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MP-05.01
Contemporary Supra- vs. Infra-costal Percutaneous Nephrolithotomy in the Prone-flexed Position

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Introduction and Objectives: Percutaneous nephrolithotomy (PCNL) is the gold standard therapy for large renal calculi. The optimal puncture site for collecting system access remains controversial, with many suggesting increased morbidity from supracostal puncture. We report a retrospective review of 318 consecutive PCNL cases over a sixty month time period performed by two surgeons in a teaching environment.

Materials and Methods: Perioperative data was collected on 318 consecutive PCNL cases performed for intra-renal nephrolithiasis from May 2004 to June 2009. Patient demographics, stone, operative, postoperative and follow-up data were collected. Complications were assessed using the Clavien system and stone outcomes were assessed with KUB x-rays and CT scans. Successful treatment outcome was defined as stone free or sand-like (1 mm or less) particles on CT scan.

Results: Three hundred and eighteen patients undergoing PCNL in the prone-flexed position (57.9% male) with a mean age of 52.9 years (SD 14.4) and mean BMI 27.8 kg/m^2 (SD 6.0) were analyzed. Sixteen (5.4%) of the tracts were above the 11th rib, 120 (40.8%) were above the 12th rib and 158 (53.7%) were infracostal. Multiple tracts were used in 16 (5%) of patients. There were no significant differences between patients undergoing supracostal versus infracostal puncture with respect to side, stone area, number of tracts, number of stones, or the presence of staghorn or struvite calculi, although there was a trend to larger stones and more staghorn calculi in the supracostal group. Success rates in the supracostal group (89.8%) were equivalent to the infracostal group (94.1%). Complication rates across groups were low, with no significant difference in complications between the supracostal and infracostal puncture groups, respectively, across Clavien grade I (12 vs. 1), grade II (4 vs. 11), grade IIIa (4 vs. 0), grade IIIb (2 vs. 0), and grade IVa (1 vs. 2), $p = 0.067$. All four (2.6%) Clavien grade IIIa complications in the supracostal group were pleural complications requiring chest drain insertion. No patients required a blood transfusion or angioembolisation.

Conclusion: When indicated, supracostal access can provide excellent outcomes, particularly for patients with complex stone disease while obviating the need for multiple tracts or retreatment. Although complications, particularly pleural, occur more frequently in those patients undergoing supracostal puncture, the incidence is low and acceptable considering the significant advantages in this patient population.

MP-05.02
The Natural History of Renal Stone Fragments Following Ureteroscopy

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Introduction and Objective: The purpose of this study was to describe the natural history of post-ureteroscopic renal stone fragments ≤4 mm based on computed tomography (CT) follow-up.

Methods: Patients treated with flexible ureteroscopy and holmium laser lithotripsy for renal urolithiasis from May, 2001 to April 2006 by a single surgeon (RBN) were retrospectively identified. Patients with residual renal fragments measuring ≤4 mm on initial postoperative CT and at least one additional follow-up CT were included. Main outcomes measured were stone event (emergency visit or stone procedure) and spontaneous fragment passage. Fragment growth and location were also recorded. Patients with ureteral residual fragments, fragments >4 mm, cystine stones, and those with anatomical anomalies were excluded.

Results: Among 267 ureteroscopies, 134 were stone-free on the first post-operative CT (50.2% stone-free). Among the remaining 133 ureteroscopies, 50 met inclusion criteria. The mean fragment sizes at each follow-up CT were 2.6, 3.8, 5.2, and 2.4 mm at 3.9, 13.8, 24.9, and 38.7 months, respectively. Overall, the mean follow-up duration was 20.8 months (1.7 years). During this time, 10 ureteroscopic fragments (20%) passed spontaneously and 7 (14%) led to stone events. The remaining 33 (66%) retained asymptomatic residual fragments which remained relatively stable in size.

Conclusions: Approximately one-in-five post-ureteroscopic renal stone fragments ≤4 mm passed spontaneously within approximately 1.7 years of follow-up. One-in-seven fragments led to a stone event. The majority of residual fragments, however, remained asymptomatic and stable in size.

