AUA 2026 MAY 15-18 Washington, DC

The Latest and Greatest Surgical Options for Renal Stone Disease

Khurshid Ghani
University of Michigan

Urologic Care for the APP symposium

AUA 2026 MAY 15-18 Washington, DC

Disclosures

- Grants: PCORI, Boston Scientific, Coloplast, Urology Care Foundation
- Consultant: Boston Scientific, Olympus, Karl Storz, Coloplast, Ambu, Hugemed

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Topics I will cover

- Ureteroscopy: Problems in Stone Surgery
- Advanced Lasers & Dusting lithotripsy
- Suction for Ureteroscopy
  - Flexible suction sheaths
  - Direct in scope suction
- Advances in ureteroscopes:
  - Intra-renal pressure monitoring
  - X-ray free URS with slim-line 6F ureteroscopes

Prevalence of ureteroscopy (URS)

ONE MILLION URS  **/year**

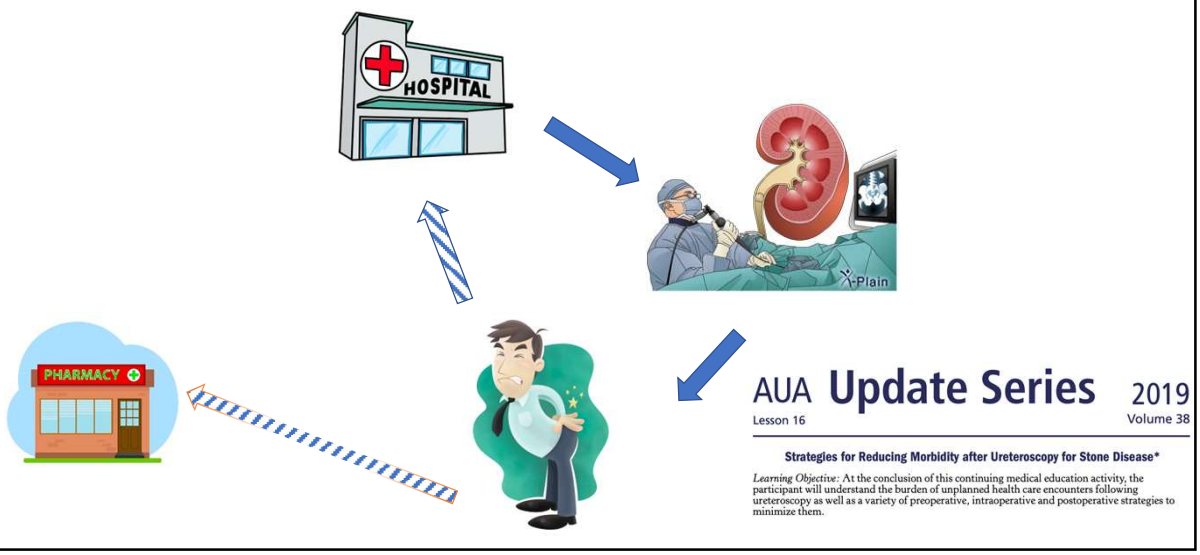
#1 **Problem** of Stone-free rate

What is the stone-free rate following flexible ureteroscopy for kidney stones? 2014

Khurshid R. Ghani and J. Stuart Wolf Nature Reviews Urology

Complete SFR (zero fragments) = 60%

#2 PROBLEM of Pain / ER visit after URS



AUA **Update Series** 2019

Lesson 16 Volume 38

Strategies for Reducing Morbidity after Ureteroscopy for Stone Disease*

Learning Objective: At the conclusion of this continuing medical education activity, the participant will understand the burden of unplanned health care encounters following ureteroscopy as well as a variety of preoperative, intraoperative and postoperative strategies to minimize them.

Problem #3: SEPSIS after ureteroscopy

Infection-related hospitalization following ureteroscopic stone treatment: results from a surgical collaborative

Adam Cole[1*], Jaya Telang[1], Tae-Kyung Kim[1], Kavya Swarna[1], Ji Qi[1], Casey Dauw[1], Brian Seifman[2], Mazen Abdelhady[3], William Roberts[1], John Hollingsworth[1] and Khurshid R. Ghani[1] on behalf of for the Michigan Urological Surgery Improvement Collaborative

- 11 centers in Michigan (MUSIC)
- 1817 ureteroscopy procedures to treat stones
- Clinical registry
- 2016-2017
- **2.5% pts hospitalized with infection-related reason within 30 days**

Cole A, et al. Infection-related hospitalization following ureteroscopic stone treatment: results from a surgical collaborative. BMC Urol. 2020;20:176.

