

MANAGEMENT OF SMALL SIZE RENAL STONES

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ABSTRACT

AIMS AND OBJECTIVES

To find out the approach and management of small size renal stones.

MATERIAL AND METHODS

A search was performed in 2015, on various guidelines and articles, using the terms renal calculi, 1-2cm, <2cm, PCNL, SWL. Articles were reviewed after determining their relevance for the management of small-sized stones. Cross-references from the articles were also viewed. We reviewed the available literature for the management of lower polar and non-lower polar stones separately because of the reported poor clearance and difficult access for stones in the lower pole.

RESULT AND CONCLUSIONS

Small sized stones less than 5mm should be managed conservatively as they have greater chance to pass out by medical management. Calculi more than 5mm but are less than 1 cm, SWL is the treatment of choice. Stones between 1 to 2cm should be managed according to patient's preference and his monetary conditions. It also depends on position and type of stone. For stone in upper and middle calyx, SWL should be preferred and for stones in lower calyx, PCNL should be the modality of choice. For stone more than 2cm, PNCL should be preferred or a more invasive method can be opted.

KEYWORDS

Kidney Stones, ESWL (Extracorporeal Shockwave Lithotripsy), percutaneous nephrolithotomy.

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INTRODUCTION: Kidney stones are one of the most common disorders of the urinary tract. Each year in the United States people make more than a million visits to health care providers and more than 300,000 people go to emergency rooms for kidney stone problems.¹ The most important thing in management of renal stone is maximal clearance of stone from urinary tract with minimal morbidity to the patients.

Keystone for the management of renal stone is its size and its position. Other characteristics of stones may also can affect the modality of treatment like type and composition of stone, symptoms of patient, general condition of patient, pregnancy, obesity, previous history of stones, previous treatment taken and other associated co-morbidities.

Small size renal stone can be managed conservatively or surgically. The ureter is the smallest diameter structure of the urinary tract and is the area most prone to obstruction by a stone. The majority of stones <5mm in diameter are likely to pass spontaneously and the likelihood of spontaneous stone passage decreases as stone size increases. Therefore stones of <5mm in size is usually treated conservatively with dietary modification and oral

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chemolysis unless there are urgent indication for any surgical intervention (Table 1).²

Table 1: Indications for urgent intervention with urinary stones

- Obstructed upper tract with infection.
- Impending renal deterioration.
- Pain refractory to analgesics.
- Intractable nausea/vomiting.
- Patient preference.

Dietary Therapies: According to the recent guidelines of American Urological Association (AUA).³ The following recommendations are important for dietary modification in management of renal stones.

1. Adequate intake of fluid so as to achieve at least 2.5 lts of urine per day.
2. Restriction of salt intake to 1-1.5gms per day in case of calcium stone with high urinary calcium.
3. Increase intake of fruits and vegetables and limit non-dairy animal proteins.

Oral chemolysis and other conservative measures: Stones composed of uric acid, but not sodium or ammonium urate, can be dissolved by oral chemolysis. Prior stone analysis may provide information on stone composition. Urinary pH measurement and X-ray characteristics may provide information on the type of stone.

Oral chemolitholysis is based on alkalisation of urine by application of alkaline citrate or sodium bicarbonate.^{4,5} The pH should be adjusted to 7.0-7.2. Dipstick monitoring of urine pH by the patient is required three times a day (at regular intervals). Morning urine must be included.

Thiazide diuretics should be given to the patients with high urinary calcium and recurrent stones and Allopurinol can be given to the patient with calcium oxalate stone with hyperuricosuria. Alpha blockers and calcium channel blocker along with NSAIDs helps in spontaneous expulsion of small sized stones. Corticosteroids (prednisolone) may be added, but long term use is not recommended.

Surgical Approach: There are various minimally invasive modalities, which can be used in treatment of renal stones such as extracorporeal Shock Wave Lithotripsy (SWL), Percutaneous Nephrolithotomy (PCNL) and retrograde uretero-renaloscopy. Best modality to be used is a matter of debate, but preferred modality for small sized stone <2cm is SWL and for >2cm is PCNL. Also the position of stone matters like stone in lower calyx has lower chances of removal by SWL than in upper calyx.

Extracorporeal Shock Wave Lithotripsy (SWL): Extracorporeal Shock Wave Lithotripsy (ESWL) uses shock waves to break a kidney stone into small pieces that can more easily travel through the urinary tract and pass from the body.

SWL is a traditionally favoured approach for small-to-moderate-sized intrarenal calculi. For small stones with a maximum diameter of 20mm, SWL had been established as the standard procedure as it is non-invasive, has a low rate of complications and does not require anesthesia. Success depends on the efficacy of the lithotripter and the following factors:

- Size, location (ureteral, pelvic or calyceal), and composition (hardness) of the stones.
- Patient's habitus.
- Performance of SWL.

