

Research

Outcome of Rirs for Renal Pelvic Stones 1.5 to 2.0 cm using Semi-Rigid Uretero-Renoscropy

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ABSTRACT

Background

Retrograde Intrarenal Surgery (RIRS) is among the recommended treatment modality for stones located in renal pelvis and is of less than 2 cm. Renal Stones with Hounsfield units more than 1000 have low stone free rate with ESWL.

Objective

To determine the outcome of retrograde intrarenal surgery using semirigid ureteroscope in fragmentation of renal pelvic stone.

Methods

Patients with 1.5-2.0 cm stone located in renal pelvis of more than 1000 HU who underwent retrograde intrarenal surgery as primary procedure at Sindh Institute of Urology And Transplantation were included. Stone fragmentation was achieved with holmium-yttrium aluminum garnet laser. Secondary procedure was performed if complete stone fragmentation was not achieved. Statistical analysis was performed by SPSS version 20.

Result

Total 82 patients with mean size of pelvic renal stones 1.7 ± 0.53 cm were included. The mean operating time was 32.1 ± 12.9 mins. The stone clearance rate at six weeks after the first procedure was 79.3%. Minor complications including flank pain, fever and hematuria were reported.

Conclusion

Retrograde intrarenal surgery performed with semi rigid ureteroscope in renal pelvic stones of more than 1000 HU is a technically safe and effective procedure.

Keywords: *Retrograde intrarenal surgery; Pelvic stone; Flexible ureteroscopy and holmium laser.*

INTRODUCTION

There is a 10% lifetime risk of developing urinary tract stone.¹ Clinical presentation ranges from asymptomatic to symptomatic stone disease consist of renal colic (intense cramping pain), flank pain (pain in the back side), hematuria (bloody urine), obstructive uropathy (urinary tract disease), urinary tract infections, blockage of urine flow, and hydronephrosis (dilation of the kidney).^{2,4} Thus, ureteral stones frequently lead to the need of urgent assistance and treatment. The management of

upper urinary tract stones has been modified by the newer technologies and miniaturization of the endoscopic instrument. The two modalities; ureteroscopes, allowing access to urinary tract, along with intracorporeal lithotripsy have led to effective stone fragmentation. Thus, reducing the complications associated with open surgery and impacting on the quality of life.^{5,6}

Retrograde Intrarenal Surgery (RIRS), Extracorporeal Shockwave Lithotripsy (ESWL) and Percutaneous Lithotripsy (PNL)

are the recommended treatment option by European association of urology for renal pelvic stone less than 2cm.⁷ Flexible Ureteroscopy (FUS) provides thorough examination and therapeutic intervention of caliceal system. However, its small caliber and maneuverability makes it vulnerable to damage and high repairing cost.⁵ On other hand, Semirigid Ureteroscopy (RUS) have larger caliber thus, allows better visualization but difficult access to middle and lower calyces.⁸ Although, RUS is ideally utilized in treatment of distal ureteric stones but studies have reported its suitability for proximal ureter and pelvic stones.⁹ ESWL is the least invasive treatment modality for urinary tract stones but stone composition plays an important role in its success. Studies have reported failure of stone fragmentation with more than 970 Hounsfield Unit (HU).¹⁰⁻¹¹ However, Chen et al⁶ suggested that holmium-yttrium aluminum garnet laser (Ho:YAG laser) can effectively fragments stone irrespective of composition.

We aim to evaluate the outcome of retrograde intrarenal surgery in renal pelvic stones as a primary modality for the treatment of renal stones measuring 1–2 cm. Literature review on this subject shows there is paucity of local data. Moreover, guidelines have failed to recognize RIRS as a primary modality. Data from this study would help in establishing the local perspective and give the confidence to use it in our setup.

MATERIAL AND METHOD

This study was carried out at Sindh Institute of Urology & Transplantation (SIUT), Karachi from August 2014 to August 2017. In this prospective, single-centered study, 82 patients of either gender between 20-70 years of age were included. After the ethical approval was obtained, all patients presenting with single pelvic renal stones of ≤ 2 cm in maximal diameter of more than 1000 Hounsfield Unit (HU) on Computerised Tomography (CT) underwent retrograde intrarenal surgery as primary procedure or secondary procedure (after a failed ESWL). The collected data included demographics, stone size, stone location, stone burden (classified as 80 mm² or less and greater than 80 mm²), radio-opacity, laterality, procedure time and hospital stay. All patients having a solitary kidney, renal vein stenosis, congenital renal anomalies, urinary tract anomalies or any other known chronic diseases were excluded from the study.