PATIENT IMPACT: Sepsis

Mom has limbs amputated after going into septic shock following kidney stone surgery

Cindy Mullins said she was a healthy 41-year-old prior to this experience.

abc NEWS

January 12, 2024, 1:27 PM

Holmium Laser Development

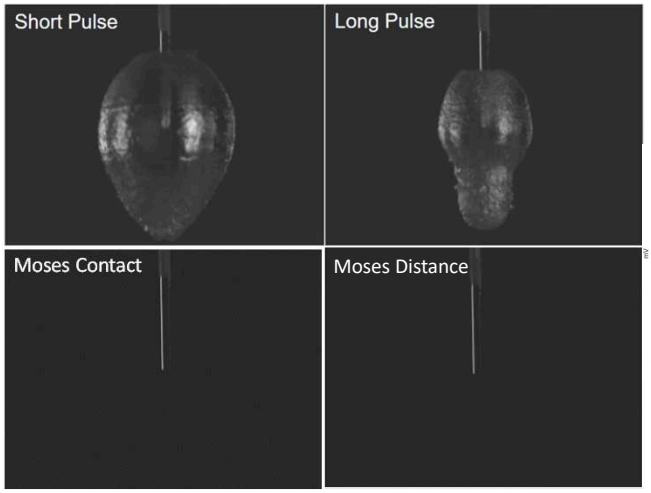
1G
1996
20 Watt
15-20Hz
Fragmentation

2G
2000s
40-100 Watt
50 Hz
Dusting

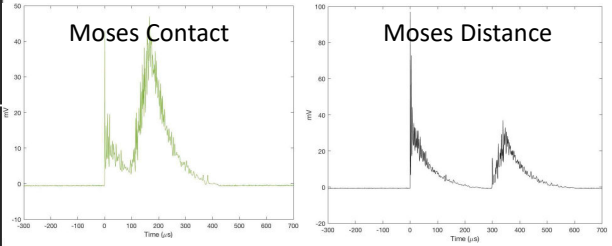
3G
2014
120 Watt
80 Hz
Long Pulse

2014

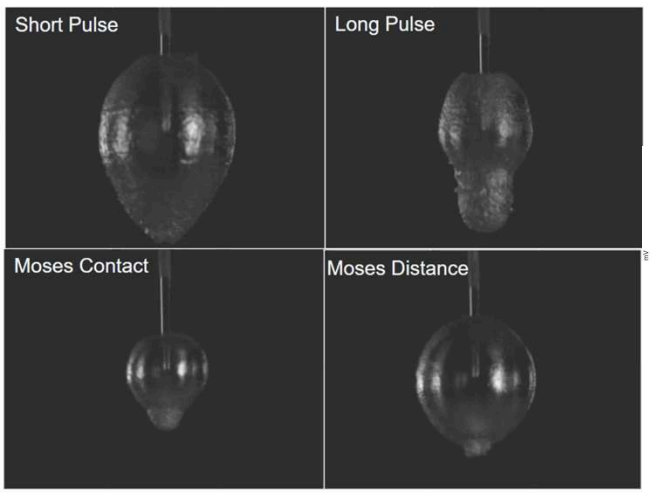
Holmium Pulse Modulation: Multi-pulse



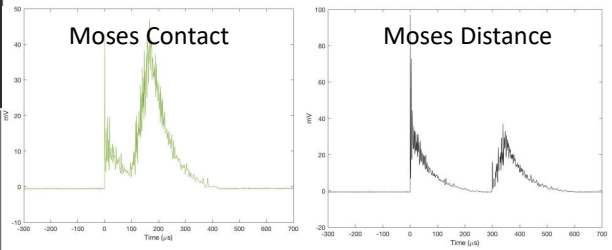
MOSES: Optical pulse profiles



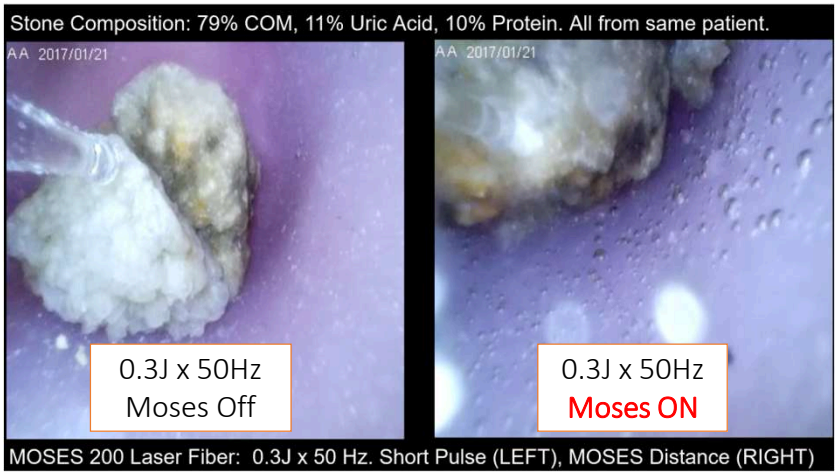
Holmium Pulse Modulation: Multi-pulse



