

# Podium Session 1: Endourology/Stones & BPH

## Saturday, June 27, 2026 • 12:55–13:55

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### POD 1.1

#### A physics-based simulation of intrarenal fluid dynamics during suction ureteroscopy

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**Introduction:** Suction during retrograde intrarenal surgery (RIRS) may lower intrarenal pressure (IRP) and improve fragment clearance, but optimal combinations of access sheath, scope, working channel size, and inflow remain undefined. We validated a physics-based model to 1) predict IRP and outflow velocity across device geometries; and 2) define safe and effective operating ranges.

**Methods:** We developed a benchtop ureteroscopy simulator with inline pressure transducers in a 3D printed collecting system, inline flow sensors at the sheath outlet, and artificial stone phantoms. We performed benchtop tests across irrigation pressures (50–500 mmHg), suction (0 or -200 mmHg), sheath ID (10/11/12 Fr), scope OD (5.0–9.3 Fr), and working channel (2.4/2.6 Fr). We then modeled the urinary tract as a resistive pipe network to compute IRP and outflow velocities as a function of time and adjustable ureteroscopy parameters. Model predictions were validated against benchtop experiments across  $n=114$  matched trials. The model then simulated  $n=18$  device geometries under a range of inflow and suction conditions; the primary efficacy criterion was the outflow fluid velocity associated with visible stone fragment extraction, and the primary safety criterion was maximum IRP < 40 mmHg.

**Results:** Across all benchtop trials and device geometries, the mean minimum fluid velocity required for visible fragment extraction was 15 cm/s (SD 2.6 cm/s). Predicted IRP closely matched benchtop measurements ( $R^2=0.98$ ; slope=0.90; mean absolute error 3.9 mmHg). To maintain IRP  $\leq 40$  mmHg, RESD  $\leq 0.75$  without suction, or  $\leq 0.85$  with -200 mmHg suction was required (Figure 1). Outflow velocity above the extraction threshold (15 cm/s) was driven primarily by working channel size; suction had minimal additional impact once inflow and outflow tracts were saturated.

**Conclusions:** A physics-based model accurately predicts IRP and outflow during suction-enabled RIRS, and yields practical parameters for safe, effective operation. Our results demonstrate that the primary driver of effective fragment extraction is adequate inflow volume, while suction is most effective for managing elevated IRP associated with high inflow rates. This framework can evaluate novel device geometries and guide selection of effective operating parameters.

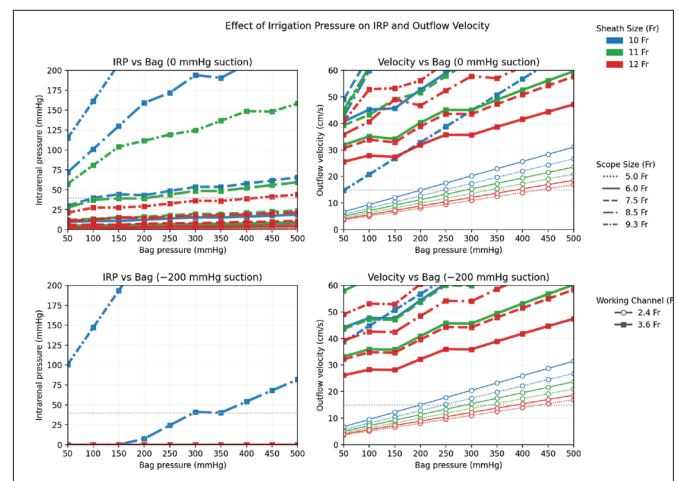
### POD 1.2

#### Intrarenal pressure regulation in flexible ureteroscopy: Comparative outcomes with standard irrigation, suction UAS, and an automated fluid management system

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**Introduction:** Elevated intrarenal pressure (IRP) during flexible ureteroscopy (fURS) increases the risk of postoperative pain, infection, and sepsis. Innovations such as pressure-sensing ureteroscopes (LithoVue™ Elite [LVE]), suction ureteral



POD 1.1. Effect of irrigation pressure on IRP and outflow velocity.

access sheaths (FANS/ClearPetra™), and automated fluid management systems (Asurys™ FMS) aim to improve safety. This study compared IRP dynamics across four fURS cohorts: 1) LVE without suction, 2) LVE with FANS, 3) LVE + FANS + Asurys FMS, and 4) LVE + FANS + Asurys FMS with blinded surgeons.

