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MP-02.01

Holmium Laser Enucleation of the Prostate for Glands Larger than 200 Grams

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Introduction and Objectives: Holmium laser technology allows for enucleation of very large prostate glands with outcomes equivalent to or superior to those of open simple prostatectomy. Here we describe our experience with HoLEP for glands ≥ 200 grams.

Methods: Between January 1999 and February 2011, 58 patients with glands ≥ 200 grams underwent HoLEP at our institution. All procedures were performed by one surgeon (JEL). Residents and/or fellows assisted in all cases.

Results: Mean patient age was 72.6 years. Mean preoperative patient characteristics include transrectal ultrasound (TRUS) volume of 218 grams, AUA symptom score (AUASS) of 18.9, Qmax of 7.5 ml/sec, post-void residual (PVR) of 237.6 cc and PSA of 19.9 ng/mL. Mean enucleation and morcellation times were 86.7 min (range 30-211 min) and 49.3 min (range 23-133 min) respectively. Mean weight of tissue resected was 213.4 grams (range 111.1 – 532.2 grams). Two patients (3.4%) required perineal urethrostomy. Eight patients (13.8%) had concomitant procedures [bladder neck incision (2), cystolithopaxy (5), bladder biopsy (1)]. One patient (1.7%) required cystostomy for tissue retrieval. One patient required same-day take back for clot evacuation and one patient required take back 48 hours postoperatively to complete morcellation. Mean pre- and postoperative hemoglobin were 14.1 g/dL and 11.5 g/dL, respectively. Two patients (3.4%) required transfusion (mean 4 units). Mean catheterization time was 19.9 hours (range 8-96 hours) and all patients voided spontaneously after catheter removal. Mean AUASS at 12 months was 3.86 and mean PVR at 12 months was 34.9 cc. Mean PSA at 6 months was 0.85 ng/ml (mean reduction 87.4%). To date, one patient (1.7%) has developed a urethral stricture and 0 patients have required secondary procedures.

Conclusions: HoLEP can be safely performed in patients with glands ≥ 200 grams. In experienced hands, results equivalent to or superior to open simple prostatectomy can be expected.

MP-02.02

Impact of 5-alpha reductase Inhibitors on Enucleation and Morcellation Efficiency during Holmium Laser Enucleation of the Prostate

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Introduction and Objectives: HoLEP is a well-established effective treatment for benign prostatic hyperplasia (BPH) that involves complete removal of the transitional zone. Due to the large volume of tissue accumulated during enucleation, morcellation is required for specimen removal. Enucleation and morcellation times are dependent on a number of factors, including prostate volume as well as tissue quality. 5-alpha reductase inhibitors (5ARIs) are a commonly prescribed medication for BPH that reduces prostate volume by inhibiting conversion of testosterone to DHT and may impact tissue quality. We hypothesized that patients taking 5ARIs prior to HoLEP may have longer surgeries secondary to a more challenging enucleation and/or morcellation. Factors potentially impacting tissue enucleation and morcellation were analyzed.

Table 1. MP-02.02. Holmium laser enucleation of the prostate: patient characteristics

	5 ARI (-)	5 ARI (+)	
N	492	222	
Mean prostate weight (g)	79.9	94.7	$p = 0.001$
Mean enucleation time (min)	66.1	66.2	$p = 1.0$
Mean enucleation rate (g/min)	1.3	1.6	$p = 0.001$
Mean morcellation time (min)	18.5	20.8	$p = 0.1$
Mean morcellation rate (g/min)	5.5	5.6	$p = 0.8$

ARI: alpha reductase inhibitors.

Table 2. MP-02.02. Univariate and multivariate analysis predicting enucleation time

	Enucleation Time
Univariate	
Age	0.07 ($p = 0.06$)
PSA	0.11 ($p = 0.05$)
5 ARI	-0.002 ($p = 1.0$)
Duration of 5 ARI	-0.04 ($p = 0.6$)
Weight of specimen	0.3 ($p < 0.001$)
Presence of cancer	-0.07 ($p = 0.07$)
Multivariate	
Age	0.02 ($p = 0.7$)
PSA	0.02 ($p = 0.8$)
5 ARI	0.01 ($p = 0.9$)
Weight of specimen	0.29 ($p < 0.001$)
Presence of cancer	-0.06 ($p = 0.2$)

ARI: alpha reductase inhibitors; PSA: prostate-specific antigen.

Methods: A retrospective single institution analysis of HoLEP patients between 1998 and 2011 was performed. Variables that may impact enucleation and morcellation times were evaluated using univariate and multivariate linear regression models.

Results: Overall, of 714 patients who underwent HoLEP 222 or 31.1% of patients were taking a 5ARI (Table 1). After univariate and multivariate analysis, only weight of the specimen that is removed was found to be predictive of enucleation and morcellation times (Table 2, Table 3). More specifically, with increasing prostate size there was a statistically significant increase in both enucleation and morcellation times.

Conclusions: On multivariate analysis only specimen weight significantly predicts enucleation and morcellation times. The use of 5ARIs as a predictor of enucleation and/or morcellation times was not found to be statistically significant.

Table 3. MP-02.02. Univariate and multivariate analysis predicting morcellation time

	Morcellation Time
Univariate	
Age	0.12 ($p=0.002$)
PSA	0.24 ($p<0.001$)
5 ARI	0.06 ($p=0.1$)
Duration of 5 ARI	0.001 ($p=1.0$)
Weight of specimen	0.67 ($p<0.001$)
Presence of cancer	-0.07 ($p=0.08$)
Multivariate	
Age	0.02 ($p=0.5$)
PSA	-0.02 ($p=0.4$)
5 ARI	-0.03 ($p=0.3$)
Weight of specimen	0.68 ($p<0.001$)

PSA: prostate-specific antigen; ARI: alpha reductase inhibitors.

MP-02.03**Early Outcomes of Office-based Laser Vaporization of the Prostate with the High Power Diode Laser**

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Introduction and Objectives: Advances in laser technology over the last fifteen years have significantly altered the treatment of lower urinary tract symptoms due to benign prostatic hyperplasia (BPH). Despite improvements in technology and refinements in surgical technique, these procedures continue to require general or regional anesthesia. Our goal was to study the feasibility and efficacy of ablative laser prostatectomy using the high power diode laser performed in the office, obviating the need for general or regional anesthesia.