MOSES: Optical pulse profiles



Dusting with Pulse Modulation Holmium



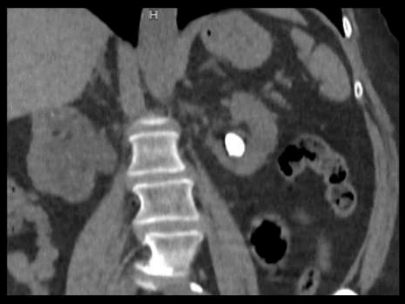
Modern day Laser Options for Lithotripsy

Thulium Fiber Laser, Thulium YAG, Holmium YAG

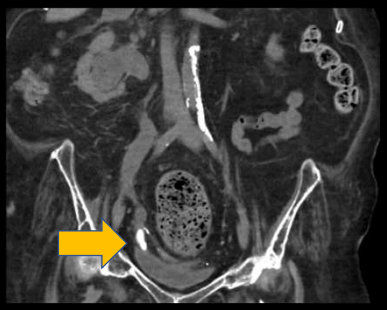
Which LASER do you choose?

Bladder stones
Cystoscopy

Kidney stone
Mini-PCNL



Ureteral stone
Ureteroscopy



Which Laser? Which Peak Power!

$$Peak\ power\ (W) = \frac{Energy\ per\ pulse\ (J)}{Pulse\ width\ (s)}$$

HOLMIUM is Bruce Lee Karate Chop

1J (Pulse modulation)

HIGH Peak Power!

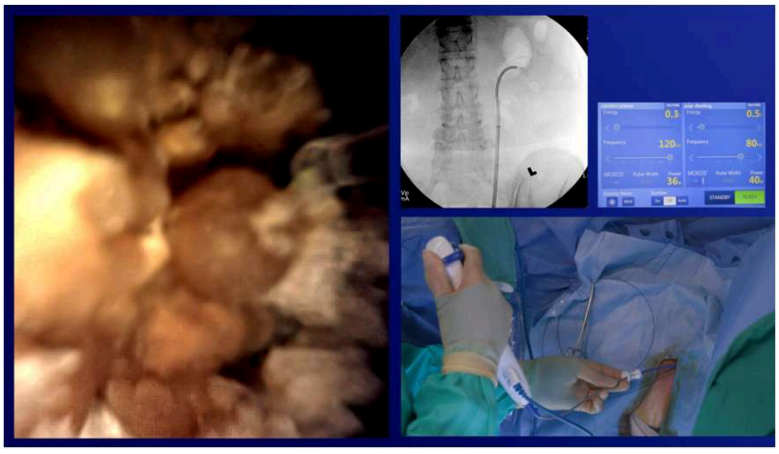
THULIUM FIBER LASER is Junior Karate Chop

1J (Short pulse)

LOW Peak Power!

