

INITIAL EXPERIENCE OF RETROGRADE INTRARENAL SURGERY(RIRS) FOR RENAL STONES IN A TERTIARY CARE CENTRE

Arshad Hasan¹, Md Zaid Imbisat², Rakesh Kumar Anand³, Ahsan Ahmad⁴

¹Senior Resident, Department of Urology, Patna Medical College and Hospital, Patna, Bihar, India.

²Resident, Department of Urology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India.

³Senior Resident, Department of Urology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India.

⁴Additional Professor, Department of Urology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India

Received : 13/08/2023
Received in revised form : 10/09/2023
Accepted : 22/09/2023

Keywords:
Outcome, Renal Stone, RIRS, Surgery.

Corresponding Author:
Dr. Ahsan Ahmad,
Email: ahsanahmad6@gmail.com

DOI: 10.47009/jamp.2023.5.5.205

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (5); 1048-1051



Abstract

Background: Retrograde Intrarenal Surgery(RIRS) has become an important modality for kidney stone treatment. It is considered to be less morbid than open surgery and percutaneous nephrolithotomy (PCNL). But many centres have still not started this procedure. Aims and objectives of this study is to evaluate the initial experience, safety and outcomes of RIRS at a tertiary care centre. **Materials and Methods:** This study is a retrospective analysis of 21 patients who underwent RIRS for renal stones between July 2022 and June 2023. We placed DJ stent for three days in all the patients before doing RIRS. We analysed stone locations, number of stones, size of stones, Hounsfield units of stones, duration of surgery, intraoperative pelvicalyceal system injury, need of blood transfusion, postoperative fever, hospital stay and stone free rate. **Result:** Mean stone size was 11.57 ± 1.40 mm. Mean operative time was 43.28 ± 1.82 minutes. We have not found any injury to pelvicalyceal system in our study. Post-operatively three patients developed fever. None of our patients needed blood transfusion. Mean duration of post operative hospital stay was 2.23 ± 0.44 days. In the follow up all the patients had complete stone clearance. **Conclusion:** RIRS is a safe and effective procedure. Cases for RIRS should be selected carefully during initial days. We advice preoperative DJ stenting before doing RIRS.

INTRODUCTION

In recent years, there has been evolution from open surgery to minimal invasive surgery in the surgical management of renal stones.^[1] Percutaneous nephrolithotomy (PCNL) for the treatment of renal stones has a higher success rate but also has serious complications. This initiated hunt for alternative treatment methods.^[2,3] In 1983, Huffman et al. performed the first retrograde intrarenal surgery (RIRS). Important advancements were provided in RIRS with the development of flexible instruments and laser devices.^[4] The main goal in the treatment of renal calculi is to provide maximum stone-free status with minimal complications at the end of surgery.^[5] Now a days RIRS has become an important modality for kidney stone treatment with the development of flexible ureteroscope and holmium laser.^[6] RIRS is less invasive technique to access kidney stones compared to percutaneous nephrolithotomy (PCNL) and open pyelolithotomy. It is a well-founded

procedure in the proximal ureter, collecting duct system, and, peculiarly, lower calyx calculi. The complication rate is remarkably lower with RIRS and the complications are mostly minor.^[7] However its long learning curve, costly and fragile instruments and increase cost for the patients still remain a challenge for the treating surgeon.^[8] In present study we report our initial experience of retrograde intrarenal surgery.

MATERIALS AND METHODS

This study is a retrospective analysis of all the patients who underwent RIRS for renal stones between July 2022 and June 2023 at a tertiary care centre of Eastern India. A total of 21 patients underwent RIRS during this period at our centre.

Aims and Objectives: This study was done to evaluate the safety and efficacy of RIRS at a tertiary care centre where the procedure has recently been started.

All the patients were operated after proper counseling of all treatment options and complications. RIRS was done in patients with previous history of failure of ESWL and on the preference of patients in renal stones of size not more than 1.5 cm. Sterile urine culture was mandatory for doing RIRS.

