DOI: https://doi.org/10.53350/pjmhs221611065

ORIGINAL ARTICLE

Percutaneous Nephrolithotomy (PCNL) vs Retrograde Intrarenal Surgery (RIRS) in the Treatment of Renal Pelvic Stones Randomized Controlled Trial in IKD Hospital Peshawar

MOHAMMAD SHAHZAD[1], MUHAMMAD ASIF[2], FAZAL WAHAB[3], ZAFAR AHMAD KHAN[4], MISHAL ZAMAN[5], ABID JAN[6]
[1]Associate Professor, Institute of kidney Disease Peshawar
[2]Consultant Urologist, District Headquarter Hospital, Mardan
[3]Consultant Urologist, District Headquarter Hospital, Batkhela
[4]Consultant Urologist, Mardan Medical Complex Mardan
[5]Trainee Medical Officer, Institute of kidney Disease, Peshawar
[6]Assistant Professor, Institute of kidney Disease, Peshawar
Corresponding author: Muhammad Asif, Email: dr.aseff@gmail.com, Cell: 03339879596

ABSTRACT

Background: Nephrolithiasis is a common disease with a 10% lifetime risk in men and 5% in women. With the emergence of noninvasive and minimally invasive methods, the management of renal stones has vastly improved.
Objective: Comparison of effectiveness of percutaneous nephrolithotomy vs retrograde intrarenal surgery for the treatment of renal pelvis stones.
Methodology: This study was randomized controlled trial carried out at the Department of Urology and Renal Transplantation, Institute of Kidney Diseases Hayatabad Medical Complex,Peshawar for six months from 23-09-2018 to 22-03-2019. Total sample size was 70 patients. Patients in group A underwent Percutaneous Nephrolithotomy (PCNL) and Group B will be subjected to RIRS. All the patients will be advised for follow up visit at 2 weeks post operatively to determine intervention effectiveness in terms of complete stone clearance.
Results: The mean size of the stone was 17.47mm ± 1.7SD, ranges 15 to 20 mm in both groups. In group A, PCNL Procedure was effective in 34(97.1%) patients at completion of study. While in group B, 28(80%) patients were effectively stone cleared. which is significant with p-value=0.027.
Conclusion: Percutaneous Nephrolithotomy (PCNL) is more efficient and safe procedure for renal stone of size 1.5cm to 2 cm as compared to RIRS. Studies show that PCNL is more effective than retrograde intrarenal surgery in the treatment of renal pelvis stones. In the light of recent data, PCNL seems to be an ideal treatment modality in the management of patients. Nevertheless, these results must be confirmed by further prospective large randomized trials.
Keywords: Percutaneous Nephrolithotomy, Retrograde Intrarenal Surgery, Renal Stones

INTRODUCTION

Nephrolithiasis is a common disease with a 10% lifetime risk in men and 5% in women [1]. Kidney stones have become a major health concern in the past three decades [2]. Apart from the possibility of a painful recurrence, kidney stone illness increases the risk of developing chronic renal disease, cardiovascular problems, and bone fracture [3, 4]. Patients suffering from nephrolithiasis are at risk of developing renal colic, hydronephrosis and eventually progressive loss of renal function.

Asymptomatic calicle stones may be managed conservatively. Active treatment is recommended in cases of stone growth, de novo obstruction, associated infection, or acute or chronic pain [5]. With the emergence of noninvasive and minimally invasive methods such as percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL), laparoscopy and retrograde intrarenal surgery (RIRS), the management of renal stones has vastly improved [6]. When there are adverse conditions for ESWL, PCNL is suggested as the standard therapy for renal stones greater than 20mm and stones 10 to 20mm of the lower renal pole, as per the European Association of Urology (EAU) guidelines [5]. Standard (sPCNL) and micro (mPCNL) PCNLs may be conducted in either a supine or prone posture, each with its own set of benefits and drawbacks. For both the patient and the surgeon, the flank-free modified supine position has significant benefits [7]. According to RIRS, a greater stone-free rate (SFR) is associated with a lower risk of renal injury and bleeding [8, 9]. However, RIRS has several drawbacks, such as the potential necessity for staged treatments, the danger of ureteral injuries, and the expenditures of acquiring and maintaining complicated endourological devices, all of which might be reasons that have hampered the capillary spread of this endoscopic method [10]. In one trial, the total stone-free percentage for ESWL, RIRS, and PCNL was 61.8 percent, 82.1 percent, and 87.3 percent, respectively [11]. In another study, 97.1% of s renal stones patient had free stone status after sPCNL [12]. However, in another study, initially the free stone status of RIRS and PCNL group was 71.4% and 96.6%, respectively [13].