Ureteral stone treatment with Thulium Fiber Laser

HOLMIUM to treat kidney stone with URS



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Pp. S-14–S-21
DOI: 10.1089/end.2021.0592

The Efficiency of Moses Technology Holmium Laser for Treating Renal Stones During Flexible Ureteroscopy: Relationship Between Stone Volume, Time, and Energy

Sami E. Majdalany, MD,[1] Brandon A. Levin, BS,[2] and Khurshid R. Ghani, MBChB, MS, FRCS[1]

Thulium Fiber Laser vs Holmium MOSES: Equivalent?

Pulse-modulated Holmium:YAG Laser vs the Thulium Fiber Laser for Renal and Ureteral Stones: A Single-center Prospective Randomized Clinical Trial

Christopher R. Haas,[1]* Margaret A. Knoedler,[1] Shuang Li,[1] Daniel R. Gralnek,[1] Sara L. Best,[1] Kristina L. Penniston,[1] and Stephen Y. Nakada[1]

[1]Department of Urology, University of Wisconsin, Madison, Wisconsin

- Renal + ureteral stones
- Stone-free rate on XR/US/CT
- OR time

Is There a Winner? Prospective Randomized Controlled Trial Comparing SuperPulse Thulium Fiber Laser vs Pulse-Modulated High-Power Holmium:YAG Laser for Retrograde Intrarenal Surgery

Kavita Gupta,[1] Anna Ricapito,[1] Christopher Connors,[1] Raymond Khargi,[1] Alan J. Yaghoubian,[1] Blair Gallante,[1] William M. Atallah,[1] and Mantu Gupta[1]

[1]Department of Urology, Icahn School of Medicine at Mount Sinai, New York, New York

- Renal stones
- Complete SFR on CT

HEAT generation during laser lithotripsy

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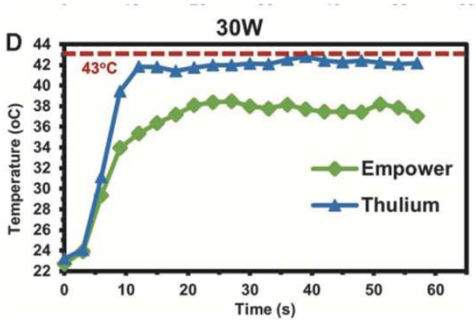
DOI: 10.1089/end.2021.0842

Open camera or QR reader and scan code to access this article and other resources online.

Does the Novel Thulium Fiber Laser Have a Higher Risk of Urothelial Thermal Injury than the Conventional Holmium Laser in an *In Vitro* Study?

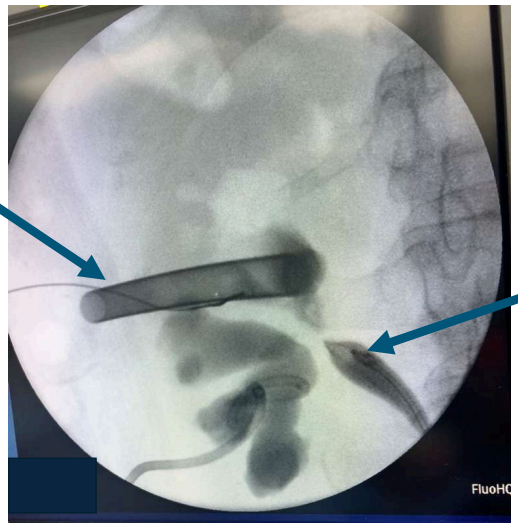
Joshua D. Belle, MD,* Ricky Chen, BS,* Nathaniel Srikureja, BS, Akin S. Amasyali, MD, Mohammed Keheila, MD, and D. Duane Baldwin, MD



Thulium fiber laser (TFL) vs Holmium YAG laser
TFL generated more heat

Why HEAT matters

Strictured renal pelvis after High Power TFL



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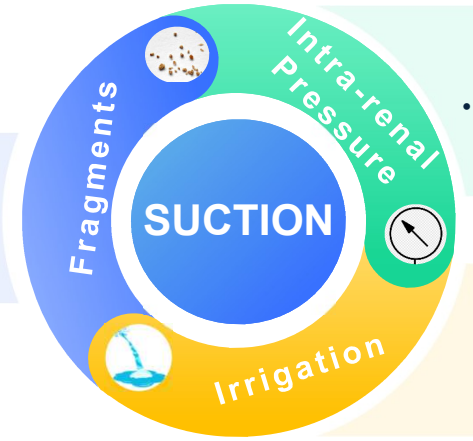
SUCTION for Ureteroscopy