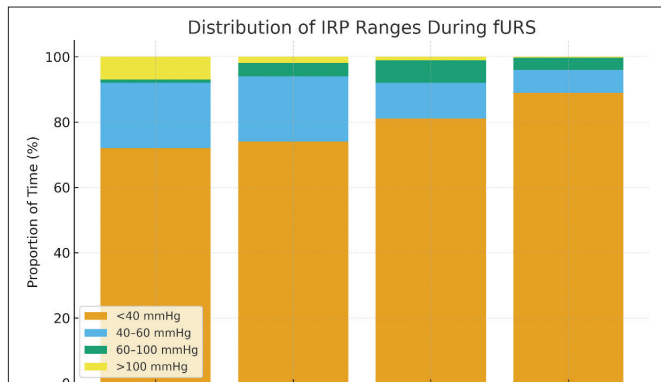
**Methods:** Group 1 ( $n=53$ ) underwent fURS with standard irrigation (150 mmHg). Group 2 ( $n=25$ ) used LVE + FANS (irrigation 200–250 mmHg; suction 200 mmHg). Group 3 ( $n=20$ ) used LVE + FANS + FMS (150 mmHg). Group 4 ( $n=11$ ) used the same setup as group 3 but surgeons were blinded to the IRP. Outcomes included median/mean IRP, time < 40/60 mmHg, and high-pressure episodes. Asurys FMS can automatically manage irrigation flow based on IRP readings from LVE and provide a temporary increase in fluid flow, called flush, activated by buttons on the LVE handle. Asurys flow limiter and flush limiter were set 40–60 mmHg and 100–150 mmHg, respectively.

**Results:** See Table 1 and Figure 1. Group 1: Median IRP 29 mmHg (mean 42.5 mmHg); 72% < 40 mmHg; 92% < 60 mmHg; 7% > 100 mmHg; 1.6% above 200 mmHg. Group 2: Median 22 mmHg (mean 30.1 mmHg); 74% < 40 mmHg; 94% < 60 mmHg; 1.9% > 100 mmHg; 0.3% > 200 mmHg. Group 3: Median 27.6 mmHg (mean 27.4 mmHg); 81.1% < 40 mmHg; 92% < 60 mmHg; 1% > 100 mmHg; 0.1% > 200 mmHg. Group 4: Median 26 mmHg (mean 25.3 mmHg); 89% < 40 mmHg; 96% < 60 mmHg; 0.3% > 100 mmHg; 0.01% > 200 mmHg.

**Conclusions:** Conventional irrigation (group 1) produces higher and sustained IRPs. Suction (group 2) significantly reduces IRP, while automated systems (groups 3, 4) maintain remarkably stable and low pressures — even when surgeons are blinded. Asurys FMS offers consistent lower pressure regulation and represents a major step toward safer, standardized intrarenal pressure management in fURS.

**POD 1.2. Table 1. Intrarenal pressure (IRP) metrics across study groups**

| Parameter         | Group I<br>LVE only | Group II<br>LVE + FANS | Group III<br>LVE + FANS<br>+ Asurys FMS | Group IV<br>LVE + FANS<br>+ Asurys FMS |
|-------------------|---------------------|------------------------|---|--|
| Irrigation (mmHg) | 150                 | 200-250                | 150                                     | 150                                    |
| Median IRP (mmHg) | 29                  | 22                     | 27.6                                    | 26                                     |
| Mean IRP (mmHg)   | 42.5                | 30.1                   | 27.4                                    | 25.3                                   |
| Time < 40 (%)     | 72 %                | 74 %                   | 81.1 %                                  | 89 %                                   |
| Time < 60 (%)     | 92 %                | 94 %                   | 92 %                                    | 96 %                                   |
| Time > 100 (%)    | 7 %                 | 1.9 %                  | 1 %                                     | 0.3 %                                  |
| Time > 200 (%)    | 1.6 %               | 0.3 %                  | 0.1 %                                   | 0.01 %                                 |



