# In the name of god
# Imaging and diagnosis of the Nephrolithiasis

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Imaging studies

The following imaging studies are used in the evaluation of nephrolithiasis:

Noncontrast abdominopelvic CT scan: The imaging modality of choice for assessment of urinary tract disease, especially acute renal colic; can determine stone diameter and density

Renal ultrasonography: To determine presence of a renal stone and the presence of hydronephrosis or ureteral dilation; used alone or in combination with plain abdominal radiography

Plain abdominal radiograph (flat plate or KUB): To assess total stone burden, as well as size, shape, composition, location of urinary calculi; often used in conjunction with renal ultrasonography or CT scanning

**Plain renal tomography**: For monitoring a difficult-to-observe stone after therapy, clarifying stones not clearly detected or identified with other studies, finding small renal calculi, and determining number of renal calculi present before instituting a stone-prevention program

Retrograde pyelography: Most precise imaging method for determining the anatomy of the ureter and renal pelvis; for making definitive diagnosis of any ureteral calculus

Nuclear renal scanning: To objectively measure differential renal function, especially in a dilated system for which the degree of obstruction is in question; reasonable study in pregnant patients, in whom radiation exposure must be limited

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*•Renal ultrasonography: To determine presence of a renal stone and the presence of hydronephrosis or ureteral dilation; used alone or in combination with plain abdominal radiography*

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*•IVP (urography) (historically, the criterion standard): For clear visualization of entire urinary system, identification of specific problematic stone among many pelvic calcifications, demonstration of affected and contralateral kidney function*

*Diagnosis*

*The diagnosis of nephrolithiasis is often made on the basis of clinical symptoms alone, although confirmatory tests are usually performed.*

Examination of patients with nephrolithiasis includes the following findings:

Dramatic costovertebral angle tenderness; pain can move to upper/lower abdominal quadrant with migration of ureteral stone

Generally unremarkable abdominal evaluation: Possibly hypoactive bowel sounds; usually, absence of peritoneal signs; possibly, painful testicles but normal-appearing

Constant body positional movements (eg, writhing, pacing)

Tachycardia

Hypertension

Microscopic hematuria

*testing*

*The European Association of Urology (EAU) recommends the following laboratory tests in all patients with an acute stone episode [1] :*

*•Urinary sediment/dipstick test: To demonstrate blood cells, with a test for bacteriuria (nitrite) and urine culture in case of a positive reaction*

*•Serum creatinine level: To measure renal function*

*Acute renal colic with resultant flank pain is a common and sometimes complex clinical problem. Whereas noncontrast abdominopelvic computed tomography (CT) scans have become the imaging modality of choice, in some situations, renal ultrasonography or a contrast study such as intravenous pyelography (IVP) may be preferred.*

*A kidneys-ureters-bladder (KUB) radiograph, in addition to the renal colic CT scan, facilitates the review and follow-up of stone patients. Alternatively,* the “CT scout” (a digital *reconstruction from the CT that has an appearance similar to a KUB) is almost as sensitive as a KUB and is a good substitute at the initial assessment if the stone seen on the CT scan is visible on the CT scout. Adding contrast to the CT scan study may sometimes help clarify a difficult or confusing case but in general, contrast obscures calcific densities and as such, contrast scans are usually only indicated during subsequent evaluation of patients with stones. The noncontrast CT is the cornerstone of initial radiographic assessment.*

*Most authors recommend diagnostic imaging to confirm the diagnosis in first-time episodes of ureterolithiasis, when the diagnosis is unclear, or if associated proximal urinary tract infection (UTI) is suspected. Lindqvist et al found that patients who are pain-free after receiving analgesics could be discharged from the emergency department (ED) and undergo radiologic imaging after 2-3 weeks without increasing morbidity.* [24]

*Initial stones in elderly people and in children are relatively uncommon; however, consider kidney stones whenever acute back or flank pain is encountered, regardless of patient age. When stones occur in persons in these uncommon age groups, a metabolic workup consisting of a 24-hour urine collection and appropriate serum laboratory testing is recommended. To minimize radiation exposure, Tasian and Copelovitch recommend ultrasound as the initial imaging study in children with suspected nephrolithiasis, with noncontrast CT reserved for those in whom ultrasound is nondiagnostic and the suspicion of nephrolithiasis remains high.* [19] *In pregnant women, ultrasound is also the preferred diagnostic modality. Guidelines from the European Association of Urology (EAU) recommend the following laboratory tests in all patients with an acute stone episode* [1] *:*

*•Urinary sediment/dipstick test for demonstration of blood cells, with a test for bacteriuria (nitrite), urinary pH, and urine culture in case of a positive reaction*

*•Serum creatinine level, as a measure of renal function*
*•Serum uric acid, (ionized) calcium, sodium, and potassium*
*•Complete blood cell count (CBC)*
*•C-reactive protein (CRP)*
*•Coagulation testing, if intervention is likely or planned: Activated partial thromboplastin time (aPTT) and prothrombin time (PT) with International Normalized ratio (INR)*
*•If no intervention is planned, examination of sodium, potassium, CRP, and blood coagulation time can be omitted*
*•The 2018 EAU guideline recommends ultrasound for initial assessment when there is concern for an acute symptomatic stone, followed by non–contrast-enhanced computed tomography to confirm stone diagnosis.* [1]

Thanks