Patients presenting in our Urology OPD were evaluated and their workup included complete blood counts, renal function test, prothrombin time and INR, random blood sugar, urine routine, urine culture, USG abdomen. In patients with normal renal function CT urography was done. In patients with raised serum creatinine non contrast CT KUB was done. Stone size was considered to be the largest diameter of stone on CT scan. For more than one stones largest diameters of all the stones were added. After pre anaesthetic checkup patients underwent RIRS. We analysed stone locations, number of stones, size of stones, duration of surgery, intraoperative pelvicalyceal system injury, post operative hematuria, post operative change in hemoglobin, need of blood transfusion, need of ICU care, postoperative fever, pyelonephritis, steinstrasse, hospital stay and stone free rate.

Surgical technique: We placed DJ stent for three days in all the patients before doing RIRS. RIRS was performed in general or spinal anesthesia and lithotomy position. Pre placed DJ stent was removed. A 0.032 inch nitinol guidewire was placed in the pelvicalyceal system and was confirmed on fluoroscopy. Ureteroscopy was done using Karl Storz 8-9.5F semi-rigid ureteroscope. Ureteroscopy helped in further ureteral dilatation and ureteric examination for any ureteric pathology. After ureteroscopy ureteral access sheath was placed over guidewire. Then flexible ureteroscope (7.5 Fr Storz Flex X2) was passed through ureteral access sheath. Then stone was localized [Figure 1].

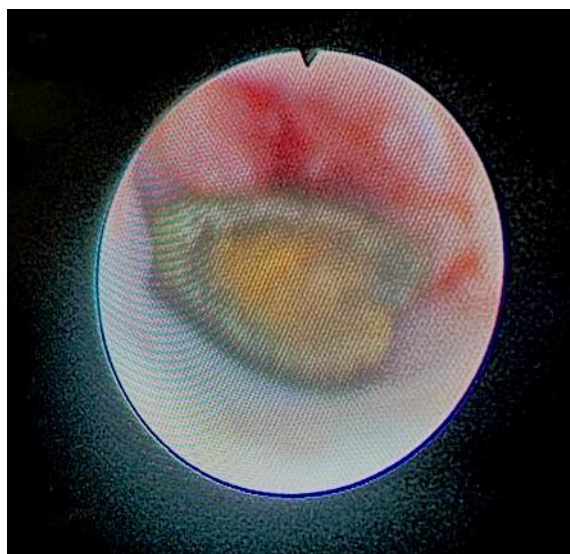


Figure 1: Stone localized in calyx for RIRS.

After stone localization Holmium: YAG laser was used for fragmentation (1.2-1.8 J and 8-12 Hz) or dusting (0.4-0.6J and 18-20 Hz) [Figure 2].

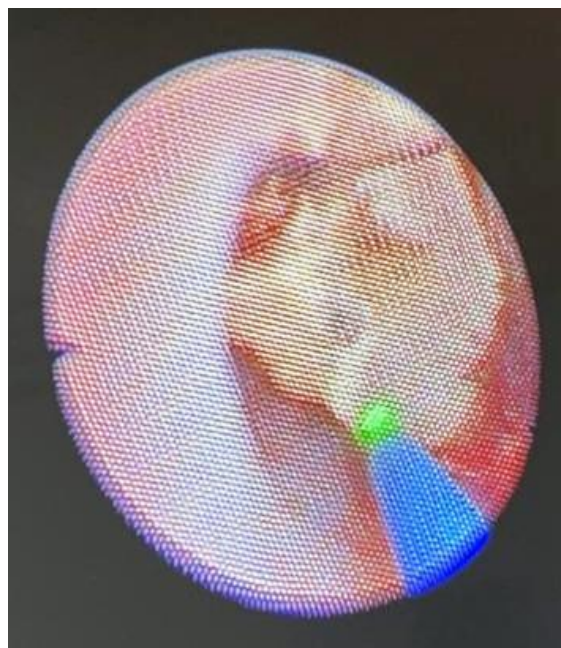


Figure 2: Use of Holmium: YAG laser

After stone fragmentation or dusting pelvicalyceal system was thoroughly examined for any residual stone [Figure 3].

