Original Research Article

Journal of College of Medical Sciences-Nepal, Vol-19, No 1, Jan-Mar 2023
ISSN: 2091-0657 (Print); 2091-0673 (Online) Open Access
DOI: 10.3126/jcmsn.v19i1.49849

Stone Free Rate of Lower Pole Calyceal Stone Versus Other Calyces in Retrograde Intrarenal Surgery

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ABSTRACT

Introduction

Miniaturization of endoscopic instruments has gained wide popularity in the treatment of renal calculi. Retrograde intra-renal surgery (RIRS) and laser in combination has already proven their superiority when compared to other modalities in the treatment of renal calculi. This study was conducted to assess the stone-free rate (SFR) of lower pole calyceal stone versus other pole calyces in RIRS.

Methods

This retrospective study analyzed the stone free rate of lower pole calyx stone versus other pole calyces in retrograde intra renal surgery (RIRS) adults above 15 years of age from March 2021 to February 2022 at Chitwan Medical College and Teaching Hospital, Nepal. The stone-free rate was assessed descriptively on post operative complications, stone size, operative time, hospital stay, and need for the second procedure.

Results

A total of 62 patients underwent retrograde intrarenal surgery. The mean age of the study population was 38.41 ± 10.54years in the lower caliceal group against 39.09 ±13.53 years with p value of 0.829.The mean hounsfield of lower caliceal stone was 1023.31±252.96 to that of other caliceal stones 1004.00±349.22 with p value of 0.806. The sizes of the stones were 11.07±2.10 mm in lower caliceal stones versus 10.67±2.51mm in other caliceal stones with p value of 0.507. The duration of operation time in 1st group was 63.82±23.57minutes to that of 65.93±28.96 in 2nd group with p value of 0.756. The hospital stay in lower caliceal stones were 6.13±1.43days to that of other caliceal stones 5.87±0.99 with significant p value of 0.412.

Conclusions

Retrograde intrarenal surgery is a better procedure that continues to undergo significant advancements. It is a technically safe and effective procedure for the treatment option for treating the lower pole calyx calculus with optimal post-surgical morbidity and stone-free rate.

Keywords: Retrograde internal surgery; Holmium laser; renal calculus.

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INTRODUCTION

Management of lower pole calyceal (LC) stones presents a problem for the urologist.[1] Extracorporeal shock surge lithotripsy (SWL) is a technology that is cheap with no major complications to achieve stone free rate (SFR). Its results have been lower than optimal for LC stones and in particular for cases with unfavorable caliceal angle.[2] The part of flexible ureteroscopy in the urologist's armamentarium has experienced a dramatic elaboration.[3] This is generally attributed to advancements in fiber optics designs, downsizing of instrumentations, better irrigation system and the vacuity of small instruments, both powered and mechanical to allow complex pushes within the confines of the upper urinary tract. Resembling to these developments, there's an adding interest in operation of retrograde intrarenal surgery (RIRS) for treatment of renal stone. In this study, we aim to analyze the Stone free rate of lower pole calyx stone versus other pole calyces in RIRS. Every treating urologist aims to achieve maximum stone-free status with minimum complications at the end of surgery. The choice among renal stone treatments depends on the size, and position of the stone, preference, and experience of the surgeon.[4] Development of caliber quality flexible ureteroscopy with its diverting angle at the tip with a better optic system renders easy access to all the pelvicaliceal system with better treatment results.[5] Still its required skill, urologist's experience and cost remain a challenge for the treating physician.