**POD 1.2. Figure 1.** Distribution of Intrarenal pressure ranges during fURS.

**POD 1.3**

**Slim 22-F miniaturized holmium laser enucleation of the prostate vs. standard 26-F sheath holmium laser enucleation of the prostate for benign prostatic hyperplasia: One-year outcomes of a prospective, randomized controlled trial**

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**Introduction:** We aimed to compare one-year outcomes of ambulatory miniaturized holmium laser enucleation of the prostate (MiLEP) using a slim 22 F sheath vs. standard holmium laser enucleation of the prostate (HoLEP) using a 26 F sheath.

**Methods:** We included 100 patients in this randomized controlled trial undergoing endoscopic enucleation of the prostate (EEP) with either 22 F MiLEP or 26 F HoLEP between April and November 2024. Preoperative, intraoperative, perioperative, and postoperative outcomes, including IPSS, QoL, Qmax, PVR, SU1, PSA, TRUS size reduction, urethral stricture, and bladder neck contracture (BNC), were assessed at one, three, six, and 12 months.

**Results:** Of the 100 patients in the study, 50 underwent 22 F MiLEP and 50 underwent 26 F HoLEP. Preoperative characteristics were comparable between groups with no significant differences in enucleation and morcellation times, resected weight, or enucleation and morcellation efficiencies; however, significant differences favoring the 26 F sheath were observed in the duration of postoperative hematuria, catheterization time, and length of hospital stay. Patients treated with 26 F HoLEP were more likely to achieve a successful same-day trial of void (TOV), with rates of 86.7% vs. 64.9% in the 26 F and 22 F groups, respectively (p=0.02). Postoperative functional outcomes, including IPSS, QoL, Qmax, PVR, PSA, and TRUS size reduction, were comparable between cohorts up to 12 months. No statistically significant difference was found between the cohorts for postoperative SU1; each group had an 8% rate of SU1 at one month (p=1) and 2% at three months (p=0.99). At the 12-month followup, one patient

in the 26 F group developed BNC, and one patient in each group developed meatal stenosis (Table 1).

**Conclusions:** Both 22 F and 26 F sheaths provide satisfactory intraoperative and postoperative functional outcomes in EEP; however, 26 F HoLEP is associated with higher same-day TOV success and lower hospital admission rates, with no significant differences in postoperative SU1, BNC, or stricture rates.

