Clinical Practice Statement

Ultrasound for the Diagnosis and Management of Ureterolithiasis in the Emergency Department

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Recommendations

1) Ultrasound, whether it be at the point of care or performed in radiology, may be the first line imaging modality utilized for patients presenting to the Emergency Department with high clinical suspicion for uncomplicated, recurrent ureterolithiasis.
2) Patients with high clinical suspicion for ureterolithiasis are appropriate for discharge without CT imaging. CT imaging should be performed if there is diagnostic uncertainty or the patient has potential for a complicated course i.e. signs of infection, acute kidney injury, solitary kidney or renal transplant patient.

Introduction

The work-up of uncomplicated suspected ureterolithiasis has been shown to be expeditious when ultrasound is the diagnostic modality of choice. Classically, a non-contrast cat scan (CT) of the abdomen and pelvis has been used to determine the size and location of a suspected ureteral stone and to determine the extent of obstruction.[1] Medical radiation has been linked to concern for radiation induced cancer. [2,3]

In contrast, bedside Point of Care Ultrasound (POCUS) performed by the emergency physician permits faster image acquisition than CT scanning, in most cases. POCUS is a procedural skill that is part of the core curriculum of emergency medicine residency training. This practice statement will review the evidence for using ultrasound for the evaluation of patients with suspected ureterolithiasis.

Executive Summary

A systemic search of PubMed produced 269 articles in English using search terms “nephrolithiasis” OR “kidney calculi” AND “emergency department.” For purposes of this review only studies which focused on emergency department patients who received point of care ultrasound (POCUS) by an attending emergency physician or emergency medicine resident for ureterolithiasis were included. Studies utilizing a variety of different operators and clinical settings were closely reviewed but ultimately were deemed dissimilar to current emergency medicine POCUS practices, and therefor not utilized for this statement. Of the 269 initial articles that were located, 6 met our inclusion criteria. The statement below represent a summary of the best evidence currently available.

A retrospective study (Grade D) showed bedside ultrasound demonstrating no or mild hydronephrosis has a negative predictive value of 87.6%.[4] Three prospective studies (all Grade C) found ultrasonography to

have a sensitivity of 72 - 86.8% specificity of 37.2 – 82.4%, a negative predictive value of 35.3-85.7, and a positive predictive value of 81.3-85.4.[5-7] Ultrasounds were performed at the bedside in all four of these studies.

A 2015 prospective study (Grade C) evaluated the ability of ultrasound to predict 30-day outcomes in patients with nephrolithiasis.[8] Of 111 patients screened, 77 were suspected of having nephrolithiasis and were enrolled. Follow-up was obtained in 73 patients. No patients had alternate diagnosis. Patients were categorized as having no, mild (any nonvascular and noncystic fluid collection), moderate (renal sinus dilatation resulting in confluence of calices) hydronephrosis. No patients had severe (grossly dilated renal sinus with cortical effacement) hydronephrosis. The hospitalization rate was 0% (0/28), 24% (9/38), and 36% (4/11) in patients with no, mild, or moderate hydronephrosis respectively.

A recent multicentered, prospective trial (Grade A) including 2759 patients compared ultrasonography and computed tomography for the evaluation of patients with suspected nephrolithiasis.[9] Patients with suspected nephrolithiasis were randomized to point-of-care-ultrasound (POCUS) by the emergency physician, ultrasonography by a radiologist, or CT as the initial imaging modality. There was no difference in high-risk diagnosis with complications (0.4%) or serious adverse events between groups. High-risk diagnosis with complications were defined as abdominal aortic aneurysm with rupture, pneumonia with sepsis, appendicitis with rupture, diverticulitis with abscess or sepsis, bowel ischemia or perforation, renal infarction, renal stone with abscess, pyelonephritis with urosepsis or bateremia, ovarian torsion with necrosis, or aortic dissection with ischemia. The mean dose of radiation was significantly lower in both ultrasound groups as compared to CT. 40.7% of patients in the POCUS and 27% in the radiology ultrasound group also had a CT performed.

Conclusion and Recommendations

The management of suspected ureterolithiasis within the emergency department can differ significantly between providers. Emergency physicians must strike an appropriate balance between imaging modalities to decrease diagnostic ambiguity, provide reassurance, and minimize ionizing radiation. Recent outcomes research documents that imaging by ultrasound is frequently but not uniformly effective for evaluation of uncomplicated ureterolithiasis.

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