Patients were given intravenous antibiotics preoperatively according to their preoperative urine culture. Patients with a negative urine culture were given cephalosporin, and those with a positive urine culture were given an appropriate antibiotic susceptible to bacteria isolated from the urine. The procedure was carried out as day care, under general anesthesia after appropriate patient counselling. Renal pelvic stone was accessed by using 8 or 8.5 Fr semi-rigid ureteroscope (Richard Wolf, Knittlingen, Germany). Intracorporeal lithotripsy was performed by holmium-yttrium aluminum garnet laser (Ho:YAG laser). A 4.8 Fr DJ stent was placed in some cases when suspicion of residual stones was high to avoid ureteral obstruction. Depending on the stone fragment size, dormie basket and other ancillary devices were used to retrieve stones out. At the completion of the procedure, C-arm was used to visualize residual stones, if any. Postoperative complications of the procedure like flank pain, fever, hematuria, urosepsis and perirenal hematoma was noted.

After being discharged patients were followed in outpatient department at one and six weeks of procedure. Secondary procedure

was performed in case of residual stones which mostly included Extra Shock Wave Lithotripsy (ESWL). A stone fragment size of larger than 4 mm was considered as residual stones. Complete stone clearance was defined as an absence of radio-opaque shadow in the renal area on X-ray and ultrasound assessed at six weeks after the auxiliary procedure. No patients failed to return for a follow-up visit. Data was analyzed by using SPSS Version 20. Data was analyzed by using SPSS version 22. Mean \pm standard deviation was calculated for quantitative data. Frequency and percentage was computed for qualitative data and presented in tables.

RESULT

A total of 82 patients underwent RIRS. The mean age and stone size in our study was 43.05 ± 8.24 years (range, 22 to 67 years) and 1.7 ± 0.53 cm. Fifty-six patients were males, and 26 were females. RIRS was performed on 32 cases and 50 case on the right and left kidney. Thirty-five of the 65 cases of RIRS were performed on the left kidney, and 30 cases were performed on the right kidney. Of the 82 patients, 43 (52.4%) and 39 (47.6%) had stone burdens less than 80 mm², and the other one-third had burdens of 80 mm² and above. Majority of the stones were located in the upper calyx (41.5%) followed by middle calyx (24.4%), pelvis (19.5%) and lower calyx (14.6%). Sixty-four stones were radio-opaque. (Table 1)

Table 1. Baseline and stone characteristics of the patients enrolled in the study (N=82)

| VARIABLE | NUMBER | PERCENTAGE | |
|--|-----------------|------------|--------|
| AGE | <50 YEARS | 30 | 36.60% |
| | ≥ 50 YEARS | 52 | 63.40% |
| GENDER | MALE | 56 | 68.30% |
| | FEMALE | 26 | 31.70% |
| LATERALITY | RIGHT | 32 | 39% |
| | LEFT | 50 | 61% |
| CUMULATIVE STONE BURDEN (mm ²) | LESS THAN 80 | 43 | 52.40% |
| | 80 AND ABOVE | 39 | 47.60% |
| RADIO-OPACITY | YES | 64 | 78% |
| | NO | 18 | 22% |
| GENDER | PELVIS | 16 | 19.50% |
| | UPPER CALYX | 34 | 41.50% |
| | MIDDLE CALYX | 20 | 24.40% |
| | LOWER CALYX | 12 | 14.60% |
| VARIABLE | MEAN | SD | |
| AGE (YEARS) | 43.05 | ± 8.24 | |
| STONE SIZE (cm) | 1.7 | ± 0.53 | |

The mean operative and hospital in our study was 32.1 ± 12.9 minutes and 2.47 ± 1.62 days For postoperative complications, 39% had flank pain (VAS ≥ 4), 48.8% had fever ($\geq 38^\circ\text{C}$), 6.1% had hematuria (macroscopic, lasting more than 24 hours), 1.2% had urosepsis and 4.9% had perirenal hematoma who required intravenous hydration and antibiotics. Majority of the RIRS procedures were primary cases, while secondary session of RIRS was performed in two patients and 15 patients underwent ESWL. Double J stents were placed in 60 patients (73.1%) to avoid urethral obstruction. Stone clearance rate after 6 weeks of first procedure was 79.3%. (65 patients). (Table 2)