**POD 1.3. Table 1. Preoperative, operative, and followup data**

| Parameter                                 | 22-F MiLEP<br>(50 patients) | 26-F HoLEP<br>(50 patients) | p        |
|---|-----------------------------|-----------------------------|----------|
| <b>Preoperative data</b>                  |                             |                             |          |
| Age years median (range)                  | 71.5 (55–90)                | 72.5 (52–89)                | 0.76     |
| Indication, n (%)                         | LUTS                        | 40 (80)                     | 39 (78)  |
|   | Retention                   | 10 (20)                     | 11 (22)  |
| Preoperative IPSS, median (range)         | 21 (15–32)                  | 21 (15–34)                  | 0.64     |
| Preoperative QoL, median (range)          | 5 (3–6)                     | 5 (3–6)                     | 0.19     |
| Preoperative PVR, mL, median (range)      | 114 (11–566)                | 138 (20–734)                | 0.16     |
| Preoperative Qmax, mL/s, median (range)   | 9 (2–14.9)                  | 8.1 (2–14.8)                | 0.54     |
| Preoperative PSA, ng/mL, median (range)   | 3.35 (0.58–13.9)            | 3.5 (0.8–25)                | 0.52     |
| Preoperative TRUS size, g, median (range) | 106 (80–227)                | 103.5 (80–298)              | 0.89     |
| <b>Operative data</b>                     |                             |                             |          |
| Enucleation time, min, median (range)     | 37 (17–57)                  | 35.5 (15–74)                | 0.58     |
| Resected weight, g, median (range)        | 79.5 (45–199)               | 78 (52–263)                 | 0.76     |
| Morcellation time, min, median (range)    | 8.5 (4–39)                  | 10 (4–27)                   | 0.69     |
| Core body temperature, °C, median (range) | 36.2 (34.7–36.8)            | 36.15 (35–37.1)             | 0.77     |
| Intraoperative complications, n (%)       | Bladder mucosal injury      | 4 (8)                       | 0 (0)    |
|   | Conversion                  | 2 (4)                       | 0 (0)    |
| CBI time hours median (range)             | 2 (2–24)                    | 2 (2–20)                    | 0.127    |
| Postoperative hematuria duration, hours   | Median (range)              | 0 (0–20)                    | 0 (0–18) |
|   | Mean                        | 4                           | 1.34     |
| Successful same-day TOV, n (%)            | 24/37 (64.9)                | 39/45 (86.7)                | 0.02     |
| Catheterization time hours                | Median (range)              | 3.5 (3–40)                  | 3 (3–46) |
|   | mean                        | 8.44                        | 5.52     |
| Hospitalization time hours                | Median (range)              | 5 (4–48)                    | 5 (4–48) |
|   | Mean                        | 10.34                       | 7.12     |
| Admission, n (%)                          | 13 (26)                     | 5 (10)                      | 0.037    |
| Readmission, n (%)                        | 3 (6)                       | 3 (6)                       | 1        |

**POD 1.3. Table 1 (cont'd). Preoperative, operative, and followup data**

| Parameter                                  | 22-F MiLEP<br>(50 patients) | 26-F HoLEP<br>(50 patients) | p    |
|--|-----------------------------|-----------------------------|------|
| <b>3-month followup</b>                    |                             |                             |      |
| IPSS, median (range)                       | 7 (1–32)                    | 6 (1–23)                    | 0.27 |
| QoL, median (range)                        | 1 (0–6)                     | 1 (0–6)                     | 0.2  |
| Qmax, mL/s, median (range)                 | 22.5 (4–49)                 | 22.7 (8.9–49.2)             | 0.77 |
| PVR, mL, median (range)                    | 43 (0–440)                  | 40 (0–400)                  | 0.85 |
| Stress urinary incontinence, n (%)         | 1 (2)                       | 1 (2)                       | 0.99 |
| Postoperative PSA, ng/mL, median (range)   | 0.74 (0.02–2.5)             | 0.67 (0.1–3)                | 0.99 |
| <b>6-month followup</b>                    |                             |                             |      |
| IPSS, median (range)                       | 5 (1–12)                    | 5 (1–23)                    | 0.55 |
| QoL, median (range)                        | 1 (0–5)                     | 1 (0–6)                     | 0.81 |
| Qmax, mL/s, median (range)                 | 24.2 (4–49.5)               | 21.4 (9.1–47.3)             | 0.06 |
| PVR, mL, median (range)                    | 50 (0–372)                  | 42 (0–421)                  | 0.58 |
| Stress urinary incontinence, n (%)         | 0 (0)                       | 0 (0)                       | –    |
| Postoperative TRUS size, g, median (range) | 20 (10.35–31)               | 19.9 (9.5–32)               | 0.57 |
| <b>12-month followup</b>                   |                             |                             |      |
| IPSS, median (range)                       | 4 (0–19)                    | 4 (0–20)                    | 0.82 |
| QoL, median (range)                        | 1 (0–3)                     | 1 (0–3)                     | 0.63 |
| Qmax, mL/s, median (range)                 | 21.45<br>(6.4–59.3)         | 20.3 (7.6–60.6)             | 0.49 |
| PVR, mL, median (range)                    | 45.5 (0–413)                | 32 (0–567)                  | 0.56 |
| Stress urinary incontinence, n (%)         | 0 (0)                       | 0 (0)                       | –    |

