IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 11 Ser.7 (November. 2020), PP 51-55
www.iosrjournals.org

Outcomes of PCNL in Patients With and Without Previous Ipsilateral Stone Surgery

Ak. Kaku Singh[1], Pradeep Deb[2,*], Hiralal Adhikari[3]
[1]*Professor & Head, Department of Urology, Regional Institute Of Medical Sciences, Imphal, Manipur, India*
[2,3]*Senior Resident, Department of Urology, Regional Institute of Medical Sciences, Imphal, Manipur, India*
[*]*Corresponding author*: *Pradeep Deb, email: scorpio.pradeep@gmail.com*

Abstract
Purpose: To compare the outcomes of PCNL in patients with and without previous renal stone surgery. Materials and methods: A total of 80 patients who underwent PCNL during the period from 1st November, 2017 to 31st October, 2019 at our institution were included in the study. Patients undergoing PCNL were classified into 2 groups. Group l included patients without previous ipsilateral renal stone surgery. Group 2 included patients with previous renal stone surgery (open or percutaneous). Age, sex, Body Mass Index, stone size, stone location and renal stone surgery, number of access tracts made during the operation, time to access the collecting system, operation time, length of hospital stay, stone free rate, and intra- and post-operative complication rates were compared between the two groups.
Results: There were no significant differences between the two groups in terms of accessory tracts required, stone clearance rate, transfusion rate, ancillary procedures required, hospital stay and complications. The only differences noted between the groups were time to access the collecting system and operating time, which were statistically significant.
Conclusion: PCNL in patients with previous open or percutaneous stone surgery is as safe and effective as PCNL in patients without renal stone surgery in the past.
Key words: *calculi , percutaneous, nephrolithotomy*

Date of Submission: 08-11-2020 Date of Acceptance: 21-11-2020

I. Introduction

Renal stone treatment has significantly evolved from open surgery to minimally invasive surgical procedures. Since the first report of the removal of renal stones via nephrostomy by Rupel and Brown in 1941,[1] there have been significant improvements in techniques, instruments, and experience. Fernström and Johansson first reported percutaneous nephrolithotomy (PCNL) in 1976.[2] Alken et al. introduced the renal endoscope and ultrasonic lithotripsy and furthered the development of the technique.[3] PCNL is indicated in selected cases according to the size, position, shape, and composition of the stones. The European Association Of Urology has considered PCNL as the first option for large, multiple or inferior calyceal stones.[4] PCNL is recommended for stones larger than 20mm^2, struvite or cystine stones, failed ESWL or in anatomical malformations.[5,12] Some patients with a history of open stone surgery need PCNL because of stone recurrence.[6,7] Stone recurrence rate is up to 50% within 5-7 years.[8] PCNL or open stone surgery causes scarring and anatomical distortion in the kidney that may affect later PCNL. Some studies have reported that open stone surgery can increase PCNL failure rate[9] while others show that previous open stone surgery does not affect PCNL outcomes.[10,11] The aim of our study was to compare the outcomes of PCNL as a primary versus secondary procedure in patients with previous open stone surgery or PCNL.

II. Materials And Methods

A total of 80 patients who had undergone PCNL during the period from 1st November, 2017 to 31st October, 2019 were included in the study. Patients with abnormal renal anatomy such as ectopic or horseshoe kidney, same session bilateral PCNL operations, tubeless PCNL, PCNL following ESWL and URS failure, recurrent renal stones after ESWL and patients unwilling to participate were excluded from the study.

Patients undergoing PCNL were classified into 2 groups. Group l included patients without previous ipsilateral renal stone surgery. Group 2 included patients with previous ipsilateral renal stone surgery (open or PCNL). Age, sex, BMI, stone size, stone location and previous renal stone surgery were the independant variables compared. Number of access tracts made, tract dilation time , operation

time, length of hospital stay, stone free rate , and intra- and post-operative complication rates were the dependent variables compared between the two groups.

Detailed history and thorough physical examination was the basis of clinical diagnosis. Pre-operatively, patients were evaluated using hemogram, coagulation tests, serum creatinine, urinalysis and urine culture. Ultrasonography, IVU or CT Urogram was done in all patients.

