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SURGICAL OUTCOME OF PERCUTANEOUS NEPHRO LITHOTOMY (PCNL) FOR UROLITHIASIS IN ANOMALOUS KIDNEYS

Urology

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ABSTRACT

Objectives: To evaluate the outcome of percutaneous nephrolithotomy (PCNL) in anomalous kidneys performed at our centre. **Methods:** A total of 66 patients with renal abnormalities were offered PCNL from January 2011 to December 2020 at our department. Of these 66 patients, 30 had a horseshoe kidney, 10 had malrotation of kidneys, and 26 had duplex kidneys. The mean age was 41.37 years (range 23-70). The male/female ratio was 1.5, and 7 patients had bilateral renal stones (all in horseshoe kidneys). The mean stone size was 19.5 mm (range 13-27). **Results:** In our study, stone clearance rate was 93% in single session and 89% after relook PCNL. The stone was cleared by a single tract in 57 renal units and 9 required multiple tracts. The mean operating time for PCNL was 98.37 minutes (range 70-150), and the mean hospital stay was 4.5 days (range 3-12). one patient developed hematuria due to arterio- venous fistula, managed by angiographic embolization. Two patients developed post-PCNL sepsis. **Conclusions:** Although PCNL in anomalous kidneys is technically demanding, it gives excellent results for large or extracorporeal shock wave lithotripsy-refractory stones, if performed carefully.

KEYWORDS

anomalous kidney, stone, PCNL

INTRODUCTION

There are various types of anomalous kidneys described with a reported incidence of 3%–11%.[1] Of these, the horseshoe kidney, crossed ectopic kidney, simple ectopic kidney, pelvic ectopic kidney, kidney with duplex system, and malrotated kidney are associated with stone disease due to impaired urinary drainage as a result of abnormal anatomy such as narrowing of pelvic ureteric junction or high insertion of ureter.[2,3] Hence, there is an ongoing debate regarding the best technique for stone removal in anomalous kidneys.

Stone clearance with Extracorporeal shock wave lithotripsy (ESWL) is 28%–78% in horseshoe kidney and 66%–71% for ectopic kidney.[4] Stone clearance rate for ESWL is unsatisfactory for larger stones and impaired urinary drainage. [4] Presently other methods include flexible ureteroscopy, percutaneous nephrolithotomy (PCNL), laparoscopy-assisted PCNL, and laparoscopic pyelolithotomy.

In anomalous kidneys, due to the abnormal orientation of kidney and abnormally placed calyces and high incidence of abnormal vessels, PCNL becomes challenging. In a normal kidney, pelvis is present medially and calyces are found posteriorly. the renal pelvis rotates anteriorly, and calyces are found postero-laterally in horseshoe kidneys and malrotated kidneys, hence puncture becomes difficult. Stones of superior calyx cannot be approached by inferior calyx and vice versa in renal duplex systems. All these factors make PCNL quite challenging in such cases.

The average stone free rate in horse shoe kidney is 84% due to technical difficulty.5] We present our experience of PCNL in various types of anomalous kidneys over last one decade.

Patients And Methods

66 patients underwent PCNL for anomalous kidneys since January 2011 to December 2020. Among these patients, 26 patients had kidney with duplex system, 30 had horseshoe kidneys, and 10 had malrotated system.

Table 1 Type of Anomalous kidneys with stone disease

Types of kidneys	No of patients
Horse shoe kidneys	30
Malrotated	10
Kidneys with bifid system	26

Clinical history, examination, hemogram, renal function test, and urine analysis was performed preoperatively for all patients. Ultrasound and X-ray of kidney, ureter, and bladder (KUB), Intravenous urogram and Computed tomography (CT) were the imaging methods used. Totally 1286 patients underwent PCNL during this period, 66 patients had anomalous kidneys. A retrospective analysis was done after obtaining the required data. Data was analyzed using Microsoft excel 2019 version.

Procedure

All patients underwent Surgery under general anaesthesia. Patient was first placed in dorsal lithotomy position, an ureteric catheter was placed on the affected side and retrograde pyelography was done. Patients were placed in prone position subsequently. Urologists of our institute performed all initial punctures

Horse -shoe kidney

Initial puncture was done under fluoroscopic guidance using bull's eye technique with an end on view of posterior calyx. Depending on the position of stones in either pelvis or in different calyces, site and number of punctures was decided by the operating surgeon.

In duplex system, malrotated kidney

Using standard principles and C-arm, with a bull's eye technique, calyceal puncture was done after injecting the contrast.

