Laparoscopic management of primary pelvi-ureteric junction obstruction: Single-centre experience

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Laparoscopic management of primary pelvi-ureteric junction obstruction: Single-centre experience

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Abstract *Objective*: To evaluate the effect and safety of laparoscopic pyeloplasty in the treatment of pelvi-ureteric junction obstruction (PUJO).

Patients and methods: In 34 patients, laparoscopic dismembered pyeloplasty was used to treat primary PUJO. Information was obtained for symptoms, results of a nuclear scan before and after surgery, intraoperative blood loss, operative duration, stenting method, and hospital stay. Under general anaesthesia and in the flank position, a 10 mm trocar was first placed above the umbilicus; three 5 mm working ports were then placed. The ureter and pelvis were freed from surrounding adhesions. The obstructive pelvi-ureteric segment was then excised, and the opened point of the ureter spatulated. Ureteropyeloplasty between the lower pole, pelvis and spatulated ureter was made using a 4-0 polyglactin suture around a JJ stent.

Results: The mean (SD) preoperative nuclear scan result was 23.6 (6.4) mL/min, with retention of tracer. The median operative duration was 200 min, and the median blood loss 120 mL. All patients were stented with a JJ stent. The mean hospital stay was 5 days. The final results were assessed at 6 months after surgery, when the mean (SD) nuclear scan result was 30 (7.4) mL/min.

Conclusion: Laparoscopic pyeloplasty is a safe and effective option which can produce satisfactory results both clinically and radiologically.

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Introduction

Pelvi-ureteric junction obstruction (PUJO) is the most common disease of the ureter, and can lead to progressive hydronephrosis and renal dysfunction [1]. PUJO can be attributed to functional or anatomical abnormalities, or there might even be an association between them. Also, secondary PUJO can occur after endoscopic or open urinary tract procedures.

The surgical management of PUJO has changed considerably over the past 20 years. Traditionally, open pyeloplasty was considered to be the standard method for treating PUJO, with success rates of up to 95%. However, the procedure requires a loin incision and so is associated with a prolonged recovery time [2]. Endopyelotomy became popular in the 1980s and 1990s as a minimally invasive technique, with a successes rate up to 93% [3] in well-selected patients. It has the advantages of a lower rate of complications, relatively short operating times, and quick recovery. Higher success rates have been cited in those patients with a small pelvis and in whom no crossing vessels are present [4]. Several other procedures were further described: balloon dilatation, retrograde endopyelotomies, and endopyelotomies with the Acucise catheter. The success rate of these minimally invasive procedures has been 15–30% lower than that of open pyeloplasty [5].

Laparoscopic pyeloplasty (LP) was initially introduced by Schuessler et al. in 1993 [6]. Success rates are repoted as 87–100% [7]. The procedure allows the identification of crossing vessels, excision of the diseased PUJ, reduction pyeloplasty and a watertight anastomosis. The analgesic requirements, hospital stay and recovery period are considerably lower than for the open procedure. However, the procedure requires considerable skill and involves longer operating times than with open and minimally invasive techniques [8]. In the present study we describe our experience using transperitoneal LP for managing primary PUJO.

Patients and methods

This study was conducted between December 2008 and March 2011, and included 34 patients (21 males and 13 females, median age 24 years, range 15–38), all of whom had hydronephrosis and primary PUJO confirmed by radio-isotopic renal scan (DMSA to assess function, and diuretic DTPA to confirm obstruction). The presenting symptoms varied between loin pain, recurrent UTI, and haematuria, with stone disease being the presenting symptoms in seven patients (Table 1).

Cystoscopy and retrograde pyelography, with a double pigtailed catheter (6 or 7 F) placed while in the operating room before surgery, was used in 29 patients, while five had their JJ stent inserted during LP. The surgical time was defined as the time from the beginning of cystoscopy and stent placement to the closure of the last trocar incision. Pneumoperitoneum was achieved using a Veress needle into the abdominal cavity at the upper border of the umbilicus. The first 10 mm trocar for a 30° optical system was then inserted. The second and third 5 mm trocars were placed at the midclavicular line, one in the subcostal region and the other on a horizontal line slightly below the umbilicus at the same side of the obstruction; a fourth trocar was inserted when needed according to the surgeon's preference. After inspecting the abdominal cavity, the white line over the colon was incised and the colon was mobilized medially to expose the retroperitoneal space. The upper ureter was identified and dissected cranially towards the renal pelvis, care was taken to identify the presence of a crossing vessels, which when identified were dissected away to allow easy access to the PUJ. An Anderson–Hynes dismembered pyeloplasty was used in all patients. The anastomosis between the ureter and the renal pelvis was made with a 4-0 polyglactin running suture. A non-suction drain was positioned close to the repair and the Foley catheter was left in place.

Seven patients had associated stone disease; five of them had a single renal pelvic stone retrieved during laparoscopy, while two had multiple renal stones and had ESWL as an ancillary procedure, and were stone-free before JJ stent removal.

The final patient outcome was assessed at 6 months after LP, with a detailed history, including improvement of symptoms; a diuretic DTPA scan was taken in all patients. The outcome was considered good when the subjective and objective data showed a significant improvement in pelvi-ureteric drainage and in symptoms. Patients were classified as failures if their postoperative diuretic DTPA scan showed obstruction or a reduction in function, or they required further procedures.

Results

Of the 34 patients included in the study, we had to convert two LPs to open pyeloplasty, due to failure to progress. The median (range) operative duration was 200 (130–350) min,

Table 1 Clinical variables.