Methods: Patients were evaluated with an American Urological Symptom Score (AUASS), Quality of Life score, Sexual Health Inventory for Men score, maximum flow rate (Qmax), postvoid residual volumes and prostate specific antigen (PSA). Patients received an oral narcotic and anxiolytic, a transrectal ultrasound guided prostate block and 1% xylocaine intra-urethral injection. They then underwent prostate vaporization using the 180W high power diode, end-firing laser system. Follow-up assessments were made at three and six months.

Results: 24 men, with a mean age of 70.6 years (range 53-86), successfully underwent in office laser prostatectomy. The mean prostate volume was 42.6 grams (range 20-78 grams) and mean PSA was 1.8 ± 1.2 ng/mL. Mean energy used $250,941 \pm 61,986$ Joules. All patients were able to successfully complete the procedure. Patients had a urethral catheter for a mean of 3.5 ± 1.8 days. At three months, patients experienced a significant reduction in AUA-SS from 21.1 ± 5.4 to 11.0 ± 4.7 . Maximum flow rates also significantly improved from 10.1 ± 3.7 to 19.4 ± 8.4 mL/sec. Patients reported similar durable results at six month follow-up.

Conclusions: Our short-term results suggest the high power diode laser was effective in relieving lower urinary tract symptoms related to BPH. It can be performed safely and effectively in an office based setting.

MP-02.04**Novel Ultra-low Dose Non-contrast CT (NCCT) for Urolithiasis: Prospective Comparison of Diagnostic Accuracy with Concurrent Standard Dose Imaging**

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Introduction and Objectives: NCCT is the gold-standard diagnostic study for urolithiasis evaluation. However, concerns over the potential risks related to ionizing radiation may limit its use. Ultra-low dose (ULD) NCCT could potentially lower radiation exposure below that of a conventional KUB, but an acceptable level of diagnostic accuracy must be maintained. We report preliminary results of our ongoing prospective ULD NCCT trial for renal stone detection.

Methods: Following informed consent, NCCT for urolithiasis evaluation was performed in 10 consecutive adults (mean age, 55.8 years; mean BMI, 27.5), using our standard-dose (SD) protocol immediately followed by a matched ULD series. All scans were performed on a GE Discovery CT750 HD scanner. Axial and coronal 5x3mm reconstructions were obtained for each series. The 40 total series were anonymized and interpreted in random order for urolithiasis detection.

Results: For the ULD series, the range of dose reduction relative to SD was 82-90% (mean, 87% reduction), with a mean effective dose ranging from 0.88 mSv to 1.54 mSv (mean, 0.99 mSv). Seven cases were below 1.0 mSv. A total of 29 renal calculi (range, 1-22 mm; mean, 4.1 mm) were identified at SD NCCT, of which 22 (75.9%) were detected at ULD. Overall sensitivity was 76%, however, subgroup analysis by stone size showed improved detection rates for stones ≥ 3 mm, i.e. all 19 calculi ≥ 3 mm were seen on both ULD reconstructions. Only 10-30% of stones ≤ 2 mm was prospectively identified on the ULD series.

Conclusions: Ultra-low dose NCCT for urolithiasis in the 1 mSv range can accurately detect calculi ≥ 3 mm but fails to detect most stones ≤ 2 mm. Typically the clinical ramifications of these stones (≤ 2 mm) is less relevant acutely. The degree of dose reduction that preserves diagnostic accuracy for tiny calculi remains uncertain, but may be influenced by further improvements in iterative reconstruction techniques.

MP-02.05**Does a Routine Baseline Plain Radiograph Influence the Need for Subsequent Imaging Studies in Patients with Ureteral Calculi?**

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Introduction and Objectives: Non-contrast CT is the gold standard for diagnosing ureteral calculi. A KUB X-ray (kidneys-ureters-bladder), at the time of CT, has been presumed to aid interpretation of future KUBs. However, the CT's scout film may make the baseline KUB redundant. Our objective was to determine if a baseline KUB allows the clinician to more definitively detect if the patient has passed the ureteral stone, thereby avoiding additional imaging.

Methods: Patients with a ureteral calculus on CT and a baseline KUB within 24 hours were retrospectively identified, then randomly divided into 2 groups: "No baseline KUB" and "baseline KUB". In the "No KUB" group, only the CT (with scout) and follow-up KUB were viewed. The "KUB" group was similar to current practice, where the baseline KUB could also be viewed. On viewing the follow-up KUB, 3 urologists independently answered "has the ureteral stone passed or migrated since the CT?" (yes, no or indeterminate). A follow-up KUB assessment was considered definitive if all 3 agreed on either "yes" or "no".

Results: 24 stones in the "No KUB" and 25 stones in the "KUB" group were identified from September 2007 to August 2009. The stone location was proximal in 20 (41%), middle in 3 (6%) and distal in 26 (53%). The patient and CT stone characteristics were not statistically different between the 2 groups. Overall, 51.0% of the stones were visible on CT scout and there was no difference between the groups. The rates of definitive assessment were similar between the "No KUB" and "KUB" groups (45.8% vs. 36.0%, $p=0.484$).

Conclusions: A baseline KUB did not affect the clinician's ability to assess stone passage or migration on a follow-up KUB. These findings challenge

the common practice of obtaining a baseline KUB at the time of CT, with its associated cost and radiation exposure.

MP-02.06
Urolithiasis Prevention Beginning in the Emergency Room: Support for Early Intervention During the Acute Event

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Introduction and Objectives: Few studies have addressed patient preferences regarding education and prevention of urolithiasis in the acute setting. Such early assessment of patient views may help in developing more effective prevention and therapeutic plans. The objective of this study was to determine patient preferences on early stone prevention strategies at the time of initial presentation.

Methods: Patients presenting to the emergency room (ER) with renal colic were given a questionnaire once their pain was adequately controlled and prior to ER discharge. The survey consisted of 15 questions which were grouped into 4 domains: (1) assessment of past history/knowledge of stone disease, (2) views about learning and prevention, (3) views about long-term medical/nutritional management, and (4) views about long-term follow-up for stone recurrence.

Results: Forty patients completed the questionnaire. One of the 40 patients was on prior treatment for stone disease (domain 1). Positive response rates were as follows: domain 2, 90%; domain 3, 86%; domain 4, 81%. An overall positive bias towards early education and prevention was 85%. The following responses were notable: in domain 3, all but one patient responded "yes" to implementing dietary changes; only 80% were

willing to take medications, and even fewer (65%) were willing to take >1 medication to achieve the same goal. In domain 4, only 65% were willing to be followed in the metabolic stone clinic. All patients showed a preference for life-long prevention over repeated surgical procedures.