- Visualization
- Improve SFR

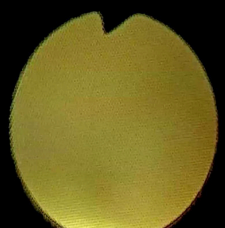


- Reduce Infection risk?
- Can increase irrigation to counter HEAT

TYPES OF SUCTION IN URS

- **Via Catheter**
  - *Ureteric catheter +T-joint*
  - *Steerable catheter*
- **Via SHEATH**
  - *Non-bendable*
  - *Bendable (Flexible Tip)*
- **Via SCOPE**
  - *Modified scope*
  - *Direct In-Scope Suction*

Flexible Access Navigable Sheath (FANS)

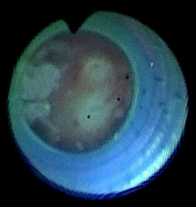


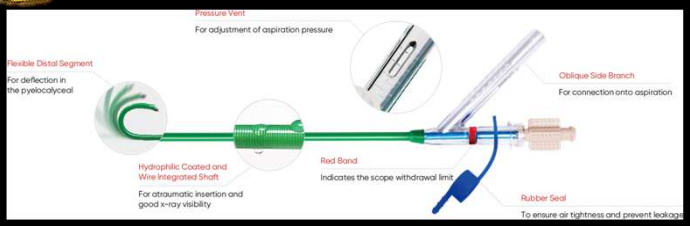
Clearpetra

10/12, 11/13, 12/14F

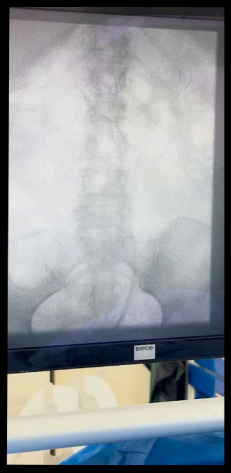
36, 40, 46, 55 cm

FDA approved April 2024





FANS technique



Patel et al. Flexible and Navigable ureteral access Sheaths (FANS): Technique and Strategies for Efficient Use. To be presented at AUA 2025

TFL

Smaller fragments for Suction sheath

available at www.sciencedirect.com
journal homepage: www.europeanurology.com/eufocus

EUROPEAN UROLOGY FOCUS

Review – Endo-urology

Flexible and Navigable Suction Ureteral Access Sheaths for the Treatment of Urolithiasis: Systematic Review and Meta-analysis

Michael Uy [a,b,], Joseph Moryousef [a], Lei Wang [c], Yanbo Guo [a], Edward D. Matsumoto [a], Stephanie Daignault-Newton [b], Wilson Sui [b], William W. Roberts [b], Casey A. Dauw [b], Khurshid R. Ghani [b]*

[a] Division of Urology, Department of Surgery, McMaster University, Hamilton, Canada; [b] Department of Urology, University of Michigan, Ann Arbor, MI, USA; [c] Department of Urology, Seventh People's Hospital of Ningbo, Ningbo, China

When compared to the traditional access sheaths, using a suction flexible access sheath was associated with

- Higher Stone-free Rate
- Lower complications

Direct In Scope Suction: Intermittent

World Journal of Urology (2024) 42:500
https://doi.org/10.1007/s00345-024-05203-x

RESEARCH

Direct in-scope suction: an in vitro evaluation of a single use flexible ureteroscope with integrated suction capability

Aideen Madden[1,2] · Carlos Alte[3] · Jordi Peña Lueza[4] · Răzvan-Ionut Popescu[5,6] · Johan Cabrera[1,2] · Mariela Corrales[1,2] · Olivier Traxer[1,2]

In vitro study

- Begostones
- Cleared <250 µm fragments
- Faster than manual aspiration
- Cannot clear dust> 250 µm

(7.5F, 9.2F)
3.6F WC, 5.1F WC
Pusen

World Journal of Urology (2024) 42:560
https://doi.org/10.1007/s00345-024-05275-9

RESEARCH

First clinical evaluation of a flexible digital ureteroscope with direct in scope suctioning system (Pusen DISS 7.5Ch): prospective multicentric feasibility study

