

Transperitoneal laparoscopic treatment of ureteropelvic obstruction: our initial experience: Laparoscopic Pyeloplasty

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Abstract

Objective: Higher morbidity rates, extensive scar tissue formation and longer hospitalization periods of the standard open surgical methods for ureteropelvic obstruction has led to acceleration of minimal invasive techniques. Success rate and clinical outcomes of laparoscopic pyeloplasty has become comparable with open surgery.

Purpose: The aim was to evaluate the clinical results and complications of transperitoneal laparoscopic pyeloplasty in ureteropelvic obstruction.

Material and Methods: Thirty-three patients with ureteropelvic obstruction were enrolled into this study. Eighteen patients underwent Anderson-Hynes dismembered Pyeloplasty and 15 underwent Y-V plasty. Patients were followed-up at postoperative 3., 6. months and then yearly. Partial or total relief of symptoms and improvement in diuretic renogram were accepted as success.

Results: Median age was 34.5±15.5(13-74) years, number of males were 13 (39.4%) and females were 20 (60.6%). Median Body Mass Index (BMI) was 25.3±15.4(18.5-33.4). Eight were asymptomatic, and 23 had intermittent pain, preoperatively. Fourteen cases had left ureteropelvic obstruction (42.4%) and 19 had in the right kidney. Intraoperatively 19 cases had aberrant vessel. Mean surgery time was 127.9±38.9 (68-245) minutes, median anastomosis time was 20.8±7.3 (8-39) minutes. Median blood loss was 57.1±28.3 (20-150) ml, median postoperative drainage time was 2.6±1.1 (2-7) days. Only one had prolonged ileus and peritoneal irritation findings. Median narcotic and nonnarcotic requirements were 21.5±4.8 (15-30) and 132.6±37.2 (75-200) mg/day, respectively. Median follow-up period was 35.1±13.6 (11-59) months.

Conclusions: Laparoscopic pyeloplasty, is minimally invasive and reliable technique replaces open pyeloplasty in many institutions. Shorter hospitalization, lower postoperative morbidity rates, better cosmetic results and higher success rates can be easily achieved..

Keywords: Hydronephrosis, Ureteropelvic junction, Pyeloplasty, Laparoscopy

Introduction

Ureteropelvic (UP) obstruction is the most common congenital or acquired disease of the upper urinary system that can be seen as a secondary functional impairment or anatomic anomaly (1,2). The most common cause of anatomic defects is the compression of an aberrant artery that supplies the lower pole of the kidney. Other less frequent intrinsic causes are the deterioration of the circular arrangement of fibres and the deposition of intracellular and intercellular non-resilient collagen (3). The most common complaint is flank pain. Major complications are urinary tract infections, renal function loss with a

gradual increase and hypertension, although hypertension is rare. Standard open surgical methods that have been applied in UP obstruction treatment result in higher morbidity rates and longer hospitalization periods and they leave extensive scar tissue. Due to these facts, these methods have been replaced by minimally invasive procedures such as laparoscopic or robotic surgery that result in lower morbidity rates and shorter hospitalization periods. In this study, we aimed to retrospectively present the results of 33 laparoscopic pyeloplasties that were performed by two surgeons.

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Figure 1: Left hydronephrosis due to ureteropelvic junction obstruction

