

Podium Session 1: Stones and Imaging

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POD-01.01

Surgical Management of Kidney Stone Disease: a Population-based Time Series Analysis

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Introduction and Objectives: The management of kidney stone disease has changed dramatically over the past 30 years. In particular, ureteroscopy (URS) has become a more efficacious procedure with less morbidity. As a result, based on physician surveys and reports from single centre series the rate of URS appears to have increased over time. However, large population-based evaluations to assess the changes over time in the surgical treatment of kidney stone disease have not been conducted. Our objective was to evaluate population-based trends in the use of extracorporeal shockwave lithotripsy (SWL), URS and percutaneous nephrolithotomy (PCNL) over the past 20 years, in Ontario.

Methods: Using the Ontario Health Insurance Plan physician claims database we conducted a population-based cross-section time series analysis by identifying all kidney stone treatments performed between July 1, 1991 and Dec. 31, 2010, in the province of Ontario. The primary endpoint was the proportion of all stone treatments represented by each modality, which was calculated for every 3-month block over the study period. Exponential smoothing models were utilized to assess for trends over time in the percent utilization of each of SWL, URS and PCNL.

Results: We identified 194,781 kidney stone treatments between July 1, 1991 and Dec. 31, 2010. A total of 96,807 SWL treatments, 83,923 URS treatments and 14,051 PCNL treatments were performed. We observed a significant trend over time for decreased utilization of SWL (68.5% to 33.7%, $p < 0.0001$) and an increase in URS utilization (24.6% to 59.5%, $p = 0.0002$), while no change over time was found for PCNL (6.88% to 6.85%, $p = 0.97$) (Fig. 1). By the end of 2004, URS had become the most widely used procedure.

Conclusions: Our population-based study confirms the increased use of URS over time suggested by physician survey and single centre retrospective series. Accordingly, the utilization of SWL has decreased in a reciprocal fashion.

POD-01.02

Ultra-low Dose CT Comparable to Standard CT in Patients with Suspected Renal Colic

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Introduction and Objectives: Non-contrast computed tomography (CT) is currently the standard radiologic investigation for patients with suspected renal colic. Concerns over the number of CT scans being performed along with the long-term effects of CT radiation exposure have led to the evaluation of low dose radiation CT scans in diagnosing renal calculi. Our objective was to compare an ultra-low dose (study) CT scan protocol to standard CT in the evaluation of patients with suspected renal colic.

Methods: Fifty-six emergency room patients with suspected renal colic underwent both a standard and study CT to assess for renal colic. The study CT protocol lowered the radiation exposure approximately 95% by fixing the tube current at 20 milliamperes-seconds (mAs). Both CT scans were read twice by a group of 4 blinded radiologists. The primary outcome was stone detection rate. Secondary outcomes included signs of obstruction, inter-observer agreement, and stone characteristics.

Results: Fifty-six patients had data available for comparison. Thirty-three of the 36 patients with a positive standard CT were identified on the study CT. This equates to a 92% sensitivity and 100% specificity for stone detection. Study CT sensitivity increased to >97% for stones >2 mm in size. There was no statistically significant difference between the two CT scans when directly compared for stone detection (McNemar's test $p = 0.63$, $\alpha < 0.05$). Inter-observer agreement for stone detection was excellent between all observers (all kappa values were greater than 0.8 with a combined mean of 0.9). The only false negative (no stone detected) with no indirect signs of obstruction was a 2 mm distal stone in a patient with a BMI of 48.

Conclusions: Our ultra-low dose CT protocol approaches the sensitivity and specificity of standard CTs in patients with suspected renal colic. This data strengthens the argument for developing reduced radiation CT protocols for patients with suspected renal colic.

POD-01.03

Therapeutic Benefits of Solifenacin (Vesicare) in the Mitigation of Ureteral Stent-induced Pain and Lower Urinary Tract Symptoms (LUTS) Post Ureteroscopy for Stone Management

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Introduction and Objectives: To evaluate the ability of solifenacin to relieve ureteral stent-induced pain and lower urinary tract symptoms following ureteroscopic surgery and stenting for stone disease.