Table 2. Postoperative Outcomes of The Patients Undergoing retrograde Intrarenal Surgery For Renal Stones (N=82)

| VARIABLE | | NUMBER | PERCENTAGE |
|-----------------------------|--------------------|--------|------------|
| STONE CLEARANCE | YES | 65 | 79.30% |
| | NO | 17 | 20.70% |
| POSTOPERATIVE COMPLICATIONS | FLANK PAIN | 32 | 39% |
| | FEVER | 40 | 48.80% |
| | HEMATURIA | 5 | 6.10% |
| | UROSEPSIS | 1 | 1.20% |
| | PERIRENAL HEMATOMA | 4 | 4.90% |
| VARIABLE | | MEAN | SD |
| OPERATIVE TIME (MINUTES) | | 32.1 | ±12.9 |
| HOSPITAL STAY (DAYS) | | 2.47 | ±1.62 |

DISCUSSION

Pakistan is among the countries that fall in “stone belt” area thus constituting the major workload of urologist.¹² The management of upper urinary tract stones has been revolutionized with the advancement in endourology. From none to minimal invasive surgery Extracorporeal Shockwave Lithotripsy (ESWL), Percutaneous Lithotripsy (PNL) and Ureterorenoscopy (URS) has reduced the need of open surgery. Thus, preventing the Percutaneous Nephrolithotomy (PCNL) associated complications like hemorrhage and organ injury.⁵⁻⁶ European association of urology has recommended use of ESWL, PNL, and URS as treatment modality for pelvic renal stones less than 2cm.⁷

Retrograde Intrarenal Surgery (RIRS) performed by using rigid or flexible instruments are evolution of basic cystoscopic procedure¹³ Although, recent studies focuses on Flexible Ureteroscope (FUS) due to its deflection mechanisms and small caliber scopes, Rigid Ureteroscope (RUS) is still considered safe and effective for distal and proximal ureteral stones.¹⁴⁻¹⁶ Studies also have reported the effectiveness of RURS in renal pelvic stones (RPS).⁵⁻⁸

There are limited studies on use of RUS for treatment of intrarenal stones. Süer et al⁵ documented stone free rate (SFR) of 83% after 12 weeks of primary session with RUS and holmium-yttrium aluminum garnet laser (Ho:YAG laser) in 48 patients with RPS. The author also reported SFR of 89 % after secondary procedure with either ESWL or FUS. We have also reported SFR of 79.3 % after 6 weeks of primary procedure. The better SFR in former study may be attributed to the fact that 45.8% of study population had undergone ESWL prior to the RUS.

Atis et al⁸, suggested utilization of semirigid ureteroscopy to access renal pelvic stone with 76% SFR at 4 weeks of procedure. The author also documented statistically significant decrease operative time as compared to FUS i.e., 71.90 ± 17.90 mins with SURS and 93.41–18.56 mins with FUS. Our mean operative time was 32.1±12.9 mins. The better time may be attributed to the large study population thus depicting increase clinical experience in treating intrarenal stones.

Many studies reported effectiveness of RUS in treatment proximal ureteral stones and reported complications like stone migration and ureteral perforation.¹⁷⁻¹⁹ Similar to Süer et al⁵ and Atis et al⁸ we used URUS in renal pelvic stones and documented minor complications like fever. In our study, 48.8% developed fever while 6.1% had hematuria which resolved with conservative management.

Stone composition is an important factor in determining the outcome of stone fragmentation in terms of procedure, number of session and stone clearance rate.^{16,17} Ouzaid et al¹⁰ and Foda et al¹¹ also reported ineffectiveness of ESWL in stone fragmentation with stone density more than 970 and 936 HU, respectively. Abd El Hamed²⁰ reported that renal pelvic stones of more than 2 cm treated with FUS and Holmium laser required more sessions with stones of more than 1,000 HU. We also fragmented renal pelvic stones of more than 1,000 HU with Ho:YAG laser but stones in our study were of smaller size and were accessed with RUS.²¹

Our study also has some limitation. Although it's a single center experience but SIUT is the largest urological institute in the country. Another limitation is that we performed abdominal X-ray and ultrasound to detect residual stone fragment. We didn't perform repeat CT scan abdomen to avoid radiation exposure. To the best of our knowledge, previously only two studies have accessed pelvic renal stones by semi rigid ureteroscope. We have reported for the first time in Pakistan the outcome of RIRS by using semi rigid ureteroscope in pelvic stone of more than 1,000 HU.

CONCLUSION

Retrograde intrarenal surgery performed with semi rigid ureteroscope in renal pelvic stones of more than 1,000 HU is a technically safe and effective procedure. Thus, in developing countries like ours where FUS is not readily available fragmentation of pelvic renal stones can be achieved with RUS.

CONFLICTS OF INTEREST

None.

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