METHODS

This retrospective cross-sectional study was conducted at Chitwan Medical College Teaching Hospital, Bharatpur, Chitwan, Nepal, from March 2021 to February 2022. Adult patients with renal stone in lower calyx and others calyces who underwent RIRS were included. Patients whose case files couldn't be retrieved were not analyzed. At Chitwan Medical College and Teaching Hospital RIRS is done with a standard technique under general anesthesia. Prophylactic antibiotics (inj. ceftriaxone) are routinely given. In lithotomy position semi-rigid ureteroscopy is done. A 0.035-inch tip hydrophilic guide wire is passed through ipsilateral ureteric orifice upwards and ureteral access sheath of 9.5Fr is railroaded up to proximal ureter under C-arm guidance. A flexible ureteroscope is introduced via access sheath up to the renal pelvicalyceal system (PCS) and renal calculi are localized. Laser fiber of 200 μm or 365 μm connected to 100 watt Holmium laser machine is passed via a flexible ureteroscope to dust the stones. The energy level of 0.2–0.6 J and a rate of 30-45 Hz are used for dusting the stone. For fragmenting stone a power of 1j and 10-20 hz were used. Dusting was the preferences were ever possible. At the end of the procedure, the flexible ureterorenoscope is pulled out under vision while the ureter is observed so that no possible injury is missed. At the completion of the procedure, C-arm is used to visualize residual stones with retrograde pyelography, if any. After removal of ureteral access sheath, DJ stent is placed routinely in all the patients, to assist the passage of small stones or clinically insignificant radiological fragments (CIRF), to assist ureteral edema to resolve and to minimize the probability of ureteral stricture development. The DJ stent is removed at four weeks after surgery. The patient is asked to visit after 6 weeks with ultra sonogram (USG). If USG reveals a stone of more than 4mm than a plain CT KUB is requested. Clinically insignificant radiological fragments 'CIRF' are defined as a stone fragment size of less than 4 mm seen in CT KUB at 4-6th week of surgery. A stone fragment size of larger than 4 mm is considered as residual stones. A stone size of 5-7mm if non obstructive is kept on follows up with no intervention. Operation room register was used to obtain the patient file numbers. Data were collected from the patient's files kept in the hospital record section. The variables analyzed

were age, gender, renal stones location and stone clearance, stone size, operative time Hounsfield units of stone, hematuria, postoperative pain & fever, urosepsis, hospital stay residual stones and need of an adjunctive procedure to achieve residual stone clearance. Sepsis was defined as postoperative fever (temperature more than 38° C or less than 36°C), pulse more than 100/minute, the respiratory rate more than 20/minute, total leukocyte count more than 12000/mm^{3}or less than 4000/mm^3. Stone free rate of lower pole calyx versus other calyx in RIRS was assessed by stone clearance, peri operative complications, residual stones, hospital stay and urosepsis. The SPSS version 21.0 was used for descriptive data analysis.

RESULTS

A total of 62 patients underwent retrograde intrarenal surgery. The mean age of the study population was 38.41 ± 10.54years in the lower caliceal group against 39.09 ±13.53 years with p value of 0.829.The mean hounsfield of lower caliceal stone was 1023.31±252.96 to that of other caliceal stones 1004.00±349.22 with p value of 0.806. The sizes of the stones were 11.07±2.10 mm in lower caliceal stones versus 10.67±2.51mm in other caliceal stones with p value of 0.507. The duration of operation time in 1st group was 63.82±23.57minutes to that of 65.93±28.96 in 2nd group with p value of 0.756. The hospital stay in lower caliceal stones were 6.13±1.43days to that of other caliceal stones 5.87±0.99 with significant p value of 0.412. There were no major complications in both arms.

The stone free rate was 25 (86.2%) in lower caliceal stones as compared to 31(93.93%) in other caliceal stones with no significant p value of 0.405. (Table 1).

Table 1. Comparison of demographical variables.

Variables		Lower calyx (n = 29)	Other calyx (n = 33)	*p* - value
Age (yrs)		38.41 ± 10.54	39.09± 13.53	0.829
Sex	Male	12 (41.3 %)	20 (60.6%)	0.203
	Female	17 (58.7%)	13 (39.4%)	
Laterality	Right	16 (55.1%)	19 (57.6%)	1.000
	Left	13 (44.9%)	14 (42.4%)	
Stone size (MM)		11.07±2.10	10.67±2.51	0.507
HU of stone		1023.31± 252.96	1004.00±349.22	0.806

Postoperative flank pain was present in 17 (27.41%) patients, postoperative fever was

Table 2. Peri-operative outcomes of the patient undergoing RIRS.

Variables	Lower calyx (n = 29)	Other calyx (n = 33)	*p* - value
Operative time(minutes)	63.83±23.57	65.93±28.96	0.756
Hospital stay(days)	6.13±1.45	5.87±0.99	0.412
Postoperative complication(n)			
- No complication	16 (55.1%)	22 (66.7%)	
- Flank pain	9 (31%)	8 (24.2%)	
- Fever	3 (10.3%)	0	0.194
- Hematuria	1 (3.6%)	3 (9.1%)	
- Urosepsis	0	0	

observed in 3 (4.83%) patients and hematuria occurred in 4(6.45%) patients. Complete stone clearance was seen in 58(94%), residual stones in 4(6%). No intra-operative complications were seen in any of the patients. There was no urosepsis among the study population. Analysis of peri-operative parameters (Table 2).