Conclusions: These data identify that patients are very willing to learn more about their disease at onset and support stone prevention strategies, particularly dietary changes; they are less inclined to take medications or follow-up in stone clinic. These considerations support early education in new stone formers and underscore the importance of intervention timed as close as possible to an acute event.

MP-02.07
Characterization of Patients with Heterozygous Cystinuria

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Introduction and Objectives: To characterize contemporary cohort of patients with heterozygous (TZ) cystinuria and compare them with a concurrent cohort of homozygous (MZ) cystinuria.

Methods: A retrospective review of prospectively collected data was performed for 42 consecutive patients presenting with positive cyanide-nitroprusside test (CNT) for cystinuria between September 2009 and September 2011. Demographic and clinical data were collected with detailed metabolic stone work-up, including two 24-hour urine collections. Based on daily cystine excretion, patients were divided into TZ group (≤ 400 mg/day or ≤ 1.7 mmol/day) and MZ group (>400 mg/day or >1.7 mmol/day).

Results: One patient was excluded since quantitative cystine excretion was within the normal range. Thirty five (83.3%) and 6 (14.3%) patients were

Table 1. MP-02.07. Comparison between heterozygous and homozygous cystinuria

Variable	Heterozygous n= 35	Homozygous n= 6	p-value
Median age in years (range)	51 (20 - 74)	43 (7 - 52)	0.08
Median BMI in kg/m ² (range)	27.5 (20.8 - 38.4)	33.8 (18.7 - 42.5)	0.33
Left-sided	21/31 (67.7%)	2/3 (66.7%)	0.98
Bilateral stones	3 (8.6%)	3 (50%)	0.03
Female gender	7 (20.0%)	4 (66.7%)	0.03
Family history of stones	11 (31.4%)	2 (33.3%)	1.0
Median Age at first stone episode in years (range)	48 (14 - 67)	17 (6 - 44)	0.002
Median number of stone episodes (range)	1 (1 - 4)	3 (1 - 4)	0.04
Median 24 hr cystine in mmol/day (range)	0.42 (0.14 - 1.5)	1.8 (1.8 - 2.7)	<0.001
Median 24 hr homocystine/ creatinine in umol/mmol cr (range)	0.9 (0.0- 13.3)	9.9 (6.7 - 16.4)	0.001
Median 24 hr cystine/ creatinine in umol/mmol cr (range)	17.2 (9.5 - 171.2)	148.5 (107.5 - 179.6)	0.001
24 hr cysteinglycine/ creatinine in umol/mmol cr (range)	0.26 (0.0 - 2.25)	0.8 (0.02 - 1.85)	1.0
Median urine pH (range)	6.0 (5.0 - 7.5)	6.5 (5.0 - 7.5)	0.82
Low e-GFR (<60 ml/min/1.73m ²)	1 (2.8%)	1 (16.7%)	0.27
Hyperparathyroidism (>65 pg/ml)	8 (22.8%)	2 (33.3%)	0.52
Inadequate vitamin D 25 (<29 ng/mL)	22 (62.8%)	4 (66.7%)	0.55
Hypercalcemia	2 (5.7%)	00	0.42
Hyperuricemia	6 (17.1%)	4 (66.7%)	0.02
24 hr urine volume/ml	Suboptimal Median (range)	25 (71.4%) 5 (83.3%)	0.48
24 hr urine calcium	Hypercalciuria Hypocalciuria	2 (5.7%) 8 (22.2%)	00 4 (66.7%)
Hyperoxaluria	7 (20.0%)	1 (16.7%)	0.67
Hypomagnesuria	12 (34.3%)	00	0.63
Hyperuricosuria	7 (20.0%)	00	0.15
Hypocitraturia	7 (20.0%)	1 (16.7%)	0.63

BMI: body mass index; e-GFR: epidermal growth factor receptor.

found to have TZ and MZ cystinuria, respectively. When compared with TZ patients, MZ patients were significantly younger at first stone episode [median (range): 48 (14-67) vs. 17 (6-44) years, $p=0.002$], and had more females (20% vs. 66.7%; $p=0.03$), more bilateral stones (8.6% vs. 50%; $p=0.03$), and more stone episodes (1 vs. 3; $p=0.04$). The median 24-hour urinary cystine excretion was significantly higher in the MZ group [0.42 (0.14-1.5) vs. 1.8 (1.8-2.7) mmol/d; $p < 0.001$]. Suboptimal urine volume was detected in 69.4% of TZ and 83.3% of MZ patients. Hyperuricemia was significantly higher in MZ group (17.1% vs. 66.7%; $p=0.02$). Whereas all 6 MZ patients formed pure cystine stones, 18 (51.4%), 7 (20.0%) and 3 (8.6%) patients in the TZ group formed calcium oxalate, uric acid, and cystine stones, respectively ($p < 0.001$). Interestingly, 11 (31.4%) patients in the TZ group had false negative results on subsequent CNT (Table 1). **Conclusions:** There were significant differences between heterozygous and homozygous cystinuria patients in terms of age at first stone episode, male to female ratio, incidence of hyperuricemia and stone compositions. The clinical significance remains to be elucidated.

MP-02.08
Office-based Ureteral Stent Placement Is Feasible and Effective for Acute, Obstructing Ureteral Calculi

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Introduction and Objectives: Ureteral stents can be safely placed in the office under local anesthesia (LA). We compared the outcomes of urgent ureteral stent placement using fluoroscopy for acute obstruction under LA against those placed under general anesthesia (GA) in the OR.

Methods: A retrospective review of all ureteral stents placed between Jan 2007 and July 2011 was conducted. Only cases involving primary stent placement for obstructing ureteral calculi were included in the analysis. The data was evaluated in two groups: GA and LA. Queries included

demographic data, time from initial presentation to stent insertion, time from stent insertion to stone removal, success and complication rates, and patient tolerance.

