Original Article

Laparoscopic assisted percutaneous nephrolithotomy in chronic kidney disease patients with ectopic pelvic kidney

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Abstract

Purpose: Patients with deranged renal functions have a number of associated factors which can impair healing of wound and increase postoperative morbidity. This study was conducted to assess the problems while managing ectopic pelvic kidney calculi using laparoscopic approach for percutaneous nephrolithotomy (PCNL) in chronic kidney disease patients.

Subjects and Methods: Patients with calculi in ectopic kidney with increased serum creatinine level secondary to obstruction were included in the study. Initially, obstruction was relieved. Patients later underwent laparoscopic-assisted PCNL. Patients were monitored postoperatively.

Results: Three patients with large renal calculi in ectopic pelvic kidney had presented in 2 years. Laparoscopic-assisted PCNL was done to remove the stone. Patients had persistent urine leak post-operatively. Mean duration for removal of nephrostomy tube and drain removal were 4.67 days and 6.67 days, respectively. These patients also had paralytic ileus for prolonged duration.

Conclusion: Although laparoscopic assisted PCNL is an option in the management of patients with stone disease in ectopic pelvic kidney, prolonged time for healing of tract may increase postoperative morbidity in these patients with impaired renal function.

Keywords: Chronic kidney disease, ectopic pelvic kidney, laparoscopy, percutaneous nephrolithotomy

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INTRODUCTION

The position of the ectopic kidney in pelvis makes any intervention directed at it challenging. Puncture in an ectopic kidney using only fluoroscan, without any other guidance is very difficult. This difficulty is the result of abnormal location of ectopic kidney, position of pelvis and calyces, anomalous blood supply and altered ureteral course. Initial puncture for percutaneous nephrolithotomy (PCNL) in an ectopic kidney with stone has been explained using laparoscopic, ultrasound or fluoroscopic guidance.[1-4]

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Patients with impaired renal functions have a number of associated factors which can impair wound healing and increase post-operative morbidity.[5] Impaired renal function has also been found to impair post-PCNL outcomes.[6] This study was carried out to assess the problems in the management of ectopic pelvic kidney calculi in patients with impaired renal function while using laparoscopic approach for PCNL.

SUBJECTS AND METHODS

This study was conducted from September 2014 to

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October 2016 after the institutional ethical committee approval. This was a descriptive study. Patients presenting with ectopic pelvic kidney and raised serum creatinine secondary to obstruction by calculi-diagnosed on initial radiological and hematological investigations done in emergency, were included in the study. Patients were explained the study and informed consent was obtained from them in language understandable to them. All patients were evaluated with detail history and examination. Their hematological and urine investigations were done. After initial stabilization, intervention was done to relieve the obstruction using either Double J stent or percutaneous nephrostomy. Patients were monitored with serial serum creatinine, blood urea nitrogen, and electrolytes till nadir serum creatinine was reached. After achieving nadir serum creatinine level, patients were evaluated in detail with computed tomography and three-dimensional reconstruction of images.

After optimization of patients and declaration of fitness by anesthetist for elective laparoscopy procedure, patients were posted for laparoscopic-assisted PCNL. Under general anesthesia, cystoscopy and retrograde catheterization of ureter were done. Patients were given supine position initially, and first, 12 mm port was inserted through umbilicus by open technique. Pneumoperitoneum was created. Two working ports, 11 and 5 mm were placed in the right and left iliac fossa, respectively. Patients were given Trendelenburg position so as to shift bowel upward. Reflection of colon was done depending on the thickness of mesentery, so as to visualize the anatomy of kidney and vasculature. Retrograde pyelography was done and desired caliceal percutaneous puncture was taken using both, visual and fluoroscopic guidance simultaneously. Guidewire was passed into pelvicalyceal system (PCS) through 18 Gauge initial puncture needle. Initially, tract was dilated using fascial dilator till 12 French. Puncture was further dilated by Alken's telescopic serial metal dilatation method. Amplatz sheath was inserted over dilator. Sheath (30 cm in length) was advanced into PCS. Long nephroscope (26 French) was introduced into PCS. Stones were identified. Sheath was held in position. Stones were fragmented using pneumatic lithoclast and fragments were removed using forceps. At the end of procedure, complete scopy of PCS was done to rule out any residual stone fragment with the help of flexible nephroscope and fluoroscan. Double J stent was placed in all patients. Suction of all intra-peritoneal fluid was done. Nephrostomy was inserted through Amplatz sheath. Single abdominal drain was kept. Patients were monitored for their drain output, urine output, renal function, and serum electrolytes, post-operatively. Repeat X-ray of abdomen-pelvis was done. Nephrostomy tube was removed initially, after confirming drain output <50 ml/24 hours. Once the drain output decreased to <50 ml/24 hours after nephrostomy tube removal, drain was removed. Double J stent was removed 4 weeks later, after ruling out residual calculi on X-ray and ultrasonogram.

