

## STONE DISEASE

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### **A prospective randomized comparison of type of nephrostomy drainage following percutaneous nephrostolithotomy: large bore versus small bore versus tubeless**

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**Purpose:** We compared postoperative outcomes among tubeless, conventional large bore nephrostomy drainage and small bore nephrostomy drainage following percutaneous nephrostolithotomy (PCNL) in a prospective randomized fashion.

**Materials and Methods:** Between January and June 2001, 30 patients undergoing PCNL were randomized to receive conventional large bore (20Fr) nephrostomy drainage (group 1, 10 patients), small bore (9Fr) nephrostomy drainage (group 2, 10 patients) or no nephrostomy drainage (group 3, 10 patients). Inclusion criteria included a single subcostal tract, uncomplicated procedure, normal preoperative renal function and complete stone clearance. Factors compared among the 3 groups were postoperative analgesia requirement, urinary extravasation, duration of hematuria, duration of urinary leak, decrease in hematocrit and hospital stay.

**Results:** The postoperative analgesic requirement was significantly higher in group 1 (217 mg) compared to groups 2 (140 mg,  $p < 0.05$ ) and 3 (87.5 mg,  $p < 0.0001$ ). Patients in group 3 had a significantly shorter duration (4.8 hours) of urinary leak through the percutaneous renal tract compared to patients in groups 1 (21.4 hours,  $p < 0.05$ ) and 2 (13.2 hours,  $p < 0.05$ ). Hospital stay was significantly shorter in group 3 (3.4 days) compared to groups 1 (4.4 days,  $p < 0.05$ ) and 2 (4.3 days,  $p < 0.05$ ). All 3 groups were similar in terms of operative time, duration of hematuria and decrease in hematocrit. Postoperative ultrasound did not reveal significant urinary extravasation in any case.

**Conclusions:** Tubeless PCNL is associated with the least postoperative pain, urinary leakage and hospital stay. Small bore nephrostomy drainage may be a reasonable option in patients in whom the incidence of stent dysuria is likely to be higher.

### **Editorial Comment**

In an effort to reduce the morbidity of percutaneous nephrostolithotomy (PCNL), making it more competitive with ureteroscopy and SWL for the management of renal calculi, some practitioners have reduced the size of the post-PCNL nephrostomy tube or eliminated the tube altogether. Although tubeless PCNL has clear demonstrable advantages over traditional large bore, nephrostomy tubes with regard to hospital stay and pain medication requirements, the advantages of a small caliber nephrostomy tube have been less clear-cut in published trials. However, the use of a small caliber tube has the advantage of allowing reentry into the collecting system if needed, but potentially incurs less discomfort postoperatively.

Desai and colleagues performed a prospective, randomized trial comparing the three approaches to post-PCNL tube management in 30 patients undergoing uncomplicated PCNL requiring a single, subcostal percutaneous access. Although the three groups were comparable with regard to postoperative complications, the tubeless group required significantly less pain medication post-PCNL, the nephrostomy tract sealed quickest and hospital stay was shortest. However, the small caliber tube group had less pain and shorter duration of urine leakage compared with the than the large caliber group.

Although the study groups were small and the study perhaps underpowered to detect small differences between the groups, there clearly appeared to be an advantage to no nephrostomy tube or a small nephrostomy tube. The authors offered an algorithm for tube selection that provides a reasonable approach for tube selection

post-operatively. In cases in which a stone free status is fairly certain (for example, simple “pluck-and-run” procedures) after a relatively simple, bloodless procedure, the tubeless approach is a good option. For cases in which the stone is complex, the stone burden large or the procedure complicated or bloody, a large bore nephrostomy tube is advisable. For other procedures that are uncomplicated and not associated with a large blood loss (the majority of procedures), a small caliber nephrostomy tube is likely to reduce patient discomfort but does not preclude second look flexible nephroscopy in the event residual stones are detected.

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### **The effect of treatment strategy on stone comminution efficiency in shock wave lithotripsy**

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**Purpose:** The comminution of kidney stones in shock wave lithotripsy (SWL) is a dose dependent process caused primarily by the combination of 2 fundamental mechanisms, namely stress waves and cavitation. The effect of treatment strategy with emphasis on enhancing the effect of stress waves or cavitation on stone comminution in SWL was investigated. Because vascular injury in SWL is also dose dependent, optimization of the treatment strategy may produce improved stone comminution with decreased tissue injury in SWL.