MP-05.03
Predictors of Outcomes of Percutaneous Nephrolithotomy

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Introduction and Objective: Percutaneous nephrolithotomy (PCNL) is the treatment of choice in patients with large stone burden or when other modalities of treatment are not successful. The stone-free rates after PCNL have ranged from 70 % to 85%. At the same time, the use of second look nephroscopy is assumed to increase stone-free rate. However, the predictors of having residual stones post PCNL have not been studied previously. Our objective is to evaluate the preoperative and perioperative factors associated with residual stones after PCNL. Our hypothesis is the use of second look nephroscopy is associated with improved outcome.

Methods: Data were extracted from an institutional review board-approved retrospective review of 230 procedures performed at our institution between January 2000 and December 2008. PCNL was performed by two endourologists with similar training and experience. Second look nephroscopy was done in patients who were not stone-free after the initial procedure. Outcome was defined as stone-free status after initial PCNL or second look nephroscopy while overall stone-free status is after subsequent additional procedures. Stone-free status was strictly defined based on complete absence of stones on subsequent radiological imaging. The assessed parameters were age, sex, Body Mass Index (BMI), stone size, number, and location, history of genitourinary anomaly or surgery, staghorn stones, prior surgery for the same stone, access location, and use of specific lithotripters. A sub-analysis was performed in patients with residual stones after the initial procedure to evaluate the role of second look nephroscopy. Univariate and multivariate analyses were performed using Pearson Chi-square, two-tailed *t*, and Fisher's Exact tests. All variables were considered statistically significant at $p < 0.05$

Results: Mean age and BMI were 54.15 years and 29.59 kg/m2 respectively. Univariate analysis revealed that stone diameter ($p < 0.0001$), complete staghorn stones ($p < 0.001$), and upper pole stones ($p < 0.0001$) were associated with having more residual stones while prior extracorporeal shockwave lithotripsy ($p < 0.037$) and holmium laser use ($p < 0.01$) were associated with improved stone-free status. In a sub-analysis of patients

who had residual stones after the initial procedure, second look nephroscopy was associated with improved overall stone-free status ($p < 0.019$) in comparison to patients who did not have a second-look. **Conclusions**: Preoperative and perioperative parameters can predict outcome of PCNL. Second look nephroscopy is associated with improved stone clearance. These results indicate that further studies with larger sample size are needed to construct preoperative prediction models.

MP-05.04

Do Ureteral Access Sheaths Make a Difference in Stone Free Rates Following Ureteroscopy?

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Table 1. MP-05.04

	UAS	No UAS
Stone location	N = 25	N = 24
Ureter	9	2
Renal pelvis	8	6
Lower calyx	5	12
Mid calyx	3	1
Upper calyx	0	3
Stone size		
Mean of largest diameter in mm (range)	10 (3-19)	9 (5-17)
Mean operative time (minutes)	59	51
Stent required	23	17
Use of a basket		
Reposition stone	6	6
Remove stone fragments ($p = 0.0123$)	11	2
Major complications	0	0
Ancillary procedures	SWL x 1, URS x 1	URS x 1
Stone free status at 3 months		
Residual fragments <5 mm	2 / 20	4 / 23
Stone free	14 / 20	17 / 23
Success rate	80 %	91 %

UAS = ureteral access sheaths.

