MEDICAL PROCEDURE
RENAL BIOPSY

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Renal Biopsy

This is the removal of a sample of kidney tissue for diagnosis, monitoring progress of renal diseases or to evaluate the function of a transplanted kidney.

History

Michael Edelbohls in 1904 first drew attention to the histological examination of kidney tissue. Percutaneous kidney biopsy was performed by Ball in 1934 using an aspiration technique to diagnose kidney tumors. In the 1940s, kidney tissue was occasionally obtained accidentally during attempts to sample the liver. This development inspired Nils Awall, who began to biopsy the kidney in patients with kidney disease on a regular basis in 1944 using x-ray guidance, although his results were not reported until 1952.

Antonio Perez-Ara, a pathologist in Cuba, described the use of the cutting Vim-Silverman needle to obtain diagnostic kidney tissue in 1950. His work went largely unnoticed outside Cuba and was unknown to Poul Iversen and Claus Brun when they began to conduct kidney biopsies in Copenhagen in 1949 using an aspiration needle. Their publication in 1951 brought kidney biopsy to the attention of clinicians everywhere. Biopsies were initially performed with the patient in the sitting position, but in the technique described by Robert Kark and Robert Muehrck in 1954, the patient underwent biopsy in the prone position, with the use of a Vim-Silverman needle and methods similar to those commonly used today. Their introduction of the Franklin-modified Vim-Silverman needle and the initial localization of the kidney with a small atraumatic needle resulted in a better core of tissue and a higher success rate. Since these initial reports, the major advances that have been made center on improved localization of the kidney using ultrasonographic technology and the introduction of more automated and smaller biopsy needles. Improved methods of tissue processing and staining, and the correlation of the light-microscopic findings with those of electron-microscopic and immunofluorescence techniques, have led to dramatic increases in our knowledge of kidney disease.

Indications

1. Idiopathic nephrotic syndrome
2. Acute nephritic syndromes especially suspected rapidly progressive glomerulonephritis
3. Unexplained proteinuria and hematuria;
4. Systemic diseases associated with kidney dysfunction, such as systemic lupus erythematosus (SLE), Goodpasture's syndrome, and Wegener's granulomatosis, to confirm the extent of renal involvement, classify and to guide management;
5. Suspected transplant rejection, to differentiate it from other causes of acute renal failure; and to guide treatment.
6. Previously identified and treated lesions to plan future therapy;

Absolute Contraindications to the Percutaneous Approach

Bleeding diasthesis
Uncontrolled severe hypertension
Uncooperative patient
Solitary native kidney

Relative Contraindications

Solitary or ectopic kidney (except transplant allografts)
Horseshoe kidney
Uncorrected bleeding disorder
Severe hypertension
Renal infection
Renal neoplasm
Hydronephrosis
End-stage renal disease
Congenital anomalies
Multiple cysts
Uncooperative patient.
Pregnancy

Types

Transvenous – Either transjugular or transfemoral. It involves inserting a small tube through the jugular or femoral vein and guiding it to the kidney under ultrasound guidance.

Laparoscopic – This involves using an endoscope after the introduction of gas to separate the organs. The needle is inserted through the laparoscope and guided to the kidney under ultrasound guidance. It requires general anaesthesia and 2 laparoscopic ports via the retroperitoneal approach. The above are performed on patients with bleeding disorders, tumor , obesity, solitary kidney.

Percutaneous biopsy is the removal of a sample by passing the needle through the skin. It allows for quicker recovery, causes less pain and has fewer risks it is therefore more commonly used. Some authors however believe that the use of transvenous renal biopsy provides diagnostic yield and safety similar to those of percutaneous renal biopsy and allows multiorgan biopsy during the same procedure.

Open biopsy – This is usually under general anaesthesia and requires a long time for recovery. It is effective for obtaining renal tissue when a pre–existing contraindication exists to the percutaneous biopsy.

Transurethral – This is novel. Described by Leal in his case report where an 18 gauge needle was used via cystoscopy to retrieve 28 glomeruli.

Procedure

The patient is prepared by adequate counseling on the procedure and a signed informed consent is obtained. If the patient is on Aspirin, anticoagulants or NSAIDS, these should be stopped.

Before percutaneous biopsy, the patient should be evaluated for conditions that may raise the risk or worsen consequences of complications such as uncontrolled hypertension, bilaterally shrunken kidneys, solitary kidney, hydronephrosis, azotemia, pyelonephritis

Since bleeding is the major complication of biopsy, most clinicians obtain a coagulation profile, platelet count, prothrombin time, partial thromboplastin time and possibly a bleeding time if the patient is uremic to screen for bleeding tendencies.

Biopsy is performed on one kidney. The person lies on his stomach on a firm table with cushioning or a sandbag under the abdomen for support and to limit mobility of the kidney. The patient should remain like that throughout the procedure.

The kidney is located with an ultrasound or CT Scan, the biopsy site marked over and local anaesthetic injected. Once the area is numb, the nephrologist uses ultrasound to view the kidney in real time and guides preferably an automated spring loaded biopsy needle into the kidney. The needle should remove about 5 – 15 glomeruli. 2–3 samples are usually required each the size and shape of one half inch of string. After the core tissue samples are extracted, pressure is applied to the incision to slow bleeding and a bandage is placed over the wound.

Post Biopsy Care

The patient must lie on his back for 8–24 hours or stomach if he has a transplanted kidney. Some nephrologists advocate a 24 hour recovery in the hospital where the patient can be observed for complications while others have shown that since the majority of complications occur within the first 6 – 8 hours it can be done on outpatient basis with regular monitoring of vital signs and a urine rack for macroscopic assessment of urine. Haematuria may be seen for the first 24 hours but if after, further care may be required to stop the bleeding. Many people experience muscle aches and general soreness during recovery and analgesics can be given for this.

Complications

The most common complication of a kidney biopsy is hematuria. Microscopic hematuria occurs virtually in all patients, whereas gross hematuria occurs in less than 10% of patients. The presence of uncontrolled hypertension or azotemia increases the risk for hematuria.

Perinephric hematomas occur commonly. Of patients evaluated immediately after kidney biopsy by computed tomography, hematomas were detected in 57% to 85%. Rarely, these hematomas can become infected, requiring antibiotic therapy and surgical drainage.

Less common complications of kidney biopsy include arteriovenous fistulas, aneurysms and infection. Sepsis and bacteremia have been reported but is rare.

Unusual complications of kidney biopsy include ileus, lacerations of other abdominal organs, pneumothorax, ureteral obstruction, and dissemination of carcinoma. Mortality following renal biopsy is uncommon and accounts for approximately 0.1% of biopsies

The technique has significantly improved over the past two decades as a result of the introduction of ultrasonography and automated-gun biopsy devices thus making the procedure relatively safe.

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