Laparoscopic Pyelolithotomy in Children Less Than Two Years Old with Large Renal Stones: Initial Series

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Purpose: Treatment of pediatric urolithiasis is still on debate. This study was designed to evaluate the safety and efficacy of laparoscopic pyelolithotomy in five children less than two years old.

Materials and Methods: Five children (less than two years old) with large kidney stones underwent laparoscopic pyelolithotomy. All patients underwent laparoscopic pyelolithotomy via a transperitoneal approach. After medial mobilization of colon and once renal pelvis and ureteropelvic junction were exposed, a longitudinal or circular incision was made on the renal pelvis, depending on the location and shape of the stone. Stones were extracted using an Endobag. Demographic data, size of stones, operation time, duration of hospital stay and stone free rate were assessed.

Results: Four boys and a one girl were included in this study. The mean age of patients was 17.6 (range: 13-22) months and the mean duration of operation was 130 (range: 115-145) minutes. The mean size of stone was 24.6 (range: 22-27) mm and the mean duration of hospital stay was 4.4 (range: 4-5) days. Stone free rate was 100%. There was no major complication.

Conclusion: Even with a small number of patients, our results seem to show that laparoscopic pyelolithotomy could be a treatment option for selected cases of young pediatric cases with large renal stones. We believe that transperitoneal laparoscopic pyelolithotomy is feasible and it introduces a novel approach for managing kidney stones in pediatric population.

Keywords: children; laparoscopic pyelolithotomy; urolithiasis.

INTRODUCTION

Pediatric urinary tract calculi, although relatively uncommon in comparison to adult stone disease, pose a significant challenge in view of the smaller size of the urinary tract and a greater risk of stone recurrence, due to higher incidence of metabolic causes and longer risk period, especially in the presence of residual calculi. Although, there is a paucity of epidemiologic data, but the review of different studies reveals increasing incidence[1]. Shock wave lithotripsy (SWL) is currently the procedure of choice for treating most urinary stones in children. However, it is not so effective in stones greater than 1.5 cm and stones with cystine components[2]. The safety and efficacy of percutaneous nephrolithotomy (PCNL) for large stone burdens have been well established in adults but regarding parenchymal damage and the associated effects on renal function, radiation exposure with fluoroscopy, and the risks of major complications including sepsis and bleeding, performing PCNL in children is on debate[3]. Ureteroscopy was not considered primary option for managing of upper tract stones in children due to concern for ureteral ischemia, perforation, stricture formation, and development of vesicoureteral reflux as a result of dilatation of small caliber ureteral orifices[4]. So, treatment of large stone burdens in children is a major challenge among urologists. Recently, laparoscopy and robotic-assisted laparoscopy were performed in children in small series and successful transperitoneal laparoscopic pyelolithotomy (LP) has been described in eight children who previously failed PCNL with no noted major complications[5]. However, the children range of age in this study was 3 to 10 years and it is obvious the function, size and accessibility of kidney in children vary with their age. As our knowledge there is no study to evaluate laparoscopic pyelolithotomy in children less than two years old. Therefore, this study was designed to evaluate the efficacy and safety of laparoscopic pyelolithotomy in five children less than two years old with large cystine renal stones.

MATERIALS AND METHODS

This study reports on children less than two years old with large renal pelvic stone with extra-renal pelvis and no previous history of open stone surgery or PCNL.

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Figure 1: CT scan revealed moderate hydronephrosis and a 22*14 mm stone at ureteropelvic junction level at right side

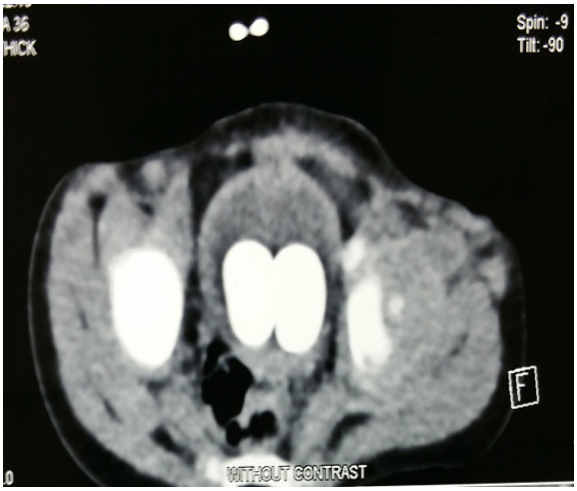

Figure 2: Two large stones with diameters of 20 and 23 mm in the bladder.