Given the widespread efficacy of endourological stone therapy, urologists continue to disagree regarding the best course of action [14, 15]. Most of the comparative studies between the two methods are not conclusive [16]. There is today a consensus on the superiority of the PCNL, but the controversy continues on whether PCNL or RIRS should be the first line treatment for patients with stones located in renal pelvis [17]. As no such study has been conducted in our population for the last five years, [18]so this study will provides us the latest and updated information regarding effectiveness between of PCNL and RIRS for treatment of renal pelvis stones. In order to build a scientific strategy for the management of renal pelvic stones patients, the findings of my research will be presented to management

and senior health specialists in the same sector.

MATERIALS AND METHODS

The study was carried out in the Department of Urology and Renal Transplantation, Institute of Kidney Diseases Hayatabad Medical Complex Peshawar Pakistan. There were two groups. In group A, patients undergo Percutaneous Nephrolithotomy (PCNL) and Group B will be subjected to RIRS. All the patients will be advised for follow up visit at 2 weeks post operatively to determine intervention effectiveness in terms of complete stone clearance.

PCNL technique: It was done in a state of general anesthesia while lying on flat position. A needle was inserted into the right calyx with C-arm fluoroscopy help. Serial dilation was conducted using a "fascial dilator" up to 24 F and a 26 F sheath was pushed through the band after a guidewire was introduced and fastened. Stone breakdown was conducted with a holmium laser and pieces were eliminated with flushes or forceps through the use of an "8/9.8 F rigid ureteroscope". In all instances, an 18 F nephrostomy tube was inserted at the conclusion of the procedure and was normally withdrawn on the 4th day following surgery, if there were no complications and the nephrostomy tube was discharging clean urine.

Figure 1:

Figure 2

Preoperative (Figure 01) and postoperative (Figure 02) X Ray of a patient with a 21mm diameter in kidney stone percutaneous Nephrolithotomy:

RIRS technique: Before RIRS, a 6 F ureteral stent is usually put before 10 to 14 to alleviate acute blockage and infection or widening of ureter to allow route of the ureteroscope. In lithotomy position, patients were placed while under general anesthesia. Following the advancement of two guidewires to the renal pelvis, implantation of ureteral access sheath was done, and a "7.5F flexible ureter scope" was introduced along the guide wires to complete the procedure. A 4–12 W Holmium laser was used to fragment the stone burden, which was then eliminated using a stone basket. We stopped the surgery if it took more than 90 minutes to avoid perioperative problems. It is common for a double-J stent to be put in the pelvis at the end of surgery.

Figure 3:

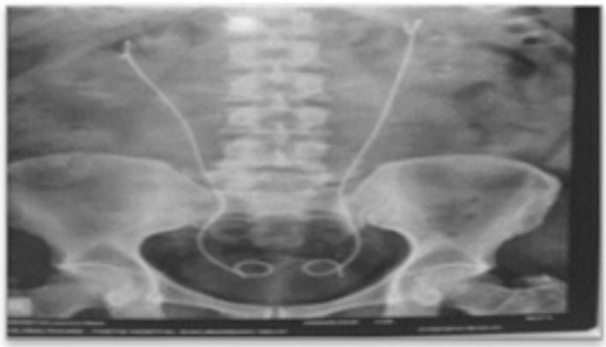

Figure 4:

Retrograde Intrarenal Surgery X.ray Before figure03 and after figure 04 images for staghorn stones:

Statistical method: For all the data analysis, SPSS 20.0 software was used. Categorical variables were calculated by using numbers and percentages. Chi-squared and Fisher exact test was used as required. Mean ± standard deviation were documented for continuous data and independent samples t-test was used for both the groups. p-value of less than 0.05 was considered to be statistically significant.

