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ORIGINAL ARTICLE

Determine the Efficacy and Safety of PCNL in Solitary Functioning Kidney

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ABSTRACT

Objective: To determine the efficacy and safety of PCNL in solitary functioning kidney.

Study design: Descriptive case series study**.**

Place and duration of study: This study was conducted at the Department of Urology, Shaikh Zayed Hospital, Lahore from October 21, 2020 to April 21, 2021.

Materials and Methods: A total of 60 patients were included in this study which was carried out at Shaikh Zayed Hospital, Lahore at Urology Department.

Results: Efficacy of PCNL in solitary functioning kidney was in 93.3% (n=56) patients. Safety of PCNL in solitary functioning kidney was in 85% (n=51) patients.

Conclusion: The effectiveness and safety of PCNL in patients with a single functional kidney and discovered that 93.3% (n=56) of patients demonstrated efficacy, and 85% (n=51) of patients shown safety.

Keywords: Urolithiasis, Extracorporeal shockwave lithotripsy, Potential consequence of percutaneous nephrolithotomy, Solitary functional kidneys.

INTRODUCTION

With a recurrence rate of up to 50% in 10 years, urolithiasis is a widespread issue around the world.[1] The majority of the work performed in urology clinics in Pakistan is due to the high frequency of stone disease. Patients with solitary kidneys are classified as high risk stone formers in the European Association of Urology's recommendations.[2] This is not because the kidneys themselves are bad; rather, avoidance of stones is crucial in a single kidney that is functioning. The type of therapy depends on a number of parameters, such as the proportion of stones present, where the stones are located anatomically in the urinary tract, and patient considerations, such as patient choice.

Percutaneous nephrolithotomy[3,4] retrograde intrarenal surgery.[5,6] Extracorporeal Shockwave Lithotripsy (ESWL)[7] and combination[8] of these treatment options have been used successfully for the management of stones in solitary functioning kidney. For large and complicated renal stones, PCNL has become the gold standard of care in the modern era. A major challenge for urologists is how to treat stones in the single kidney that functions.[9] Due to the lack of the benefit of functioning kidneys on both sides, any damage to the kidney or the drainage system will result in considerable morbidity. Therefore, the main goal in treating a single kidney that is working but has a stone is to maintain that functioning while minimizing renal damage. The best option for treating large and complex renal stones is PCNL because it offers higher stone-free rates and is safer than other methods.[10] According to European Association of Urology standards, PCNL is recommended for stones that are 2cm or larger in the upper and middle calyx and 1cm or larger in the lower calyx.[11] Although the technical approach for PCNL is the same as in kidneys with bilateral functioning, surgery is more difficult in kidneys with a single working kidney due to the potential of problems during surgery that could worsen the single renal unit.[12] Sepsis, disruption to the collecting system, urine leakage, kidney damage, pleural or visceral injury, bleeding that necessitates transfusion or embolization, and sepsis are possible consequences. When utilized to treat renal calculi, PCNL is associated to a high degree of success and a tolerably low complication rate. A concise and organized classification scheme for complications appears to be extremely appealing.[13] In order to track and evaluate the outcomes of this treatment, the modified Clavien-Dindo classification of complications is essential. Only 12.44% of patients experienced slight variations from the typical intraoperative and postoperative course, demonstrating the procedure's safety in more than 85% of cases.[14]A study revealed a 22% complication rate and a 95.1% overall success rate for PCNL.[15] According to a systematic review, the stone-free rate with PCNL in kidneys with single functioning are good, even though overall complication rates are somewhat higher than those reported in kidneys with bilateral functioning.[16] Renal function appears to be preserved.The goal of this study is to evaluate PCNL's effectiveness and safety in a single functioning kidney. Due to the limited published data and the scarcity of local studies to date, this study is being planned and will be carried out.

