biopsy specimen the Vim-Silverman needle, with the Franklin modification, and the Tru-Cut disposable needle (Travenol Laboratories Ltd) are equally effective. We shall describe the Tru-Cut technique. The 11.4 cm needle is suitable for most patients, but use the 15 cm one for larger patients.

Make a nick in the skin with the point of a scalpel blade and then advance the biopsy needle, with the cannula closed over the obturator, stepwise as with the exploring needle. A large arc of swing usually shows that the kidney has been located, but beware the patient who uses his chest more than his diaphragm when asked to breathe deeply. When the swing is small it is easy to penetrate the full thickness of the kidney, and the specimen obtained will comprise only fat or blood clot. In these patients correct location of the point of the needle depends on feeling the resistance of the capsule and the "give" on penetrating it. The disposable needle is sharp and the change in resistance slight, so, for sensitive control, hold it low down by the shaft rather than by its handle. Another indication of reaching the kidney is the transmission of arterial pulsation. A small jerk with each respiratory movement means that the tip of the needle is just scraping the capsule and should be advanced a little further. If the needle moves only at the extreme of inspiration it is probably being struck by the lower pole and should be reinserted higher up.

When you are satisfied that the tip is *just* within the kidney ask the patient to hold his breath in inspiration. Then tap the obturator handle in, push the cannula smartly down the length of its travel to cut the specimen, keeping the obturator handle firmly fixed with the other hand, and finally withdraw the needle with the cannula closed over the obturator. The last three manoeuvres must be made while the patient is holding his breath, so practise them on a pear first!

The specimen

A successful biopsy produces a strip of kidney up to 20 mm long. Immunofluorescence microscopy is carried out on fresh tissue, while routine and electron microscopy require appropriate fixatives. When all these techniques are available the specimen must be divided into three, so examine each part with a hand lens or dissecting microscope and make sure that all contain glomeruli. If there is any doubt about their adequacy obtain another specimen rather than risk having to repeat the whole performance later when you receive a histology report reading "medulla only."

Aftercare and complications

Check pulse and blood pressure
Keep patient in bed
Beware haemorrhage

The patient should remain in bed for 24 hours and have his pulse and blood pressure checked hourly for four hours and then at four-hour intervals.

The most important complication is haemorrhage, which may be perirenal, causing loin pain and sometimes a palpable mass as well as the signs of blood loss; or intrapelvic, causing persisting heavy haematuria and sometimes clot retention. More minor haematuria is common and usually settles quickly. Continuing haemorrhage should be treated by blood transfusion and sedation. Exploration of the kidney is only rarely required.

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