RESULTS

A total of 70 patients with renal stones were randomly allocated through lottery method in two groups equally. Group A were subjected to PCNL and Group B were subjected to retrograde intrarenal surgery (RIRS).In group A we had patients from adult age group but population in there under forties were predominant. Mean age was 37.74 years + 13.7SD. The greatest representation was founding the 25 to 40 years age groups i.e. 15(42.9%) patients, followed by the 41 to 55 years i.e.9(25.7%) patients and the less than 25 years age groups i.e. 7(20%) patients. In older age groups, a steady decline in the frequency was noted. In above 55 years of age, the number of patients were 4 (11.4%). The oldest patient was a gentleman of 65 years. In group B we had patients from adult age group but population in their 18 to 40 was predominant. Mean age was 41.4 years + 13.4. greatest representation was found almost equal in the age group 26 to 40 years i.e. 13(37.1%)

and 41 to 55 years age groups i.e. 12(34.3%) patients, followed by the above 56 years i.e. 5(14.3%) patients. In above below 25 years of age, the number of patients were 5 (14.3%). The oldest patient was a gentleman of 64 years. The age distribution in both the group are insignificant with p-value=0.797

Table 1: Overall effectiveness of the both Group

Effectiveness	Group A	Group B	P value
Yes	34 (97.1%)	28 (80%)	0.027
No	1 (2.9%)	7 (20%)	

Table 2: Age wise distribution of the patients

Age group	Group A	Group B	P value
≤25 years	7 (20%)	5 (14.3%)	0.797
26-40 years	15 (42.97%)	13 (37.1%)	
41-55 years	9 (25.7%)	12 (34.3%)	
≥56	4 (11.4%)	5 (14.3%)	
Mean age (SD)	37.74 (13.7)	41.4 (13.4)	

DISCUSSION

Because of remarkable advancements in endoscopic technology, the surgical therapy of renal stones has altered considerably. As a result of the higher risk of peri-operative problems and renal function loss in patients with a single kidney during surgical therapy, the surgical strategy used remains a major issue. Despite several research described in the literature, a number of important concerns remain unanswered.

Our findings showed that both PCNL and RIRS may be performed safely on individuals with a single kidney. Both groups' final SFRs were comparable. The primary benefit of RIRS versus PCNL appears to be a less significant mean reduction in hemoglobin levels.

RIRS, on the other hand, often need further therapy. The possibility of complication, like severe uncontrolled bleeding, was the chief concern with PCNL in single kidneys. In these patients, 30.6 percent had problems following PCNL, with 5.6 percent requiring blood transfusion. Untrained surgeon, massive stone, many tracts, and a single kidney are all risk factors for significant bleeding. The requirement for blood transfusions and the risk of serious bleeding were found to be greater in solitary kidneys following PCNL than in bilateral kidneys. PCNL was conducted on 412 individuals with a single kidney by Hosseini and colleagues; 19 (4.6%) of these patients had bleeding that necessitated transfusions, but none of them needed nephrectomy. It was thought that accessing the kidney via such a thick parenchyma would raise the danger of bleeding. PCNL tools and procedures have improved throughout time, allowing urologists to conduct this surgery with excellent levels of effectiveness and safety in difficult instances such solitary kidney stones [19].

Despite the poorer SFR and greater morbidity, a previous research shown that PCNL is effective and safe therapy for patients with solitary kidneys [20]. It is unexpected that PCNL for renal stones improved renal function significantly in these individuals when matched to the treatment results of noninvasive PCNL and RIRS for stones bigger than 2 cm in single kidney patients. After a single surgery, they observed that SFRs in the minimally invasive PCNL group and RIRS group were 70% and 43.4% respectively, with both groups experiencing comparable rates of complications. In both groups, our SFR of single-session was rather low. This might be connected to the fact that the majority of our patients had more difficult stones.