Methods: A total of 77 patients underwent JJ ureteral stenting (6Fr, 24 or 26 cm) following surgery for stone disease. Patients were randomized into two cohorts, one receiving standard narcotic treatment (oxycodone) for postoperative pain, the other receiving narcotics in addition to solifenacin

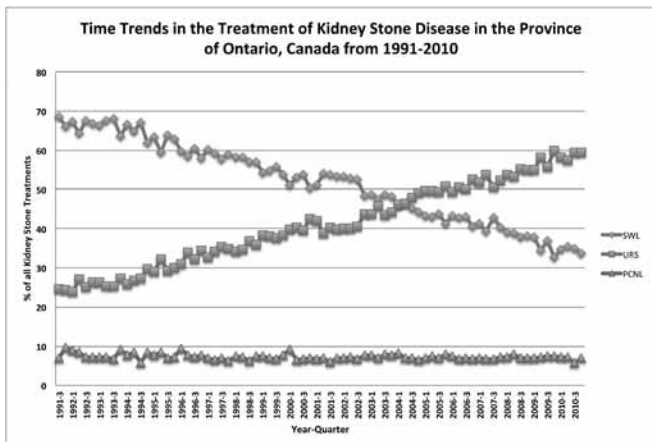


Fig. 1. POD-01.01.

(5 mg). No patients were prescribed alpha blockers. The Ureteral Stent Symptom Questionnaire was administered i) with the stent in situ (5 to 7 days after insertion) and ii) 3 to 5 weeks following stent removal.

Results: 77 patients participated in the study (50 solifenacin treatment, 27 no solifenacin treatment). The mean improvement in the solifenacin cohort was greater than the control in 8 out of 11 evaluated measures of urinary issues and 3 out of 6 measures of general health. When treated with solifenacin, potentially significant improvements in nocturia (U2, $p=0.106$), urination pain (U7, $p=0.079$), hematuria (U9, $p=0.0817$), and overall urinary satisfaction (U10, $p=0.002$) were seen. A clinically significant reduction in maximum pain (P3, $p=0.0693$) and an increased ability to perform strenuous activities (G2, $p=0.070$) were achieved. In both cohorts, those who did not return for the final questionnaire were below average in all 6 of these critical measures upon their first completion of the Ureteral Stent Symptom Questionnaire. The only minor side effect was dry mouth is 14% of patients on 5 mg.

Conclusions: In the critical areas of i) maximum pain experience, ii) the ability to perform strenuous activity and iii) one's overall sensitivity to urinary issues, clinically significant improvements were observed. We would expect an even greater benefit using the 10 mg dose of solifenacin.

POD-01.04

Impact of Radiological Technologists on the Outcome of Shock Wave Lithotripsy

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Introduction and Objectives: In shock wave lithotripsy (SWL), radiological technologists (RTs) play a significant role in stone localization and monitoring of treatment under the supervision of the urologists. At several centres, RTs assume a large role in performing SWL and the tasks completed by the RTs directly impact the results of SWL. The aim of this study was to evaluate the correlation of RTs and the outcome of SWL in terms of fluoroscopy time, fragmentation rate and stone-free rate.

Methods: A retrospective review of a prospectively collected data of 601 SWL treatments between June 2009 and March 2010 was performed. Patients with radiolucent stones were excluded. SWL was done by 6 RTs with different levels of experience. Follow-up was available for 534 treatments. Multivariate analysis was performed.

Results: RTs (A-F) performed 144, 109, 118, 58, 57, and 48 SWL sessions, respectively. There was no statistical difference among RTs in terms of mean stone size or stone location. In comparison with other RTs, RT A had significantly lower mean fluoroscopy time of 129 seconds (95% CI: 120.8- 137.3) ($p<0.001$), higher stone-free rate (75.7%) ($p=0.035$), and stone fragmentation rate after a single SWL session (82.6%) ($p=0.004$). After correcting for stone size and location, fluoroscopy time ($p<0.001$), fragmentation rate ($p=0.002$), and stone-free rate ($p=0.04$) maintained their significance. When comparing the top 3 RTs performing >100 SWL sessions, RTs B and C had significantly higher fluoroscopy time compared with RT A [OR (95%CI): 1.84 (1.38- 2.45); $p<0.001$ and 2.67 (2.00- 3.57); $p<0.001$], respectively. After correcting for stone size and location, RT B had significantly lower fragmentation rate when compared with RT A [OR (95%CI): 0.21(0.05-0.86), $p=0.03$]. However, there were no significant differences among the top 3 RTs in terms of stone-free rates.