## POD 1.4

### Incidence of ureteral stenosis and thermal injury following ureteroscopy with thulium fiber laser: A quality-of-care single tertiary-center retrospective study

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**Introduction:** Ureteroscopy (URS) with thulium fiber laser (TFL) lithotripsy was introduced at our institution in 2021 for stone treatment. Compared to holmium:YAG systems, TFL offers improved dusting efficiency and shorter operative times, with the potential drawback of increased intrarenal and intraureteral temperatures.<sup>1</sup> This study aimed to assess the incidence of ureteral stricture (US) and thermal-related injury after TFL URS and to identify risk factors to guide postoperative surveillance and preventive strategies.

**Methods:** We conducted a retrospective study at a single tertiary care center, including all URS with TFL for stones between August 2021 and August 2024. A provincial database was reviewed for any postoperative cross-sectional abdominal imaging. For patients with significant postoperative imaging abnormalities, detailed clinical, stone-related, and perioperative data were extracted from the electronic medical record.

**Results:** In total, 1605 TFL URS procedures were performed in 1384 patients, of whom 872 (63%) had valid postoperative imaging. New urinary tract abnormalities were identified in 40 patients (4.6%): nine (1.0%) with non-obstructive hydronephrosis (HN), one (0.1%) with obstructive HN, 11 (1.3%) with focal renal atrophy, and 19 (2.1%) with cortical global atrophy. Overall, 17 patients (1.2%) developed a non-functional kidney ( $\leq 25\%$  differential function), and four

(0.3%) underwent simple nephrectomy for refractory symptoms. The median total laser energy was 14 kJ (range 0.6–72), with higher median energy use in patients with cortical atrophy without HN (30.9 kJ, range 3.9–49). The median time to detection was 4.5 months (2.1–25.2) for HN and 17.5 months (4.2–40.9) for cortical atrophy.

**Conclusions:** Close to 5% of patients presented urinary tract abnormalities following TFL URS. Higher laser energy use may be associated with postoperative complications. Prospective studies are needed to refine intraoperative strategies to reduce TFL-related complications and the best surveillance protocol after surgery.

Reference:

- Chen R, Song Y, Liu Y, Li J, et al. Efficacy and safety of thulium fiber laser vs. holmium: yttrium-aluminum-garnet laser in lithotripsy for urolithiasis: A systematic review and meta-analysis. *Urolithiasis* 2025;53:33. <https://doi.org/10.1007/s00240-025-01709-0>

## POD 1.5

### Risk factors for urinary tract infection after shockwave lithotripsy for urolithiasis: A secondary analysis of the international APPEAL trial

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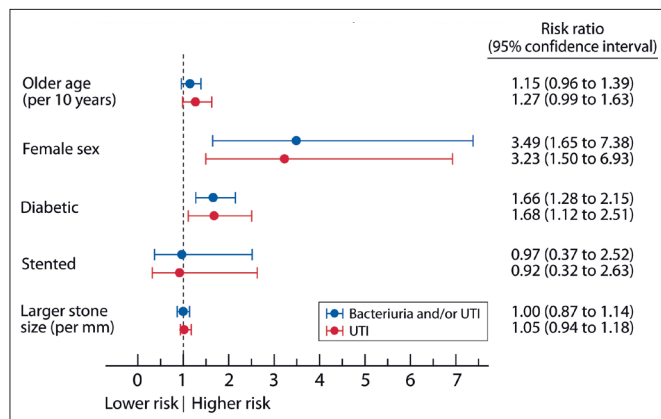
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**Introduction:** Antibiotic prophylaxis reduces post-shockwave lithotripsy (SWL) urinary tract infections (UTI); however, because risk of infection without treatment is low and resistance concerns mandate targeted antimicrobial use, it is important to identify patients at higher UTI risk who may benefit most.

