Advances in Ureteroscopic Stone Management

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Advanced Maneuvers
Moving Beyond Simply Accessing the Stone

• Will review subjects of popular discussion
  – Laser fragmentation approaches
  – Anti-retropulsion devices
  – Scope longevity
Laser Fragmentation

How do we break up stones?

Piece by Piece
(fragment stone and extract all of the pieces)

Dusting
(ablate stone into <1 mm remnants)
Laser Fragmentation

• The considerations are different, depending on stone location
  
  – Kidney
    • Speed is important
      – Stones are larger
      – Kidney is resilient
  
  – Ureter
    • Caution is important
      – Stones are smaller
      – Ureter is fragile
Fragmenting/Extraction in Kidney “Piece by Piece”

What are Ideal Conditions for Fragmenting?

- Small renal calculus
- Stones that don’t easily “dust”
  - CaOx monohydrate
- Ureteral access sheath in proximal ureter/kidney will simplify procedure
- Need a basket

Ideal Laser settings: 0.6 – 1.0J, 6 - 10 Hz
“Dusting” the Stone

- Keep fiber slightly off stone
- Less need for ancillary tools
  - Access sheath, baskets, extra wires
- Less ureteral injury risk
- New lasers exist to facilitate
  - 80w & 100w
- Less laser fiber burn-back
- Decreased OR time?
- Assumes spontaneous fragment passage

Ideal Laser settings: 0.2J / 40-50 Hz
What are the optimal Holmium laser settings?

**Fragmentation**
- Higher Joules, Lower Frequency
  - 0.8 J & 8 Hz = 6.4 Watts
- As pulse energy increases:
  - Retropulsion increases
  - Fragment size increases
  - Consider anti-retropulsion device for ureteral stones

**Stone Dusting**
- Lower Joules, Higher Frequency
  - 0.2 J & 50 Hz = 10 Watts
- Retropulsion is less likely to occur
- Case duration may increase
Which is better – dusting or fragmentation/extraction?

We have no idea!
Spontaneous passage cohort with worse outcomes:

- Unplanned visits 30% vs 3%*
- Rehospitalization 10% vs 0%
- Ancillary treatment 7% vs 0%
- Stone free rates 87% vs 100%
Laser ing in the Kidney

• Decide on your approach
  – Dusting vs. fragmenting / extraction

• For dusting
  – Access sheath is optional

• For fragmenting / extraction
  – Access sheath can be very helpful
Laser in the Kidney
Move the Stone to Someplace Convenient
Lasering in the Ureter

- Always use safety wire
- Start at low energy
  - 0.6 Joules / 6 Hertz
- Cautious basket use
  - Avulsion risk greatest in proximal ureter
Lasering in the Ureter

- Proximal ureter
  - Flexible scope
- Distal ureter
  - Semi-rigid scope
- Consider anti-retropulsion device
Basket Techniques

• In ureter
  – Stones are always BIGGER than they appear!
  – PATIENCE!
  • Resist temptation to grab borderline stone fragments
When the Basket is Stuck...

• You can cut Nitinol
  • With scissors – outside of the body
  • With the laser – inside the ureter
• Or you can disassemble basket
• Re-insert ureteroscope alongside basket and fragment stone
• Last resort: stent and return different day
Anti-Retropulsion Devices

• Reduces chance of proximal stone migration
• Proximal migration of stone is problematic
  – Increases procedure duration
  – May necessitate conversion to flexible scope
  – Adversely impacts stone-free outcome
  – Increases cost of procedure
3 Main Categories of Devices

- **Basket Plus Laser**
  - Escape Basket

- **Mechanical Anti-Retropulsion Device**
  - Stone Cone
  - N-Trap
  - Accordion device

- **Full Occlusion of Ureter with Gel**
  - Backstop Anti-Retropulsion Device
Escape Basket
(Boston Scientific)
Accordion Device (PercSys)
Stone Cone
(Boston Scientific)

- Deploy above the stone
- At conclusion, can use to sweep fragments out
Backstop Gel
(Boston Scientific)
Prolonging Ureteroscope Lifespan
A Day in the Life of a Ureteroscope
Damage to the Ureteroscope Occurs:

• During the:
  – Surgical procedure
  – Post-procedure turn-over
  – Transport to sterile processing
  – Cleaning / decontamination

• Due to:
  – Improper containers and protection
  – Improper sterilization techniques
Urologists can minimize damage by:

• Careful handling

• Care with laser fibers

• Minimize over-deflection
Instrument Handling
Not Good
Instrument Handling
Bad
Instrument Handling

Really Bad
Instrument Handling
The Worst
Care with Laser Fibers
TECHNIQUES TO MAXIMIZE FLEXIBLE URETEROSCOPE LONGEVITY

Durability of Working Channel in Flexible Ureteroscopes When Inserting Ureteroscopic Devices

LOCATION AND ETIOLOGY OF FLEXIBLE AND SEMIRIGID URETEROSCOPE DAMAGE

Frequency of Ureteroscope Damage Seen at a Tertiary Care Center

Independent Analysis of Olympus Flexible Ureteroscope Repairs

Improving Flexible Ureterorenoscope Durability Up to 100 Procedures

Ureteroscope Cleaning and Sterilization by the Urology Operating Room Team: The Effect on Repair Costs

Michelle Jo Semins, M.D., Susanna George, R.N., Mohamad E. Allaf, M.D., and Brian R. Matlaga, M.D., M.P.H.
What did all of these studies have in common?

Ureteroscope breakage rates

What did all of these studies have in common?

Cause of ureteroscope breakage

Insertion of 200 µm fiber with ureteroscope 60° deflected

Repositioning the Stone
Repositioning the Stone
Does fiber tip matter?
Conclusions

• Both fragmentation with basket extraction and dusting are acceptable approaches to stone management
  – Try both and see which you prefer
• Manipulating the stone within the kidney can simplify laser lithotripsy
  – Relocate stones to easy-to-access calyces
• Anti-retropulsion devices are effective
  – Great variety in technologies
  – Try them all and see which you prefer
Thank You