Standard prone PCNL was performed using Cook Amplatz Renal Dilator Set (Cook Medical, USA), rigid nephroscope (27292 AMA with 26 Fr sheath from Karl Storz, Germany) with EMS Master Lithoclast (EMS, Switzerland) using pneumatic and/or ultrasonic energy in all cases. If there were significantly sized residual stone fragments that could not be accessed from the first tract, a second access tract was established. At the end of the procedure, complete clearance was ensured by fluoroscopy and direct nephroscopy. A 5 Fr D-J stent was inserted in antegrade fashion, and an adequate size nephrostomy tube was placed in all cases. Nephrostomy was normally removed on the second postoperative day after performing X-ray KUB and abdominal ultrasonography if required, to determine the residual stones and confirming the complete clearance or insignificant residual fragments and to rule out other complications, if suspected.

Intra-operative parameters like tract dilation time, accessory tracts, operation time, blood loss during surgery and stone clearance were recorded. Any ancillary procedures required, hospital stay and intra- and post-operative complications were also recorded. The complications were categorized according to The Clavien-Dindo Classification.[13]

- X-ray KUB was taken on the second postoperative day and the decision to remove the nephrostomy or to subject the patient to any ancillary procedures was taken. The patients were followed up again at 1 month with X-ray KUB and ancillary procedures as appropriate were provided.
- Stone clearance (defined as absence of any stone / radiographic shadow in X-ray KUB on the same side) was decided from the X-ray KUB at 1 month. The X-ray was read by an uninformed radiologist/urologist.
- The final result was noted at the end of 1 month.

Statistical analysis was done using IBM SPSS Version 21 for Windows. Chi square test was used as a test of significance of the study for comparing the categorical variables whereas independent sample t-test was used for nominal variables. For non-parametric data, Mann Whitney U-test was used for statistical analysis. P-value < 0.05 was taken as statistically significant. The study was taken up after getting clearance from the Research Ethics Board, RIMS.

III. Results And Observations

Table 1: Demographic parameters

		Group 1 (n=44)	Group 2 (n=36)	P value
Mean age (years)		41.68	41.55	0.96
Sex	Male	18 (41%)	15 (41.66%)	0.47
	Female	26 (59%)	21 (58.33%)	
Average BMI (kg/m^2)		27.04	28.94	0.73
Total		44	36	

Table 1 shows that there were no significant differences between the groups and they were comparable in terms of age, sex and BMI.

Table 2: Stone characteristics

		Group 1 (n=44)	Group 2 (n=36)	P value
Mean stone size (mm^2)		25.65	25.38	0.92
Location	Pelvic	10 (22.72%)	6 (16.66%)	0.76
	Calyceal	17 (38.63%)	14 (38.88%)	
	Pelvicalyceal	17 (38.63%)	16 (44.44%)	
Number of stones	Single	28 (63.63%)	19 (52.77%)	0.32
	Multiple	16 (36.36%)	17 (47.22%)	
Hydronephrosis	None	18 (40.90%)	17 (47.22%)	0.15
	Mild	9 (20%)	3 (8.33%)	
	Moderate	12 (27.27%)	15 (41.66%)	
	Gross	5 (11.36%)	1 (2.77%)	

Table 2 shows both the groups were comparable without any significant differences in terms of mean stone size (mm), stone location in the kidney, no. of stones, presence and degree of hydronephrosis.

Table 3 : Intraoperative parameters

	Group 1	Group 2	P value
Mean ± SD tract dilation time (minutes)	10.31±3.46	13.94±3.61	0.00001
Mean ± SD operation time (minutes)	62.75±12.11	73.86±18.52	0.002
Patients requiring accessory tracts	15 (34%)	13 (36%)	0.94

Table 3 shows that the tract dilation time in Group 1 was 10.31 min whereas it required 13.94 min in Group 2 and it was statistically significant (p-value < 0.05).
Mean operation time in Group 1 was 62.75 min and in Group 2 it was 73.86 min. This difference in operation time was statistically significant (p-value < 0.05).
There was no statistically significant difference between Group 1 and Group 2 in terms of percentage of patients requiring accessory tracts.