**Materials and Methods:** Using an in vitro experiment system that mimics stone fragmentation in the renal pelvis spherical BegoStone (Bego USA, Smithfield, Rhode Island) phantoms (diameter 10 mm) were exposed to 1,500 shocks at a pulse repetition rate of 1 Hz in an unmodified HM-3 lithotripter (Dornier Medical Systems, Kennesaw, Georgia). The 3 treatment strategies used were increasing output voltage from 18 to 20 and then to 22 kV every 500 shocks with emphasis on enhancing the effect of cavitation on medium fragments (2 to 4 mm) at the final treatment stage, decreasing output voltage from 22 to 20 and then to 18 kV every 500 shocks with emphasis on enhancing the effect of stress waves on large fragments (greater than 4 mm) at the initial treatment stage and maintaining a constant output voltage at 20 kV, as typically used in SWL procedures. Following shock wave exposure the size distribution of fragments was determined by the sequential sieving method. In addition, pressure waveforms at lithotripter focus (F2) produced at different output settings were measured using a fiber optic probe hydrophone.

**Results:** The rate of stone comminution in SWL varied significantly in a dose dependent manner depending on the treatment strategies used. Specifically the comminution efficiencies produced by the 3 strategies after the initial 500 shocks were 30.7%, 59% and 41.9%, respectively. After 1,000 shocks the corresponding comminution efficiencies became similar (60.2%, 68.1% and 66.4%, respectively) with no statistically significant differences ( $p = 0.08$ ). After 1,500 shocks, the final comminution efficiency produced by the first strategy was 88.7%, which was better than the corresponding values of 81.2% and 83.5%, respectively, for the other 2 strategies. The difference between the final comminution efficiency of the first and second strategies was statistically significant ( $p = 0.005$ ).

**Conclusions:** Progressive increase in lithotripter output voltage can produce the best overall stone comminution in vitro.

### Editorial Comment

Surprisingly little progress has occurred in lithotripter technology over the last 2 decades, and even less has translated into improved clinical success. However, recent efforts have been underway to not only improve technological aspects of lithotripters but to optimize treatment parameters to improve the efficiency and success of stone fragmentation.

Zhou and colleagues compared the efficiency of in vitro fragmentation of stone phantoms with a Dornier HM3 lithotripter using 3 different strategies for administering output voltage: stepwise increase in voltage, stepwise decrease in voltage and constant voltage, with all strategies delivering approximately the same overall acoustic dose. Although initially, fragmentation efficiency correlated with shock wave dosage, ultimately comminution efficiency was greatest when output voltage was increased in a stepwise fashion compared with a strategy of decreasing or constant voltage. These findings are consistent with 2 synergistic processes of stone fragmentation, one based on stress waves that are thought to be pivotal in initial stone fragmentation, and one based on cavitation that is responsible for completion of fragmentation to small, passable pieces.

These findings have yet to be validated in an animal model or in the clinical realm; however, they suggest that a strategy of a stepwise incremental increase in shock wave voltage output may provide for more effective stone fragmentation while potentially reducing tissue injury. This is encouraging news; perhaps by slowing the rate of delivery of shock waves as suggested by a recent randomized trial and incrementally increasing the output voltage during SWL, stone free rates may be improved without further risking tissue injury and without the need for new lithotripter technology.

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## ENDOUROLOGY & LAPAROSCOPY

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### **Clinical utility of dual active deflection flexible ureteroscope during upper tract ureteropyeloscopy**

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**Objectives:** To evaluate the clinical utility of a dual active deflection ACMI DUR-8 Elite ureteroscope in a referral endourology practice.

**Methods:** Retrospective chart review was performed on 54 consecutive patients who underwent flexible ureteroscopy by a single surgeon (S.Y.N.) from February to July 2003. Cases in which standard flexible ureteroscopes alone could complete the procedure, cases in which standard flexible ureteroscopy could not complete the procedure and the DUR-8 Elite ureteroscope did, and cases in which both ureteroscopes failed to complete the procedure were analyzed.

**Results:** A total of 54 procedures were performed on 37 patients. Three cases were not analyzed because they were distal ureter procedures. Of the remaining 51 procedures, 6 were removed from analysis because they were second-look procedures. When classified by diagnosis, 27 patients had stones (79.4%), 5 had cancer