Imaging in the Emergency Department for Suspected Nephrolithiasis

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The excruciating pain of renal colic often drives the affected patient to the emergency department. Given the increasing prevalence of nephrolithiasis,[1] more patients than ever before are arriving for evaluation and treatment — nearly 1 million emergency department visits for upper-tract stone disease per year.[2] In the emergency department, rapid diagnosis should facilitate the most appropriate therapy.

Patients with a previous episode of colic will often make the diagnosis themselves, but those who have renal colic for the first time rarely do. Laboratory tests are nondiagnostic. The urine sediment will occasionally reveal crystals, but more commonly there will be nonspecific findings of leukocyturia and hematuria. Diagnostic certainty typically rests on imaging studies. A plain radiograph of the kidneys, ureters, and bladder is neither sensitive nor specific and does not provide information about other potentially important diagnoses. Ultrasonography and computed tomography (CT) each have advantages and disadvantages. The advantages of ultrasonography include the fact that the patient is not exposed to radiation and the possibility that the imaging can be performed at the bedside, but ultrasonography is less sensitive than CT for identifying the number and size of kidney stones and rarely identifies the location of a ureteral stone. CT has been widely considered to be the best available imaging method for diagnosis because it can detect stones as small as 1 mm, provides information on location and possibly composition, and detects the presence of other asymptomatic stones. However, CT is more expensive than ultrasonography and exposes the patient to radiation. A common belief is that CT leads to more rapid diagnosis, thereby reducing the time spent in the emergency department.

The report by Smith-Bindman and colleagues in this issue of the *Journal*[3] provides valuable information about the choice of the first imaging study for patients presenting to the emergency department with suspected nephrolithiasis. The strengths of the study include its multicenter, randomized, pragmatic design and the large sample size and excellent retention rate. Participants were randomly assigned to undergo ultrasonography performed by an emergency physician (point-of-care ultrasonography), ultrasonography performed by a radiologist, or abdominal CT, but the treating physician could order additional imaging studies if clinically indicated. Among patients with suspected nephrolithiasis, the clinical outcomes did not differ substantially according to the first imaging method used, but the ultrasonography group had lower cumulative radiation exposure. Although ultrasonography was not as sensitive as CT when used initially, the diagnostic accuracy for nephrolithiasis among patients who were randomly assigned initially to ultrasonography was essentially the same as that among patients assigned initially to CT.

Several issues should be considered in the interpretation of this important study. The diagnosis of nephrolithiasis was based either on the patient's report of stone passage or on a medical record that a stone was surgically removed. Because many patients pass their stone after an episode of renal colic without actually seeing the stone, their reports could have been influenced by the information given by the emergency department providers, thereby increasing the apparent diagnostic accuracy of the imaging studies.

Interpretation of the ultrasound examination could have been influenced by the patient's history and by previous imaging. It is possible that the characteristic shadowing or hydronephrosis would have been more likely to be reported in a patient with a history of stone disease, particularly if a recent imaging study had identified a stone. This latter possibility is supported by the study's findings that among persons in the ultrasonography groups, those with a history of nephrolithiasis were less likely than those without such a history to undergo subsequent CT. In addition, there is no mention in the article about whether a patient had had a recent stone-related procedure, which would also greatly influence the probability that a diagnosis of nephrolithiasis would be made.

On the basis of the study findings, it is reasonable for a physician to use ultrasonography

as the initial imaging method for a patient presenting to the emergency department with suspected nephrolithiasis, remembering that additional imaging studies should be used when clinically indicated. Although CT had higher sensitivity than ultrasonography, this increased sensitivity did not lead to better clinical outcomes. Importantly, patients assigned to ultrasonography performed by a radiologist actually spent more time in the emergency department than did patients in either of the other two groups, supporting the long-held belief that CT would lead to quicker disposition (although the length of stay with point-of-care ultrasonography was similar to that with CT). Although we want to limit radiation exposure from all sources, the decision to use ultrasonography needs to be balanced against the additional information obtained by CT, which may influence subsequent clinical decisions. For example, additional renal stones may be seen on CT but not on ultrasonography, leading to a more aggressive regimen to prevent new stone formation. It should be emphasized, as the authors note, that ultrasonography when used alone is not very sensitive for detecting stones; more than 40% of stones were not detected by initial ultrasonography. However, the approach of starting with ultrasonography and then proceeding to CT if indicated resulted in similar levels of sensitivity in the three groups. It is reassuring that high-risk diagnoses were rarely missed with this approach.

In the future, the wider use of low-dose CT,[4-6] which exposes the patient to substantially less radiation than conventional CT, may change the risk–benefit balance of these imaging methods, but low-dose CT will need to be examined as carefully as the imaging methods in the current study. Regardless of which imaging method is used, providers should remember to tell their patients that new stone formation can be prevented and to give them preventive strategies that should reduce the number of future emergency department visits for renal colic.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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1. Scales CD Jr, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. Eur Urol 2012;62:160-5.
2. Ghani KR, Roghmann F, Sammon JD, et al. Emergency department visits in the United States for upper urinary tract stones: trends in hospitalization and charges. J Urol 2014;191:90-6.
3. Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. N Engl J Med 2014;371:1100-10.
4. Sohn W, Clayman RV, Lee JY, Cohen A, Mucksavage P. Low-dose and standard computed tomography scans yield equivalent stone measurements. Urology 2013;81:231-4.
5. Niemann T, Kollmann T, Bongartz G. Diagnostic performance of low-dose CT for the detection of urolithiasis: a meta-analysis. AJR Am J Roentgenol 2008;191:396-401.
6. Kim BS, Hwang IK, Choi YW, et al. Low-dose and standard-dose unenhanced helical computed tomography for the assessment of acute renal colic: prospective comparative study. Acta Radiol 2005;46:756-63.

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Immunotherapy for Tuberculous Pericarditis

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Pericardial tuberculosis is an important clinical problem in resource-limited countries, particularly in those with concomitant epidemics of human immunodeficiency virus (HIV) infection. Tuberculosis involving closed anatomical spaces such as the pericardium or meninges can cause devastating inflammatory injury, and management with antimicrobial therapy alone may not prevent complications. Host-directed therapies that attenuate destructive inflammatory responses may prevent serious sequelae. Current American and World Health Organization guidelines strongly recommend treatment with glucocorticoids in addition to antituberculosis drugs in patients with tuberculous pericarditis, but expert European guidelines are more muted, reflecting the uncertainty of the evidence.[1-3]

Mayosi and colleagues now report in the *Journal* the results of the Investigation of the Management of Pericarditis (IMPI) trial, a multicenter, factorial-design trial that tested two host-directed therapies in patients in Africa who had presumed tuberculous pericarditis.[4] Participants were randomly assigned to receive a course of high-dose prednisolone tapered over the course of 6 weeks or placebo and were fur-