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Original Research Article

Assessing Outcomes of Retrograde Intrarenal Surgery (RIRS) for Kidney Stones: A Single Center Comparative Study

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Abstract

Aim: The aim of the present study was to compare the intraoperative adverse events, postoperative complications and stone free rates (SFR) of RIRS in patients with renal calculi of varying sizes.

Methods: The patients who underwent RIRS at Department of Urology from October 2019 to October 2022. were included in the study. The informed consent was taken from all the patients included in the study. 200 patients were selected for the study.

Results: The size of calculi was calculated and the smallest size of calculi came to be 3 mm and the largest size of calculi was found to be 60 mm. The average size of the calculi came out to be 22.9 ± 11.2 mm, the demographic characteristics were studied for all the patients, the features that were studied included size of the stone, its location and position in the body. Out of all the patients that were taken for study some of them were at the first step of procedure and the remaining was at the starting stage of the multifunctional procedure. There were almost 90% of the patients that refused to undergo re-surgery or any observation. There were only 10% patients that undergo repetitive RIRS to clear the stones and were later-on confirmed stone free.

Conclusion: RIRS is an effective treatment option for the management of renal stones, including those greater than 20 mm in size. We observed a size dependent increase in the postoperative complications and a reduction in the SFRs. The majority of the postoperative complications were low grade.

Keywords: Renal Calculi, Retrograde Intrarenal Surgery.

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Introduction

Percutaneous nephrolithotomy (PCNL) has until recently been the first-line treatment of kidney stones measuring more than 2 cm. [1,2] Although PCNL has high rates of kidney stone clearance, the technique has a morbidity and mortality to consider, which can prolong the need for hospitalization. [3-5] Recent studies have shown that retrograde intrarenal surgery (RIRS) can be an effective and safer alternative in the treatment of kidney stones of considerable size. [6-8] Technological progress, both in the design of new flexible ureteroscopes (thinner and with better vision) and in the extensive variety of endourological materials (ureteral access sheaths, basket extraction, guidewires), coupled with the greater experience of certain surgeons have contributed to the dissemination of RIRS. Thus, the kidney stone clearance rates for patients with kidney stones treated with RIRS have improved, greatly approaching the success rates of PCNL, with less associated morbidity. [9,10] The latest review of the clinical guidelines of the European Association of Urology considers endourology as the treatment of choice for kidney stones measuring more than 2 cm, with centers with experience in these types of treatments being able to opt between PCNL or CRIR. [11]

Preoperative ureteric stenting is primarily used for internal urinary drainage in patients with obstructive renal stones, hydronephrosis, urinary tract infection, and in patients with a need for passive dilatation of the ureter. However, ureteral stents are associated with complications that include infection, encrustation, hematuria, and discomfort caused by tissue irritation. Previous studies reported that preoperative ureteral stenting improves the stone-free rate (SFR) after

ureteroscopic lithotripsy; however, this issue is still being debated within the urologic community. [11,12] The number are people are suffering from the urinary tract stone. In the recent years the minimallyinvasive procedure like RIRS have replaced the open surgery approaches. The RIRS are widely accepted by the physicians as compare to the other approaches. It is alternative to the percutaneous nephrolithotomy PCNL. [13] For the treatment of the lower pole stones, the European Association of Urology (EAU) has labelled the RIRS and PCNL as the first-line and effective treatment. The role RIRS play in treatment of the calyces and renal pelvis is still under investigation. The RIRS is seldom used for the management of the renal calculi with the renal stone of size greater than 40 mm. [14,15] The limited visualization, reduced size of fragment removal are the drawbacks associated with the RIRS. It is very expensive procedure and a major deterrent to the RIRS. [16] It is not only prove as an effective treatment for adults, but also different studies have showed that it is reasonable treatment for the children also. The minimum complications are observed in the children after RIRS treatment. The better stone free rates are observed after the RIRS treatment. Some studies have showed that if RIRS is performed as outpatients procedure . [17,18]

The aim of the present study was to compare the intraoperative adverse events, postoperative complications and stone free rates (SFR) of RIRS in patients with renal calculi of varying sizes.

