



ASSESSMENT OF EFFICIENCY AND SAFETY OF RETROGRADE INTRARENAL SURGERY USING URETEROSCOPY AND LASER LITHOTRIPSY IN PATIENTS WITH RENAL STONE.

Urology

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ABSTRACT

Background: The incidence of renal calculi has been increased in recent years. The treatment modalities in standard practise includes extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy and laser stone fragmentation using ureteroscopy. Minimal invasive method Retrograde intrarenal surgery (RIRS) using ureteroscopy and laser lithotripsy has been shown to have better stone free rate with minimal complications. Whereas few other studies have reported upward migration of the stones and ureteral damage in RIRS. Hence the present study was conceived to assess the efficiency and complications of RIRS.

Materials and Methods: We enrolled 25 participants in the mean age group of 42 years of either gender with renal calculi (unilateral or bilateral presentation) for our study and we monitored the patient preoperatively, intraoperatively and postoperatively following RIRS. We assessed their stone free status and complications following the surgery.

Results: We observed 88% of stone free rate following RIRS with laser therapy.

Conclusion: Retrograde intrarenal surgery with ureteroscopy along with laser therapy is effective and safe comparing other treatment modalities. Hence, we recommend ureteroscopy along with laser therapy for solitary and bilateral renal calculi.

KEYWORDS

Renal calculi, Retrograde intrarenal surgery, Stone free status, laser lithotripsy, kidney stone

INTRODUCTION

The incidence of renal calculi has been increased in recent years. The occurrence of renal calculi is seen among all the age groups but, the occurrence peaks in individuals between 20-40 years. Usually, the renal calculi are composed of mainly calcium oxalate with less proportion of calcium phosphate. Other stones of metabolic origin include cystine, xanthine and uric acid. The factors causing renal calculi is a consequence of various factors such as hydration status, residential area temperature and the secondary causes includes metabolic conditions like cystinuria, oxaluria and gout. Infective organism which are known to synthesise urease and few drugs were established causes for renal calculi apart from anatomical defects (obstruction in uteropelvic junction, horseshoe kidney, calyceal diverticulum, urinary division surgery)1.

The treatment modalities in standard practise includes extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy, laser stone fragmentation and ureteroscopy 2. Out of which, percutaneous nephrolithotomy have been reportedly associated with better stone free rate; however, it has been shown to linked with bleeding complication due to compensatory renal parenchymal hypertrophy3,4. Recently, minimal invasive Retrograde intrarenal surgery (RIRS) using ureteroscopy and laser lithotripsy is used and have documented better stone free rate5.

One study by have documented good rate of efficiency in treating proximal ureteral calculi by small diameter endoscopy and lithotripters 6. Few investigators have documented good stone free condition following ureteroscopy with Ho-YAG laser therapy even in obese individuals7. Similarly, other studies also have documented the efficiency and safety of Ho- YAG laser lithotripter, which uses endoscopic mode of approach 8,9. Whereas few other studies have reported upward migration of the stones as an important complication of utretrorenoscopy due to incomplete stone removal along with complications such as ureter damage as a result of sheath placement

10-12. However, the dearth of quality data on RIRS' success rate and complications. Hence, in the present study we evaluated the efficiency of RIRS using ureteroscopy and laser lithotripsy.

MATERIALS AND METHODS

The present study is retrospective and prospective analytical study. The study was commenced after getting approval from the institute Ethics committee for human studies. We gathered database on patients who have undergone RIRS following clinical manifestation of renal calculi and their operative notes from department of urology, Madras Medical College, Chennai. Only patients in the mean age group of 42 years who have undergone RIRS procedure for stones < 1.5 cm were included for our study. Patients presented with calyceal diverticular stones or medullary sponge kidney were excluded. Complete physical examination was carried out along with routine investigations such as Blood glucose levels (Fasting and postprandial), complete blood cell count, urine culture, liver function test, renal function test, HbsAg and HIV. Further, we assessed diagnostic tests such as X-Ray KUB (kidney, ureter and bladder), intravenous pyelogram (IVP), contrast enhanced CT (CECT), electrocardiography and chest X-ray for all the cases. Subjects were included after getting written informed consent for participating in the study.

