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Laparoscopic management of pelvi-ureteric junction obstruction after failed open surgery or Laparoscopic pyeloplasty in adults

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ABSTRACT

Objectives: a prospective study of our experience and midterm results of laparoscopic pyeloplasty (LP) for patients who have failed open or Laparoscopic pyeloplasty in adults.

Patients and methods: Thirty two patients with failed open pyeloplasty were reviewed; all of them had transperitoneal dismembered LP. All procedures were performed by experienced laparoscopist during a period of two years.

Results: The study group consisted of 14 men and 18 women with the mean age of 29± 6 years. Mean operative time was 123± 22 minutes. Mean hospital stay was 4.7 ± 2.3 days. Mean follow-up was 5.6 ± 2.15 months (range 3-9 months). The overall success rate for secondary LP was 90.6%. There was no conversion to open surgery. Intraoperative and postoperative complications were 9.4 and 12.5% respectively.

Conclusions: LP is a safe and viable treatment option for secondary pelviureteric junction obstruction with high success rate but with long operative time. A good experience in laparoscopic reconstructive procedures is a prerequisite for optimal results.

Introduction

Laparoscopic pyeloplasty (LP) for pelvi-ureteric junction obstruction (PUJO) was first described in 1993 [1]. Since then, the technique has been refined and standardized until it has emerged as an alternative first-line option with success rates that parallel those of the open approach. Although success rates are high, failures do occur and necessitate additional interventions [2].

Secondary open pyeloplasty is associated with significant difficulty and increased morbidity with variable success rates of 37.5% to 71.4%, which are uniformly lower than primary surgery [3, 4]. Endopyelotomy was considered as the initial salvage method of choice for failed PUJO repair, however its results was later shown to be even inferior to open re-operation [5].

Although it is a challenging reconstructive endeavor, LP after failed open surgery is increasingly reported. We have a prospective study of our experience and midterm results with LP for patients who have failed an initial open or laparoscopic pyeloplasty.

Patients and methods

We reviewed 32 patients (14 men and 18 women) who had laparoscopic redo pyeloplasty following previous failed open or laparoscopic pyeloplasty. The procedure was performed after a mean of 24±9 months (range 10 – 38 months) after the last pyeloplasty procedure. All patients were subjected to transperitoneal LP for 2 years study. All procedures were performed by experienced laparoscopist.

Indications of redo pyeloplasty in our patients were persistent flank pain (in 21 patients), recurrent febrile infection (in 4 patients),infected hydronephrosis with nephrostomy tube (in 2 patients)lack of radiological improvement and persistence of symptoms(in 5 patients)

after the initial repair. Obstructive pattern was individually confirmed by diuretic renal dynamic scan, using diethylene triamine penta acetic acid (DTPA) and further clarified anatomically by an intravenous urography (IVU) or contrast-enhanced CT. Preoperative preparations included mechanical bowel preparation on the night before the surgery and intravenous 3rd generation cephalosporin 2 hours before surgery

Operative technique:

Pre-operative retrograde pyelogram was performed in all cases to ascertain the anatomy of the ureter and pelvis (Fig. 1). Then, the patient was placed in lateral decubitus position. Pneumoperitoneum was obtained with a Veress needle. The first 10-mm trocar for a 30-degree optical system was then inserted through the umbilicus. The second and the third 5-mm trocars were placed at the mid-clavicular line, one immediately below the costal margin and the other on a horizontal line slightly below the umbilicus.

Dismembered pyeloplasty technique (Anderson-Hynes) was utilized in all cases. The posterior peritoneum overlying the kidney is divided from the upper pole to a distance approximately 3 cm below the lower pole and the colon and its mesentery were displaced medially. The ureter was identified by following the psoas muscle to a point just medial to the lower pole of the kidney then dissected cranially to allow good exposure of the pelvi-ureteric junction (PUJ), where dissection of dense adhesions was meticulously done (fig. 2). When crossing vessels were present over the PUJ, they were dissected away from the PUJ. The dissection was carried out by sharp and blunt instruments with avoiding the use of cautery or heat producing instrumentation especially close to the PUJ. The PUJ was then transected and spatulated for about 1.5-2 cm postero-laterally and anastomosed to the most dependent part of the incised renal pelvis with interrupted polygalctin suture of 4-0 after excision of redundant pelvis. The kidney was mobilized when required to allow tension-free anastomosis. The anastomosis was done hand-free in all patients where the posterior wall sutures were first done in a continuous manner, then a 6Fr ureteral JJ stent was inserted antegradly, and the remaining anterior wall of anastomosis was then completed. A 14Fr tube drain was then fixed and port closure was performed. A Foley bladder catheter was kept in place for 24 hours. JJ stent was removed after 6 weeks. Operative and postoperative parameters, including operation time, hospital stay, success rate, and complications if encountered were recorded.