Out of 6 patients with residual stones, 4 patients planned to undergo the second session RIRS and they denied for second session RIRS as they were non obstructive and were managed conservatively. The success rate of RIRS according to the site of stone in the kidney is shown in (Table 3). The overall complete stone clearance rate was 90.32% (56/62 cases). Complete stone clearance among patients with stones located at the lower calyx was 86.20 %(n=25) whereas in the other calyx was 90.32 %(n=31) with no significant p value of 0.405 (Table 3).

Table 3. Success rate according to stone location.

Success rate	Lower calyx (n %)	Other calyx (n %)	Total	p - value
Stone clearance	25 (86.20%)	31 (93.9%)	56 (90.32%)	
Residual stone	4 (13.80%)	2 (6.1%)	6 (9.68%)	0.405
Total	29 (100%)	33 (100%)	62 (100%)	

DISCUSSION

Urinary system stone disease is the third most common pathological condition following urinary tract infections and prostate disorders that affects the urinary tract. The size, site, and number (single or multiple) of stone(s), anatomy of the urinary system, co-morbidities, age, and activity of the patient are important for the treatment plan. The aim of the urinary stone treatment is to achieve the highest stone-free rate with the lowest morbidity. Thus, currently, less invasive endo-urological methods are used in urinary stone treatment. Nowadays, RIRS is being considered as a primary procedure in the treatment of stone size less than 2 cm, owing to the technical advancement of flexible ureteroscope and its size, the degree of deflection and the quality of fiber optics.[6] RIRS has been reported as an effective and definitive therapeutic option for renal stones.[7,8] It has been shown to achieve high stone-free rate (SFR) with a low rate of complications compared.[8] The mean operation time and mean hospital stay was 64.95 ± 26.39 (35-125) minutes and 6 ± 1.22(4-9) days respectively. This was comparable to a study done by Elbiret al,[9] where the median operative time was 62.5 (40-180 min) and hospitalization of 26.4 (12-120) hours. Relatively longer hospital stay seen in our study was probably because of the tendency to overstay at the hospital by our patients even after discharge order, owing to fear of any untoward complication that may happen back home. In terms of operative time, our finding was comparable to the study of Fatih Elbir et al.[9] Which obviously is a benefit of RIRS for treating stones less than 20 mm.(10) In the study of Binbay et al.[10], a significant decrease in surgical time has been demonstrated. With further experience, we believe we do achieve shorter operative time with a better outcome in the days to come. Location, size of renal stones and surgeon expertise usually decide treatment modality. In the study of RIRS for stone size less than 2 cm, Ho CCK et al[6] found a significantly higher success rate of 75% clearance of stone. Elbir et al [9] in their study found complete stone-free rates of 67.8%, while in 10.7% patients clinically insignificant residual stones were detected compared to our study where the mean stone size was 10.86 ± 2.32 (7-15mm) with a stone clearance of 93.5% and 6.5 % of Residual stone. In the present study, stone position did not

affect the SFR. This is consistent with another study by Perlmutter et al.[1], who found no significant differences in the SFR between stones in different positions.[11] When lower-pole stones were analyzed separately, the SFR was 91.1%. This outcome is comparable to another study by Pearle et al. that reported an SFR of 50% for lower-pole stones measuring 1 cm or less.[12] Distribution of success rates according to the location of stones was detected as follows: lower calyx 46.8 %; other calyx 53.2%, comparable to study done by Elbir et al.[9] Similarly, Zilberman et al.[13] reported only 19% clearance of lower calyx stone with first session RIRS. Lower calyx stones are believed to be more difficult to tackle compared to stone located to other regions because of technical difficulty to access them hence stone-free clearance rate decreases. The potential infections should be treated with appropriate antibiotics, and the procedure should be conducted after sterilization of urine.[14] In our study, all patients received appropriate antibiotic prophylaxis. However, postoperative complication between the two group's lower calyx and other calyx were non-significant (p >0.194). Fan S et al.[15] in their study found complications of around 8-10 percent. Similarly, Castro et al found an overall complication rate after RIRS about 9% to 25 percent.[16, 17] Usually, serious complications are not frequently seen following retrograde intrarenal surgery. Complication following RIRS is similar to those seen in with other endo-urological interventions. The limitations of this study include its retrospective nature and the small sample size from a single center. A randomized study with a large sample size with a longer follow-up would be much more desirable.