RESULTS

Three patients with calculi in ectopic pelvic kidney and impaired renal function, presenting in the emergency department were included in the study. Details of patients and the emergency interventions performed are given in Table 1. Mean age in our study was 39 years. Mean serum creatinine before intervention was 4.14 mg/dl. After intervention, patients were monitored. Mean nadir creatinine achieved after relieving obstruction was 1.94 mg/dl.

After achieving nadir serum creatinine, laparoscopic assisted PCNL was done. All three patients were thin built, so the vascular anatomy of ectopic kidney was visible without mobilizing mesentery. Only superficial tissues were dissected so as to delineate the site of puncture. Superior caliceal puncture was taken in all patients. Tract was dilated and complete stone clearance was achieved in all three patients through single puncture only. There was minimal spillage in peritoneal cavity during PCNL (<50 ml) in all three patients. Mean duration for procedure was 119 min. Mean stone size was 4 cm. Details of the intra- and post-operative findings are given in Table 2.

All patients had increased drain output (>750 ml/24 h) initially. Drain fluid creatinine was done which was suggestive of urine. Nephrostomy tube was continued. Nephrostogram was done to visualize PCS on post-operative day 3. Nephrostogram revealed non-obstructed ureter and PCS, but there was extravasation around nephrostomy tube. Nephrostomy and drain were kept *in situ*. Gradually, drain output decreased from day 4 onward. Nephrostomy tube was removed after decreasing 24 h drain output to <50 ml. Removal of drain was done only after decreasing drain output to <50 ml/24 h.

These patients also had paralytic ileus for prolonged duration- manifested as abdominal distension, vomiting, failure to pass flatus, absent bowel sounds, and dilated bowel loops on X-ray (mean duration- 5 days). Serum electrolytes were normal. Bowel sounds appeared only after decrease in drain output. Mean durations for nephrostomy tube and drain removal were 4.67 days and 6.67 days, respectively.

Table 1: Patient pre-intervention details

Patient	Age (years)	Sex	Site of ectopic kidney	Opposite kidney status	Stone size (cm)#	Pre-intervention serum creatinine	Intervention done (D-J/PCN insertion)	Nadir Sr. creatinine (mg/dl)*
1	31	Female	Left pelvic	Atrophic, small	4.2	4.3	D-J stent in left kidney	1.9
2	39	Female	Right pelvic	Pelvi-ureteric junction calculus with hydronephrosis	3.3	2.9	D-J stent in right and PCN in left kidney	1.8
3	47	Male	Right pelvic	Atrophic, small	4.5	5.2	D-J stent in right kidney	2.1

Table 2: Operative and post-operative details

Patient	Tract size (Fr)£	Surgery duration	Nephrostomy tube duration (days)	Paralytic ileus duration (days)	Drain duration (days)	Post-op nadir serum creatinine (mg/dl)*
1	28	136 minutes	4	4	6	1.7
2	30	112 minutes	5	6	7	1.8
3	28	109 minutes	5	5	7	2.2