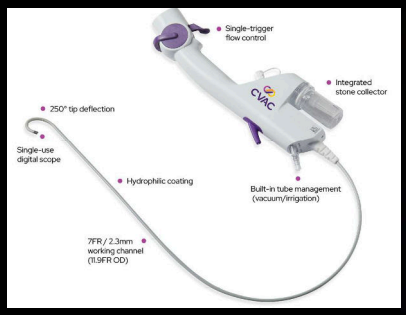
Carlotta Nedbal[1,2] · Steffi Kar Kei Yuen[3] · Mahir Akram[4] · Etienne Xavier Keller[5] · Begoña Ballesta Martinez[6] · Joe Philip[7] · Esteban Emiliani[8] · Joseph K. M. Li[3] · Damiano Stracci[9] · Vineet Gauhar[9] · Daniele Castellani[2] · Bhaskar Kumar Somani[10]

Clinical study

- 57 cases
- 58% pre-stented
- 65% had UAS
- SFR (<2mm) 84% (mixed imaging)

Direct In Scope Suction: Continuous (CVAC)

Recommends use of 12/14F access sheath



(12F)
7F WC
Calyxo

Passive aspiration fragments during laser lithotripsy clears visual field

Courtesy of Dr Brian Eisner

Active aspiration (without laser)

Active aspiration/suction of fragments after lasering is complete

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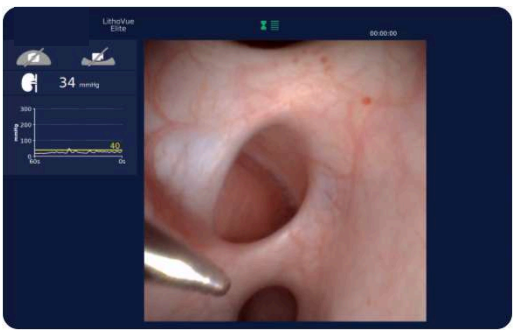
Topics I will cover

- Ureteroscopy: Problems in Stone Surgery
- Advanced Lasers & Dusting lithotripsy
- Suction for Ureteroscopy
  - Flexible suction sheaths
  - Direct in scope suction
- **Advances in ureteroscopes:**
  - **Intra-renal pressure monitoring**
  - **X-ray free URS with slim-line 6F ureteroscopes**

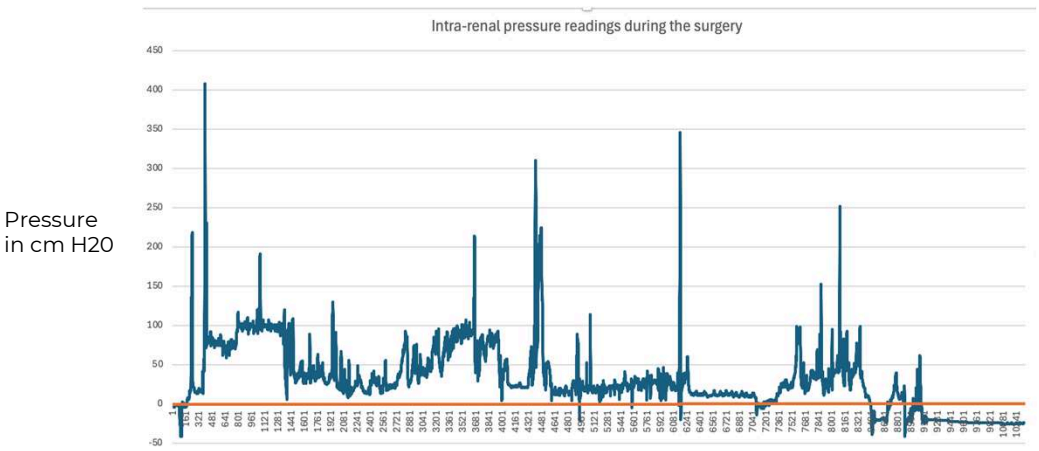
LithoVue Elite ureteroscope to measure IRP



