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Study on Standard Percutaneous Nephrolithotomy For Renal Calculi

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Abstract

Background: Percutaneous renal surgery caused a revolution in the treatment of renal stone surgery.It is now considered the first line intervention for management of patients with asignificant stone burden. Percutaneous nephrolithotomy in the prone position allows better access to perform upper urinary tract endoscopy surgery with ability to clear the stones. This study represents a case series to evaluate how successful a standard percutaneous nephrolithotomy is, as a tool for clearance forrenal stones. *Methodology:* PCNL was carried out on 123 patients who were having renal stone size between 2 to 4cms from January 2014 to December 2017 at JJMMC, Davanagere, a tier 2 city in Karnataka. We have observed the site and number of the required access, the intra and postoperative complications. *Results:* The procedure was completed, using a single access tract in 110 patients, with the site of puncture being the lower calyx in 40 cases[36.36%], the posterior middle calyx in 60 cases[54.54%], 10 superior calyceal puncture (9%),Only in thirteen patients[10.5%], two access tracts (an upper and a lower calyceal) were required for completion. We had post op complications in 13 cases with 7 cases requiring ancillary procedures for stone clearance. *Conclusion:* Supine Percutaneous nephrolithotomy is a safe and successful procedure for the management of renal stones in terms of morbidity, convalescence, and cost replacing open surgical removal of renal calculi.

Keywords: Percutaneous Nephrolithotomy; Kidney; Renal Calculi; Horseshoe Kidney.

Introduction

The treatment of renal calculi has been revolutionized with the advent of modern and minimally invasive techniques. Percutaneous nephrolithotomy represents an important advance that significantly reduces the number of open surgeries performed for lithiasis.[1] The concept of percutaneous tubeless nephrolithotomy was to achieve maximum stone clearance and to drain the renal cavities with or without a ureteral stent.[2] PCNL are reported to have beneficial effects, including low retreatment rates and a low incidence of complications.[3] However, PCNL has potential limitation in undilated renal system. A serial of comparative studies concerning complications or outcomes between PCNL and pyelolithotomy have been described. As for clinical outcomes, many parameters such as the efficacy and the length of hospital stay and preserved renal function postoperatively were also discussed.[4] The present study conducted a case series to evaluate how successful ispercutaneous nephrolithotomy as a tool for clearance of renal stones, complication rates and efficacy of the procedure.

Materials and Methods

We have carried out PCNL (percutaneous nephrolithotomy) for 2 to 4 cms renal calculi, in 123 patients at our department at JJMMC, Davanagere. Each patient had a CT scan KUB plain and a documented negative urine culture and normal

coagulation profile report and other preoperative investigations (Fig.1). After administration of preoperative antibiotics, procedures were done under general / regional anesthesia, using fluoroscopic guidance for localization and standard Alken dilatation followed by 24 frrigid nephroscopy and stone extraction with or without stone disintegration using pneumatic lithoclast. We analyzed our results regarding the site and number of the required access, the intra and postoperative complications, the presence of any residual stones, as well as their location and stent-related morbidity. We have excluded the patients with bilateral kidney stones, patient under 20 y, bleeding disorders, stone size less than 2 cm (Fig 2).

Procedure: Surgeries were done under General anesthesia/regional anaesthesia. General anaesthesia was considered in case of staghorn calculi, obese patients, superior calyceal calculi, patient who did not give consent for regional anaesthesia. Regional anaesthesia was done under spinal anesthesia. Initially a cystoscopy was done and ureteric catheterterization was introducedon the stone side upto the renal pelvis and fixed to Foleys catheter. Later patient was turned prone. Pelvicalycealsytem was delineated by injecting the contrast (urograffin 76%) through the ureteric catheter; calyceal puncture was taken with puncture needle and track dilated upto 27 Fr with Alken metaldilators (series of dilators starting from 9 Fr to 27 Fr). After introducing 30 FrAmplatz, 24 fr Nephroscope was introduced. With the help of pneumatic lithoclast the stone was fragmented and removedand DJ stent was placed. Postoperative X ray KUB was used to check anyresidual fragments. Patients were discharged after 2 to 3 days postoperative period (Fig 3).

Results

The procedure was completed, using a single access tract in 110 patients, with the site of puncture being the lower calyx in 40 cases [36.36%], the posterior middle calyx in 60 cases [54.54%], 10 superior calyceal puncture (9%),Only in thirteen patients [11.8%], two access tracts (an upper and a lower calyceal) were required for completion.Intra-operative bleeding was not significant; 5 of the cases required blood transfusion intraor postoperatively. 3 patient with infected stones suffered urosepsis postoperatively, which was successfully managed conservatively. seven cases had residual stones and 2 underwent re look pcnl and 5 underwent extra corporeallithotripsy for the residual calculi (Table 1,2,3,4,5)(Fig 2). The site of puncture, superior calyx were in 10 cases, middle calyx were 60 cases, inferior clayx were 40 and multiple puncture in 13 cases (Table 5,6). General anaesthesia given in 33 cases and in 90 cases regional anaesthesia given (Table 7. In 4 cases the site of puncture was supracostal punctures and infracostal puncture was in 119 cases (Table 8).