CONCLUSIONS

RIRS is a relatively better procedure that continues to undergo significant advancements. RIRS is a technically effective procedure in the treatment of renal stone disease. Maximum stone clearance, shorter operative time with decrease hospital stay is possible in properly selected patients. The LC of the kidney is the most difficult part of the kidney to access, although with new flexible ureteroscope the LC can be accessed in 93% of cases. This study shows that RIRS is safe and applicable to our general population with minimal morbidity.

Conflicts of interest: None

ACKNOWLEDGEMENT

The author of study would like to express a deep sense of gratefulness towards all the participants of study, without their help this study would not have been successful.

FINANCIAL DISCLOSURE: None

REFERENCES

1. Perlmutter AE TC, Tarry WF, Zaslau S, Mohseni H, Kandzari SJ. . Impact of stone location on success rates of endoscopic lithotripsy for nephrolithiasis. Urology. 2008;71:214-7.
2. Auge BK DP, Wu NZ, Preminger GM. Ureteroscopic management of lower-pole renal calculi: technique of calculus displacement. J Endourol.200(15):835-8.
3. Monga M BS, Landman J, Conradie M, Sundaram CP, Clayman RV. Ureteral access for upper urinary tract disease: the access sheath. J Endourol. 2001;15:831-4.
4. Argyropoulos AN TD. Evaluation of outcome followinglithotripsy. CurrOpin Urol. 2010;20:154-8.
5. Wendt-Nordahl G MT, Krombach P, Michel MS, Knoll T. Do new generation flexible ureterorenoscopes offer a higher treatment success than their predecessors? Urol Res. 2011;39:185-8.
6. Ho C C K HJ, Praveen S, Goh E H, Bong J J, Lee B C, Zulkifli M Z. Retrograde intra

renal surgery for renal stones samller than 2 cm. Singapore Med J 2010;51(6):512-7.

7. Resorlu B UA, Ziypak T, et al. Comparison of retrograde intrarenal surgery, shockwave lithotripsy, and percutaneous nephrolithotomy for treatment of medium-sized radiolucent renal stones. World J Urol 2013;31:1581-6.
8. Sabnis RB JJ, Mishra S, et al. Treating renal calculi 1-2 cm in diameter with minipercutaneous or retrograde intrarenal surgery : a prospective comparative study. BJU Int. 2012;110:E346-E9.
9. FatihElbir İB, RamazanTopaktaşSina Kardaş, MuhammedTosun, Abdulkadir Tepeler, and Abdullah Armağan. Flexible ureterorenoscopy results: Analysis of 279 cases. Turk J Urol. 2015;41(3):113-18.
10. Binbay M YE, Akman T, Ozgor F, Seyrek M, Ozkuvanci U, et al. Is there a difference in outcomes between digital and fiberoptic flexible ureterorenoscopy procedures? . J Endourol. 2010;24:1929e-34.
11. Perlmutter AE TC, Tarry WF, Zaslau S, Mohseni H, Kandzari SJ. Impact of stone location on success rates of endoscopic lithotripsy for nephrolithiasis. Urology. 2008;71(2):214-7.
12. Pearle MS LJ, Leveillee R, Kuo R, Preminger GM, Nadler RB, et al. Prospective, randomized trial comparing shock wave lithotripsy and ureteroscopy for lower pole caliceal calculi 1 cm or less. J Urol. 2005;173(6):2005-9.
13. Zilberman DE MY, Duvdevani M, Ramon J, Winkler HZ. Retrograde intra renal surgery for stone extraction. Scand J Urolnephrol. 2007;41:204-7.
14. Stern JM YJ, Park S. S. afety and efficacy of ureteral access sheaths. J Endourol. 2007;21:119-23.
15. Fan S GB, Hao Z, Zhang L, Zhou J, Zhang Y, et al. Risk factors of infectious complications following flexible ureteroscope with a holmium laser: a retrospective study. Int J ClinExp Med. 2015;8:11252-9.
16. Perez Castro E OP, Jinga V, Razvi H, Stravodimos KG, Parikh K, et al. 2014; 66:102e9. Crossref. Differences in ureteroscopic stone treatment and outcomes for distal, mid-, proximal, or multiple ureteral locations: the Clinical Research Office of the Endourological Society ureteroscopy global study. EurUrol. 2014(66:102e9.).
17. Preminger GM TH-G, Assimos DG, Alken P, Buck AC, Gallucci M, et al. Guideline for the management of ureteral calculi. EurUrol 2007;52(161e31).

Citation: Shah R, Kandel T, Adhikari D. Stone Free Rate of Lower Pole Calyceal Stone Versus Other Calyces in Retrograde Intrarenal Surgery. JCMS Nepal. 2023; 19(1); 50-55.