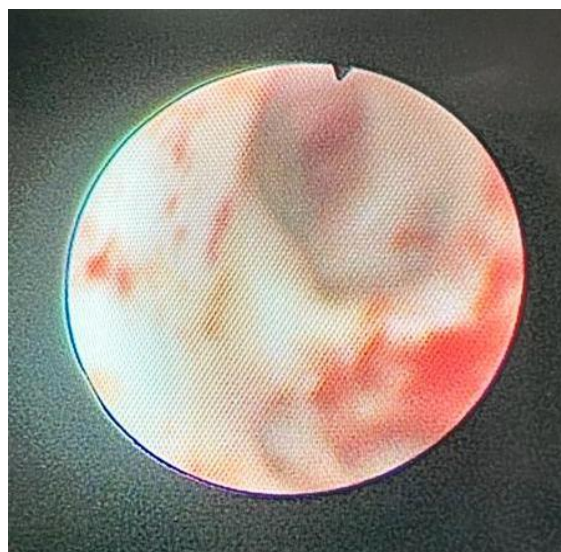


Figure 3: Pelvicalyceal system examined for any residual fragment.

After thorough examination of pelvicalyceal system for any stone fragments 5Fr DJ stent was placed and per urethral catheterization was done. Per urethral catheter was removed once urine was clear and stent was removed after 3 weeks in follow up visit. In the follow up after 3 months USG was done and complete clearance was defined as the absence of any stone on USG.

RESULTS

Between July 2022 and June 2023 a total of 21 patients underwent RIRS at our institute, out of these 14 patients were male and 7 patients were female.

Mean age of patients was 39.76 ± 5.18 years. Mean stone size was 11.57 ± 1.40 mm. Stone was located in upper calyx in seven patients, in middle calyx in six patients, in pelvis in three patients, in lower calyx in three patients and in multiple calyx in two patients. Mean operative time was 43.28 ± 1.82 minutes. All the patients tolerated the procedure well. We have not found any injury to pelvicalyceal system in our study. Post-operatively three patients developed fever. Urine became clear on post operative day one in 18

patients and on post-operative day two in three patients. Per urethral catheter was removed on post-operative day 2 in 18 patients and on post-operative day 3 in three patients. None of our patients needed blood transfusion. Pyelonephritis and steinstrasse was not reported in any of our patients. Mean duration of post operative hospital stay was 2.23 ± 0.44 days. In the follow up all the patients had complete stone clearance [Table 1 and 2].

Table 1: showing patient's characteristics

Total number of patients	21
Male patients	14
Female patients	7
Mean age	39.76 ± 5.18 years
Mean stone size	11.57 ± 1.40 mm
Mean Pre operative total leucocyte counts	$7514.28 \pm 1198.86 / \mu\text{l}$
Mean pre operative serum creatinine	1.13 ± 0.23 mg/dl
Mean pre operative INR	1.19 ± 0.15
Mean Random Blood Sugar	111.66 ± 18.71 mg/dl
Sterile Urine culture	In all patients.
Hydronephrosis on USG	None of the patients

Table 2: Showing intra-operative and post-operative outcomes

Mean operative time	43.28 ± 1.82 minutes
Any injury to pelvicalyceal system	No
Post operative fever	Three patients
Fall in hemoglobin	0.91 ± 0.24 g/dl
Need of blood transfusion	No
Need of ICU care	No
PUC removal on POD 2	18
PUC removal on POD 3	3
Pyelonephritis	No
Steinstrasse	No
Post operative hospital stay	2.23 ± 0.44 days
Stone free rate	100%

PUC: Per Urethral Catheter; POD: Post Operative Day

DISCUSSION

In recent era of minimally invasive techniques for stone diseases, RIRS has become increasingly popular treatment. PCNL is worldwide approach for stone treatment but is not without morbidity. Postoperative complications in PCNL is proclaimed up to 20%.^[9] RIRS has excelled with better scope and technical improvements in the size of the scope, the degree of deflection and the quality of the fibre optics during the past few years.^[10,11] This outdistanced PCNL in terms of decreased morbidity with acceptable success rate.^[12,13] RIRS has reported the success rate above 90% for renal stone and 85% for lower calyceal stone depending on stone bulk and calyceal anatomy.^[14]

Our centre has recently started RIRS. Before starting RIRS at our centre operative workshop was held in which experienced faculties of national and international importance have participated. Senior consultants of our institute have also participated in many other workshops of RIRS. Then our consultants who were experienced in endourology started RIRS at our centre. In this study we are sharing our initial experience and outcomes of RIRS.