Postoperative follow up:

The follow-up protocol included ultrasonography and IVU one month after removal of the JJ stent, then ultrasonography or diuretic renogram every 3 months if indicated. Symptoms relief in addition to improve in the imaging results were our definition of success. Failure is defined as persistence or recurrence of symptoms and/or obstructive drainage pattern in ultrasonography, IVU,diuretic renogram. Data collected included basic patient demographics, operation details, pre- and post-operative symptoms, post-operative imaging results, and success and complications rate. Complications were categorized according to the Clavien–Dindo classification system [6].

RESULTS

The study group consisted of 14 men and 18 women with the mean age of 29± 6 years (range, 21 to 45 years). Secondary PUJ was in the left side in 24 patients while it was right in 8 patients. The mean time from previous failed open pyeloplasty was 24 ± 9 months (10-38 months). There was no conversion to open surgery and all cases were completed laparoscopically. Etiologies of secondary PUJO based on operative findings included peripelvic fibrosis and scarring in 22 cases (Fig.2), missed lower pole crossing vessels at initial surgery in 5, proximal ureteric stricture in 3 and a kink at the PUJ associated with redundant pelvis in 2 cases.

Mean operative time was 123± 22 minutes (range, 80 to 235 minutes) and mean hospital stay was 4.7 ± 2.3 days (range, from 3 to 10 days). Mean follow-up was 5.6 ± 2.15 months (range 3-9 months). Secondary LP was successful for symptom relief and radiological improvement in 29 patients achieving an overall success rate of 90.6% (Fig. 3). Post-operative obstruction after DJ removal was experienced in 3 cases; one patient required reinsertion of DJ stent for a month then removed without further signs of definite obstruction, in the other two case, renal scan was done revealing a poorly functioning kidney with a split function of < 10%; one of whom was symptomatic (infected hydronephrosis) and underwent nephrectomy, while the other patient was managed conservatively.

Intraoperative complication in secondary LP was reported in 3 cases (9.4%) where in two patients there was bleeding due to accidental injury of the gonadal vein during dissection of dense fibrosis and in one patient there was colonic serosal injury which was successfully sutured intraoperatively. Postoperative complications were observed in four cases (12.5%) where prolonged anastomotic leak was encountered in 2 cases in whom conservative management was successful through continuation of bladder drainage in one (Clavien grade I) while the other patient needed percutaneous nephrostomy drainage (Clavien grade IIIa) and in one patient severe hematuria was encountered and it was resolved on medical treatment (Clavien grade II) and the fourth patient had urinary tract infection (UTI) (Clavien grade II). None of this group of patients required blood transfusion.

DISCUSSION

Optimal results after pyeloplasty is dependent on following adequate reconstructive surgical principals including: meticulous dissection, preservation of the periureteral sheath containing blood supply to the ureter, watertight tension-free anastomosis and identification and transposition of crossing vessel when present [7].

The common causes of failure of open pyeloplasty are peripelvic and periureteral scarring due to urinary extravasation, excess use of thermal energy, and bleeding associated with inadequate hemostasis. Other common factors are compromised vascularity of the proximal ureter with stricture formation or overlooked lower pole crossing vessels at the initial procedure [8]. In the present series, the causes for failure were peripelvic fibrosis and scarring in 22 cases, missed lower pole crossing vessels at initial surgery in 5, proximal ureteric stricture in 3 and a kink at the PUJ associated with redundant pelvis in 2.

Managing failed pyeloplasty is technically more challenging and success rates are typically lower. Currently available options for recurrent

PUJO with salvageable renal unit includes: balloon dilatation, antegrade and retrograde endopyelotomy, redo pyeloplasty and ureterocalicostomy [9]. Due to low success rate and inconsistent long term results of minimal invasive procedures such as balloon dilation and endopyelotomy [9,10] and their role in selected cases (minimal narrowing, pelvis volume<70 ml, renal function>30% and no crossing vessels).

Redo pyeloplasty provides excellent results, with reported success rates of 77.8-100%. Many Authors suggest redo open pyeloplasty as the first method of choice after failed pyeloplasty [11-13]. Inspite of the fact that LP is technically more challenging; it has also been shown to have excellent success rates for persistent PUJO after a previously failed procedure [14-17].

Multiple studies in the literature report the feasibility and high success rate of secondary LP after recurrent PUJO not only in adults, but also in pediatric population. Sundaram et al. reported 83% success rate with laparoscopic redo pyeloplasty in 36 adult patients but with longer operative time compared with their experience of primary repair [17]. Similarly Basiri et al. had reported a success rate of 77.8% using different techniques during laparoscopic redo pyeloplasty in 18 patients [15]. In a study analyzing outcome of redo pyeloplasty in 11 children, Piaggio et al. had achieved equal success rate with laparoscopic and open redo pyeloplasty with the advantage of reduced hospital stay and postoperative complications in the laparoscopic redo pyeloplasty group [14]. Obstruction following initial open pyeloplasty and unsuccessful subsequent endoscopic procedures presents another more technically challenging scenario. A report by Levin and Herrell who presented their experience with four of these cases treated through transperitoneal laparoscopic approach confirmed a success rate of 75% [2]. Our results for redo laparoscopic pyeloplasty have shown to have excellent success rate (90.6%) in the context of previously reported series.