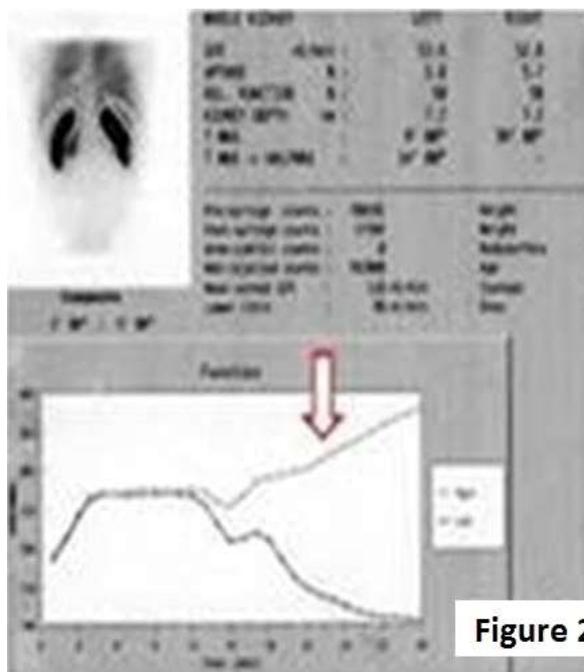


Figure 2: Renal scintigraphy shows radionuclide accumulation on affected side

Material and Methods

Laparoscopic trans-peritoneal pyeloplasty procedures were performed on 33 patients (20 female, 13 male) that had been previously diagnosed with UP stenosis following ultrasound, intravenous urography, and diuretic scintigraphy. This study was performed after the Scientific Research Review Board approval was given (23.11.2015/33/30). Written informed consent was obtained from participants or, their parents. All cases were admitted to the institution with flank pain complaint from April 2011 to September 2014. Preoperative demographic data, intraoperative features and postoperative findings were recorded. Complications were evaluated using the Clavien classification system. Cases with hydronephrosis that was revealed by preoperative ultrasound/intravenous urography and that had a $T_{1/2}$ radionuclide excretion time longer than 20 minutes on a renogram were included to this study (Figures 1 and 2).

Success criteria were considered as a radionuclide excretion time shorter than 20 minutes on a renogram, symptomatic improvement, and improvement in renal functions or at least functions remaining at the preoperative level. Urinary tract infection status was documented with a urine culture before the surgery. A preoperative retrograde stent was placed in each case preoperatively.

A one gr intravenous prophylaxis of cefazolin 1gr intravenous prophylaxis was given to all patients before the operation.

Following induction anaesthesia, a nasogastric tube and a 16 F Foley catheter were put in place for each patient. Next, patients were positioned in a 20° lateral decubitus position. A 10 mm optic trocar was inserted to the 5 cm point of the umbilicus with a modified Hasson's technique through a 15 mm skin incision under direct vision. The creation of pneumoperitoneum was obtained by carbon dioxide insufflation at 3.5 L/min until 12 mm Hg pressure was reached. The second port of 5mm was placed over the anterior axillary line, 1cm below the 12th rib. The third port of 10 mm was applied over the same axis, 5 cm cranial of the iliac crest. Three port entries were carried out for each patient. When a fourth port entry was necessary, a flattened suture needle was applied through the abdominal wall under direct vision for traction (Figure 3). The time from the skin incision for the first trocar until the end of last suture placement at the end of the procedure is defined as operating time. The lateral peritoneum was dissected from the Toldt line, and colon was moved medially. Thus, the renal pelvis was released (Figure. 4).

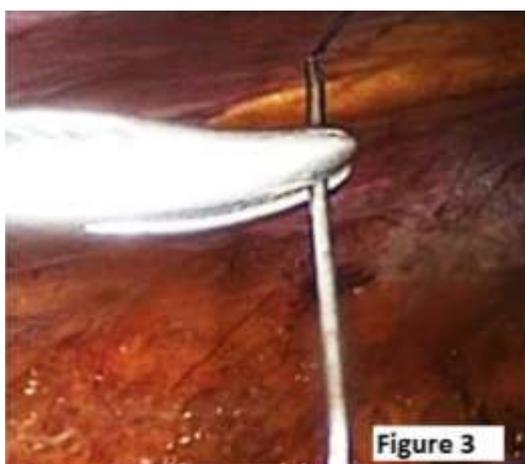


Figure 3: Flattened suture needle was applied through the abdominal wall under direct vision for traction

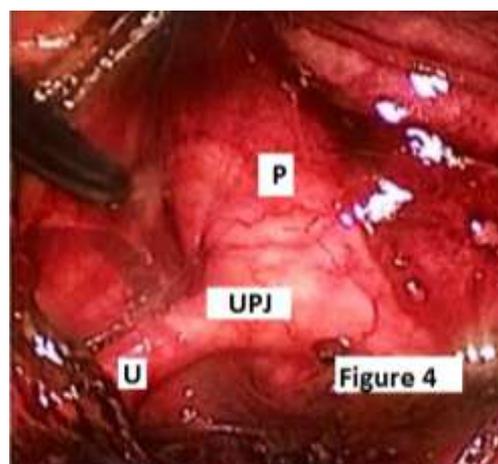


Figure 4: Laparoscopic appearance of ureteropelvic junction obstruction

Table 1: Demographic characteristics, operative and postoperative findings of the patients