Results: 119 primary stent insertion procedures were identified and reviewed; 73 were placed in the OR under GA, and 46 were placed with LA. No differences in mean age were seen between the two groups (54y and 52y in GA and LA, respectively, $p=0.53$), and no differences in gender distribution between the two groups were seen, ($p=1.0$). The primary indication for urgent stent placement differed between the groups ($p=0.005$): in the GA group, 55% were placed for fever/pyuria and 33% for pain, whereas in the LA group 57% were placed for pain and 28% for fever/pyuria. Both GA and LA groups were typically stented within 12 hours of presentation, $p=0.69$. Mean time from stent insertion to stone removal was 33 days and 35 days in GA and LA groups, respectively, $p=0.79$. One procedure was terminated in the LA group due to pain; no significant differences in failure to stent were observed between the GA and LA group (1.3% versus 8.7%, respectively, $p= 0.07$). No major complications occurred in either group.

Conclusions: Urgent ureteral stent placement for symptomatic ureteral stones can be safely and effectively performed under LA in the office. This paradigm eliminates unnecessary GA, and this approach did not delay scheduling definitive therapy.

MP-02.09
Variations among Urology Trainees in Their Use of Fluoroscopy during Ureteropyelography

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Introduction and Objectives: In a training program, post-graduate trainees assist in performing URS under direct supervision of an attending urologist. Therefore, the aim of the present study was to assess variations among

Table 1. MP-02.09. Patient, stone and operative characteristics

Variable	Trainee	A No. (%)	B No. (%)	C No. (%)	D No. (%)	E No. (%)	F No. (%)	G No. (%)	p value
No. of URS		11	18	18	11	16	13	13	NA
Male gender		7 (64)	12 (67)	12 (67)	8 (73)	12 (75)	7 (54)	8 (62)	0.74
Mean age (years) (95%CI)		55 (47-64)	50 (41-58)	55 (48-63)	50 (39-60)	56 (48-64)	56 (46-65)	50 (43-57)	0.69
Left-sided		7 (58)	9 (50)	7 (35)	5 (45)	11 (69)	10 (63)	6 (46)	0.58
Mean stone size (mm) (95%CI)		15 (10-20)	19 (9-29)	12 (10-15)	11 (7-14)	12 (8-15)	11 (8-14)	9 (6-11)	0.10
Stone location	Ureteral	3 (27.3)	9 (50)	6 (33.3)	6 (54.5)	9 (56.2)	7 (53.8)	5 (38.5)	0.57
	Renal	6 (54.5)	8 (44.4)	7 (38.9)	4 (36.4)	5 (31.3)	4 (30.8)	6 (46.1)	
	Both	2 (18.2)	1 (5.6)	5 (27.8)	1 (9.1)	2 (12.5)	2 (15.4)	2 (15.4)	
Multiple stones		6 (54.5)	6 (33.3)	7 (38.9)	2 (18.2)	5 (31.3)	4 (30.8)	5 (38.5)	0.46
Lucent stones		3 (27.3)	2 (11.1)	3 (16.7)	0 (0)	3 (18.7)	1 (7.7)	0 (0)	0.15
Preoperative stones		3 (27.3)	11 (61.1)	13 (72.2)	4 (36.4)	8 (50.0)	8 (61.5)	10 (76.9)	0.16
	Flexible	6 (54.5)	9 (50.0)	8 (44.4)	5 (45.4)	6 (37.5)	6 (46.1)	2 (15.4)	
URS-type	Rigid	1 (9.1)	4 (22.2)	3 (16.7)	1 (9.1)	2 (12.5)	1 (7.7)	4 (30.8)	0.84
	Both	4 (36.4)	5 (27.8)	7 (38.9)	5 (45.4)	8 (50.0)	6 (46.1)	7 (53.8)	
Balloon dilations		1 (9.1)	2 (11.1)	1 (5.6)	2 (18.2)	0 (0)	0 (0)	2 (15.4)	0.77
Access sheath		7 (63.6)	10 (55.6)	8 (44.4)	5 (45.5)	6 (37.5)	5 (38.5)	3 (23.1)	0.03
Residual stone		2 (18.2)	5 (27.8)	3 (16.7)	2 (18.2)	3 (18.7)	1 (7.7)	2 (15.4)	0.35
Mean OR (min) (95%CI)		79 (50-107)	75 (59-91)	81 (67- 94)	66 (57-74)	81 (60-101)	76 (57- 95)	83 (56-110)	0.90
Mean fluoroscopy time (sec) (95%CI)		194 (115-272)	105 (65-144)	91 (66-117)	117 (58-175)	91 (52-131)	107 (71-143)	64 (36-91)	0.004

URS: ureterorenoscopy; CI: confidence interval; OR: operating room; NA: not available.

Table 2. MP-02.09. Predictors of fluoroscopy time on univariate and multivariate analysis

Variable	Univariate		Multivariate		
	Change/ sec	p-value	Change/ sec	p-value	
Trainee	A	98.3	0.001	74.5	0.01
	B	-2.0	0.92	3.4	0.81
	C	-18.1	0.39	-12.4	0.32
	D	11.7	0.65	8.7	0.72
	E	-17.8	0.04	-8.7	0.02
	F	1.0	0.97	2.3	0.82
	G	-48.8	0.03	-36.7	0.04
Male gender	29.6	0.04	34	0.02	
Age	8.8 /10 years	0.11	6.8 /10 years	0.15	
left side	-11.6	0.74	6.8 sec	0.63	
Renal stones	22.0	0.048	16.0	0.26	
Multiple stones	14.8	0.38	- 26.6	0.19	
Stone size	1.6 / mm	0.04	0.38	0.67	
Lucent stones	6.5	0.79	14.6	0.52	
Operative time	6.9/ 10 min	0.004	4.2/ 10 min	0.07	
Balloon dilation	115.7	0.001	81.7	0.004	
Preoperative stenting	-23.6	0.14	-25.4	0.08	
Residual stones	67.6	0.001	54.1	0.01	
Flexible ureteroscope	4.0	0.69	-3.9	0.69	
Access sheath	62.4	0.001	41.7	0.03	

post-graduate trainees in their use of FT during URS.

Methods: A retrospective review of prospectively collected data was performed for consecutive patients undergoing URS by urology trainees between July 2009 and December 2010. Trainees in the Post-Graduate Year-4 (PGY-4) assisted in performing these cases under the direct supervision of a single endourologist. Standard fluoroscopic unit using 30 frames per second was used in all cases. Patient and stone characteristics together with operative data were compared among trainees using univariate and multivariate analyses.