Materials and Methods

The patients who underwent RIRS at Department of Urology, Narayan Medical College and Hospital, Sasaram, Rohtas, Bihar, India from October 2019 to October 2022. were included in the study. The informed consent was taken from all the patients included in the study. 200 patients were selected for the study.

Inclusion and Exclusion Criteria

All patients who underwent unilateral RIRS for renal calculus/calculi were included in the study. Patients under the age of 18 years, or those who underwent bilateral RIRS or percutaneous nephrolithotomy (PCNL) or other surgeries along with RIRS or those who underwent RIRS for ureteral or impacted pelvic ureteric junction calculi were excluded from this study. Patients who had not undergone recommended imaging evaluation or underwent scheduled staged procedures were also excluded. Patients who lost to follow up were also not considered in the evaluation.

The experienced endourologist performed the all surgeries. The frequency of the laser was set between 20-50 Hz. The dusted calculi were preferred rather than their fragmentation. The completion of the procedure depends upon the removal of DJ stent. The calculi of dimension 1-9 mm were included in the group 1, while 10-19 mm were included in the group 2, 20-29 mm were included in group 3. The calculi of dimension 30-39 mm were included in group 4, the calculi of dimension 40-49 mm in group 5, while calculi greater than 50 mm dimension were included in the group 6. The post-operative complications were reported while six-month follow months. The demographic details location and side of calculi, total operative time of each patient was recorded. The intraoperative and postoperative adverse event and complication were recorded respectively. The follow up also noted the stone related events. SPSS version 21.0 was used for the statistical analysis. Receiver operative curves were plotted.

- The Olympus URF-P7 flexible fibre uretero-renoscope and Sphinx Jr 30 W Holmium laser was used in all the procedures.

Results

Table 1: Demographic features and the characteristics of the stone

Features	Group #1(n=20)	Group #2 (n=75),	Group #3(n=60),	Group #4(n=30),	Group #5(n=10),	Group #6(n=5),	P-value
Primary RIRS without the urge for DJ stent	17 (85)	65 (86.66)	50 (83.34)	25 (86.66)	10 (100)	5 (100)	0.1
No. of procedure	1.14±0.6	1.36±0.4	1.76± 0.44	2.06± 0.34	2.08± 0.42	2.32± 0.48	
1	16(80)	45(60)	18(30)	1(3.33)	1(10)	0	0.0
2	4(20)	30(40)	42(70)	29(96.67)	9(90)	3(60)	
3	0	0	1(1.5)	2(5.5)	2 (11.3)	2(40)	
Total duration of operation(min)	4.0± 12.14	71.5± 30.2	116.4± 46.4	188± 45.5	232± 34.6	257.1± 45.8	0.0
Intra operative negative events	2(10)	5(6.66)	10(16.66)	3(10)	1 (10)	5(20)	0.05

Ureteral sheath related ureteral wall wound - Grade1	1(5)	4(5.34)	3(5)	0	0	0	
Incompetence to Reach Part of Calculus and Left Alone	0	0	2(3.34)	1(6.66)	0	0	
Inability to access the calculus fully and left alone	1(5)	0	0	0	0	0	
Infundibular	0	3(4)	1(1.66)	2(6.66)	0	1(10)	
Pelvictear	0	1(1.33)	2(3.33)	0	0	0	
Injury that require Replacement of the exible ureterorenoscope	0	0	1(3.33)	0	1(10)	1(40)	
Broken and fixed basket	0	0	1(1.66)	0	0	0(0.0)	

The size of calculi was calculated and the smallest size of calculi came to be 3 mm and the largest size of calculi was found to be 60 mm. The average size of the calculi came out to be 22.9 ± 11.2 mm, the demographic characteristics were studied for all the patients, the features that were studied included size of the stone, its location and position in the body.