Variable	Value
Male	21
Female	13
Median (range) age, years	24 (13–38)
Right PUJ	19
Left PUJ	15
Complaint	
Pain	22
Haematuria	7
Recurrent UTI	5
Associated stones	7
Mean (SD) preoperative	
Creatinine (mg/dL)	1.32 (0.18)
DTPA (mL/min)	23.6 (6.48)

Table 2 Perioperative results.

Variable	Value
Median (range)	
Operative duration (min)	200 (130–350)
Blood loss (mL)	120(100–500)
Hospital stay (days)	6 (3–13)
Follow-up (months)	12 (6–24)
Crossing vessel, n (%)	9 (27)
Conversion, n (%)	2 (6)
Complications, n (%)	5 (15)
Mean (SD) postoperative	
Creatinine (mg/dL)	1.29 (0.11)
DTPA (mL/min)	30 (7.4)
Success rate, n/N (%)	31/34 (91)

Table 3 Comparisons with previous reports of LP.

Characteristic	[18]	[19]	[20]	[21]	[22]	[23]	Present
N patients	65	50	49	66	147	47	34
Mean operative time, min	123	164	165	224	246	157	211
Mean hospital stay, days	4.1	2.6	3.7	3.6	3.1	2.2	5.1
Conversion (%)	1.5	4	0	0	0	0	6
Complications (%)	3	4	0	15	8.8	0	15
Mean follow-up (months)	25	18.8	23.2	15	24	24	13
Success rate (%)	98	81.2	97.7	92	95	94	91

the median blood loss 120 (100–500) mL, and there was no need for transfusion in any patient. There was a crossing vessel in nine patients (26%).

In the first few patients a urethral catheter was left for 5 days, except in those with prolonged leakage, when the urethral catheter was left until the leak stopped. The drain was removed 1 day after the urethral catheter, and the patient was discharged on the same day. With accumulating experience, the urethral catheter was removed earlier, with a median urethral catheterization time of 5 (3–10) days, a median time to drain removal of 6 (4–12) days, and a median hospital stay of 6 (3–13) days (Table 2).

Early complications developed in five patients; two had prolonged ileus, and evaluation of these patients showed a retroperitoneal haematoma, which was managed conservatively. Three patients developed fever and prolonged urine leakage requiring prolonged urethral drainage (Table 2).

The median (range) follow-up was 12 (6–24) months, with a mean (SD) follow-up of 13 (6.1) months. The final outcome was assessed at 6 months, when all patients were assessed with IVU, diuretic DTPA scan and a detailed history. Three patients had persistent obstruction and were managed endoscopically using percutaneous endopyelotomy with antegrade insertion of a double-pigtail catheter (Table 2). They were evaluated 12 weeks later and had a uneventful course.

Discussion

The Anderson–Hynes open pyeloplasty remains the standard treatment for PUJO, with a success rate of >90% [9]. Endoscopic incisions of the PUJ can be made in different ways; an antegrade or retrograde approach have been used as a minimally invasive treatment alternative, with the success rate being lower than for open pyeloplasty [3].

Despite being slightly more invasive than endopyelotomy, LP reproduces open surgery for its results and positive outcomes. However, it also carries the well-known advantages of laparoscopic surgery (less pain, shorter hospital stay, shorter convalescence and less scarring) and it allows patients to resume their daily activities earlier [10]. Several studies have shown a success rate of >90% for LP [11–13], similar to that of traditional open dismembered pyeloplasty. It could replace open surgery as the standard treatment for PUJO [7].

In the last decade, robot-assisted LP (RALP) (using the Da Vinci robotic surgical system, Intuitive Surgical, Sunnyvale, CA, USA) has emerged as a minimally invasive treatment option for PUJO with several advantages over conventional LP; it gives magnified three-dimensional vision with improved dexterity and several degrees of movements of the instruments,

improving intracorporeal suturing, it has also a shorter learning curve than LP [14].

In 2002, Gettman et al. [15] reported the first human series of RALP, with favourable results and lower operative and suturing time. In 2011, Etafy et al. [16] reported their RALP series, including 61 patients with a mean follow-up of 18 months; they showed an overall success rate of 81% based on a normal diuretic renogram, and lack of pain using a validated pain scale.

LP can be done using either a retroperitoneal or transperitoneal approach. In the present study patients underwent laparoscopic dismembered pyeloplasty via a transperitoneal approach because we have already accumulated experience in these procedures [13–17]. Crossing vessels were found in nine patients (26%); Janetschek et al. [15] reported that crossing vessels were identified in 116 of 331 normal renal units of unobstructed volunteers by colour Doppler ultrasonography, and the incidence of crossing vessels in obstructed patients was more than twice that [18].

Reviewing our series, the success rate was 90% at 6 months, with a mean follow-up of 13 months, with only two patients needing auxiliary procedures; failure occurred in the first 3 months. The mean operative duration was estimated to be 211 min; this was within the range of most LP series [13–17].

Evaluating large series of LP (Table 3), laparoscopy is usually associated with a shorter hospital stay, but has a longer operative duration and is more difficult to learn than standard open pyeloplasty [18–23].

The present study has several limitations; the patients were few and were selected; we only operated on patients with primary PUJO; the patient's body mass index was also considered. Patients were operated by several surgeons in our department, and the routine insertion of a JJ stent before LP prolonged the operative duration; as we gained experience this was changed to its insertion during LP.

In conclusion, LP is feasible, although technically challenging, and the results are comparable with those from the standard open procedure. However, LP to date has been used only in a selected population, and that special attention should be given to a longer follow-up, and its use in recurrent cases.

Conflict of Interest

The authors have no conflict of interest to declare.

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