Results: Seven trainees (A, B, C, D, E, F, and G) assisted 100 URS with a median (range) of 13 (11-18) procedures per trainee. There were significant differences among the trainees in their use of fluoroscopy ($p=0.004$). The mean FT (95%CI) for trainees A through G were 194 (115-272), 104 (65-144), 91 (66-117), 117 (58-175), 91 (52-131), 107 (71-143) and 64 (36-91) seconds, respectively ($p=0.004$). There were no significant differences regarding patients (age and sex) and stone characteristics (size, laterality, location, and multiplicity) ($p>0.05$). Likewise, operative time and balloon dilation were comparable among trainees ($p>0.05$). There were significant differences among trainees in their use of access sheath ($p=0.03$). Trainees, male gender, balloon dilation, access sheath and residual stones maintained their significance in multivariate analysis as predictors of FT during URS (Table 1, Table 2).

Conclusion: Post-graduate trainees vary significantly in their use of fluoroscopy during URS. The trainees, male gender, balloon dilation, residual stones at the end of the procedure together with the use of access sheath were the most significant independent predictors of prolonged FT during URS.

MP-02.10 Prediction of Calcium Oxalate Monohydrate Stone Composition during Ureteroscopy

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Introduction and Objectives: Prior research shows that Ho:YAG lithotripsy produces tiny dust fragments at low pulse energy (0.2J). However, calcium oxalate monohydrate (COM) stones may not fragment at this low pulse energy. Stone composition is rarely known until after surgery and composition analysis performed. Historically, attempts to predict stone composition on the basis of endoscopic stone appearance were unsuccessful. Current endoscopic technology permits visual details that previously were not evident. As COM appears black under ambient light, we attempt to predict COM stone composition at the time of ureteroscopy by the endoscopic appearance of the stone.

Methods: Consecutive subjects undergoing ureteroscopy for stone disease were studied. Any portion of the stone that appeared black under endoscopic vision was considered clinical evidence of COM. Stone analysis was conducted postoperatively by infrared spectroscopy and x-ray diffraction crystallography. Predicted stone composition was correlated to postoperative stone analysis. Fisher's exact test was used for statistics ($p<0.05$ was considered significant).

Results: 46 consecutive ureteroscopic stone cases were analyzed prospectively. 25 of 28 subjects (89%) with black stones had stones later proven to be COM by composition analysis; versus one of 18 patients (6%) with non-black stones that were COM, $p<0.0001$. A black endoscopic stone appearance had a positive predictive value for COM of 89% and a non-black endoscopic stone appearance had a negative predictive value for COM of 94%, for a test sensitivity of 96% and specificity of 83%.

Conclusions: COM may reasonably be predicted intraoperatively by its

black endoscopic appearance. The clinical utility would be to use higher laser pulse energy settings than for non-COM compositions. This data raise the possibility that more sophisticated optical characterization of endoscopic stone appearance may prove to be a useful tool to predict stone composition.

MP-02.11

Backstop Eliminates Retropulsion and Withstands Ho:YAG Energy

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Introduction and Objectives: Laser lithotripsy can be compromised by retropulsion. Anti-retropulsion devices have been shown to prevent retropulsion. Pulsed Ho:YAG laser radiation is capable of destroying all metal materials. BackStop is a novel reverse thermosensitive polymer-based anti-retropulsion material. Response of Backstop to pulsed Ho:YAG radiation is unknown. We test BackStop as a retropulsion device and its ability to withstand Ho:YAG exposure.

Methods: U-cal Stone phantoms (0.25" diameter, approximately 540 g) were targeted with Ho:YAG lithotripsy using a 365 um fiber at various power settings (0.2 J – 2.0 J pulse energies, 10-40 Hz) in an in vitro setup. Experiments were conducted in water in an 8 mm cylindrical tube. Phantoms were tested in two conditions: without stabilization and with BackStop deployed proximal to the stone. Retropulsion was measured. BackStop was also deliberately targeted with Ho:YAG energy to simulate accidental pass-pointing during laser lithotripsy. Ablation craters in BackStop were measured and function assessed. Laser polymer interaction was characterized using fast flash imaging and needle hydrophone.

Results: At all energy settings tested, retropulsion was greater for the non-stabilized stone vs. the stone stabilized with BackStop where no retropulsion occurred, $p < 25$ bars. Modulation of frequency did not have effect on retropulsion.

Conclusions: BackStop can be ablated by Ho:YAG energy. However, it retains its shape and function. BackStop effectively eliminates retropulsion, even when it is accidentally lasered.

MP-02.12

The Safety of Percutaneous Nephrolithotomy (PNL) in an Elder Population: Outcomes and Complications of Septuagenarians, Octogenarians and Nonagenarians

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Introduction and Objectives: Patients with a large stone burden presenting later in life may be felt to be at increased risk of complications and poor outcomes. Age alone has not been investigated in terms of safety and efficacy. Our objective is to compare outcomes and complications of PCNL in septuagenarian, octogenarian and nonagenarians, compared to a younger population matched for stone burden.

Methods: We reviewed 231 PNLs (2006-2010), for demographics, age, ASA score, length of stay (LOS), and location of access. Stone size, clearance and complications were assessed. All patients over 70 years old were compared to a stone size matched, age adjusted control group of 20 patients between 30 and 60 years old.

Results: 32 PNLs in 28 patients over 70y (n=15 aged 71-79, 9 aged 80-89, and 4 aged 90-94) were performed. Mean age was 77y, ASA of 2.63, and had 2.86 comorbidities/patient. The control group (47.1y) had significantly reduced ASA scores of 1.78, with 1.10 comorbidities ($p=0.001$ and $p=0.0001$ respectively). Those >70y had significantly increased CV disease, hypertension, a.fib and cancer ($p < 0.05$). Risk factors, first time presenters, and stone characteristics did not differ significantly. Stone free rate was 63.3% in those >70y and 74% in controls, without differences in OR time or LOS. There was an increased frequency of complications (33%), and Clavien class (2.08) (5 grade I, 1 grade II, 6 grade III) but did not differ significantly from controls (n=3, $p=0.29$).

Conclusions: In patients over 70y, we have found PCL efficacy and safety is equivalent to a younger population. Thus age alone should not be

an excluding criteria. Concerns regarding multiple anesthetics, prone positioning, bleeding and LOS should be considered individually, rather than favoring second line therapies based on advanced age. Given this is a retrospective case controlled study, subtle trends may not have been appreciated.