Table 4: Operative parameters

		Group 1	Group 2	p-value
Transfusion requirement	Not required	36 (81.8%)	29 (80.55%)	0.95
	1 unit blood	4 (9.09%)	4 (11.11%)	
	2 unit blood	4 (9.09%)	3 (8.33%)	
Complete stone clearance		40 (90.9%)	31 (86.11%)	0.49
Ancillary procedures required		6 (13.63%)	7 (19.44%)	0.48
Mean hospital stay (days) ± SD		5.75 ± 1.18	5.8 ± 1.16	0.91

There was no statistically significant difference in terms of requirement of transfusion between the two groups (p-value > 0.05).
There was no statistically significant difference between the two groups in terms of stone clearance (p-value > 0.05). There was no significant difference between the two groups (p-value > 0.05) in terms of requirement of ancillary procedures.
Mean hospital stay (days) in Group 1 was 5.75 days and in Group 2 mean hospital stay was 5.8 days. There was no statistically significant difference between the two groups (p-value > 0.05).

Table 5: Complications

		Group 1	Group 2	p-value
Complications	None	27 (61.36%)	22 (61.11%)	0.56
	Clavien-Dindo Grade 1	8 (18.18%)	6 (16.66%)	
	Clavien-Dindo Grade 2	8(18.18%)	8 (22.22%)	
	Clavien-Dindo Grade 3	1 (2.27%)	Nil	
	Total	44	36	

There were no complications in 61% patients (n=27) in Group 1 and 61% patients (n=22) in Group 2. In Group 1, 18.18% patients (n=8) were Clavien-Dindo Grade 1, 18.18% patients (n=8) were Clavien-Dindo Grade 2 and 2% (n=1) fell in Clavien-Dindo Grade 3.

In Group 2, 17% patients (n=6) had Clavien-Dindo Grade 1 complications and 22% patients (n=8) had Clavien-Dindo Grade 2 complications.

In our study, Grade 1 complications most commonly included postoperative fever and Grade 2 complications most commonly included blood transfusions. The only Grade 3 complication encountered was a single case of hydrothorax in Group 1, which was managed successfully by intercostal drainage. There was no statistically significant difference between the complications in the two groups (p-value > 0.05).

IV. Discussion

Previous renal surgery may impact secondary PCNL in different ways. Both open surgery and PCNL lead to perinephric scarring and complicate the introduction of the needle into the desired calyx and adequate tract dilatation. Anatomic distortions such as infundibular stenosis or ureteropelvic junction obstruction are also seen in kidneys with surgical history. Incisional hernia and bowel adhesions after open surgery may lead to higher complication rates. Maneuvering of nephroscope, as well as fragmentation and removal of stones in scarred kidneys is difficult.

Our study shows that previous surgery for renal calculi does not affect the results of subsequent PCNL on the same kidney except for longer tract dilation time and operating time**.** Sofikerim et. al.[11] compared the results of PCNL on 27 patients with previous open surgery and 62 patients without any intervention. They found no differences in success or complication rates. Operative time, success rate, hospital stay and complications were similar.

Margel et. al [15] compared the results of PCNL in 21 patients with previous open surgery and 146 patients without. The mean operative time and number of attempts to gain access were significantly greater after previous open surgery.

Basiri et al.[10] compared 65 patients who underwent PCNL after an open stone procedure with 117 patients having primary PCNL. They found no difference between the groups in the overall stone-free rate. However, their results were confounded by the fact that a higher percentage of patients with a history of open nephrolithotomy had a single stone, whereas there was a higher stone burden in the primary PCNL group. There was no significant difference between groups in respect to operative time in the study of Sofikerim et al.[11] They have reported that mean operative time was 70 min (range 15–210 min) in the group with previous open surgery, whereas it was 66 min (10–180 min) in the other group. Margel et al.[15] stated that the operative time was significantly longer in group with previous open surgery. They reported the operative time in the previously operated group as 203 ± 92 min and in previously non-operated group as 177 ± 52 min. Our study also found that operative time was longer in previously operated group (73.86 ± 18.52 min), compared with the previously non-operated group (62.75 ± 12.11). Tugcu et al.[18] also reported significantly longer mean operative time in patients with previous open renal surgery. Margel [15] demonstrated not only operative time but also that the number of attempts to gain access were significantly higher after previous renal surgery. Gupta et. al [20] also reported increased time to access the collecting system in the previously operated patients. Similarly in our study, mean operative time as well as tract dilation time were longer in patients with previous renal surgery, and the parameter was reflected as statistically significant.