**Methods:** The APPEAL trial, a multicenter, blinded, pragmatic trial across 12 centers in nine countries randomized adults undergoing SWL for urolithiasis to a single dose of preprocedural ciprofloxacin or placebo. APPEAL excluded patients with positive pre-SWL urinalysis or culture, current or planned antibiotics, and UTI-risk factors, such as suspected struvite stones, indwelling catheter, and prior urosepsis. To identify patients at higher risk of postprocedural infection, we conducted a secondary analysis using two outcomes: 1) any bacteriuria or symptomatic UTI, and 2) symptomatic UTI; both within 30 days after SWL. Our comprehensive appraisal of prior evidence identified age, sex, stone size, ureteral stent, and diabetes as potential risk factors for post-SWL UTI. We chose these as independent variables in a modified Poisson regression model.

**Results:** Of 1514 patients in our analysis (median age 50 years; 29% female), 50 (3.2%) developed any bacteriuria or symptomatic UTI, and 31 (2.0%) experienced symptomatic UTI, including nine pyelonephritis. Diabetes was present in 14%, a ureteral stent in 11%; the median stone size was 9 mm. In multivariable analysis, female sex had a risk ratio (RR) of 3.49 (95% CI 1.65–7.38), diabetes RR 1.66 (95% CI 1.28–2.15), and older age (per 10 years) RR 1.15 (95% CI 0.96–1.39) for bacteriuria/UTI. These associations were similar for symptomatic UTI (Figure 1). Presence of double J stent was not associated with infection.

**Conclusions:** Female sex, diabetes, and possibly older age increase the risk of post-SWL infection. This information can help target pre-SWL prophylaxis.  
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POD 1.5. Figure 1. Risk factors for 1) bacteriuria and/or UTI, and 2) UTI.

**POD 1.6**

**Performance and patient experience of a novel flowthrough uroflowmetry device in clinical practice**

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**Introduction:** Uroflowmetry is a core urologic diagnostic tool, yet current bucket-and-scale systems are outdated, inefficient, and compromise patient comfort and dignity. Patients void in unfamiliar environments with prolonged wait times, often resulting in unrepresentative voids, while staff must manually empty and clean devices between uses. This study validated a novel flowthrough (FT) uroflowmetry device that integrates directly into a standard toilet and requires no manual cleaning. This study evaluated its impact on clinic efficiency and patient experience compared to a conventional system.

**Methods:** A prospective, observational study (IRB 21-220) was conducted at St. Michael's Hospital, University of Toronto, over 40 clinic days: 20 using a prototype FT device (Creative Medical) and 20 using a conventional system (Latorie Flowstar U2-1). Between 2023 and 2025, 223 adult patients undergoing routine uroflowmetry were enrolled. Wait time, voiding duration, and time to postvoid residual (PVR) were recorded, and patient experience was assessed via questionnaires. Continuous variables were analyzed using unpaired t-tests.

**Results:** Mean wait time was significantly shorter with FT uroflowmetry (0.90±1.30 min) vs. conventional (12.28±15.17 min, p<0.001), as was time in the uroflow room (1.30±1.55 vs. 10.20±7.80 min, p<0.001). Time to PVR was similar (6-7 min, p=0.8). Among patients with prior uroflowmetry, 65% preferred FT. Privacy satisfaction was "very satisfied" in 99% of FT users vs. 66% with conventional systems. FT was representative of home toileting for 59% vs. 35%, and wait time satisfaction was "very satisfied" in 73% FT vs. 39% conventional.

**Conclusions:** The FT uroflowmetry device significantly improves clinic efficiency, patient comfort, and satisfaction while reducing staff workload and clinic space requirements. By eliminating manual bucket handling and dedicated uroflow rooms, this device represents a transformative advance in uroflowmetry practice and healthcare resource utilization.

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