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MATERIAL AND METHODS

This is a descriptive case series study conducted atUrology Department of Shaikh Zayed Hospital,Lahore from 21-10-2020 to 21-04-2021. Both gender of patients viz male and female.Patients of age between 18 to 65 years of age.Patients with solitary functioning kidney containing stone size of 3cm or less.Data collection was done by non-probability consecutive sampling.Informed consent was taken. Basic demographics like name, age, gender were noted. A complete history, examination and routine investigations along with CT KUB were completed in all patients. An intravenous urogram was obtained in all patients unless contraindicated and stone size was calculated by multiplying the two largest dimensions.All PCNL was performed under general anesthesia in the prone position. Data was analyzed with SPSS version 21.Age & stone size were presented by using Mean±SD. Gender, efficacy and safety were described by using frequency. Data was stratified for age, gender and stone size.

RESULTS

To assess the effectiveness and safety of PCNL in a single functioning kidney, 60 patients who met the inclusion criteria and presented to the Department of Urology. When the patients' ages were distributed, it was discovered that 10% of the patients (n=6) fell into the 18–40 age cohort, while 90% of the patients (n=54) fell into the 41–65 age group.

Table 1: Stratification for efficacy with respect to age using chi-square test

Age (years	Efficacy		Total	P value
	Yes	No		
18-40	6 (10%)	0 (0%)	6 (10%)	0.49
41-65	50 (83.3%)	4 (6.7%)	54 (90%)	
Total	56 (93.3%)	4 (6.7%)	60 (100%)	

Table 2. Stratification for safety with respect to age using chi-square test

Age (years	Efficacy		Total	P value
	Yes	No		
18-40	5 (8.3%)	1 (1.7%)	6 (10%)	0.90
41-65	46 (76.7%)	8 (13.3%)	54 (90%)	
Total	51 (85.0%)	9 (15.0%)	60 (100%)	

Table 3. Stratification for safety with respect to gender using chi-square test

Gender	Efficacy		Total	P value
	Yes	No		
Male	29 (48.3%)	9 (15.0%)	38 (63.3%)	0.01
Female	22 (36.7%)	0 (0.0%)	22 (36.7%)	
Total	51 (85.0%)	9 (15.0%)	60 (100%)	

Table 4: Stratification for efficacy with respect to stone size using chi-square test

Stone size (cm)	Efficacy		Total	P value
	Yes	No		
1-2	34 (56.7%)	2 (3.3%)	36 (60%)	0.49
3	22 (36.7%)	2 (3.3%)	24 (40%)	
Total	56 (93.3%	4 (6.7%)	60 (100%)	

Table 5: Stratification for safety with respect to stone size using chi-square test

Stone size (cm)	Efficacy		Total	P value
	Yes	No		
1-2	32 (53.3%)	4 (6.7%)	36 (60%)	0.30
3	19 (31.7%)	5 (8.3%)	24 (40%)	
Total	51 (85.0%	9 (15.0%)	60 (100%)	

Age was calculated to have a mean and standard deviation of 48.55 and 6.99 years. According to descriptive data on stone size, the mean and standard deviation were calculated to be 2.05cm and 0.86cm, respectively. The patients' gender distribution revealed that 63.3% (n=38) were men and 36.7% (n=22) were women. 93.3% of patients (n=56) with one functioning kidney had PCNL success. 85% of patients (n=51) with a single functioning kidney were safe after PCNL. In tables 1-6, the data were segregated according to the patients' age, gender, and stone size.