Initial views Laser lithotripsy of lower pole stone high IRP

Laser lithotripsy of interpolar stone

Intra-renal pressure readings during surgery



Clarence Dally (1865-1904): Death by Radiation

X-ray free ureteroscopy: Safe, feasible and not always needed

- SFRs same with X-ray free
- No difference in complications

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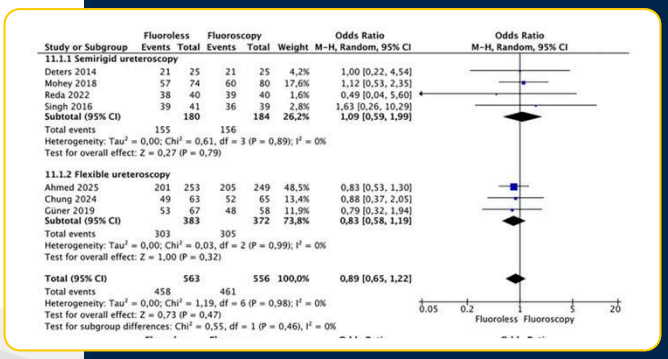
Is Fluoroscopy Needed for Endourologic Treatment of Ureteral and Renal Stones? Results from a Systematic Review and Meta-Analysis of Randomized Studies by the FUTURE Collaborative of the Endourological Society

Daniele Castellani, MD, PhD,[1,2] Federico Falsetti, MD,[3] Luca Spinozzi, MD,[3] Vineet Gauhar, MD,[4,5] Steffi Kar-Kei Yuen, MD,[6] Luca Orecchia, MD,[7] Giacomo Maria Pirola, MD,[8] Pankaj N. Maheshwari, MD, MS, DNB, MCh, FRCS,[2,9] Horacio Sanguinetti, MD,[2,10] Scott Quarrier, MD, MPH,[2,11] Hsiang Ying Lee, MD,[2,12] Brett A. Johnson, MD,[2,13] Khurshid R. Ghani, MD, BSc (Hons),[2,14] and Carlo Giulioni, MD[2]



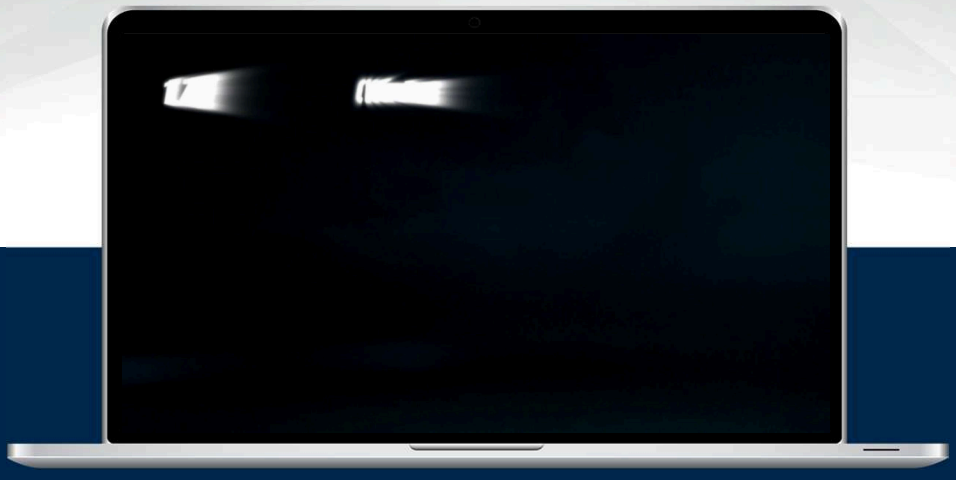
Study or Subgroup	Fluoroless Events	Total	Fluoroscopy Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
11.1.1 Semirigid ureteroscopy						
Deters 2014	21	25	21	25	4,2%	1,00 [0,22, 4,54]
Mohey 2018	57	74	60	80	17,6%	1,12 [0,53, 2,35]
Reda 2022	38	40	39	40	1,6%	0,49 [0,04, 5,60]
Singh 2016	39	41	36	39	2,8%	1,63 [0,26, 10,29]
Subtotal (95% CI)		**180**		**184**	**26,2%**	**1,09 [0,59, 1,99]**
Total events	155		156			
Heterogeneity: Tau² = 0,00; Chi² = 0,61, df = 3 (P = 0,89); I² = 0%						
Test for overall effect: Z = 0,27 (P = 0,79)						
11.1.2 Flexible ureteroscopy						
Ahmed 2025	201	253	205	249	48,5%	0,83 [0,53, 1,30]
Chung 2024	49	63	52	65	13,4%	0,88 [0,37, 2,05]
Güner 2019	53	67	48	58	11,9%	0,79 [0,32, 1,94]
Subtotal (95% CI)		**383**		**372**	**73,8%**	**0,83 [0,58, 1,19]**
Total events	303		305			
Heterogeneity: Tau² = 0,00; Chi² = 0,03, df = 2 (P = 0,99); I² = 0%						
Test for overall effect: Z = 1,00 (P = 0,32)						
Total (95% CI)		**563**		**556**	**100,0%**	**0,89 [0,65, 1,22]**
Total events	458		461			
Heterogeneity: Tau² = 0,00; Chi² = 1,19, df = 6 (P = 0,98); I² = 0%						
Test for overall effect: Z = 0,73 (P = 0,47)						
Test for subgroup differences: Chi² = 0,55, df = 1 (P = 0,46), I² = 0%						

