

Treating lower pole renal stones: in defence of shock wave lithotripsy

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I have been invited to participate in this written debate, with Reem Al-Bareeq and John Denstedt, on the preferred treatment option for lower pole renal stones.

We have been instructed to exclude observation or flexible ureteroscopy and holmium laser lithotripsy as options, and concentrate on shock wave lithotripsy (SWL) and percutaneous nephrolithotomy (PCNL). Although this may not reflect my true philosophy, it is my charge to convince you that SWL is the most appropriate first-line treatment approach to radiopaque lower pole renal calculi.

Stones larger than 20–25 mm in diameter should be treated with PCNL, wherever they are in the kidney, including the lower pole.

Small stones 10 mm or less in diameter, excluding both infection stones, where complete clearance is essential, and cystine stones, should surely be treated with SWL, as the more invasive option of PCNL would be unreasonable in this group. We are therefore debating the most reasonable option, after a full informed discussion with the patient, for the treatment of uninfected, radiopaque lower pole stones between 10 and 20 mm in diameter.

At the onset of discussions the patient, quite reasonably, might expect the treatment to remove the stone and relieve him or her of symptoms. PCNL would seem the ideal procedure to achieve this; however, the patient must understand that this invasive, inpatient procedure under general anesthesia with endotracheal intubation, may have a stone-free rate far below 100% and may not relieve him or her of symptoms. Published stone-free rates for

PCNL are frequently in the region of 78%¹ and, in practice, may be lower. One must remember that published series are usually from tertiary referral units with a large case volume, and countless reports have confirmed that success rates, with a wide spectrum of surgical procedures, closely match case volumes.

PCNL can be expected to have a complication rate of up to 30%¹ and a blood transfusion rate of up to 16%.² Complications such as intercostal artery or nerve injuries, and hydro- or hemothorax simply do not occur with SWL.

When discussing PCNL as an option for a moderate-sized stone (10–20 mm in diameter) the patient must understand that not only is there a chance that fragments may remain, but that symptoms may not be improved. In a prospective study by Staios and coworkers³ fewer than half (40%) of the patients undergoing PCNL for secluded lower pole or calyceal diverticular stones benefited subjectively from the procedure in terms of quality of life.

The fragmentation rate with SWL for stones in the lower pole is similar to that for stones in other locations. The morbidity and convalescence time for SWL is undoubtedly less than that for PCNL, making SWL the preferred treatment for most renal stones — so why not lower pole stones? The lower pole anatomy, including the infundibulopelvic angle, and the width and length of the lower pole infundibulum are thought to have an effect on the clearance of fragments following SWL. Published results have, however, been conflicting, and there are no accepted treatment guidelines. In a study by Sumino and colleagues,⁴ stones in the

The purpose of the Point / Counterpoint section is to encourage vigorous and informed discussion on controversial issues in urology through the presentation of diverse opinions. We aim for a dispassionate discussion of controversies, recognizing that strong passions may exist in support of some positions.

lower pole treated with SWL, where the anatomy was favourable, had an 85% stone-free rate.

Therefore, it comes down to a question of how concerned should we be if, after a noninvasive procedure such as SWL, possibly with a pretreatment stent for the larger (> 15 mm) stones, one is left with some asymptomatic lower pole fragments. Are there ways to improve the fragmentation and clearance of lower pole fragments? And, finally, if residual fragments do enlarge over the years or become symptomatic, repeat SWL, a noninvasive half-hour treatment, is always an option. On the other hand, in a prospective long-term follow-up of patients with asymptomatic lower pole stones by Inci and coworkers,⁵ 24 patients were followed up for up to 6 years. Only 9 patients had any progression in the size of their stones and only 2 patients required treatment.

Can modification to the treatment strategy result in improved fragmentation and success? In 2005 a study from my unit,⁶ which was later confirmed by other investigators, demonstrated that slowing the shock wave rate from 120 down to 60 shocks/min resulted in higher fragmentation and stone-free rates. Two-hundred and twenty patients were randomized to receive either a rate of 60 or 120 shocks/min. Lower calyceal stones represented 110 stones (50%) treated in the trial. With stones larger than 100 mm² the success rate was 71% for 60 shocks/min versus 32%, and the stone-free rate was 60% versus 28% ($p = 0.018$).

Voltage stepping, which involves initiating treatment at a low kV, and then more gradually increasing the power in a stepwise manner, has been demonstrated to improve fragmentation of model stones in vitro, and my unit is now 1 year into this clinical study.⁷

Is it possible to improve clearance of fragments from the lower pole? In 2000⁸ colleagues and I were able to demonstrate, on plain abdominal radiography, that stone fragments can be relocated out of the lower pole with a combination of mechanical percussion over the flank and inversion. In 2001⁹ coauthors and I performed a prospective randomized controlled trial to assess the effectiveness of mechanical percussion, using a percussor designed for use during chest physiotherapy, inversion and diuresis for residual lower pole stones after SWL. Sixty-nine patients with residual lower calyceal fragments, 4 mm or less, were randomized to receive mechanical percussion,

inversion and diuresis, or observation for 1 month. The treatment group had a substantially higher stone-free rate than the observation group (40% v. 3%) and those patients not rendered stone-free by this treatment method had a 50% reduction in the stone burden.

Several reports have demonstrated improved stone clearance and a shorter time to becoming stone-free following SWL when patients are treated with an α blocking agent. A randomized study¹⁰ with tamsulosin versus placebo involving 130 patients treated with SWL for renal stones demonstrated a statistically significant improvement in stone-free rates for the tamsulosin treated group ($p = 0.04$).

Soygür and coworkers¹¹ studied the effect of oral potassium citrate therapy on both stone clearance and recurrent stones after SWL for lower pole stones in a randomized controlled trial. Their initial stone-free rate, by plain renal tomography at 4 weeks, was 56%. Patients with residual fragments were randomized to receive either 60 mEq of potassium citrate daily or no treatment; 46% of the treated group cleared their fragments over the next 12 months, whereas only 12% of the control group became stone-free. None of the patients taking potassium citrate showed any increase in the size of residual fragments, whereas, without treatment, 62% of patients with residual fragments at 4 weeks showed stone growth by 12 months.

Complications following SWL are rare, and the Mayo Clinic paper¹² from 2006 suggesting that SWL caused diabetes and hypertension has been strongly criticized. Two studies since then have failed to demonstrate any association between SWL and these conditions.^{13,14}

So, if you had a 15-mm lower pole stone, what treatment would you choose? Outpatient SWL under sedation, at a rate of 60 shocks/min, with a prescription for tamsulosin and potassium citrate, followed by postural drainage, with the possibility that you may be left with some small lower pole fragments? Or would you have a PCNL? This, still with a chance that you may be left with the stone, or fragments, and complications from the surgery?

If you chose SWL you would undoubtedly be in the majority. In a paper by Kuo and colleagues,¹⁵ "Incorporation of patient preferences in the treatment of upper urinary tract calculi: a decision analytical view," when patients were asked for their preference, they chose SWL over PCNL. Patients

who had previously had a PCNL were even more likely to choose SWL the next time.

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The positions provided in the Point/Counterpoint series are presented as general information and do not necessarily reflect the personal opinions of the authors.

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