DISCUSSION

Patients with solitary kidneys are also more likely to produce kidney stones, and nephrolithiasis prevalence has been rising.[18] As a result of this situation, their renal function may eventually deteriorate, these patients demand an appropriate metabolic examination and effective stone removal.[19] Patients with one or two functional kidneys respond similarly to shock wave lithotripsy (SWL) and retrograde intrarenal surgery (RIRS).[20-21] In contrast, research suggests that percutaneous nephrolithotomy (PCNL) in individuals with solitary kidneys may result in a higher morbidity rate than in people with two healthy kidneys. Even for patients with single kidneys, PCNL is still the gold standard treatment for difficult kidney stones, offering reasonable probability of success despite the potential surgical problems it is associated with, such as haemorrhage, infection. Torricelli et al. studied patients with solitary kidneys who underwent PCNL in a referral centre for the treatment of kidney stones. They then looked at factors that could affect intraoperative bleeding and postoperative complications. Both trials demonstrated reasonable stone-free rates (>65%) with high transfusion and mild complication rates when compared to the biggest series of PCNL in single kidneys published. When compared to only 10.6% of cases from the CROES trial, over 25% of our PCNLs were performed using two percutaneous approaches, which was substantially associated with a greater bleeding rate. They also had a lot of complex situations (Guys 3 and 4), which could have affected our results even though it was not strongly related to the conclusions of our analysis. Only 3 (11.1%) of the eight individuals who experienced postoperative problems needed additional treatment. In a study of 39 patients who had bleeding that required angiographic renal embolization and were treated at PCNL, El-Nahas et al.[22] found that a single kidney, staghorn calculi, many tracts, and an unskilled surgeon were all important risk factors for severe bleeding. In our investigation, bleeding was dramatically correlated with a second tract. In these patients, a more cautious approach avoiding several renal punctures in difficult instances may be safer. Since all treatments in our institution were carried out by residents under the guidance of an experienced staff urologist, surgeon experience was not taken into account in our research.[22] In a research involving 53 patients, Jones et al[23] reported that PCNL was safe in individuals with solitary renal disease, with a stone-free rate of 77.3%. Except for one patient whose renal function deteriorated, the authors did not note any major side effects. Recently described by Resorlu et al[2]no serious intraoperative problems occurred, but one patient experienced bleeding from an infundibular tear that was likely caused by over-turning the kidneys. There were no patients who advanced to end-stage renal disease during the course of the 1-year study. They came to the conclusion that PCNL is safe and efficacious in staghorn calculi in a single kidney. Three minor problems (11.1%), including two urinary fistulas and a double-J misplacement, necessitated additional treatment in our study. Each of them was successfully resolved.[3]When patients were categorized based on their BMI, Terrecialla-Ortiz et al[24] in a prospective analysis with 225 PCNL found no statistically significant difference in terms of complications or stone-free rate. Additionally, there were no changes in hospital stays, auxiliary operations needed, or access denied. Only the length of surgery and radiation treatments were longer in patients with higher BMI in this study.[3]

Recent systematic reviews and meta-analyses shown that as compared to RIRS, PCNL offers a greater stone free-rate. However, PCNL is also followed by more blood loss and complications. In recent years, minimally invasive endoscopic procedures have rapidly advanced. They can be used to treat people with a single kidney who have upper urinary tract nephrolithiasis. Previously, the kidney or ureter structures would need to be surgically removed if a concrement could not be passed by the body naturally. The majority of endoscopic procedures were restricted to the Dormia Basket or Zeiss loop clearance of obstructions from the distal ureter. EAU recommendations currently state that only patients with a substantial coral calculus, concrements in a transplanted kidney, concrements in an ectopic kidney, scheduled resection of the renal pole, anatomical defects, and obese individuals should undergo surgery to treat a solitary kidney.[25] Patients with solitary kidneys are also more likely to acquire kidney stones due to the rising prevalence of nephrolithiasis. Given that this condition may ultimately damage their renal function, these individuals demand a proper metabolic examination and effective stone removal. Urolithiasis care in patients with a single kidney is still a difficult situation. In contrast, research suggests that patients with solitary kidneys may experience more morbidity from percutaneous nephrolithotomy (PCNL) than those with two healthy kidneys. Patients with solitary kidney disease (SKD) and chronic kidney disease (CKD) typically have higher American Society of Anesthesiologists scores and are more likely to experience complications from anaesthesia. Regarding PCNL problems in single functional kidneys, the evidence is scant. Patients with unilateral kidneys have a reduced success rate for PCNL and are at higher risk of experiencing an increase in serum creatinine. Therefore, the effectiveness of PCNL over the long term in this environment is being investigated. Our hospital has extensive experience treating complex stone disease as a tertiary referral facility. Each year, more than 1500 treatments involving stones are carried out, including PCNL, ureterorenoscopy, and extracorporeal shock wave lithotripsy (ESWL).

CONCLUSION

The effectiveness and safety of PCNL in patients with a single functional kidney and discovered that 93.3% (n=56) of patients demonstrated efficacy, and 85% (n=51) of patients shown safety. Therefore, we inferred that PCNL in a solitary kidney is not only efficient but also secure.

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