Introduction and Objective: Initially introduced in the 1970s, ureteral access sheaths (UAS) were designed to improve ureteroscope entry and re-entry. Theoretically the increased irrigant outflow afforded by the UAS might allow the passive elimination of small stone fragments and thus improve stone free rates (SFR). This claim however has not been fully investigated and is only supported by retrospective evidence. We present the results of a multicentre prospective randomized trial to determine the impact of the use of UAS during ureteroscopic retrograde surgery (URS).
Methods: This trial was conducted at 4 Canadian centres. Patients with proximal and renal calculi, were randomized 1:1 to UAS (Navigator 11/13 Fr UAS) or no UAS. Ureteroscopy with Ho:YAG laser lithotripsy were performed according to each of the institutions standard protocols. The use of a basket was based on the surgeon's discretion. Primary outcome was SFR at 3 months post URS. Secondary outcomes included operative time, complications and need for stent insertion.
Results: Twenty-five patients were randomized to UAS and 24 to no UAS. Patient demographics were similar (age 55 vs. 52 years, gender 16 vs. 17 males, BMI 32 vs. 29). Stone characteristics were not significantly different (Table 1). We were unable to pass the sheath in 5 patients randomized to UAS and unable to access the stone in 2 in the no UAS group. One patient (no UAS) was lost to follow-up. No significant differences in primary or secondary outcomes between the two groups (Table 1) were found.
Conclusions: Our data shows that the use of UAS during flexible ureteroscopy was not associated with greater SFR. Furthermore, in this cohort the surgical time, need for ancillary procedures and stent placement were not affected. The use of UAS was significantly associated with increased use of a basket and therefore should be further explored since it may have an impact on the overall cost of the procedure.

MP-05.05

Effective Radiation Exposure in Follow-up of Patients with Nephrolithiasis

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Introduction and Objective: Patients known to have previous nephrolithiasis are regularly followed in Stone Clinic with frequent imaging to rule out recurrences. Recently, there has been increasing awareness and concerns among both patients and health care professionals regarding long term risks from radiation exposure in follow-up of patients with benign disease. The aim of the present study was to quantify the yearly effective radiation doses associated with the follow-up of patients with nephrolithiasis in Stone Clinic at a single institution.
Methods: Retrospective chart review of 56 patients attending the Stone Clinic at a single academic centre between January and September 2009 was performed. Number and modality of diagnostic imaging studies in the previous 2 years were collected. Effective radiation exposure doses (reported in mSV) were calculated from the Dose Length Product values reported with each CT scan performed since November 2007. Radiation exposure from Kidney Ureter Bladder Plain Films (KUBs), Intravenous Pyelograms (IVPs) and fluoroscopic examinations were estimated from previous published data.
Results: A total of 38 males and 18 females with a mean age of 49 years (range: 21-78 years) were included in this study. There were 137 KUBs, 9 IVPs, 47 fluoroscopic examinations and 73 CTs reviewed. Median yearly calculated effective radiation exposure dose was 36.87mSV (Mean: 33.86, range: 1.7 – 54.59 mSV) in 2008 and 21.64 mSV (mean 22.42, range: 1.4 – 77.27 mSV) in 2009. A total of 7 (12.5%) patients received a calculated effective radiation exposure dose >50 mSV per year. Mean effective radiation exposure dose was significantly higher in 2008 when compared to 2009, but did not correlate with stone location, age or sex of the patient.
Conclusions: Currently there are no guidelines on imaging modality or frequency in follow-up of patients with nephrolithiasis. A significant portion of patients are receiving effective radiation doses that exceed the current occupational radiation hazard limits. Therefore, urologists should be cognizant of the radiation exposure of patients when ordering imaging studies for follow-up of patients with benign disease.

MP-05.06

Variables Influencing the Likelihood of Cardiac Dysrhythmias Requiring ECG-Gating During Extracorporeal Shockwave Lithotripsy

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Introduction and Objective: Cardiac dysrhythmias (CD) may occur during extracorporeal shockwave lithotripsy (ESWL) of upper urinary tract stones and are rarely associated with serious side effects. The etiology and importance of avoidance of these CD remains unclear but the appearance of different patterns of multiple ventricular premature complexes (VPC) during ESWL is disconcerting and may lead to the need for intervention. We sought to identify variables influencing the likelihood of developing CD during ESWL which required ECG-gating as decided by the attending anaesthetist.

Methods: Sixteen cases were identified in a prospective fashion and their charts were compared with 56 control patients treated on the same day by the same anaesthetist and urologist for the variables shown in the tables. Patients with known CD or pacemakers were excluded.

Results: All of the CD were described as frequent runs of bigeminy, trigeminy and/or multiple uni-/multi-focal VPC which stopped promptly following ECG-gating. No other interventions were required and no side effects were noted.