MP-02.13–WITHDRAWN

MP-02.14

Retrograde Access for Percutaneous Nephrolithotomy: Is This The Way to Go?

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Introduction and Objectives: Percutaneous nephrolithotomy is the standard for large renal stones considered unsuitable for, or refractory to ESWL. Obtaining renal access is a crucial step, and is generally done in an antegrade fashion. Retrograde techniques provide an alternative means of establishing a nephrostomy tract and has many advantages, including establishing a tract in a decompressed kidney, accessing an optimal calyx, and decreased radiation exposure to the surgeon and patient. Purpose: To retrospectively assess outcomes in a single institution series of percutaneous nephrolithotomy using retrograde nephrostomy access.

Methods: Retrospective evaluation of 333 consecutive patients treated between May 2003 – July 2008. Measured variables included patient demographics, retrograde nephrostomy site, postoperative drainage, operative time, rate and degree of stone clearance, requirement for secondary procedures, stone composition and complications.

Results: Total number of patients reviewed was 333, median age 56 (range 17-87). Mean length of hospital stay was 2.5 days (range 1-13 days). 17 patients (5%) required placement of antegrade access due to difficult/suboptimal anatomy. Mean OR time was 76 min (range 10 min-246 min). 79% achieved complete clearance, 19% had minor residual fragments, 2% had significant persisting stones; 11 patients (3%) required secondary ESWL. Stone analysis: Calcium oxalate 57%, 24% uric acid, 5% infection stones, 21% others. Complications: 4 patients (1%) had a significant postoperative hemorrhage; 2 required angioembolization, 1 patient was transfused 4 units PRBCs, 1 was observed.

Conclusions: Retrograde percutaneous access for PCNL is a safe and effective approach, with comparable rates of stone clearance and complications to antegrade access.

MP-02.15

Without Stone Culture Infectious Kidney Organisms Are Misidentified in almost 1/4 of Patients Undergoing Percutaneous Nephrolithotomy

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Introduction and Objectives: One of the most significant complications of percutaneous nephrolithotomy (PCNL) is sepsis. In order to avoid this complication, preoperative urine cultures are used to adequately treat patients before performing PCNL. Patients who are known to harbor struvite stones are carefully scrutinized when preparing for PCNL. However, non-struvite stone formers may harbor equally lethal bacteria. As well, perioperative stone cultures can harbor different bacteria than preoperative urine cultures. The objective of this study is to demonstrate the relationship between stone type, stone culture and urine culture in order to enable one to adequately treat and/or prevent sepsis post-PCNL.

Methods: We performed a retrospective data analysis of percutaneous nephrolithotomy patients treated at one institution between 1999 and 2009.

Results: The overall agreement between urine and stone culture occurred in 361 cases (72.7%). A positive stone culture in the presence of sterile urine occurred in 10.5% of patients overall and this occurred most frequently in non-struvite stone formers (n=47, 10.8%). Of patients present-

Table 1. MP-02.15. Culture results of percutaneous nephrolithotomy patients grouped by stone mineral content

Stone Mineral Content	Both Negative (%)	Only Positive Urine Culture (%)	Only Positive Stone Culture (%)	Both Urine and Stone Culture Positive (%)	Total (%)
Struvite	9 (14.8)	11 (18.0)	5 (8.2)	36 (59.0)	61 (100)
Other	201 (46.2)	72 (16.6)	47 (10.8)	115 (26.4)	435 (100)
Total	210 (42.3)	83 (16.7)	52 (10.5)	151 (30.4)	496 (100)

ing with both a positive urine and stone culture (n=151), 67 or 44.4% (13.5% overall) were found to have different infectious organisms between the urine and the stone cultures. Therefore, 24% of patients will present with a positive stone culture in the presence of sterile urine (10.5%) or a different organism cultured from stone than from urine (13.5%).

Conclusions: The simplification of the infection stone being synonymous with struvite stone may have negative consequences in the clinical treatment and management of stone disease. As well, the utilization of urine cultures alone will often lead to misidentification of the actual infectious organism present in the kidney. Therefore, it is our belief that both the urine culture, as well as the stone culture, are useful in identifying and managing infectious risk associated with PCNL.

MP-02.16

Interim Analysis of a Multi-centre Randomized Controlled Trial Comparing Three Different Modalities of Newer Lithotrites for Intracorporeal Lithotripsy

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Introduction and Objectives: There are three newest intracorporeal lithotriptors are available on the North American market. The objective of this study is to compare the efficiency and fragmentation rate of these three modern lithotrites during percutaneous nephrolithotomy.

Methods: Patients undergoing percutaneous nephrolithotomy with stones greater than 2 cm in diameter were randomized to intracorporeal lithotripsy with the Cyberwand (Olympus-ACMI), Lithoclast Select (EMS/Boston Scientific Microvasive), or StoneBreaker (Cook Urological) and Olympus LUS-2 ultrasonic lithotripsy. The total time to perform the procedure including fragmentation time, grasping fragments, and ultrasonic lithotripsy was recorded. Clearance rate was calculated by dividing the surface area of the targeted stone by the total clearance time. Stone free rate was determined by postoperative CT scan or secondary nephroscopy within 30 days. (Table 1).

Results: Seventy-five patients to date have been enrolled in the study across multiple sites.

Conclusions: No patients required blood transfusion. Preliminary data shows that there was no significant difference in clearance efficiency or stone free rates among the different lithotripters. The study is ongoing and further patients will help determine if true differences exist among lithotrites in their efficiency of fragmenting stones during percutaneous nephrolithotomy.

MP-02.17

Combined Percutaneous Nephrolithotomy/Parathyroidectomy under One Anesthetic in Patients with Primary Hyperparathyroidism and Stones

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Introduction and Objectives: Up to 20% of patients with primary hyperparathyroidism (HPT) develop renal stones. Standard treatment for HPT is resection of the offending adenoma(s). We present our results for combined percutaneous nephrolithotomy (PNL) and parathyroidectomy for patients with HPT and stones.

Methods: Between December 2003 and October 2010, 8 patients underwent PNL /parathyroidectomy. All PNL were performed by one surgeon (JEL) as were all parathyroidectomies (RG). PNL was performed first (prone), followed by parathyroidectomy (supine).

