

What is the best treatment modality for children with renal stones of 1–2 cm diameter?

Original article Shokeir AA *et al.* (2006) Treatment of renal stones in children: a comparison between percutaneous nephrolithotomy and shock wave lithotripsy. *J Urol* 176: 706–710

SYNOPSIS

KEYWORDS pediatric percutaneous nephrolithotomy, pediatric shock wave lithotripsy, pediatric stones, urolithiasis

BACKGROUND

Although shock wave lithotripsy (SWL) is the treatment of choice for children with stones <1 cm and percutaneous nephrolithotomy (PCNL) is favored for stones >2 cm, no consensus exists regarding the optimal treatment for stones between 1 cm and 2 cm.

OBJECTIVE

To compare PCNL with SWL for treating pediatric patients with stones of 1–2 cm in diameter.

DESIGN AND INTERVENTION

This retrospective study included patients <15 years old treated for urolithiasis between 1995 and 2004. Eligible patients had stones of 1–2 cm diameter, without distal obstruction. All patients were preoperatively evaluated using excretory urography and, when available, noncontrast spiral CT. In patients with calculous anuria or impaired renal function, abdominal ultrasound, plain abdominal X-ray, and antegrade pyelography were used. Cultured urine specimens were also assessed. PCNL was performed under general anesthetic using fluoroscopic guidance; ultrasound guidance was used in patients with calculous anuria. In younger patients, tract dilatation was restricted to 22 Fr (7.3 mm) and stones were fragmented using ultrasonic lithotripsy. In older patients, maximum tract dilatation was 30 Fr (10 mm), allowing adult stone extraction instruments to be used. SWL using the electromagnetic Lithotripter S[®] (Dornier Medical Systems, Inc., Marietta, Georgia) was performed under general anesthetic in younger patients and with IV sedation in older patients. SWL power was increased

in a stepwise fashion up to an intensity of 65% maximum power. The total number of shocks was restricted to 2,000. Stones were localized using fluoroscopy or ultrasound. Patients were repeatedly assessed for fragmentation, obstruction, and need for re-treatment until either complete stone clearance or treatment failure after three sessions. Stone-free rates for each treatment modality were calculated, and overall stone-free rates were measured at 3 months, following secondary procedures. Follow-up assessments were performed at 3-month intervals for the first year, then at 6-month intervals thereafter.

OUTCOME MEASURES

The main endpoints were stone-free rate, re-treatment rate, necessity of auxiliary procedures, complications, and incidence of stone recurrence.

RESULTS

Of the 166 patients with renal stones of 1–2 cm, 75 were treated with PCNL (82 kidneys), and 91 with SWL (93 kidneys), according to the physician's preference. The stone-free rate of PCNL monotherapy was significantly better than that of SWL monotherapy (95.0% vs 84.9%; $P=0.049$), as was the overall stone-free rate at 3 months (100% vs 92.5%; $P=0.031$). Likewise, the re-treatment rate was significantly lower in the PCNL group compared with the SWL group (8.5% vs 55%; $P<0.001$). Of the kidneys that failed to respond to SWL, 7.5% required subsequent PCNL, and small residual fragments required further medical management and follow-up in 7.5%. There were no significant differences in complication rates or stone recurrence rates between the two treatment groups after a mean follow-up of 31 ± 10 months.

CONCLUSION

While PCNL and SWL seem to be equally safe, PCNL is a more effective treatment modality for stones between 1 cm and 2 cm in pediatric patients.

COMMENTARY

Mahesh R Desai

Pediatric urolithiasis is uncommon in the West but is endemic in developing countries. In pediatric patients, urolithiasis is associated with anatomical and metabolic abnormalities complicated by urinary tract infection. High recurrence rates make complete calculus clearance an integral part of any management strategy, and it is important to determine the effect of each treatment modality on the growth of the kidney. Many studies have shown SWL to be safe and not associated with any long-term functional or parenchymal abnormalities. It can even be given safely in kidneys that have been previously damaged or operated on.¹ The availability and development of small caliber nephroscopes with newer energy sources, such as ultrasound and laser, in recent years has made PCNL feasible and safe—even in children less than 5 years old.^{2,3} An important consideration when deciding on the correct modality for treating stones between 1 cm and 2 cm in diameter is a proper assessment of the volume of the stone. Predicting fragment clearance after SWL on the basis of radiographic criteria has a potential clinical utility. Wang and colleagues found that a large maximal stone diameter (>12 mm), a high stone burden (>700 mm³), a high maximal stone density (>900 HU) on CT, and stone shape (non-round/oval) were significant predictors of SWL failure.^{4,5}

In this well designed study, Shokier *et al.* compare the outcomes of PCNL and SWL in pediatric patients with stones between 1 cm and 2 cm in diameter. Owing to several shortcomings, I feel the results of this study should be interpreted with caution. Firstly, the study has a retrospective design, hence the results cannot necessarily be extrapolated to a pediatric population, as such. Secondly, tract dilatation in PCNL should not depend only on age, as

calyceal anatomy, infundibular size, and calculus location should also determine the size of the largest dilator to be used. Thirdly, the number of shocks and the amount of power used for SWL should have been stratified by the location, composition, and bulk of the stones. Fourthly, follow-up in young patients is crucial, as there are concerns regarding the fate of residual stones after PCNL and SWL. Additionally, higher stone-free rates are reported with PCNL on long-term follow-up. There are also a few concerns regarding the effect of PCNL and SWL on the growing kidney, which could have been addressed with adequate follow-up. Finally, although the authors conclude that PCNL and SWL are equally safe and efficacious, it is important to note that SWL has higher re-treatment rates and requires more auxiliary procedures, thus defeating the purpose of giving the patient complete stone clearance with minimal morbidity and a single hospital stay.

In our experience, PCNL is a safe and effective therapy for achieving complete calculus clearance. Nevertheless, when choosing the treatment modality for stones <2 cm in diameter, a 3-D volume-rendered CT scan would be the investigation of choice.

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Competing interests

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PRACTICE POINT

Percutaneous nephrolithotomy and shock wave lithotripsy are safe and efficacious in managing pediatric stones of 1–2 cm; however, the choice should be tailored to the stone size and composition, using three-dimensional computed tomography