Table 1. MP-05.06. Descriptive statistics of continuous variables

Continuous variable	Cases (mean ± SD)	Controls (mean ± SD)	Probability
Age	43.01±15.6	53.6±15.4	0.01
Heart rate pre-Rx	72.6±14.5	77.9±14.9	0.16
Number of shocks	2327±572	2245±685	0.20
Energy level	3.5±0.8	3.6±1.0	0.49

Table 2. MP-05.06. Analysis of odds ratio estimates

Class variable	Estimate	95% confidence limits		Probability
Sex *F vs. M*	0.848	0.237	3.026	0.64
Stent *No vs. yes*	1.075	0.235	4.925	0.27 Previous
ESWL *No vs. yes*	0.495	0.138	1.767	0.10
Side of Rx *Left vs. right*	0.011	0	0.201	0.005

Conclusions: Worrisome CD developing during ESWL occur more frequently in younger patients and in those being treated for right sided stones. Heart rate pre-treatment, number and energy of shock waves, sex, presence of a ureteric stent and history of previous ESWL do not have an impact on the likelihood of them occurring. Normal rhythm can be established promptly by ECG-gating.

5-STAR

MP-05.07

Outcomes of Robot-Assisted and Laparoscopic Pyeloplasty: Preliminary Results of a Multi-Institutional Pyeloplasty Study

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Introduction and Objective: Laparoscopic (LP) and robot assisted pyeloplasty (RP) are effective means of treating UPJ obstruction, yet analysis of these techniques is often limited to a single or few centres. We present preliminary results of the multi-institutional pyeloplasty study, comparing LP and RP.

Methods: Data was collected retrospectively from centres with experience in minimally invasive pyeloplasty. Preoperative data included demographic and anatomic data. Intraoperative data included pyeloplasty type, operative time, and complications. Postoperative data included complications, radiologic and symptomatic follow-up, and need for more procedures.

Results: We have collected data from 486 patients, from 7 centres: 202 LP and 284 RP. LP was similar to RP in median age (35.0 yr, IQR = 21.0 yr vs. 36.0 yr, IQR = 27.0; $p = 0.685$). Median follow-ups for LP and RP were 12.1 mo (IQR = 14.5) and 9.0 mo (IQR = 16.0), $p = 0.015$. Preoperative pain was more frequent in LP than RP: 180 (90%) vs. 230 (81%), $p = 0.016$. Radiographically, both groups had similar median renal function (LP: 42.0%, IQR = 21.0; RP: 42.0%, IQR = 17.0, $p = 0.214$) and median T1/2 (LP: 26.0min, IQR = 18.0; RP = 30.0 min, IQR = 12.0, $p = 0.325$). The rate of previous UPJ procedure was similar for LP and RP: 13.4% v 9.8%, $p = 0.193$. Each had similar operative time (LP: 209.0 min (IQR = 108.3); RP: 196.0 min (IQR=104.0), $p = 0.224$). Intraoperative complications occurred in 3 LP and 6 RP ($p = 0.964$). Postoperative complications occurred in 17/202 LP (4 urine leaks) and 17/284 RP (4 urine leaks), $p = 0.257$. Postoperative renal function (46.0%, IQR = 15.5 vs. 45.0%, IQR = 12.5; $p = 0.102$) and T1/2 (10.2 min, IQR = 8.3 vs. 10.0 min, IQR = 7.8, $p = 0.153$) were similar for LP and RP. Postoperative pain worsened or remained unchanged in 7% LP and 2% RP, $p = 0.005$. Postoperative obstruction worsened or remained the same in 9.5% LP and 2.8% RP, $p = 0.007$. Secondary procedures occurred in 16 (7.9%) LP and 6 (2.1%) RP, $p = 0.002$.

Conclusions: Comparison of LP and RP reveals excellent outcomes for both. Difference in postoperative pain may be due to a higher rate of preoperative pain in the LP group. Secondary procedures may reflect different practices that vary by institution. Overall, there was a slight advantage in outcome with RP.