Results: Table 1 reviews preoperative characteristics. All patients had serum-based evidence of HPT. In 6 (75%), adenomas were identified on sestamibi scan. In 2 (25%) the scan was indeterminate. Table 2 reviews intra-operative findings. Mean total OR time was 254.8 min (mean PNL 174 min, mean parathyroidectomy 80.9 min) and mean blood loss (EBL) was 128.2cc (mean PNL 117.4cc, mean parathyroidectomy 9.4cc). No intra-operative complications occurred during parathyroidectomy. In 1 (12.5%) patient, pus was found behind impacted stones and the procedure was terminated prematurely. Table 3 reviews postoperative results. Mean hospital stay was 2.5 days. Six (75%) patients required secondary PNL for residual stones. No patient required transfusion. Serum calcium normalized in all. Two postoperative PNL complications occurred (1 UTI, 1 pleural effusion requiring drainage). No postoperative parathyroidectomy complications occurred. To date, 1 (12.5%) patient required additional surgery for stones (basket extraction of ureteral stone).

Conclusions: Combined PNL and parathyroidectomy can be safely performed in patients with HPT and renal stones.

Table 1. MP-02.16

	Cyberwand (n=25, 13F, 12M)	Lithoclast Select (n=25, 12F, 13M)	StoneBreaker (n=25, 11F, 14M)	p-value
Median patient age (Years) (range)	55 (33–89)	55 (34–80)	58 (32–79)	NS
Median stone size (mm ²) (range)	451 (210–2557)	431 (182–1289)	360.16 (205–919)	NS, p=0.096
Median Clearance Efficiency (mm ² /sec)	24.21 (0–62.45)	27.16 (4.57–64.17)	22.64 (0–53.78)	NS, p=0.905
Stone Free Rates	48%	60%	52%	NS, p=0.75
Complications	Mixed respiratory and metabolic acidosis (1) confusion d/t narcotics (1)	Fever (1) Pleural effusion (1) hypotension in pacu (1), small perforation (1)	Pleural effusion (2) Bleeding (2) Small perforation (2) hypotension in pacu (1). Perinephric Hematoma (1) ureteral stent/persistent leak at NT site (1)	NS

Table 1. MP-02-17. Preoperative Characteristics

Male	1 (12.5%)
Female	7 (87.5%)
Mean age (years)	53 (28–79)
Mean years with stone disease	7.8 (0.16–25)
Number with prior stone surgery	5 (62.5%)
Mean preoperative Serum Calcium (mg/dL)	11.01 (10.1–11.9)
Mean preoperative Serum Phosphorus (mg/dL)	2.67 (1.7–3.2)
Mean preoperative Serum Parathyroid Hormone (PTH; pg/ml)	138.3 (101–172)
Mean preoperative Urine Calcium / Creatinine (mg/g)	258.8 (80–310)
Mean preoperative Serum Creatinine (mg/dL)	1.04 (0.5–1.5)
Mean preoperative Hemoglobin (g/dL)	11.7 (9.3–15.3)

Table 3. MP-02-17. Postoperative results

Mean length of hospital stay (days)	2.5 (1.5–3.5)
Mean postoperative day 1 Hb (g/dL)	10.4 (6.8–15.1)
Number patients requiring transfusion	0 (0%)
Mean postoperative day 1 Serum Creatinine (mg/dL)	1.3 (0.9–1.8)
Mean postoperative day 1 Serum Calcium (mg/dL)	8.6 (8.2–9.5)
Number patients requiring 2nd look procedure for residual stones during admission	6 (75%)
Postoperative complications PNL	2 (25%)
–Urinary Tract Infection	–1 (12.5%)
–Pleura Effusion	–1 (12.5%)
Postoperative complications parathyroidectomy	0 (0%)
Stone analysis	
–Mixed stone types	7 (87.5%)
–Calcium Phosphate (Hydroxyapatite)	5 (62.5%)
–Brushite	3 (37.5%)
–Calcium oxalate monohydrate (COM)	3 (37.5%)
–Calcium oxalate dihydrate (COD)	1 (12.5%)
–Carbonate Apatite	1 (12.5%)
–Ammonium Acid Urate	1 (12.5%)
Final pathology results of parathyroid specimen	
–Hypercellular adenoma	8 (100%)
Mean 1 month follow-up Serum Calcium (mg/dL)	9.2 (8.8–9.7)
Mean 1 month follow-up Serum Creatinine (mg/dL)	0.98 (0.5–1.2)
Mean follow-up Urine Ca / Creatinine (mg/g)	106.8 (75.8–144.4)
Number patients requiring additional stone surgery	1 (12.5%)

Table 2. MP-02-17. Intra-operative results

Number patients undergoing unilateral PNL	4 (50%)
Number patients undergoing bilateral PNL	4 (50%)
Mean total OR time (minutes)	254.8 (210–303)
Mean OR time PNL (minutes)	174 (120–210)
Mean # accesses / kidney	1.08 (1–2)
Mean OR time parathyroidectomy (minutes)	80.9 (44–140)
Mean Intra-operative PTH (pg/ml)	37.8 (14.3–70)
Mean total EBL (cc)	128.2 (25–260)
Mean EBL PNL (cc)	117.4 (20–250)
Mean EBL parathyroidectomy (cc)	9.4 (5–30)
Intra-operative complications PNL	1 (12.5%) – pus behind impacted stones
Intra-operative complications parathyroidectomy	0 (0%)

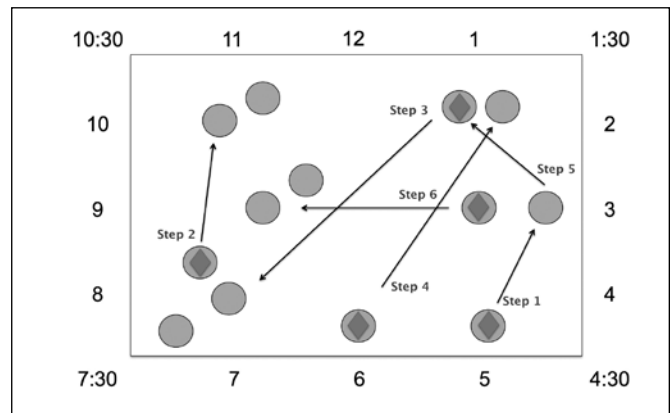


Fig. 1. MP-02.19.