After initial puncture, guide wire was inserted and tract was dilated up to 24–28 Fr and amplatz sheath placed. In all cases, 20 Fr rigid nephroscope was used. A pneumatic lithotripter was used to fragment the stones and removed with forceps. X-ray and renal ultrasound were used to assess residual stones. Stones <4 mm were considered clinically insignificant. Stone characteristics, number of punctures, type of calyceal puncture, relook procedures, blood transfusion, mean operative time, mean hospital stay, stone free rate,and complications were recorded.

RESULTS

Totally 70 sessions of PCNL were done in 66 patients. Mean age was 41.37± 13.14 years. Presenting complaints were flank pain (36%), haematuria (18%), and nonspecific abdominal pain (22%). Patient's demographic characteristics and stone configuration is listed in table 2. Table 3 shows operative results of percutaneous nephrolithotomy.

Totally 62 patients required only single session of PCNL for complete stone clearance while 4 patients underwent relook procedure. 20 patients had superior calyx puncture, 26 had middle calyx puncture, 11 had lower pole puncture, and 9 patients had multiple calyceal punctures. Mean operating time was 98.37 +/- 24.39 minutes. 8 patients needed blood transfusion in post operative period. Grade 1 clavin dindo complication was seen in 17 patients ,16 patients had clavin dindo grade 2, and were managed conservatively. One patient of horse shoe kidney, developed arterio-venous fistula, angiography and embolization was done.

Table 2 – Demographic characteristics and stone configuration

Characteristics	Mean +/- SD
Age (years)	41.37 +/- 13.14
Right /left	27/39
Male / female	39/26
Site of stone (unilateral / bilateral)	59/7
Stone size (mm)	19.51 +/- 4.98
Number of stones (single/multiple)	54/12
Stone configuration	
Pure pelvis	22
Calyceal	6
Complex (pelvis with multiple calyces)	15

Table 3- operative details of PCNL

Characteristics	Mean +/- SD
Mean operating time (min)	98.37 +/- 24.39
PCNL in one sitting /Relook	62/4
Mean hospital stay	4.5+/- 1.77
Calyceal puncture	
Superior	20
Middle	26
Lower	11
Multiple	9
Blood transfusion (%)	8/66
Complications (Clavein)	
Grade 1	17
Grade 2	16
Grade 3	1
Grade 4	0

DISCUSSION

Horseshoe kidney, kidney with duplex system, and malrotated kidneys are the common congenital kidney anomaly with stone disease.[6] Due to the altered orientation of pelvis and calyces, altered renal vasculature as well as altered relations with intra-abdominal organs and relative immobility, stone removal is difficult with PCNL.[7] Minimal invasive techniques have the advantage of reduced hospital stay, early recovery, and reduced analgesia requirement.[8]

ESWL is one of the option available, but due to the anatomic abnormalities, fragmented stone passage is prevented. With increasing stone size, the stone clearance decreases with ESWL.

The mean stone size in our was 1.9cm study for which PCNL is the preferred treatment. Rigid nephroscope was used for PCNL in all cases.

In our series, most of the patients with a pelvic stone needed one session for complete clearance. In the 4 cases that underwent relook nephroscopy, stone were either larger in size or present in multiple calyces. Flexible nephroscopy could be one option in such cases.[9]

RIRS was attempted in 2 cases of horse shoe kidney, but the stones could not be visualized due to anatomical variation, hence PCNL was done. Adequate preoperative counselling regarding the need for relook procedure as well as probability of residual stones and auxiliary procedures should be done to all patients with complex stones. In our study, stone clearance rate was 93% in single session and 89% after relook and auxiliary procedure which are comparable to those reported literature.[9] 4 patients needed relook procedure.

Middle posterior calyx was the most common puncture site in our series, superior posterior calyx puncture was also done without pleural injury particularly in horseshoe kidneys and minimal pleural complications.[10]

In one study, PCNL in horseshoe kidney with stones, major complications was 6.6%. In the present series, no major complications were found, although a large number of patients (30/66) were of horseshoe kidney. [11].

One patient of horse shoe kidney, developed gross and persistent haematuria on post operative day 5, arterio-venous fistula was suspected, angiography was done, which confirmed the same, and embolization was done, following which the patient improved.

PCNL has its own complications and morbidities; The reported incidence of blood transfusion in PCNL is 14%–24% in larger stones.[12] In the present case, total 8(12.1%) patients underwent blood transfusion. Although there are limited studies for PCNL in duplex system, in our study, 26 patients successfully underwent PCNL procedure.

CONCLUSION

Likewise PCNL in normally located kidney, it is safe and feasible to perform PCNL in anomalous kidney but requires careful pre operative planning and be cautious about the possible intra and post operative complications associated with the procedure.

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