There are several contraindications to the use of extracorporeal SWL including:

- Pregnancy due to the potential effects on the fetus;
- Bleeding diatheses, which should be compensated for at least 24h before and 48h after treatment;
- Uncontrolled UTIs;
- Severe skeletal malformations and severe obesity, which prevent targeting of the stone;
- Arterial aneurysm in the vicinity of the stone;
- Anatomical obstruction distal to the stone.

Percutaneous Nephrolithotomy (PCNL): Percutaneous Nephrolithotomy (PCNL) is the preferred technique for treating large stones (over 2cm in diameter) within the kidney. It involves keyhole surgery performed through a 1cm incision in the skin overlying the kidney.

The advantages are it allows large or complicated stones to be treated in a minimally invasive fashion, where in the

past this would have necessitated a large skin incision and the hospital stay is 3-4 days and out of hospital recovery time is significantly shorter than traditional open surgery.

But as compared to SWL it has more morbidity, greater hospital stay involves anesthesia and anxiety of patient for an operative procedure. PCNL is costlier than SWL, but SWL may require multiple sittings which overcome its expense.

For small sized stone, there are varied preferences among various authors. Deem et al.⁶ compared the outcome of SWL and PCNL in patients with 1-2cm upper and middle-pole renal calculi.⁷ The Stone-Free Rates (SFR) at one week was 95% for PCNL and 17% for SWL, where SFR at three months was 85% for PCNL and 33% for SWL groups, respectively. Patients who had undergone PCNL reported a better quality of life than their counterparts. It is concluded in the study that PCNL should be offered as a treatment option to all patients with moderate-sized renal stones in a center with an experienced urologist and if SWL is contraindicated.

To reduce the invasiveness of conventional PCNL, the use of miniaturized instruments [mini percutaneous (mini perc)] has been evaluated.^{7,8,9} Various authors have found the rate of success in the range of 89-96% with this technique. Mishra et al.⁹ prospectively compared the outcome of mini perc and standard PCNL for the treatment of 1 to 2cm-sized renal stones and found an SFR of 96 and 100%, respectively. The study showed that mini perc reduces bleeding, analgesic requirement and hospital stay. Due to low morbidity, some authors have suggested mini perc as an alternative to SWL for renal calculi of size 1-2cm in the renal pelvis and calyces.⁸ although this should be interpreted should be confirmed by further studies.

There are still many controversies among authors for stones at lower pole. The reported clearance rate of SWL for lower calyceal stone is 25-85%.¹⁰ The stone clearance decreases with increase in stone size. In a meta-analysis, Lingeman et al.¹¹ found SFR of 74% for stones >1cm and 56% for 1-2cm stones after SWL. Kupeli et al.¹² Reported an overall SFR of 53% with SWL for inferior calyceal stone, 62% for stones of >1cm and 48% for 1-2cm stones. May and Chandhoke.¹³ reported SFR of 75% for stones >2cm after SWL.

McDougal et al.¹⁴ noted a higher SFR for PCNL than SWL (86.2 vs. 54.3%). Netto et al.¹⁵ also found similar results, but as SWL is less morbid and does not require anesthesia or hospitalization, they considered it to be the method of choice for Lower Pole Calyceal Stone (LPCS) of >2cm. In 1994, Lingeman et al.¹¹ published a landmark meta-analysis, which included a total of 17 studies on LPCSs. They found an overall SFR of 59.2% for SWL and 90% for PCNL. For stones of 1-2cm, the SFRs were 56 and 89% for SWL and PCNL, respectively.

A landmark study by Abala et al.¹⁶ was a multicentric prospective randomized trial comparing these two approaches for LPCSs of >3cm. Randomization was done according to size >1cm, 1-2cm and 2-3cm. The SFR was significantly better for PCNL group (95 vs. 37%), but the morbidity did not differ significantly. For stones of >1 cm, 1-

2cm and 2-3cm, the success was 63, 23 and 14% for the SWL group and 100, 93 and 86% for the PCNL group, respectively. The SFR of SWL was only acceptable for stone size >1cm. This study recommended PCNL for the treatment of LPCSs of <1cm. In the Cochrane review, Srisubat et al.¹⁷ calculated the overall Efficacy Quotient (EQ) for the Abala group and found it as 28% for SWL and 86% for PCNL. The EQ for 1-2cm stones was reported to be 17 and 88% for SWL and PCNL, respectively.

CONCLUSION: To conclude, small sized stones less than 5mm should be managed conservatively as they have greater chance to pass out by medical management. Calculi more than 5mm, but are less than 1cm. SWL is the treatment of choice. Stones between 1 to 2cm should be managed according to patient's preference and his monetary conditions. It also depend on position and type of stone. For stone in upper and middle calyx, SWL should be preferred and for stones in lower calyx, PCNL should be the modality of choice. For stone more than 2cm, PNCL should be preferred or a more invasive method can be opted.

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