The optimal management of a 2cm kidney stone - PCNL

Mordechai Duvdevani, M.D.
Director of Endourology and Lithotripsy
Hadassah Ein-Kerem University Hospital
The Hebrew University
Treatment options

- Shock wave lithotripsy
- Ureterorenoscopy
- Percutaneous nephrolithotomony
- Open/laparoscopic/robotic surgery
Surgical Management of Stones

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Surgical Management of Stones: American Urological Association/Endourological Society Guideline

Dean Assimos, MD; Amy Krambeck, MD; Nicole L. Miller, MD; Manoj Monga, MD; M. Hassan Murad, MD, MPH; Caleb P. Nelson, MD, MPH; Kenneth T. Pace, MD; Vernon M. Pais Jr., MD; Margaret S. Pearl, MD, Ph.D; Glenn M. Preminger, MD; Hassan Razvi, MD; Ojas Shah, MD; Shank Matiaga, MD, MPH

Purpose
The purpose of this Guideline is to provide a clinical framework for the surgical management of patients with kidney and/or ureteral stones.

Methodology
A systematic review of the literature using the Medline In-Process & Other Non-Indexed Citations, MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Database of Abstracts of Randomised Controlled Trials, and other relevant electronic databases was performed.
ESWL?
Treatment options

• In patients with total renal stone burden > 20 mm, clinicians should not offer SWL as first-line therapy.

• *Moderate Recommendation; Evidence Level Grade C*
Treatment options

- Shock wave lithotripsy
- Ureterorenoscopy
- Percutaneous nephrolithotomy
- Open/laparoscopic/robotic surgery
Open/Laparoscopic/Robotic surgery?
Treatment options

• Open/laparoscopic/robotic surgery should not be offered as first-line therapy to most patients with stones.

• Exceptions include rare cases of anatomic abnormalities, with large or complex stones, or those requiring concomitant reconstruction.

• *Strong Recommendation; Evidence Level Grade C*
Treatment options

- Ureterorenoscopy
- Percutaneous nephrolithotomy
- Open/laparoscopic/robotic surgery

lowest

Highest
Treatment options

• Ureterorenoscopy
• Percutaneous nephrolithotomy
Volume of sphere

- Remember:
- A 2cm stone > 2 stones of 1 cm
Volume of sphere

- Remember:
- A 2cm stone > 2 stones of 1 cm

sides = 3
surface = 3^2 \times 6 = 54
volume = 3^3 = 27

sides = 2
surface = 2^2 \times 6 = 24
volume = 2^3 = 3

sides = 1
surface = 1^2 \times 6 = 6
volume = 1^3 = 1

\text{surface/ volume} = 2 \quad \text{surface/ volume} = 3 \quad \text{surface/ volume} = 6
Volume of sphere

- 20mm stone = 8000 fragments of 1mm!

- sides = 3
  - surface = $3^2 \times 6 = 54$
  - volume = $3^3 = 27$
  - surface/volume = 2

- sides = 2
  - surface = $2^2 \times 6 = 24$
  - volume = $2^3 = 3$
  - surface/volume = 3

- sides = 1
  - surface = $1^2 \times 6 = 6$
  - volume = $1^3 = 1$
  - surface/volume = 6
Treatment options

- PCNL stone-free rates are the least affected by stone size, while stone-free rates of both SWL and URS decline with increasing stone burden.

Treatment options

• PCNL should be offered as first-line therapy for patients with a total renal stone burden > 20 mm

• Compared to SWL and URS, the success rate of PCNL is also less affected by stone composition, density and location.
Treatment options

- In a RCT comparing PCNL to URS for >2cm renal pelvic stones, the stone-free rate was higher for PCNL compared to URS (94% versus 75%)!

Treatment options

• A recent prospective randomized trial comparing standard PCNL to staged flexible URS for renal pelvic stones > 2 cm showed an advantage of PCNL over URS because of the need for multiple treatments and longer treatment time for URS.

Treatment options

- However-
- A recent systematic review and meta-analysis of PCNL versus URS reported higher complication rates for PCNL (OR 1.61; 95% CI 1.11-2.35).

Treatment options

• The CROES PCNL Global Study reported a 15% overall complication rate with the majority of complications categorized as Clavien Grade I.

• Bleeding necessitating blood transfusion was the most common complication at 7%.

Treatment options

• Lower calyx
Treatment options

• Impossible to reposition?

• In situ treatment with flexible ureteroscope?
  – Less effective
  – Scope damage
## Treatment options

**stones 10-20mm (lower calyx)**

<table>
<thead>
<tr>
<th>procedure</th>
<th>10-20mm</th>
<th>&gt;20mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWL</td>
<td>58%</td>
<td>10%</td>
</tr>
<tr>
<td>URS</td>
<td>81%</td>
<td>71%</td>
</tr>
<tr>
<td>PCNL</td>
<td>87%</td>
<td>83%</td>
</tr>
</tbody>
</table>
Treatment options

• Statement 32: Clinicians should inform patients with lower pole stones >10 mm in size that PCNL has a higher stone-free rate but greater morbidity.

Strong Recommendation; Evidence Level Grade B
Retrograde IntraRenal Surgery

Is really a delicate procedure
Staghorn?
Special cases?

- Infected stones / Struvite
- A real definitive stone free state is mandatory
Anatomic abnormalities?

- Horsehoe
- UPJ stenosis
- Significant hydronephrosis
- Lower tract reconstruction
- Ureteral re-implantation?
Horseshoe?
- Number of tracts
- Inaccessible calyces
Treatment options for a 2cm stone

- Ureterorenoscopy
- Percutaneous nephrolithotomy

Lowest

Highest
PCNL is the optimal treatment for a 2 cm stone in most cases.