We have performed all the ureteroscopy under general anesthesia or spinal anesthesia and cystoscopy was carried out using 21 Fr/30 telescope in lithotomy position. Following the removal of previously inserted ureteric stent, a 0.032" thermophilic guide wire was passed into ureter and placed in the renal pelvis under fluoroscopic guidance, under which 9 Fr ureteric access sheath was placed to ensure safety to the ureter and drainage. The 6 fr Olympus ps 5 flexible ureteroscope (UK) was passed till the renal pelvis through we visualized the stone location and it was pulverized using Holmium YAG laser 365 m (VersaPulse Holmium Power suite 100W, Lumenis (UK) Ltd., Elstree, UK). After the procedure, ureter and pelvic mucosa were observed for mucosal bleeding, abrasions, false passage and perforation and at the end of the procedure all the patients were stented.

Intraoperative parameters like operative time, number and position of stones, injury to mucosa, difficult access, bleeding was all noted. Patient were monitored during postoperative period for fever, infection, sepsis, hematuria, stent colic and urinary tract infection (lower). We again performed Urine routine and culture, complete blood count, renal function test, X-ray (kidney, ureter, and bladder) and Ultrasound KUB postoperatively. During post-operative period patients were on antibiotics continuously for 7 days and higher doses of antibiotics were suggested if they manifest with symptoms of infection. DJ stents were removed after 2 to 4 weeks on an outpatient basis. All the data was fed into excel sheet (Microsoft, USA) for further analysis. Data were recorded in an Excel spread sheet (Microsoft, USA) and analyzed.

Statistical analysis: Data was expressed in frequency (percent). The statistical analysis was carried out using SPSS version 20.0 (IBM, USA).

RESULTS

We reviewed 50 cases and in our study we enrolled 25 patients who have undergone RIRS. 92% of surgery was completed successfully. The mean age of the subjects was 42.16 ±10.47. Our study group comprised of 14 male (56%) and 11 females (44%). 5 (56%) of the subjects had stone in left kidney, 6 (24%) in right and 5 (20%) had bilateral stones. Overall, 20 (80%) had unilateral stone disease and 5 (20%) had bilateral stones. Among the patients 15 (60%) had stones in favorable location of stones such as upper & middle calyx, pelvis and 10 (40%) had stones in unfavorable location (lower calyx).

Figure 1 shows that out of 25 cases, RIRS was completed successfully for 23 cases (92%).

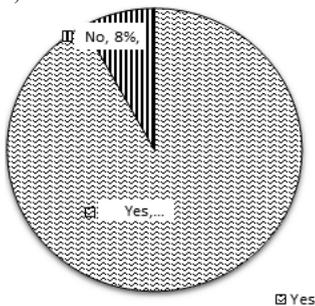


Figure 1: Successful completion of the surgery

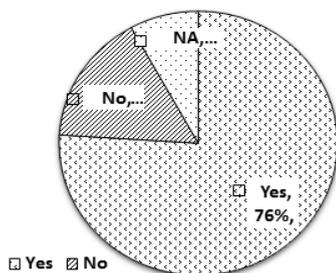


Figure 2: Stone free rate immediately after the procedure

Figure 2 shows that out of 25 cases, 19 cases (76%) were stone free immediately, while 2 cases (16%) were not and for 2 cases (8%) results were not available.

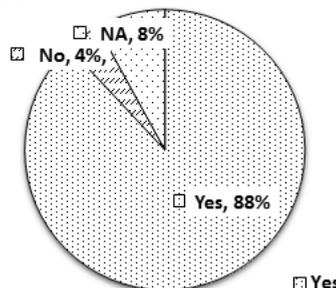


Figure 3: Stone free rate after 1 month following the procedure

Figure 3 shows that out of 25 cases, 22 cases (88%) were stone free

immediately, while 1 case (4%) were not and for 2 cases (8%) results were not available.

Table 1: Complications during intraoperative and post-operative period

Complications	Yes Frequency (Percentage)	No Frequency (Percentage)
Mucosal abrasions	6 (24.00)	19 (76.00)
Thermal injury	Nil	25 (100)
Bleeding	3 (12)	22 (88)
False Passage	1(4)	24 (96)
Extravasation	1 (4)	24 (96)
Perforation	Nil	25 (100)
Avulsion	Nil	25 (100)
Intussusception	Nil	25 (100)
Difficult access	6 (24)	19 (76)
Haematuria	6 (24)	19 (76)
Fever	6 (24)	19 (76)
Infection	1 (4)	24 (96)
Sepsis	1 (4)	24 (96)
LUTS	4 (16)	21 (84)
Stent colic	6 (24)	19 (76)

Table 1 shows complication of RIRS - mucosal abrasions (24%), bleeding (12%), Extravasation (4%), false passage (4%), difficult access (24%), hematuria (24%), Fever (24%), Infection (4%), sepsis (4%), LUTS (16%) and stent colic (24%).

