

FUNCTIONAL AND LABORATORY RESEARCH METHODS FOR URINARY TRACT DISEASES

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Abstract

Instrumental methods of investigation are used to assess the anatomic-morphological and functional status of the kidney and urinary tract. These include radiologic and radionuclide methods, ultrasound and kidney biopsy.

Keywords: Kidney and urinary tract, renal morphologic examination, ultrasound and kidney biopsy, radiation.

Introduction

Overview radiography. Overview radiographs (radiographs of the kidneys, ureters, and bladder) can give an idea of the size and localization of the kidneys. However, the contours of the kidneys may not be clear due to intestinal contents, the presence of a hematoma or abscess near the kidney. Identification of a urinary stone, with the exception of a coral stone, is almost impossible. Occasionally, radiopaque bodies are seen in the region of the adrenal glands, kidneys, ureters, bladder or prostate. To clarify the locations of detected masses, ultrasound and CT are used, which are now replacing radiography [12,13,14].

Radionuclides are unstable atoms that decay into other nuclides and emit electromagnetic radiation (γ -quanta, α - and β -particles). In renal studies, radionuclides are used to determine the glomerular filtration rate (99m Tc-DTPK), renal blood flow (131 I-orthoiodihippurate, 99m Tc-merthyatide), renal perfusion (99m Tc-pertechnetate) and renal morphologic examination (99m Tc-dimercaptoanthanoic acid) [10,11].

The drugs are administered parenterally. The radiation is monitored using an external γ -camera and the results are analyzed by computer separately for each kidney.

Radionuclide examination provides information on both the morphology and function of the kidneys. The method provides an image of the renal cortex, shape and size of each kidney. For example, early nephrosclerosis and features of dysfunction of each kidney are detected with high



reliability. Renovascular hypertension due to renal artery stenosis is characterized by increased drug accumulation time, peak activity is delayed and excretion is reduced [7,8,9].

Administration of captopril, an ACE inhibitor, is accompanied by renogram changes. Radionuclide examination allows differentiating between nonobstructive and obstructive bladder enlargement. The advantage of the method is the ability to image the kidneys in chronic renal failure. Complications of the method are related to the side effects of the administered drugs. The risk of side effects, including nephrotoxicity, can be reduced by avoiding the administration of diuretics [4,5,6].

Ultrasonography (ultrasound). Ultrasound scanning in various positions allows a relatively accurate definition of the contours and position of the kidneys, assess the calyx-lochanal system, detect tumors, cysts, renal abscesses and nephrolithiasis, differentiate between cysts and renal tumors, hydronephrosis and perinephric fluid accumulation. Renal ultrasound is used to determine kidney size and parenchyma thickness and to select the optimal site for percutaneous renal puncture. Ultrasound diagnostics is preferable in chronic kidney diseases with impaired function, in which the absorption of contrast agent or isotope is impaired, and in the study of transplanted kidney. The method is effective in detecting retroperitoneal tumors, abdominal and pelvic cavity pathology [6,7,8].

Ultrasound can be used to visualize the outline of the bladder and to assess the degree of bladder emptying in the presence of obstruction. Changes in bladder contours, bladder displacement or changes in bladder wall thickness may be associated with bladder tumor or pelvic pathology [14,15,16].

The blood flow of extrarenal and large renal vessels is studied using Doppler ultrasound. The ratio of peak velocity to diastolic velocity (resistance index) is calculated, reflecting the resistance to blood flow through the small renal arteries. Severe renal artery stenosis weakens and slows blood flow through the intrarenal vessels. Doppler ultrasound is used to study blood flow in acute renal failure, detect renal vein thrombosis and assess the dynamics of renal transplant rejection reaction [11,12,13].

Kidney biopsy. There are two methods of biopsy, open and percutaneous (puncture). The open surgical method is rarely used: only if the puncture biopsy was insufficient. Puncture biopsy is performed in the position of the patient lying on the stomach after the introduction of sedatives and local anesthesia of the skin and muscles of the back over the kidney area with a special needle. The kidneys are visualized by ultrasound or radiograph. Kidney tissue is taken for morphologic examination [5,6,7,8,9,10].

Kidney biopsy is performed to clarify the diagnosis, to clarify the nature of the disease, to assess the effectiveness of treatment and prognosis of further development of renal disease [1,2,3,4].

There are no absolute contraindications to biopsy. Relative contraindications are renal tumors, large renal cysts, hydronephrosis, purulent paranephritis, severe untreatable hypertension, symptoms of uremia in patients with primary or secondary wrinkled kidneys [15,16].



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