In certain circumstances, the good results of RIRS in conditions of morbidity rate could be overshadowed by its SFR, which should not be overlooked, particularly solitary renal disease patients. Bryniarski et al. looked at the results of RIRS and PCNL. They observed that 13 PCNL patients needed blood transfusions, but 26 RIRS patients did not require blood transfusions. RIRS patients had problems in 6% (12/45) of cases, and 20% (9/45) were classified as I Cloven grade, with no patients requiring blood transfusions [21]. There were no serious issues in our research, although mild complications were common. A 6 F stent was regularly inserted 10–14 days prior RIRS to treat acute blockage and infection in our study, which might explain why the infectious consequences were similar in both groups. RIRS has often been suggested as a substitute to PCNL in the management of large renal stones. Despite the fact that hemorrhagic illnesses are often considered contraindicated for both PCNL and SWL, RIRS has shown to be rather safe in these individuals [22].

Because our patients are typically hesitant to leave the hospital with a nephrostomy tube in situ, the hospital stay in both groups in our research was lengthier. Furthermore, in our group of single kidney patients with big stones, therapy should be more cautious, and the postoperative surveillance time should be prolonged. In terms of hospitalisation duration, our findings are consistent with prior studies in China using RIRS or PCNL for larger stones [23, 24].

CONCLUSION

Percutaneous Nephrolithotomy (PCNL) is more efficient and safe procedure for renal stone of size 1.5cm to 2 cm as compared to RIRS more over study show that PCNL is more effective than retrograde intrarenal surgery in the treatment of renal pelvis stones. In the light of recent data, PCNL seems to be an ideal treatment modality in the management of patients. Nevertheless, these results must be confirmed by further prospective large randomized trials.

REFERENCES

1. Scales Jr CD, Smith AC, Hanley JM, Saigal CS, Project UDiA. Prevalence of kidney stones in the United States. Eur Urol. 2012;62(1):160-5.
2. Sakhaee K, Maalouf NM, Sinnott B. Kidney stones 2012: pathogenesis, diagnosis, and management. The Journal of Clinical Endocrinology & Metabolism. 2012;97(6):1847-60.
3. Cheungpasitporn W, Thongprayoon C, Kittanamongkolchai W, Brabec BA, O'Corragain O, Edmonds P, et al. High alcohol consumption and the risk of renal damage: a systematic review and meta-analysis. QJM: An International Journal of Medicine. 2015;108(7):539-48.
4. Taylor EN, Feskanich D, Paik JM, Curhan GC. Nephrolithiasis and risk of incident bone fracture. The Journal of urology. 2016;195(5):1482-6.
5. AEYMON M, RASOOL S. Efficacy and Safety of Holmium: Yag Laser in Comparison with Pneumatic Lithoclast for Ureteric Calculi. Laser.50(40.8400):8.57942.
6. Ferakis N, Stavropoulos M. Mini percutaneous nephrolithotomy in the treatment of renal and upper ureteral stones: Lessons learned from a review of the literature. Urology annals. 2015;7(2):141.