In our study, stone clearance was 90.9% in previously non-operated group and 86.11% in previously operated group. Studies by Resorlu et al.[16] (88.5% vs 87.1%). Sofikerim et. al.[11] (92% vs 94%) and Lojanapiwat et. al [7] (80.3% and 82.6 %) had similar stone free rates in groups with and without previous open renal surgery, respectively.

In our study, 34% patients in previously non-operated group required secondary tracts whereas 36.11% of previously operated patients required secondary tracts. Similarly, Kurtulus et al.[17] did not find any significant differences in the percentage of patients requiring secondary tracts although less number of patients in their study required secondary tracts than us (8.5% in previously non-operated vs 10.2% in previously operated groups).

In our study, the rate of ancillary procedures was 13.63% in group 1 whereas it was 19.44% in group 2 and there was no significant difference between the two groups. 5 patients required relook PCNL and 1 required ESWL in group 1, whereas 3 patients required relook PCNL and 4 patients required ESWL in group 2. Studies by Lojanapiwat et. al.[7] , Sofikerim et. al,[11] Kurtulus et. al [17] and Tugcu et. al,[18] have reported similar results.

Only two studies have reported different results about ancillary procedures needed. Margel et. al [15] found secondary procedures to be higher in patients with previous nephrolithotomy. Gupta et. al[20] also found that relook PCNL is higher in patients with previous open surgery (18.2% vs. 7.8% in previously non-operated group).

Bleeding is a feared complication of PCNL. In our study 18.18% patients (n=8) required transfusion in Group 1 and 19% (n=7) required transfusion in Group 2 and there was no statistically significant difference in the transfusion rates between the two groups. 9.09% (n= 4) patients in Group 1 and 8.33% (n= 3) patients in Group 2 required 2 units of blood. The others were managed with a single unit blood. Gupta et. al [21] and Basiri et. al [10] also reported no significant differences in transfusion rates between the two groups.

In our study, there were no significant differences in the complication rates between the two groups. In Group 1, Clavien-Dindo grade 1 complications were seen in 8 patients (18.18%), grade 2 complications were seen in 8 patients (18.18%) and grade 3 complications were seen in only 1 patient. In Group 2, grade 1 complications were seen in 6 patients (16.66%) and grade 2 complications were seen in 8 patients (22.22%).

Many studies report that previous procedures do not significantly affect the results of subsequent PCNL on the ipsilateral kidney. Resorlu. et. al [16] reported that PCNL with standard technique could be performed safely in patients with a history of open nephrolithotomy or ESWL without a higher risk of complications and with a success rate similar to that of PCNL in patients with no previous intervention. Similar results were reported in studies by Basiri et al.[10] , Sofikerim et al.[11] , Lojanapiwat. et. al [14] , Margel et al.[15] and Tugcu et al.[18]

Our study showed that there was no difference in the hospitalization time between the non-operated and the previously operated groups. Mean hospital stay in our study was 5.75 days in Group 1 and 5.8 days in Group 2. Similar results were reported in studies by Basiri. et. al [10], Sofikerim. et. al [11] , Kurtulus. et. al [17] , Yesil. et. al [22], Lojanapiwat. et. al [7] and Falahatkar. et. al.[19]

. We are also well aware of the limitations of our study. Firstly, our sample size is small. Secondly, the duration since the previous surgery and the type of surgery done were not taken into account which may have affected the technical difficulties. And lastly PCNL was done by two different surgeons which may have influenced the results

V. Conclusion

Our study showed that previous surgery for renal stones did not significantly alter the outcome of PCNL, and did not unduly increase the risk of complications although it may lead to longer tract dilation time and operating time which may be caused by perinephric scar tissue formation and anatomical alterations from the previous surgery.