Surgical method

LP was performed under general anesthesia in modified lateral decubitus position. First, a 5 mm port was fixed at the umbilicus using open access approach. Then three 5 mm ports were inserted at sub xiphoid, 2 cm medial of anterior superior iliac spine and para rectal region parallel to the umbilicus under direct vision. All patients underwent LP via a transperitoneal approach. After medial mobilization of colon and once renal pelvis and ureteropelvic junction were exposed, a longitudinal or circular incision was made on the renal pelvis, depending on the location and shape of renal stone. Stones were extracted using an Endobag. A double-j stent was passed through renal pelvis to the bladder. Finally, pelvis was closed using a 4-0 absorbable polyglactine suture in an interrupted fashion. We removed Foley catheter three days after operation on a regular basis. Drain was removed when its daily output reached lower than 25 mL. Double-j stent was also removed 4 weeks later and under general anesthesia. The study design was approved by the ethics committee of Iranian Urology and Nephrology Research Center.

RESULTS

Four boys and one girl were included in this study. The mean of age was 17.6 (range: 13-22) months and the mean duration of operation was 130 (range: 115-145) minutes. The mean size of renal stone was 24.6 (range: 22-27) mm and the mean duration of hospital stay was 4.4 (range: 4-5) days. Stone free rate was 100%. All cases were free of stone after mean one year follow up period. The first case was a 20 month-old boy, a known case of Tetralogy of Falot. This case presented with gross hematuria and right flank pain. He had history of right open stone surgery 10 months ago at another center. Ultrasonography revealed a 27 mm stone at right kidney with bilateral hydroureteronephrosis. Time of surgery was 145 minutes. He had a fever < 38.5 c for two days that was managed with conservative treatments. Hospitalization time was 5 days. The second case was a 22 month-old boy who underwent LP Because of a 25 mm stone at right renal pelvis. He had a history of two episodes of unsuccessful ESWL. Ultrasonography showed normal appearance of both kidneys. Time of surgery was 130 minutes and hospital stay was 4 days. The third patient was a 13 month-old girl presented with a 24 mm stone in left renal pelvis, 11 mm stone at middle part of the right ureter, a 6 mm stone at middle calyx of right kidney and grade one hydronephrosis at this side in computed tomography scan. She had no previous history of renal stone interventions. Right transureteral lithotripsy was not successful for managing of the 11 mm stone at right ureter; so, right laparoscopic ureterolithotomy was done and one month later, left renal stone was extracted using left LP. Operative time was 140 minutes and no postoperative adverse events were seen. Hospitalization duration was 4 days. Ureteral stents in both sides were removed at one session. Patient number four was a 15 months old boy with previous history of neurogenic bladder and bilateral grade III vesicoureteral reflux. Ultrasonography and CT scan revealed moderate hydronephrosis and a 22*14 mm stone at ureteropelvic junction level at right side and two large stones with diameter of 20 and 23 mm in the bladder (**Figures 1 and 2**). In past medical history the patient only had history of club foot. At first, the patient underwent percutaneous cystolitholapexy for removal of bladder stones and then underwent left laparoscopic pyelolithotomy two weeks later. Duration of surgery was 115 minutes. After surgery, ileus and abdominal distention happened for two days that was managed with conservative treatment. Hospital stay was 5 days. The last patient was an 18 month-old boy that was referred to our clinic from pediatrics nephrology clinic with chief compliant of bilateral kidney stones. He had no history of PCNL, ESWL or other stone surgeries. In sonography he had 2.5 cm stone at left ureteropelvic junction and numerous stones at middle and lower calices of right kidney (**Figure 3**). At first, the patient underwent left laparoscopic pyelolithotomy and stent insertion. Duration of surgery was 120 minutes. No fever or other adverse effects happened after surgery. Hospitalization time for him was 4 days. After three weeks, he underwent PCNL for contralateral side and the left side stent was removed. **Figure 4** reveals the cosmetic appearance of the abdomen one month after operation.