Table 1: Age wise distribution

Age of Patient	Number
21- 30	22
31-40	24
41-50	28
51-60	26
>61	23
Total	123

Table 2: Side wise distribution

Side of Kidney - PCNL	Number
Right	67
Left	56
Total	123

Table 3: Type of kidney

Type of Kidney - PCNL	Number
Normal	113
Malrotated	7
Horse shoe shaped	2
Solitary Kidney	1
Total	123

Table 4: Complications

Complications	Number
Blood Transfusion	5
Sepsis	3
Deranged RFT	5
Total	15

Table 5: Ancillary procedures for stone clearance

Re PCNL	2
ESWL	5

Table 6: Site of puncture

Site of puncture	Number
Superior calyx	10
Middle calyx	60
Inferior clayx	40
Multiple puncture	13
Total	123

Table 7: Type of anesthesis

Anaesthesia	Number
General	33
Regional	90
Total	123

Table 8: Site of puncture

Site of punture	Number
Supracostal punctures	4
Infracostal puncture	119
Total	123

Discussion

Percutaneous Nephrolithtomy (PCNL) as a minimally invasive conduit to the pelvicalyceal system, the percutaneous approach provides a convenient route for treating the renal stones. Fernstrom and Johans son first reported the technique of establishing a percutaneous track specifically to remove a stones from kidney in 1976.[5]

Fig. 1: IVP showing a large left renal calculus with hydroneophrosis

Fig. 2: Nephroscopicview of large pelvic calculi

Fig. 3: Post op X ray KUB showing no radiopacity with DJ stent in situ

Advances in surgical technique andtechnology have allowed the urologist to remove calculi percutaneously with increasing efficiency. As the percutaneous approach to stone removal is superior to the open approach interms of morbidity, convalescence, and cost, PNL has replaced open surgical removal of largeor complex calculi at most institutions. Significant residual calculi post pcnl is considered to be more than 4 mm size. An absolute contraindication to PCNL is uncorrected coagulopathy and an active,untreated urinary tract infection. Although percutaneous procedures of the kidney are associated with less morbidity than open surgery, the potential for significant complications still exists. In a recent systematic review and meta-analyzes Zhang et al found that PCNL provided a significantly higher stone-free rate compared to RIRS (Retrograde Intra Renal Surgery) and SWL (Shock Wave Lithotripsy) for a large stone burden (>2 cm)[6,7].

Horse shoe kidney is the most common renal fusion abnormality with an incidence of about 1/400. This anatomic anomaly is challenging for retrograde or extracorporeal treatment modalities because of malrotation of the kidney and collecting system complexity. In these cases, an even smallerstone volume can be better treated percutaneously. The optimal anatomic point of renal puncture for HSKs is through a posterior upper calix, which is typically in a moremedial and caudal location than the normal kidney and enables infra-costal approach. PCNL in HSK is safe and effective with success rates of about 92%. Auxiliary procedures may be needed in order to achieve this stone freerates.[7,8,9] In cases of renal abnormalities, PCNL is a challenging procedure because of collecting system architecture and vascular differences. During PCNL in anatomically normal kidney, the pelvis is found medially while the calyces are located posteriorly. However, in a malrotated kidney, the pelvis rotates anteriorly, and the calyces are found posterolaterally so the puncture becomes challenging. In the ectopic pelvic kidney, as bowel is surroundingthe kidney hindering a safe access, laparoscopic assistance is required. In a duplex system, stones located in upper calyx cannot be managed by accessing a lower calyx and vice versa. All these aggravating factors make PCNL quite difficult. In a recent study of 86 cases, the authors conclude that the chance of stone clearance by PCNL is about 84% but still higher in comparison to extracorporeal shock wave lithotripsy (ESWL).[7,10] Patient positioning influences not only the endourological approaches but also the cardio vascular and ventilationstatus

of the patient during the procedure. Variations in different position for PCNL like prone, supine and lateral decubitus position are practised now. The pros and cons of prone versus supine PCNL are indebate. Prone position is still considered as the standard approach. The advantages are easier identification ofrenal anatomy and selection of the appropriate puncturesite. It also provides a wider surface area for percutaneousaccess with a low risk of abdominal visceral injuries[7,11].

Percutaneous nephrolithotomy is a safe and successful procedure for the management of large complex renal stones in terms of morbidity, convalescence, and cost replacing open surgical removal of large complex calculi. Hemorrhage, Injury to the Renal Pelvis, Fluid Absorption, Injury to the PleuralCavity, Bowel Perforation, Injury to the Spleen and Liver, Sepsis are some of the known complications of PCNL. The risk of blood loss during percutaneous renal surgery is increased byexcessively medial punctures, multiple punctures, and punctures into kidneys with abnormal anatomy. Delayed bleeding after percutaneous procedures usually indicates the presence of apseudoaneurysm or an arteriovenous fistula if the renal pelvis is perforated during percutaneous surgery, maximal decompression with a ureteral stent and a nephrostomy tube should be accomplished and the procedure should be discontinued. Because the risk of injuryto the lungs or pleura increases with more superior punctures, a postoperative chest radiograph should be obtained for all patients in whom an intercostal puncture is performed. In the case of colonic perforation during percutaneous renal surgery, the gastrointestinal and urinary systems should be separated to avoid fistula formation. A double-pigtail stent should be placed in the ureter and a nephrostomy tube should be placed in the colon.

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