STONE DISEASE

Intraoperative Fragment Detection during Percutaneous Nephrolithotomy: Evaluation of High Magnification Rotational Fluoroscopy Combined With Aggressive Nephroscopy

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Purpose: Percutaneous nephrolithotomy effectively treats large volume renal calculi but relies on postoperative imaging to judge success. We evaluated the effectiveness of maximizing intraoperative imaging through combined high resolution fluoroscopy and flexible nephroscopy.
Materials and Methods: Percutaneous nephrolithotomy was performed cooperatively with a radiologist in an interventional radiology suite equipped with a ceiling mounted, high resolution C-arm. Aggressive rigid and flexible nephroscopy was performed. At the conclusion patients were prospectively classified as radiologically and/or endoscopically stone-free. Postoperative noncontrast CT allowed fragment classification as stone-free, 2 mm or less, 2 to 4 mm and greater than 4 mm.
Results: The average stone dimension +/- SEM was 579 +/- 77 mm(2) in 25 consecutive renal units. CT demonstrated that 15 renal units (60%) were stone-free after the primary procedure, while 2 (8%), 5 (20%) and 3 (12%) had fragments 2 or less, 2 to 4 and greater than 4 mm, respectively. Of 21 renal units considered endoscopically and fluoroscopically stone-free postoperative CT demonstrated that 6 had residual fragments, of which all were less than 4 mm. All 4 renal units not considered radiologically and endoscopically stone-free had fragments on CT. Intraoperative fluoroscopy after nephroscopy demonstrated fragments in 36% of renal units, of which after further nephroscopy 78% were stone-free on CT. The sensitivity of intraoperative imaging with reference to the gold standard of postoperative CT was 40%, 38% and 100% at thresholds of 0, 2 and 4 mm, respectively. Specificity was 100%, 94% and 95%, respectively.
Conclusions: Flexible nephroscopy combined with high magnification rotational fluoroscopy allows sensitive and specific intraoperative detection of residual fragments, enabling immediate removal or the planning of necessary second look nephroscopy.

Editorial Comment

The benefit of achieving a stone free state after surgical stone procedures has been amply demonstrated by Streem and others who showed that even small residual stones are associated with a high likelihood of stone growth, eventual development of symptoms or the need for surgical intervention (1). As such, the identification of residual fragments and aggressive removal is strongly encouraged. Unfortunately, accurate identification of residual fragments is typically performed postoperatively, necessitating a second procedure to remove remaining fragments. However, Portis and colleagues showed that the use of high magnification rotational fluoroscopy along with flexible nephroscopy could improve the detection and removal of residual fragments at the time of initial percutaneous nephroscopy and potentially reduce the need for a second operative intervention. With the use of this technique in 22 patients and 25 renal units, 7 of 9 renal units in which residual fragments were detected by high magnification fluoroscopy after endoscopic inspection were rendered stone free. Postoperative CT confirmed a stone free state in 15 of 21 renal units thought to be endoscopically and radiographically stone free, and demonstrated < 4 mm residual fragments in the remaining 6.

This technique results in a 3-4 fold higher stone free rate after initial PCNL for large stones than has been reported in series in which standard fluoroscopy and flexible nephroscopy were utilized in conjunction with rigid nephroscopic debulking at the time of initial PCNL. Pearle and colleagues achieved a 20% or 32% stone free rate depending on whether CT or flexible nephroscopy was used as the gold standard for residual

fragments (2). Consequently, the need for reoperation is substantially reduced by the use of this aggressive radiographic and endoscopic regimen.

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Appropriate Cutoff for Treatment of Distal Ureteral Stones by Single Session In Situ Extracorporeal Shock Wave Lithotripsy

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Objectives: To determine an appropriate cutoff for treatment by single session in situ extracorporeal shock wave lithotripsy for a prevesical stone by determining the differences in the efficiency quotient (EQ).
Methods: This was a review of a series of patients who underwent shock wave lithotripsy for a primary, single, prevesical stone from January 1995 to June 2003. All 153 patients were treated using a Dornier MPL 9000 lithotripter in the prone position under intravenous sedation. The stone size was measured in two dimensions (parallel and perpendicular to the long axis of the ureter). The EQ was calculated using a standard formula.
Results: Of the 153 patients, 141 (92.2%) were stone free within a mean period of 12.2 +/- 12.2 days (EQ 68.8). No significant complications occurred, and none of the patients required admission. The treatment failed in 10 patients (6.5%), who subsequently required an ancillary procedure (ureteroscopy). Statistically, we found 7 mm to be an appropriate cutoff for treatment using in situ shock wave lithotripsy. The EQ for stones greater than 7 mm and those 7 mm or smaller was 58 and 81, with a stone-free period of 13.6 +/- 12.9 and 10.9 +/- 11.6 days, respectively.
Conclusions: Ultrasound-guided shock wave lithotripsy is an efficient and safe modality for the treatment of prevesical stones 7 mm or less. Using an echo-guided lithotripter, the treatment was a radiation-free, day care procedure performed under intravenous sedation. Only 11% of our patients required repeat treatment.

Editorial Comment

The optimal treatment of distal ureteral stones remains one of the more controversial topics in endourology. Both procedures are associated with high success rates and low complication rates. In situ SWL with the Dornier HM3 has been shown in a number of series to be associated with remarkably high stone free rates and low retreatment rates, even for stones up to 15 mm in size (1,2). Although high stone free rates have also been achieved with third generation lithotripters, retreatment rates, particularly for larger stones, have been higher than in HM3 series. Akhtar & Ather compared stone free and retreatment rates for in situ SWL of distal ureteral stones ≤ 7 mm or > 7 mm in size in a retrospective analysis of 153 patients treated with a MPL9000 lithotripter.

Although stone free rates were quite high in both size categories (95% versus 89%, respectively), retreatment rates were significantly higher in the larger stone group (45% versus 11%, respectively), translating into an efficiency quotient of 81 for treatment of stones ≤ 7 mm and 58 for stones > 7mm. Although this size cutoff was chosen randomly, it provides a reasonable algorithm to guide treatment of distal ureteral calculi when considering treatment with a third generation lithotripter. For stones ≤ 7 mm in size, ureteroscopy or in situ SWL are certainly reasonable treatment options. However, for stones > 7 mm in size, the high success rate and low retreatment rate of ureteroscopy makes this treatment option more attractive then SWL if an HM3 is not available.

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ENDOUROLOGY & LAPAROSCOPY

Current Concepts in Achieving Renal Hypothermia during Laparoscopic Partial Nephrectomy

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Objectives: To review current methods of renal hypothermia during laparoscopic partial nephrectomy.
Methods: Review paper describing different methods of renal hypothermia during laparoscopic partial nephrectomy, including laparoscopic ice-slush, endoscopic retrograde cold saline infusion, transarterial renal hypothermia, laparoscopic cooling sheath and ancillary techniques for ischemic renoprotection.
Conclusion: Renal hypothermia is occasionally required during current laparoscopic renal procedures. Of the various techniques available to achieve laparoscopic renal hypothermia, the surface hypothermia achieved with ice-slush, although cumbersome, duplicates open surgical time-tested principles and is currently the preferred option. Better delivery systems for hypothermic solutions are needed for optimum uniform cooling of the kidney.

Editorial Comment

This paper reviews the different methods of renal hypothermia during laparoscopic partial nephrectomy and succinctly discusses the renal physiology of hypothermia and protective mechanisms from ischemia-reperfusion