Figure 3. A 2.5 cm stone at left ureteropelvic junction and numerous stones at middle and lower calices of the right kidney.

No major peri and postoperative complications occurred and no blood transfusion was done in all cases.

DISCUSSION

Treatment of large stone burdens in children is technically challenging and often requiring multiple procedures. The universal principles of surgical treatment of stone disease entail: preservation of renal function, maximal stone clearance and minimal patient morbidity. With the current array of minimally invasive techniques available at the disposal of the urologist, the challenge lies in selecting the most appropriate treatment modality and using it judiciously, keeping in mind the small size of the urinary tract in children. The role of laparoscopic surgery in management of renal calculi is still in a state of evolution. Although, laparoscopic pyelolithotomy takes a longer time to perform, requires considerable skill and has a steeper learning curve compared to PCNL but non- parenchymal damage, similar hospital stay and similar stone-free rates are the advantages[6-8]. While, there is lack of data to compare PCNL versus laparoscopic pyelolithotomy in children, laparoscopy and robotic-assisted laparoscopy have been utilized successfully in adults for treatment of calculi. Small series utilizing these techniques in children have only recently been described and showed safe and effective alternative to open stone surgery. In the first report of robotic-assisted laparoscopic pyelolithotomy, Lee et al[9]. described their experience in five patients; four with cystine staghorn calculi refractory to PCNL and SWL and one with calcium oxalate calculi and concurrent ureteropelvic junction obstruction. Of these cases, four were completed robotically, with one patient having a residual 6 mm lower pole stone and one patient required conversion to an open procedure. Mean operative time in this series was 315 minutes and the mean estimated blood loss was 19.0 ml. These early experiences demonstrate that laparoscopic pyelolithotomy is feasible, safe, and efficacious as an alternative to open pyelolithotomy in children. Our results confirmed their findings; however, more future studies should be designed, especially in lower age range. Gaur et al[7]. successfully performed retroperitoneal laparoscopic ureterolithotomy in five patients with calculi impacted in the upper and middle ureter. Interestingly, all the patients were discharged after 24h. Casale et al[5]. evaluated transperitoneal laparoscopic pyelolithotomy in eight children (mean age: four years) with a mean stone burden of 2.9 cm and showed 100% success rate, a mean hospital stay of 2.15 days, and a mean operative time of 1.6 hours with no major complications. Likewise, Agrawa and their colleagues[10] revealed the feasibility and safety of laparoscopy for managing of pediatric renal and ureteric stones. They performed 22 procedures including 12 pyelolithotomies and 10 ureterolithotomies with 95% stone free rate and 13.5% complication rate [urinoma (4.54%), failure (4.54%) and omental prolapse (4.54%)]. Our study showed acceptable efficacy and safety for laparoscopic pyelolithotomy in children less than two years old with large renal stones. The strongest advantage of our study is that all our cases were less than two years old. So we could better evaluate the efficacy and safety of this surgical approach in pediatric urolithiasis. However, more comparative studies with large sample size and longer follow-up are warranted to lighten the role of this treatment in managing of pediatric nephrolithiasis.

Figure 4. One month after the operation.

CONCLUSIONS

Even with a small number of patients, our results seem to show that laparoscopic pyelolithotomy should be a treatment option. We believe that transperitoneal laparoscopic pyelolithotomy is feasible and it introduces a novel approach complex stone pediatric population.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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