STONE DISEASE

The Learning Curve in the Training of Percutaneous Nephrolithotomy

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Eur Urol. 2007; 52: 206-11

Objectives: To investigate the learning curve in the training of percutaneous nephrolithotomy (PCNL).
Methods: A total of 104 PCNL cases were included in this evaluation to define the learning curve of a surgeon with no previous experience at performing solo PCNL. Two parameters of expertise were reviewed, namely the operation and fluoroscopic screening times. The operation time was calculated as the beginning of access with the needle until the nephrostomy tube was placed and secured. PCNL procedures were analyzed in seven sets of 15 cases regarding the operation and fluoroscopy times, stone size, stone clearance rate, blood transfusion rate, and estimated blood loss.
Results: The mean operation time was 2.4 h for the first 15 patients. It decreased to a mean of 1.5 h for cases 46 through 60. No further decrease in the operation time was observed after case 60. The fluoroscopic screening time was a peak of 17.5 min in the first 15 cases, whereas it dropped to a mean of 8.9 min for cases 46 through 60. The decline in the mean fluoroscopy screening time continued in cases 61 to 104, but the decline was not significant. There was no significant difference in stone size, stone clearance rate, blood transfusion rate, and estimated blood loss among each set of cases.
Conclusions: This study suggests that the surgical competence in PCNL can be reached after 60 cases. PCNL and fluoroscopy times drop to a steady-state level after performing 60 procedures.

Editorial Comment

It is important first to note that this study reflects the learning curve for only one surgeon, and one would anticipate a range of learning curves dependent on prior experience with other procedures that require the Seldinger technique and fluoroscopic guidance and certainly innate skills might play a role. If safety is the primary outcome, then the transfusion rate suggests that after 15 cases, competency is achieved. If efficiency is the primary outcome, then the fluoroscopic time and operative time suggests that after 60 cases, competency is achieved. However, if stone-free results are the bar to judge competency, it appears that more experience is needed. The authors report only a 75% stone-free rate, though a liberal definition of 3 mm residual fragments or less was utilized. In addition, one should note that though 17% of patients had staghorn calculi and more had upper calyceal stones, only 4% of patients had an upper calyceal puncture. Defining the learning curve for an intercostal puncture may require another study!

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Antegrade Pyelography versus Unenhanced Multidetector CT in the Assessment of Urinary-Tract Stones after Percutaneous Nephrostomy Insertion: A Prospective Blinded Study

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J Endourol. 2007; 21:473-7

Background and Purpose: In patients with a percutaneous nephrostomy tube (PCN) inserted for symptomatic stone disease, antegrade pyelography is an accepted modality to assess the collecting system and residual stone status prior to PCN removal. Recently, unenhanced multidetector CT (UMDCT) has shown its superiority for the assessment of urinary-tract stones. Comparison of UMDCT with antegrade pyelography has never been done; hence, our aim was to compare the two methods for the assessment of urinary stones in patients with a PCN.

Patients and Methods: Between July 2004 and July 2005, we prospectively imaged 49 consecutive patients with known urinary-tract stone disease who had PCN (27 men and 22 women; average age 57 +/- 20 years; range 4-88 years). All patients underwent UMDCT and antegrade pyelography within 24 hours. Both examinations were prospectively and blindly evaluated by two attending radiologists for the presence, location, and size of urinary-tract stones.

Results: According to the findings of both imaging modalities, 18 patients were stone free, and 31 patients had urinary stones. In 20 of the latter 31 patients (64.5%), the urinary stones were diagnosed only by UMDCT. Antegrade pyelography missed renal as well as ureteral stones, with a significant mean size (5.1 x 6.2 mm, and 6 x 5.3 mm, respectively). Antegrade pyelography missed radiolucent (8/20) as well as radiopaque (12/20) stones. In 11 of the 31 patients (35.5%), urinary stones were diagnosed by both UMDCT and antegrade pyelography. The average size of these renal stones was 6 x 11 mm, and the mean ureteral stone size was 11 x 13 mm. In 64% (7/11), the stones were radiolucent and in 36% (4/11) radiopaque. There was no patient in whom urinary stones were diagnosed by antegrade pyelography but missed by UMDCT.

Conclusions: Unenhanced multidetector CT is more accurate than antegrade pyelography via a PCN for the assessment of urinary-tract stones, with the advantage of reducing the risks of contrast injection side effects.

Editorial Comment

Resolution of stones on antegrade nephrostogram may be dependent on the patient's body mass index and the density of the stone composition. It would be helpful to re-evaluate the relative accuracy of antegrade nephrostogram stratified by these two parameters – one might hypothesize that the Hounsfield units on the CT prior to placement of the percutaneous nephrostomy tube might predict whether reimaging with antegrade nephrostogram would be useful. Similarly, stone location may be an important variable – stones in the ureter or in the pelvis close to the retention coil may be more difficult to discern on CT compared to calyceal stones.

It is important to note that the antegrade nephrostogram performed in this study utilized fluoroscopy. Antegrade nephrostograms that incorporate tomograms prior to instillation of contrast might have a higher sensitivity for stone detection. Though the authors state that sensitivity of a stone-protocol CT scan is 100% with a nephrostomy tube in place, they did not repeat the CT scan after nephrostomy tube removal in those patients thought to be stone-free. It is possible that some stones were "masked" by the presence of the nephrostomy tube.

It is important to note that antegrade nephrostogram will at times be an important post-operative study, specifically if one is evaluating for urinary extravasation, adequate positioning of the nephrostomy tube, residual ureteral obstruction unrelated to calculus, or adequacy of access for a second-look procedure.

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