MP-02.18 Shock Wave Lithotripsy Referral Patterns Changes Over a Decade at a Single Centre

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Introduction and Objectives: To assess the impact of the revised American and European Urological Associations guidelines (2007) on the referral patterns for Shock Wave Lithotripsy (SWL) at a single centre.

Methods: A retrospective review of prospectively collected SWL database was performed for consecutive patients referred for SWL at a tertiary stone centre between December 1999 and December 2010. A total of 7620 SWL treatments were included (3884 from Dec. 1999 till Dec. 2005, 1438 from Jan 2006 till Dec. 2007, and 2298 from Jan 2008 till Dec. 2010). The location of the original stone referred for SWL treatment was used for the present study.

Results: Left-sided stones were comparable in all groups (55.5%, 54.7%, and 53.2%, $p=0.11$). There was no significant difference among the three groups in terms of mean stone size (95%CI) [9.5 (8.4– 10.6), 9.0(8.8–9.2), and 9.7 (9.5–9.8), mm; $p=0.37$]. The proximal ureteral was the most common location prior to Dec 2005, whereas renal pelvis was the most common location after Jan 2006. There was a small but significant

Table 1. MP-02.18. The pattern of stone referral for SWL in the last 10 years

Stone location	From December 1999-December 2005	To December 2007	To December 2010	p value
Upper and mid poles	455 (11.7%)	203 (14.1%)	308 (13.4%)	0.03
Lower pole	785 (20.2%)	276 (19.2%)	433 (18.8%)	0.34
Renal pelvis	889 (22.9%)	336 (23.4%)	624 (27.1)	0.65
Proximal ureter	965 (24.8%)	299 (20.8%)	417 (18.1%)	0.006
Mid ureter	240 (6.2%)	102 (7.1%)	166 (7.2%)	0.82
Distal ureter	550 (14.2%)	222 (15.4%)	350 (15.2%)	0.34
Total	3884	1438	2298	NA
		7620		

NA: not available.

increase in the percentage of upper and mid-caliceal stones (11.7%, 14.1%, and 13.4%; $p=0.03$). Proximal ureteral stones treated with SWL significantly decreased over the study period (24.8%, 20.8%, 18.1%; $p=0.006$). Likewise, the proximal ureteral stones ≥ 10 mm were significantly decreased over time (38.6%, 24.7%, 18.9%, $p=0.003$). In comparison with cases referred by urologists practicing more than 10 years, the number of cases referred by younger surgeons (<10 years of practice) was significantly lower in all groups ($p<0.001$) (Table 1).

Conclusions: There was a trend of decreasing referral of proximal ureteral stones for SWL over the study period. These findings suggests adherence of local urologists to the 2007 EUA/AUA guidelines on management of urolithiasis. The referral pattern for SWL was significantly decreased by the young urologist practising less than 10 years.

MP-02.19
On Screen Frame of Reference System and Standardized Communication Promotes Safe and Efficient Laparoscopic Teaching: a Three Armed Randomized Control Trial

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Introduction and Objectives: During laparoscopy, the staff surgeon often directs the trainee to points on a surgical field. Variability between verbal instructions may be a source of errors, confusion, and conflicts. To have a successful outcome, errors need to be minimized and communication clear. We developed a novel on screen frame of reference (FOR) system, coupled with standardized verbal commands to facilitate intra-operative teaching. The objective of this study was to determine the impact of two novel FOR systems used with a standardized language on performance of laparoscopic tasks when compared to standard techniques.

Methods: Sixty-three medical students were randomized to three groups. Group 1 (control) performed tasks with no overlay and simple commands (i.e. left, right, up and down). Group 2 performed tasks on an overlay with directions based on a clock/x:y triangulation (Fig. 1). Group 3 performed tasks on an overlay with an alphanumeric coordinate system. All subjects performed three different trials, consisting of object transfers, while instructed by one of the three methods. Time to task completion and error score recorded and analyzed using non-parametric statistics.

Results: Group 2 (69, 70, 56) was significantly faster than the control (86, 80, 71, $p<0.05$) as well as Group 3 (92, 85, 68, $p<0.05$) across all trials. Group 2 (0.94, 0.97, 0.26) had fewer errors than the control (1.43, 1.14, 0.81) across trials 1 and 3 ($p<0.05$) but similar error scores to Group 3 (0.68, 0.68, 0.23). Although Group 3 had similar time to completion to the control, there were statistically fewer errors (0.68, 0.68, 0.23, $p<0.05$).

Conclusions: Using a frame of referencing overlay and standardized communication for directing laparoscopy promotes safe and efficient endoscopic teaching. This data has helped validate the use of the first on screen, real time video overlay of a frame of referencing system for endoscopic monitors to improve teaching and patient safety.

MP-02.20
How Accurate Are Urologists at Estimating Lesion Size Endoscopically?

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Introduction and Objective: Cystoscopic and ureteroscopic estimates of lesion size can influence the urologist's therapeutic approach to the patient, but their accuracy has not been established. Our objectives were to assess the accuracy of endoscopic estimates of lesion size in urology using in vitro urinary tract models and to identify factors impacting this accuracy.

Methods: Rigid cystoscopy was carried out by eleven staff and nine learners in the Department of Urology on pig bladders containing papillary (ball bearings) and sessile (washers) lesions of various sizes. For each lesion, participants provided three size estimates: two using only the cystoscope in order to assess intra-observer agreement and the third with the aid of a ureteric catheter as a visual reference. Similar estimates were then made with a flexible ureteroscope on several papillary lesions within an inorganic urinary tract model. Welch two-sample and paired t-tests were used to assess differences in mean estimates and the intraclass correlation coefficient (ICC) was used to assess the agreement between repeat estimates.

Results: The mean errors in estimation did not differ with the level of endoscopic training for either cystoscopy or ureteroscopy regardless of lesion size and appearance, or the use of a visual reference. Staff and learners consistently underestimated lesion size with median errors ranging from 6% to 49% for cystoscopy and from 37% to 56% for ureteroscopy (top graphs). Participants demonstrated excellent (median ICC of 0.97) and fair (median ICC of 0.56) reproducibility of estimates with cystoscopy and ureteroscopy respectively (bottom graphs).

Conclusions: We demonstrate for the first time that urologic endoscopists substantially underestimate the size of observed lesions with both ureteroscopy and cystoscopy despite fair to excellent reproducibility of their estimates. This finding is independent of level of training, lesion characteristics, and the use of a visual reference.