CRITICALLY APPRAISED TOPICS

Is non-contrast helical computed tomography superior to intravenous pyelography for the diagnosis of renal colic?

Articles chosen

1. Miller O, Rineer S, Reichard S, Buckley R, Donovan M, Graham I, et al. Prospective comparison of unenhanced spiral computed tomography and intravenous urogram in the evaluation of acute flank pain. Urology 1998;52:982-7.

2. Sourtzis S, Thibeau JF, Damry N, Raslan A, Vandendris M, Bellemans M. Radiologic investigation of renal colic: unenhanced helical CT compared with excretory urography. AJR 1999;172:1491-4.

Reviewers
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Clinical bottom line

These and other studies show that non-contrast helical CT (NCCT) is more sensitive and specific than intravenous pyelography (IVP) for the diagnosis of renal and ureteral stones. In addition, NCCT often demonstrates alternate pathology not evident on IVP and eliminates the risk of allergic reactions and contrast-mediated nephrotoxicity.

Literature search

Using MEDLINE (1966-present):

1.	exp. tomography, x-ray computed	107203
2.	exp. urography	14403
3.	exp. ureteral calculi	3208
4.	1 and 2	1004
5.	4 and 3	25

We then identified those trials that prospectively compared NCCT to IVP and were published in English.

The evidence

Design: Prospective comparison of NCCT and IVP using independent radiologists blinded to the findings of the alternate diagnostic study.

Population: 106 patients (article 1; Miller et al) and 53 patients (article 2; Sourtzis et al), 18 years of age or older, with suspected renal colic. Exclusion criteria included a history of contrast allergy or serum creatinine levels > 180 µmol/L.

Intervention: All patients underwent NCCT and IVP. Treating physicians had access to both tests, but radiologists who interpreted the NCCT or IVP were blinded to the alternate imaging study.

Outcomes measured: The sensitivity and specificity of each imaging modality were calculated against a (positive) gold standard of stone recovery or lithotripsy versus a (negative) gold standard of symptom resolution without stone recovery. Alternate diagnoses identified by CT scans were also documented.

Results: In the Miller study, 75 (71%) of 106 patients had urolithiasis (based on the gold standard). Sensitivity and specificity for NCCT were 96% and 100%, while the corresponding values for IVP were 87% and 94%. In the Sourtzis study, 36 (68%) of 53 patients had urolithiasis. Sensitivity and specificity of NCCT were 100% and 100%, while the corresponding values for IVP were 67% and 100%. Combining these data allows us to derive the estimates of sensitivity, specificity, positive likelihood ratio (LR+) and negative likelihood ratio (LR–) shown in Table 1. Among the patients who had no follow-up evidence of urolithiasis, NCCT provided several alternate diagnoses, including 3 bladder calculi (one visible on IVP), 3 ovarian or uterine masses, 2 renal cysts (one, a renal carcinoma, was also visible on IVP), 1 pyelonephritis, and 1 aortic aneurysm. One patient in the combined series experienced a mild contrast reaction.

Table 1. Derived diagnostic parameters of NCCT and IVP

Parameter	NCCT	IVP
Sensitivity	97%	80%
Specificity	100%	96%
LR+	>48	20
LR–	0.03	0.2

Comments

Not all patients with renal colic require emergency department (ED) imaging, but for those who do, these authors provide us useful information. The referenced studies demonstrate that NCCT is more accurate than IVP for the diagnosis

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of urolithiasis. The authors also note that NCCT is faster and, in some cases, reveals other important pathology. There are, however, issues to consider before we extrapolate the results of these studies to general clinical practice. First, the IVP sensitivity parameters derived from these studies are worse than those previously published, and the reasons for this are unclear. Imaging modalities require subjective interpretation by a radiologist; therefore, accuracy is observer-dependent and in these studies, single radiologists interpreted each imaging test, raising questions about interobserver reliability. The sensitivities reported for IVP by these authors reflect, in part, the skills (and lack of bias) of the small number of radiologists who participated in the studies. It is difficult to know whether the determinations of these readers are generalizable to the entire world of IVP interpreters. It is also conceivable that the IVP might perform better in the hands of physicians who are not blinded to clinical presentation and pre-test likelihood. This may be especially true for emergency physicians who routinely interpret their own IVPs, but may have limited experience with NCCT.

These issues aside, NCCT almost certainly *is* more sensitive than IVP; however, sensitivity does not equate to clinical utility. Large obstructing stones (that require treatment) are likely to be visualized on IVP, while small non-obstructing stones (requiring no treatment) are more likely to be missed. Therefore it is not clear that the greater sensitivity of NCCT will lead to changes in treatment or outcome of patients with urolithiasis. In other words, the difference in utility between these tests may not be as dramatic as the difference in sensitivity.

If we accept at face value the diagnostic parameters published in these studies, the IVP is still a relatively strong diagnostic test in patients with no contraindication to contrast material. In addition, IVP has 2 major advantages over NCCT. First, it is available in virtually all centres and all times of day, whereas (especially in Canada) NCCT is not. Second, IVP provides dynamic information about renal function and degree of obstruction, whereas NCCT does not.

To summarize, NCCT is faster, less invasive and more accurate than IVP for the diagnosis of urolithiasis. When available, it is clearly the preferred test if there is concern about non-renal pathology or contrast toxicity. IVP remains a useful diagnostic test that is preferred in cases where it is important to demonstrate the presence of renal function and the degree of obstruction.

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