Mean stone size in this study was 11.57 ± 1.40 mm as we have excluded patients with stone size more than 1.5cm. In the study done by Ram Dhayal I et al. the mean sizes of the stone in RIRS group was 10.62 ± 2.51 mm.^[15] However Eissa A et al have done RIRS for single renal stones of size 2-3 cm.^[16]

In this study mean operative time was 43.28 ± 1.82 minutes. For our first case operative time was 59 minutes and then operative time started decreasing gradually. In the study done by Ram Dhayal I et al. the mean operative time was 51.2 ± 8.63 minutes.^[15]

In the study done by Eissa A et al mean operative time was 96.4 ± 37.3 minutes which could be due to larger stones (of size 2-3 cm) in their study.^[16]

In this study mean duration of post operative hospital stay was 2.23 ± 0.44 days. In the study done by Ram Dhayal I et al. the mean hospital stay was 3.02 ± 0.65 days.^[15] In the study done by Giulioni C et al mean hospital stay was 3.55 days.^[17]

In this study at three months follow up stone free rate was 100%. Our 100% stone free rate could be due to mean stone size 11.57 ± 1.40 mm in our study. In the study done by Eissa A et al stone free rate was 74.2% after single session of RIRS. However in they had larger stone size in their study compared to our study.^[16] Mahmoud MA et al in their study reported

the outcomes of RIRS in pediatric patients. In their study initial stone free rate was 88.9%.^[18]

In this study all the patients tolerated the procedure well. We have not found any injury to pelvicalyceal system in our study. In the study done by Eissa A et al one patient(out of 31 patients) had renal pelvis perforation.^[16]

In this study three patients developed post operative fever. Pyelonephritis and steinstrasse was not reported in any of our patients. In the study done by Niwa N et al three patients (out of 39 patients) developed post operative fever; however their study was done on staghorn calculi.^[19] Mahmood SN et al in their study reported the results of RIRS in 25 patients with solitary kidney. They reported postoperative fever in three patients and steinstrasse in one patient.^[20]

In this study urine became clear on post operative day one in 18 patients and on post-operative day two in three patients. None of our patients needed blood transfusion. In the study done by Giullioni C et al need of blood transfusion due to hematuria was 6.1%.^[17]

In the study done by Mahmood SN et al Hematuria was found in one patient out of 25 patients.^[20]

Even after being our initial experience our results are comparable to other studies available in the literature. We attribute this result to proper selection of cases, preoperative DJ stenting in all the patients and operative surgeons being experienced in endourology.

Limitation of Study: Our study is a retrospective study which could be a limitation of this study.

CONCLUSION

RIRS is rapidly emerging for the surgical management of renal stones. It is a safe and effective procedure which can be done at any centre with proper facilities and by the urologists with experience in endourology. Our initial experience is satisfactory for safety and outcomes. We suggest that cases for RIRS should be selected carefully during initial days. We advise preoperative DJ stenting before doing RIRS.