Table 2: The problems during the retrograde intra renal surgery and the outcomes

Anatomical problems	No. of patients	Size of stone(mm)	Intraoperative negative events, n	Postoperative issues, n (%)	Remaining stones, n (%)
Infundibular stenosis	10	25.5±. 9.16	1	3	2
Mild pelviureteric junction blockage, post pyeloplasty	7	17.0± 5.60	1	0	0
Duplicated collecting complex	9	14.8± 6.68	1	0	1
Impacted	10	26.4± 16.8	1	1	0
In fundibularcalculus	5	28.8± 12.6	2	1	0
Pelvic kidney(ectopic)	3	40.0± 0.00	0	0	0

Out of all the patients that were taken for study some of them were at the first step of procedure and the remaining was at the starting stage of the multifunctional procedure. There were almost 90% of the patients that refused to undergo re-surgery or any observation. There were only 10% patients that undergo repetitive RIRS to clear the stones and were later-on confirmed stone free.

Discussion

The urolithiasis incidence are rising globally. The physicians focused on choosing the process that remove the stones completely with least morbidity rates. The ureterorenoscopic management of the renal calculi has been advanced by the ureterorenoscope miniaturization. [19] Further advancement in the surgical and laser techniques have added to the advents in the medical instrumentation. Stone size highly effect the choice of treatment. For the removal of the renal stone greater than 20 mm in size the retrograde intrarenal surgery is considered as second line of treatment. Therefore RIRS is being effectively used for the treatment of the large and varying size calculi. It is safe option for removal of kidney stone. [20,21]

It was reported that the elevated rates of RIRS in primary form are attributed to the routine ureteral dilation up to 12 Fr and condition in case of small size was up to 9.5 Fr UAS. [22] In order to get higher SFR the pop dusting was combined with the

conventional stone dusting. The procedure always starts at the dusting settings and later on it leads to lithotripsy. At the end of the procedure even though there was no change in the settings of laser, the procedure was altered to non-contact form of lithotripsy. Here the technique was performed uniformly all around the stone s that a very fine dust of stone can be made without producing any larger fragment. [23]

The size of calculi was calculated and the smallest size of calculi came to be 3 mm and the largest size of calculi was found to be 60 mm. The average size of the calculi came out to be 22.9 ± 11.2 mm, the demographic characteristics were studied for all the patients, the features that were studied included size of the stone, its location and position in the body. Out of all the patients that were taken for study some of them were at the first step of procedure and the remaining was at the starting stage of the multifunctional procedure. There were almost 90% of the patients that refused to undergo re-surgery or any observation. There were only 10% patients that undergo repetitive RIRS to clear the stones and were later-on confirmed stone free. The SFRs reported in the literature vary widely (54–96%) for renal stones sized 1–2 cm after a single session of RIRS.[22] This observed difference in rates may be due to differences in how 'stone-free' was defined, and differences in the imaging method used during follow-up. Previous studies reported a residual stone size of 4 mm [24] and 2 mm [25] to be clinically significant residual stone. Imaging modalities for detecting stones include plain radiography, ultrasound, and CT scan, and each of these methods has a different sensitivity and specificity. Plain radiography and ultrasound have lower sensitivity (48–63%) for overall size of renal stone, sothere is a higher likelihood that they could miss a small residual stone. [26] Kanno et al. reported that the sensitivity of plain radiography and ultrasound decreased as the size of the renal stone became smaller. For stone size ≤5 mm, the sensitivity of plain KUB and ultrasound were 12% and 78%, respectively. [27]

Conclusion

RIRS is an effective treatment option for the management of renal stones, including those greater than 20 mm in size. We observed a size dependent increase in the postoperative complications and a reduction in the SFRs. The majority of the postoperative complications were low grade. There were no stone related events in the patients who were managed conservatively for residual stones after surgery, on short term follow up.

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