Sources Of Support : None
Conflict Of Interests : None

References

[1]. Rupel E, Brown R. Nephroscopy with removal of stones following nephrostomy for obstructive calculus anuria. J Urol 1941;46(2):177-82.
[2]. Fernström I, Johansson B. Percutaneous pyelolithotomy. A new extraction technique. Scand J Urol Nephrol 1976;10(3):257-9.
[3]. Alken P, Hutschenreiter G, Günther R, Marberger M. Percutaneous stone manipulation. J Urol 1981;125(4):463-6.
[4]. Turk C, Knoll T, Petrik A. Guidelines on Urolithiasis. Chapter 6.4: selection of procedure for active removal of kidney stones. Presented at: 26th European Association of Urology congress; 2011 March 18-22: Vienna, Austria.
[5]. Al-Kohlany KM, Shokeir AA, Mosbah A, Mohsen T, Shoma AM, Eraky I et al. Treatment of complete staghorn stones: a prospective randomized comparison of open surgery versus percutaneous nephrolithotomy. J Urol. 2005;173(2):469-73.
[6]. Trinchieri A, Ostini F, Nespoli R, Rovera F, Montanari E, Zanetti G. A prospective study of recurrence rate and risk factors for recurrence after a first renal stone. J Urol. 1999;162(1):27-30.
[7]. Lojanapiwat B. Previous open nephrolithotomy: does it affect percutaneous nephrolithotomy techniques and outcome? J Endourol. 2006;20(1):17-20.
[8]. Parmar MS. Kidney stones. BMJ. 2004;328(7453):1420-4.
[9]. Jones DJ, Russell GL, Kellett MJ, Wickham JE. The changing practice of percutaneous stone surgery. Review of 1000 cases 1981-1988. Br J Urol. 1990;66(1):1-5.
[10]. Basiri A, Karrami H, Moghaddam SM, Shadpour P. Percutaneous nephrolithotomy in patients with or without a history of open nephrolithotomy. J Endourol. 2003;7(4):213-6.
[11]. Sofikerim M, Demirci D, Gülmez I, Karacagil M. Does previous open nephrolithotomy affect the outcome of percutaneous nephrolithotomy? J Endourol. 2007;21(4):401-3.
[12]. Labate G, Modi P, Timoney A, Cormio L, Zhang X, Louie M, et al. The percutaneous nephrolithotomy global study: classification of complications. J Endourol. 2011;25(8):1275-80.
[13]. Falahatkar S, Moghaddam KG, Kazemnezhad E, Farzan A, Aval HB, Ghasemi A. Factors affecting complications according to the modified Clavien classification in complete supine percutaneous nephrolithotomy. Can Urol Assoc J. 2015;9(1-2):83-92.
[14]. Lojanapiwat B. Does previous open nephrolithotomy affect the efficacy and safety of tubeless percutaneous nephrolithotomy? Urol Int 2010;85:42–46.
[15]. Margel D, Lifshitz DA, Kugel V. Percutaneous nephrolithotomy in patients who previously underwent open nephrolithotomy. J Endourol 2005;19:1161–64.
[16]. Resorlu B, Kara C, Senocak C. Effect of previous open renal surgery and failed extracorporeal shockwave lithotripsy on the performance and outcomes of percutaneous nephrolithotomy. J Endourol 2010;24:13–16.
[17]. Kurtulus FO, Fazlioglu A, Tandogdu Z. Percutaneous nephrolithotomy: primary patients versus patients with history of open renal surgery. J Endourol 2008;22:2671–5.
[18]. Tugcu V, Su FE, Kalfazade N. Percutaneous nephrolithotomy (PCNL) in patients with previous open stone surgery. Int Urol Nephrol 2008;40:881–4.
[19]. Falahatkar S, Panahandeh Z, Ashoori E. What is the difference between percutaneous nephrolithotomy in patients with and without previous open renal surgery? J Endourol 2009;23:1107–10.
[20]. Gupta NP, Mishra S, Nayyar R. Comparative analysis of percutaneous nephrolithotomy in patients with and without a history of open stone surgery: single center experience. J Endourol 2009;23:913–16.
[21]. Gupta R, Gupta A, Singh G. PCNL—a comparative study in nonoperated and in previously operated (open nephrolithotomy/ pyelolithotomy) patients—a single-surgeon experience. Int Braz J Urol 2011;37:739–44.
[22]. Yesil S, Ozturk U, Goktug HN. Previous open renal surgery increased vascular complications in percutaneous nephrolithotomy (PCNL) compared with primary and secondary PCNL and extracorporeal shock wave lithotripsy patients: a retrospective study. Urol Int 2013;91:331–4.