REFERENCES

1. El-Husseiny T, Buchholz N. The role of open stone surgery. Arab J Urol. 2012 Sep;10(3):2848. doi: 10.1016/j.aju.2012.03.004. Epub 2012 May 2. PMID: 26558038; PMCID:PMC4442944
2. Tiselius HG, Ackermann D, Alken P, Buck C, Conort P, Gallucci M et al. Guidelines on urolithiasis. Eur Urol. 2001 Oct;40(4):362-71.
3. Michel MS, Trojan L, and Rassweiler JJ. Complications in percutaneous nephrolithotomy. Eur Urol. 2007;51(4):899-906.
4. Huffman JL, Bagley DH, Lyon ES. Extending cystoscopic techniques into the ureter and renal pelvis. Experience with ureteroscopy and pyeloscopy. JAMA. 1983;250(15):2002-5.
5. Argyropoulos AN, Tolley DA. Evaluation of outcome following lithotripsy. Current Opinion Urol. 2010;20(2):154-158.
6. Ho CCK, Hafidzul J, Praveen S, Goh EH, Bong JJ, Lee BC, et al. Retrograde intra renal surgery for renal stones smaller than 2 cm. Singapore Med J. 2010;51(6):512-519.
7. Sabnis RB, Jagtap J, Mishra S, Desai M. Treating renal calculi 1-2 cm in diameter with minipercutaneous or retrograde intrarenal surgery: a prospective comparative study. BJU Int. 2012;110(8b):E346-E349.
8. Wendt-Nordahl G, Mut T, Krombach P, Michel MS, Knoll T. Do new generation flexible ureterorenoscopes offer a higher treatment success than their predecessors? Urol Res. 2011;39(3):185-188.
9. Labate G, Modi P, Timoney A, Cormio L, Zhang X, Louie M. The percutaneous nephrolithotomy global study: Classification of complications. J Endourol. 2011 Aug;25(8):1275-80.
10. Al-Qahtani SM, Gil-Deiz-de-Medina S, Traxer O. Predictors of clinical outcomes of flexible ureterorenoscopy with holmium laser for renal stone greater than 2 cm. Adv Urol. 2012;2012:543537.
11. Galvin DJ, Pearle MS. The contemporary management of renal and ureteric calculi. BJU Int. 2006 Dec;98(6):1283-8.
12. Dave S, Khoury AE, Braga L, Farhat WA. Single-institutional study on role of ureteroscopy and retrograde intrarenal surgery in treatment of pediatric renal calculi. Urology. 2008 Nov;72(5):1018-21.
13. Zhong W, Zhao Z, Wang L, Swami S, Zeng G. Percutaneous-based management of Staghorn calculi in solitary kidney: Combined mini percutaneous nephrolithotomy versus retrograde intrarenal surgery. Urol Int. 2015;94(1):70-3.
14. Hyams ES, Bruhn A, Lipkin M, Shah O. Heterogeneity in the reporting of disease characteristics and treatment outcomes in studies evaluating treatments for nephrolithiasis. J Endourol. 2010 Sep;24(9):1411-4.
15. Ram Dhayal I, Gupta R, Srivastava A, Rai P. A Comparative Study on Outcomes of Retrograde Intrarenal Surgery (RIRS), Mini Percutaneous Nephrolithotomy (PCNL), and Extracorporeal Shock Wave Lithotripsy (ESWL) for Lower Pole Renal Calculi of < 1.5 cm. Nephro-Urol Mon. 2023;15(1):e128168. <https://doi.org/10.5812/numonthly-128168>.
16. Eissa A, Ragab M, Bianchi G, Hassan A. Retrograde intrarenal surgery in the management of solitary large renal stones, 2-3 cm: a single center experience. Int Surg J 2021;8:939-43.
17. Giullioni C, Castellani D, Somani BK et al. The efficacy of retrograde intra-renal surgery (RIRS) for lower pole stones: results from 2946 patients. World J Urol 41, 1407-1413 (2023). <https://doi.org/10.1007/s00345-023-04363-6>
18. Mahmoud MA, Shawki AS, Abdallah HM et al. Use of retrograde intrarenal surgery (RIRS) compared with minipercutaneous nephrolithotomy (mini-PCNL) in pediatric kidney stones. World J Urol 40, 3083-3089 (2022). <https://doi.org/10.1007/s00345-022-04186-x>
19. Niwa N, Matsumoto K, Ohigashi T, et al. Clinical Outcomes of Retrograde Intrarenal Surgery as a Primary Treatment for Staghorn Calculi: A Single-Center Experience. Clinical Medicine Insights: Urology. 2019;12. doi:10.1177/1179561119854772
20. Mahmood SN, Babarasil MH, Fakhralddin SS et al. Retrograde intrarenal surgery for the treatment of renal stones in patients with a solitary kidney: Does access sheath matter?. Afr J Urol 27, 35 (2021). <https://doi.org/10.1186/s12301-021-00133-1>.