#cm:Centimeters, *Mg/dl: Milligrams per deciliter, £Fr: French

DISCUSSION

Percutaneous nephrolithotomy is a well-established modality for treatment of renal stone disease in the orthotopic kidney. Ectopic kidney stone disease represents a challenge in their management. Their position makes direct puncture into the desired calyx difficult. Different approaches have been explained for taking initial puncture safely in an ectopic kidney which includes laparoscopy, ultrasound, and fluoroscopy. For management of renal calculus in a medially and anteriorly directed pelvis in an ectopic kidney, laparoscopic pyelolithotomy has been explained.[7] For small stone, use of shock wave lithotripsy or flexible ureteroscopy has also been mentioned.[8]

Location of the kidney, orientation of PCS and blood supply to ectopic kidneys can vary in each case, so safe approach needs to be planned depending on the imaging features and intra-operative anatomy. Laparoscopy allows direct visualization of the anatomy of PCS and blood vessels. In thin patients, blood vessels can be seen easily trans-peritoneally which avoids mobilization of peritoneum along white line of Toldt.[7,9,10] We noticed similar finding in our study. Puncture taken directly under combined fluoroscan and visual guidance can avoid intra-operative injury to adjacent organs and the vasculature.

In patients with prolonged drain output following laparoscopic-assisted PCNL, any obstruction in the tract due to migrated stone in the ureter, obstructed stent or associated co-morbidity impairing healing should be ruled out. This needs initial intra-operative scopy after complete stone removal in addition to fluoroscopy and post-operative imaging. We could not find any study in the literature mentioning laparoscopy-assisted PCNL in pelvic ectopic kidney patients with deranged renal functions. In the studies, where trans-peritoneal procedures were carried out without mobilizing overlying peritoneum along the white line of Toldt, no such complications in the form of increased drain output, prolonged paralytic ileus were seen. All these patients had normal renal functions.[7,9,10] In our study, obstruction as a cause of persistent drain output was ruled out on initial work-up which included intra-operative scopy and post-operative nephrostogram. There was no other comorbid illness, except deranged renal function. Finding of prolonged drain output seen in these patients might be due to their deranged renal function which resulted in impaired tract healing, similar to the findings mentioned by Heller *et al.* in their study on impaired healing in chronic renal disease patients.[11]

Patients with impaired renal function have a number of associated factors which can hamper wound healing such as aging, peripheral vascular disease, neuropathy, chronic venous insufficiency, proteinuria, edema, electrolyte abnormalities, acid-base disorders, secondary hyperparathyroidism, and poorly controlled diabetes mellitus. All these factors can result in impaired wound healing and prolonged paralytic ileus. Adverse effects of impaired renal function on fibroblast proliferation, collagen production and level of hydroxy-proline in the healing wound were known since the 1960s and 1970s.[12-14] Chronic kidney disease (CKD) patients have a number of uremic toxins in addition to calciphylaxis which can affect wound healing through platelet dysfunction and impaired hemostasis. This affects the functioning of multiple systems. Further, asymmetric dimethylarginine accumulation interferes with endothelial function.[15] Disruption of keratinization kinetics, prolonged rate of granulation with large epithelial gaps, low rate of vascularization and cell proliferation were all identified as the factors leading to poor wound healing in the research on effects of CKD on wound healing in mice.[16] Similar findings were also found in the research on human beings

that confirmed higher rate of wound disruption in CKD patients than normal renal functioning individuals.[5]

We evaluated only three CKD patients with ectopic pelvic kidney. This was the limitation of our study. Although results seen in our study showed impaired healing in CKD patients leading to increased morbidity in these patients, further research is needed to compare these results with ectopic pelvic kidney patients with normal renal function. Low incidence of ectopic pelvic kidney restricted the number of patients in this study and comparison with ectopic kidney patients with normal renal function.

CONCLUSION

Though laparoscopic assisted PCNL is an option in the management of stone disease in patients with ectopic pelvic kidney, healing of tract may take prolonged duration in patients with deranged renal function which can increase post-operative morbidity.

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Conflicts of interest

There are no conflicts of interest.

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