DISCUSSION

Globally the incidence of renal stone disease is increasing 13,14. Therapeutic approach for renal calculi using Retrograde intrarenal surgery (RIRS) involves the operation of ureteroscope and laser; RIRS has shown decreased morbidity rate and good efficiency 15. Resorlu et al., proposed that the success rate outcome of PCNL, and RIRS was better than SWL. In the present study we have completed 92 percent RIRS procedure successfully for our study participants (Figure 1). Takazawa R et al., have reported 100 percent stone free status following retrograde intrarenal surgery 16. But, one study observed that the mean of stones treated by URS had a mean of 858 HU while stones that were not successfully treated had a mean of 1115 HU. In view of stone clearance rate, SWL have shown lesser rate of stone clearance even after following consecutive sessions, specifically for stones present in lower pole of the kidney. In our study, we observed better stone clearance rate immediately following the surgery (76%) and even better stone clearance rate after one month following the procedure (88%).

Previous literature have shown that the superiority of ureterorenoscopy over the PCNL and SWL in terms of reduced complication and stone free rate among patients with bilateral kidneys 17. Further, studies have reported positive association of SWL with onset of diabetes and hypertension 18. Furthermore, existing study also suggests that resultant complications of PCNL includes, hemorrhage, sepsis, kidney loss and injury to the nearby organs 3,4.

The complication often associated with PNL is haemorrhage 19,20. Apart from this perforation of the bowel is the major complication of PNL 21. Few large scale study have reported notable morbidity or mortality among the subjects who have underwent PCNL 22-24 and increased number of PCNL procedure is associated with complications related to bleeding 22. In our study, patients who have undergone ureterorenoscopy have shown only 12 percent of bleeding and no incidence of perforation. Haematuria and haematoma is frequently associated with ESWL 25. But, in our study, following ureterorenoscopy we could notice significant haematoma but 24 percent have reported haematuria following the procedure.

Stone size and/or volume is identified to influence stone free rate in RIRS 26,27. Contrary to this finding few studies have reported no relationship between size of the stone and stone free rate 28,29. Takazawa R et al., have reported 100 percent stone free status following retrograde intrarenal surgery 16. But, one study observed that the mean of stones treated by URS had a mean of 858 HU while stones that were not successfully treated had a mean of 1115 HU 29. The location of the stone in kidney also determines the success rate in ureterorenoscopy specifically for the stones in lower pole 28-30. Available evidences have reported 80 percent stone free rate for lower

pole stone 28 and 90 percent stone free rate for proximal ureteral and intra-renal 30. In our study, we observed 15 (60%) of stones in favorable location of stones such as upper & middle calyx, pelvis. 10 (40%) of stones were in unfavorable location (lower calyx). We also observed 20 (80%) of unilateral stone disease and 5 (20%) of bilateral stones in our study group. Previous literature have shown that the superiority of ureterorenoscope over the PCNL and SWL in terms of reduced complication and stone free rate among patients with bilateral kidneys 17. Further, Studies have reported positive association of SWL with onset of diabetes and hypertension 18,31. Furthermore, existing study also suggests that resultant complications of PCNL includes, hemorrhage, sepsis, kidney loss and injury to the nearby organs 3,4. Whereas, in our study we noticed no significant complications in patients except for postoperative hospital stay only in subjects with bilateral kidney stones. Ureteroscopy and laser stone fragmentation procedure have not shown any complication such as hematoma of the kidney, renal wall injury or death in solitary kidney. Similarly, in our study, we also did not find any significant complications following RIRS except for moderate complications (Table 1) such as mucosal abrasions (24%), bleeding (12%), Extravasation (4%), false passage (4%), difficult access (24%), hematuria (24%), Fever (24%), Infection (4%), sepsis (4%), LUTS (16%) and stent colic (24%). Overall, RIRS confers good stone clearance rate along with minimal complications. Firstly, the sample size of from our study is small. Secondly, we could have performed a case control study, which is more appropriate for small sample size study.

CONCLUSION

Our study outcome suggests that RIRS is effective in stone removal rate and safe without any complications.

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Conflict of interest: None declared

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