It is well recognized that prolonged operative time is a challenges that adds to the difficulties associated with secondary LP. Sundaram al. reported their experience of secondary LP with a mean operative time 6.2 h [17]. Nakada et al. also reported their experience of LP in four patients of secondary UPJO in whom anterior crossing vessel was the cause of obstruction. The average operating time was also quite long (9.05 h), however their success rate was 100% although it was technically more demanding and time consuming [18]. Our mean operative time was 123± 22 minutes (range, 80 to 235 minutes) which is shorter than operative time reported in previously mentioned studies. This excellent results achieved might be explained by the fact that laparoscopic transperitoneal approach for managing PUJO is the standard approach at our institution.

Intraoperatively, we have encountered significant periureteral fibrosis in secondary LP that mandates extra time to better delineate PUJ anatomy, release of the previous scarred tissue, fashion ureteral and pelvic flaps clearly, mobilization of kidney in some cases and finally, perform water tight anastomosis with fine sutures. Complications encountered in secondary LP was of low grade and mostly managed conservatively and none experienced major complications or required blood transfusion.

Robotic assisted urologic laparoscopy has been significantly expanded over the last two decades. Gettman et al. in 2002 reported the first case series of robotic pyeloplasty (RP) [19], and since then RP has been widely adopted worldwide [20]. Atug et al reported 7 adult patients who had redo robotic-assisted dismembered LP and they compared their results with 37 patients of primary PUJO [21]. Like with LP, their mean operative time was 60 min longer in the redo pyeloplasty group, but the hospital stay, blood loss and success rates were similar between the two groups. Another report by Hemal et al. that included 9 patients with secondary PUJO after failed open pyeloplasty, all of them showed both clinical and radiological improvement [22]. Lindgren et al reported a larger series of robotic assisted redo pyeloplasty in 16 children and their conclusion was that the procedure is technically safe and highly effective even in patients with multiple previous interventions and/or complex renal anatomy [23]. Recently, Niver et al published the largest series of redo robotic assisted pyeloplasty in adults with encouraging midterm results [24]. Inspite of these overall excellent results of redo robotic-assisted LP both in adults and children, none of the previously mentioned reports compared the cost of robotic-assisted and conventional redo LP.

Our study includes a relatively large number of patients with failed open or laparoscopic pyeloplasty who had redo LP with excellent mid-term results when compared with those who had primary LP. However, the limitations of this study may include the short-term follow-up for such technically challenging cases.

CONCLUSION

Redo LP is a safe and viable treatment option for secondary PUJO with a high success rate and a considerable experience in laparoscopic reconstructive procedures is needed to get optimal results.

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Legend of tables:

Table 1 shows patients' demographics and surgical outcomes of secondary LP.

Legend of Figures:

Figure 1: Pre-operative left retrograde pyelogram showing the anatomy of the pelvis and The ureter.

Figure 2: Intraoperative picture showing dense adhesions around the PUJ

Figure 3: Follow-up IVU of one of the patients after redo LP after 6 months showing Patent PUJ with improved renal function

Table 1

Variable	LPP in recurrent cases(n=32) value
Mean age (years)	29± 6 (21-45)
Sex (male/female)	14/18
Disease side (left/right)	24/8
Mean operative time (min)	123± 22 (80–235)
Mean blood loss (ml)	55±36 (30–190)
Mean hospital stay (days)	4.7 ± 2.3 (3-10)
Mean follow-up (months)	5.6 ± 2.15 (3-9)
Success rate %	90.6
Intraoperative complication %	9.4%
Postoperative complication	12.5%

Figure 1

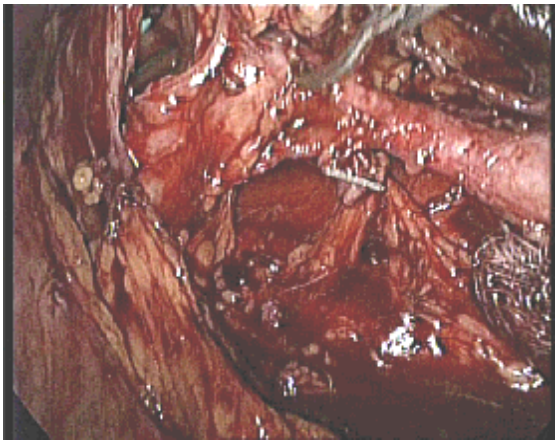

Figure 2

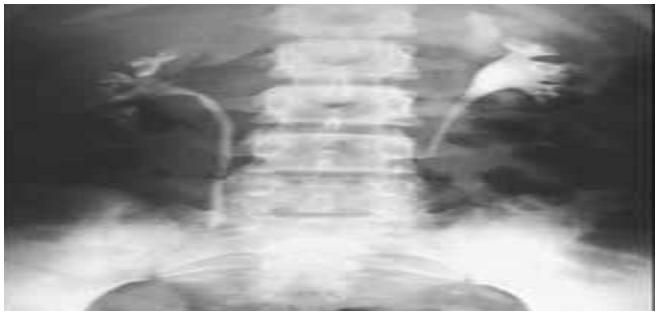

Figure 3