Conclusions: RTs significantly differ in fluoroscopy usage in addition to stone fragmentation and stone-free rates.

POD-01.05

Cost-effectiveness of Shock Wave Frequencies of 60 versus 120 Shocks per Minute for Upper Ureteral Stones: Economic Analysis of a Randomized, Double-blind Trial

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Introduction and Objectives: Increasing evidence suggests that lower shockwave frequencies may improve stone fragmentation rates. The purpose of our study was to compare the cost-effectiveness of shockwave

frequencies of 60 and 120 shocks per minute for primary treatment of upper ureteral stones.

Methods: A decision analysis model was developed to estimate the costs and stone-free rates associated with treatment at shockwave frequencies of 60 and 120 shocks per minute. Stone-free rates and probabilities of requiring ancillary procedures, including shock wave lithotripsy (SWL) retreatment, ureteroscopy with laser lithotripsy and percutaneous nephrolithotomy, following primary treatment were derived from our previously published randomized, double-blind trial. Costs of SWL at 60 and 120 shocks per minute were obtained from our institutional data. Costs of ancillary procedures were obtained from the Ontario Case Costing Initiative. Univariate and probabilistic sensitivity analyses were performed to determine which parameters affected the outcome of our model.

Results: Primary treatment of upper ureteral stones with SWL at 60 shocks per minute was the more cost-effective treatment strategy, rendering one patient stone-free for \$1925 Canadian dollars (CAD). SWL at 120 shocks per minute rendered one patient stone-free for \$2178 CAD. Probabilistic sensitivity analysis reinforced SWL at 60 shocks per minute as the more cost-effective treatment strategy compared to 120 shocks per minute across all willingness-to-pay thresholds.

Conclusions: Primary treatment of upper ureteral stones with SWL at 60 shocks per minute is more cost-effective than treatment at 120 shocks per minute. Our study demonstrates that although the cost of initial treatment at 60 shocks per minute exceeds that of treatment at 120 shocks per minute due to increased OR time, treatment at 60 shocks per minute is more cost-effective due to the decreased need for ancillary treatments.

POD-01.06

The Influence of Body Mass Index on Outcomes Following Percutaneous Nephrolithotomy: a Global Perspective

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Introduction and Objectives: In addition to forming stones more commonly, obese patients present a number of challenges when undergoing percutaneous nephrolithotomy (PCNL). This study evaluates outcomes of PCNL in a series of 3709 patients stratified by body mass index (BMI).

Methods: A prospective database administered by the Clinical Research Office of the Endourological Society (CROES) captured data from patients treated with PCNL at 96 centres between November 2007 and December 2009. Patients with known solitary kidney, previous PCNL and congenital abnormalities were excluded from the analysis. Patients were categorized as normal weight (BMI 18.5-25), overweight (BMI 25-30), obese (30-40) and super obese (BMI >40) for the purpose of statistical analysis. A separate multidimensional match of 97 super obese patients with 97 control patients of normal weight was created using propensity score matching. Student's T-test and Chi-square tests were used to assess for differences between the groups.

Results: During the study period, 5803 patients underwent PCNL, of whom 3709 met the inclusion criteria. Operative time was significantly longer in obese patients ($p<0.001$) and the use of a balloon device for tract dilation was more common ($p<0.001$). Stone free rates (SFR) declined with obesity ($p=0.009$) which corresponded with a significantly higher re-treatment rate in this group ($p<0.001$). No significant difference was seen in length of stay or transfusion rate. Mean operative duration was longer in the super obese group (112 ± 56 mins vs. 86 ± 43.5 mins, $p<0.001$). Super obese patients were significantly more likely to experience a postoperative complication (22% vs. 6%, $p=0.004$).

Conclusions: PCNL may be performed with acceptable outcomes in both obese and super obese individuals, albeit with longer operative duration, inferior SFR and higher rates of re-intervention. Higher rates of postoperative complications are associated with super obesity.