

STONES

Ultrasonography and computed tomography: performance in detection of kidney stones

The most appropriate imaging method for the diagnosis of kidney stones in patients with suspected nephrolithiasis is unclear. Computed tomography (CT) is the most commonly used imaging modality owing to its high sensitivity for the detection of stones, but this approach is more expensive than ultrasonography and exposes the patient to radiation. Findings from a randomized controlled trial, published in the *New England Journal of Medicine*, now demonstrate that clinical outcomes do not substantially differ for patients who undergo ultrasonography rather than CT as an initial diagnostic imaging test, but that radiation exposure is higher in those who receive CT. “On the basis of our findings, patients with a suspected first episode of a kidney stone, or patients who have had a prior kidney stone and have a repeated episode, should ask their caring physicians to consider imaging them with ultrasonography rather than CT,” notes lead researcher Rebecca Smith-Bindman.

The use of CT for the diagnosis of kidney stones has soared in recent years, despite the lack of evidence of an association between use of CT and improved patient outcomes. “There is a growing belief that CT is overused,” explains Smith-Bindman. “Evidence-based research is needed to help guide the use of CT and ensure it is used in settings where it will lead to improved patient outcomes, and not used when a simpler test such as ultrasonography can be used without exposing patients to the radiation associated with CT. The clinical setting we focus on in this paper is one in which ultrasonography seems to be an excellent and readily available test, but where CT has become the most frequent test used.”

To compare the effect of diagnostic imaging techniques on patient outcomes, Smith-Bindman and colleagues randomly allocated 2,759 patients who presented to any of 15 emergency



Stockdevil/Stock/Thinkstock

departments to one of three imaging groups: ultrasonography performed by an emergency physician (point-of-care ultrasonography), ultrasonography performed by a radiologist (radiology ultrasonography) or abdominal CT. After assignment, decisions about patients' care during the remainder of their emergency department visit, including decisions about further imaging, were managed by the treating physicians.

The primary outcome of high-risk diagnoses with complications in the first 30 days after randomization was recorded in 17 patients (0.4%), with no significant difference between study groups ($P=0.30$). A second primary outcome, 6-month cumulative radiation exposure, was significantly lower in patients assigned to ultrasonography than in those assigned to CT (10.1 mSv and 9.3 mSv in patients assigned to point-of-care ultrasonography and radiology ultrasonography, respectively, versus 17.2 mSv in patients assigned to CT; $P<0.001$). The researchers found no significant differences in the number of serious adverse events between the groups. “Patients who received ultrasonography received around half the radiation dose than patients who received

CT,” says Smith-Bindman. “Other than this difference, the outcomes were the same across the different arms of the trial.”

Smith-Bindman and colleagues assessed the diagnostic accuracy of the imaging modalities by comparing the diagnosis at time of discharge from the emergency department with confirmation by the patient that the stone had passed or had been surgically removed. On the basis of the diagnosis at the end of the emergency department visit, the researchers found no difference in the sensitivity or specificity of the three modalities for diagnosis of nephrolithiasis. However, patients who initially received ultrasonography were more likely than those who received CT to undergo additional diagnostic testing during the initial emergency department visit (40.7% of patients in the point-of-care ultrasonography group and 27.0% of patients in the radiology ultrasonography group underwent CT, whereas 5.1% of patients who initially underwent CT received ultrasonography; $P<0.001$). When the researchers looked at the diagnostic accuracy of the first imaging test patients underwent, they found that the sensitivity of ultrasonography was lower than that of CT (54% sensitivity for point-of-care ultrasonography and 57% for radiology ultrasonography versus 88% for CT; $P<0.001$).

“Our results show that ultrasound, either performed by a trained and qualified emergency physician or by a radiologist, is an excellent way to initially manage this clinical problem,” says Smith-Bindman. “The next steps in this research area are to try and disseminate the results of our study to encourage physicians to change their practice.”

Susan J. Allison

Original article Smith-Bindman, R. et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. *N. Engl. J. Med.* 371, 1100–1110 (2014)