7. Desoky EA, Allam MN, Ammar MK, Abdelwahab KM, Elsaid DA, Fawzi AM, et al. Flank free modified supine position: a new modification for supine percutaneous nephrolithotomy. Arab Journal of Urology. 2012;10(2):143-8.
8. De La Rosette J, Denstedt J, Geavlete P, Keeley F, Matsuda T, Pearle M, et al. The clinical research office of the endourological society ureteroscopy global study: indications, complications, and outcomes in 11,885 patients. J Endourol. 2014;28(2):131-9.
9. Koo V, Young M, Thompson T, Duggan B. Cost-effectiveness and efficiency of shockwave lithotripsy vs flexible ureteroscopic holmium: yttrium-aluminium-garnet laser lithotripsy in the treatment of lower pole renal calculi. BJU Int. 2011;108(11):1913-6.
10. Karaolides T, Bach C, Kachrilas S, Goyal A, Masood J, Buchholz N. Improving the durability of digital flexible ureteroscopes. Urology. 2013;81(4):717-22.
11. Bozzini G, Verze P, Arcaniolo D, Dal Piaz O, Buffi N, Guazzoni G, et al. A prospective randomized comparison among SWL, PCNL and RIRS for lower calyceal stones less than 2 cm: a multicenter experience. World J Urol. 2017;35(12):1967-75.
12. Sakr A, Salem E, Kamel M, Desoky E, Ragab A, Omran M, et al. Minimally invasive percutaneous nephrolithotomy vs standard PCNL for management of renal stones in the flank-free modified supine position: single-center experience. Urolithiasis. 2017;45(6):585-9.
13. Pan J, Chen Q, Xue W, Chen Y, Xia L, Chen H, et al. RIRS versus mPCNL for single renal stone of 2–3 cm: clinical outcome and cost-effective analysis in Chinese medical setting. Urolithiasis. 2013;41(1):73-8.
14. El-Nahas AR, Ibrahim HM, Youssef RF, Sheir KZ. Flexible ureterorenoscopy versus extracorporeal shock wave lithotripsy for treatment of lower pole stones of 10-20 mm. BJU Int. 2012;110(6):898-902.
15. Prabhakar M. Retrograde ureteroscopic intrarenal surgery for large (1.6-3.5 cm) upper ureteric/renal calculus. Indian Journal of Urology: IJU: Journal of the Urological Society of India. 2010;26(1):46.
16. Karakoç O, Karakeçi A, Ozan T, Fırdolaş F, Tektaş C, Özkarataş ŞE, et al. Comparison of retrograde intrarenal surgery and percutaneous nephrolithotomy for the treatment of renal stones greater than 2 cm. Turkish journal of urology. 2015;41(2):73.
17. Hafron J, Fogarty JD, Boczko J, Hoenig DM. Combined ureterorenoscopy and shockwave lithotripsy for large renal stone burden: an alternative to percutaneous nephrolithotomy? J Endourol. 2005;19(4):464-8.
18. Ricchiuti DJ, Smaldone MC, Jacobs BL, Smaldone AM, Jackman SV, Averch TD. Staged retrograde endoscopic lithotripsy as alternative to PCNL in select patients with large renal calculi. J Endourol. 2007;21(12):1421-4.
19. Hosseini MM, Yousefi A, Hassanpour A, Jahanbini S, Zaki-Abbasi M. Percutaneous nephrolithotomy in solitary kidneys: experience with 412 cases from Southern Iran. Urolithiasis. 2015;43(3):233-6.doi:10.1007/s00240-014-0743-3.
20. Saltirov I, Petkova K, Petkov T. S244 Percutaneous nephrolithotripsy in patients with solitary kidneys: A single-center experience. European Urology Supplements. 2013;4(12):e1352, S244.
21. Resorlu B, Unsal A, Ziypak T, Diri A, Atis G, Guven S, 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(6):1581-6.
22. Turna B, Stein RJ, Smaldone MC, Santos BR, Kefer JC, Jackman SV, et al. Safety and efficacy of flexible ureterorenoscopy and holmium: YAG lithotripsy for intrarenal stones in anticoagulated cases. The Journal of urology. 2008;179(4):1415-9.
23. Zeng G, Zhu W, Li J, Zhao Z, Zeng T, Liu C, et al. The comparison of minimally invasive percutaneous nephrolithotomy and retrograde intrarenal surgery for stones larger than 2 cm in patients with a solitary kidney: a matched-pair analysis. World J Urol. 2015;33(8):1159-64.
24. Gao X, Peng Y, Shi X, Li L, Zhou T, Xu B, et al. Safety and efficacy of retrograde intrarenal surgery for renal stones in patients with a solitary kidney: a single-center experience. J Endourol. 2014;28(11):1290-4.