Odds Ratio M-H, Random, 95% CI

0.05 0.2 1 5 20

Fluoroless Fluoroscopy

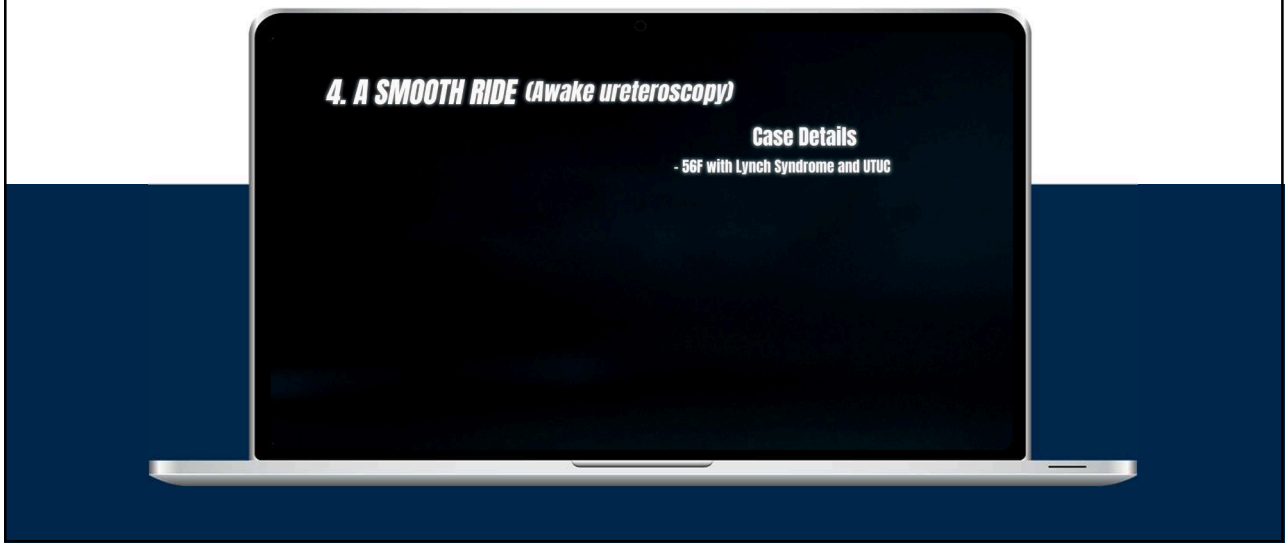
Guidewire and X-ray Free Ureteroscopy: 6.3F scope



No WIRES, No X-ray, No STENT

X-ray free URS in clinic

AWAKE: No anesthesia !



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Take Home Messages

- Standard ureteroscopy achieves a complete stone-free rate of ~60%: set realistic patient expectations and plan for follow-up imaging
- Laser choice: Holmium YAG offers high peak power for fragmentation; TFL may generate more heat and carries a risk of thermal injury (e.g., stricture) at high power settings
- Suction access sheaths (FANS) improve stone-free rates and reduce complications compared to standard access sheaths
- X-ray free ureteroscopy achieves comparable stone-free rates with zero radiation