Characteristics	Findings
Gender	
Female	20 (60.6%)
Male	13 (39.4%)
Age year±SD (min-max)	34.5±15.5 (13-74)
Laterality (n)	
Right	19 (57.6%)
Left	14 (42.4%)
Pain (n)	
Yes	23 (69.7%)
No	10 (30.3%)
BMI ¹ kg/m ² ±SD (min-max)	25.3±15.4 (18.5-33.4)
Crossing vessel	
Yes	19 (57.8%)
No	14 (42.2%)
Operation time min±SD (min-max)	127.9 ±38.9 (68-245)
Anastomosis time min±SD (min-max)	20.8±7.3 (8-39)
Blood loss ml±SD (min-max)	57.1±28.3 (20-150)
Complications	
Intraoperative	None
Early postoperative ²	
Prolonged ileus due to urinary leakage	1 (3%)
Postoperative	
Re-stenosis	1 (3%)
Narcotic analgesic Requirement mg±SD (min-max)	21±4.8 (15-30)
Non-narcotic analgesic Requirement mg±SD (min-max)	132.6 ± 37.2 (75-200)
Drain retrieval day	2.6±1.1 (2-7)
Follow- up time month±SD (min-max)	35.1±13.6 (11-52)
Length of hospital stay (day±SD (min-max)	2.6±1.05 (2-7)
Success rate	32 (97%)

¹ BMI:Body Mass Index, ² During hospital stay

Eighteen cases underwent Anderson-Haynes dismembered pyeloplasty. Y-V plasties were performed on the other 15 cases without aberrant vessels. Renal pelvis reduction was done in two cases. The proximal end of a double J catheter was controlled for its placement in the renal pelvis, the posterior layer of ureteropelvic anastomosis was sutured by 4/0 running vicryl, and anterior face was closed with a second running suture. In one of the cases, a 10 mm kidney stone that was situated in the lower pole of the kidney was laparoscopically removed. Following the completion of anastomosis, the intraperitoneal pressure was decreased to 5 mm Hg and bleeding control was done. Insufflation was terminated after placement of 20 F drain in all cases. Trocar entrance incisions were infiltrated with prilocain and then closed with a No 0 J suture. Pain pump application was routinely done in all cases. The nasogastric tube was drawn away at the end of anaesthesia. All cases were mobilized within a postoperative period of 24 hours.

Results

Evaluation of all cases enrolled into this study revealed that the median age was 34.5 ± 15.5 (13-74) years, and there were 13 male cases (39.4%) and 20 female cases (60.6%). The median body mass index (BMI) was 25.3 ± 15.4 (18.5-33.4). Two of the cases had had abdominal surgery before previously (6%). Eight of the cases were asymptomatic, and 23 had the history of intermittent pain. In one case asymptomatic kidney stone accompanied the UP stenosis (3%). Fourteen cases had UP stenosis in the left kidney (42.4%) while 19 had it in the right kidney (Table 1).

When intraoperative findings were evaluated, an aberrant vessel that supplies the lower pole of the kidney was seen in 19 cases, while in other 14 cases there was no additional pathology that would cause external pressure to the kidney. There was no comorbidity factor in the cases, except for a lower pole kidney stone that was not interfere to the urine flow in one case. The median surgical period was 127.9 ± 38.9 (68-245) minutes, and the median UP anastomosis time was 20.8 ± 7.3 (8-39) minutes. In 32 cases, the operations were performed laparoscopically, however in only one case due to severe peri-pelvisitis the procedure had to be shifted into open surgery. The median blood loss during the operation was 57.1 ± 28.3 (20-150) ml. The median duration of drainage in the postoperative period was 2.6 ± 1.1 (2-7) days. Unfortunately in one case due to urine leakage from UP anastomosis, there was prolonged ileus and peritoneal irritation findings (Clavien grade II). The median need for a narcotic analgesic drug was 21.5 ± 4.8 (15-30) mg/day, and the median need for a non-narcotic analgesic was 132.6 ± 37.2 (75-200) mg/day.

The median hospital stay was 2.6 ± 1.05 (2-7) days, and the median follow-up period was 35.1 ± 13.6 (11-59) months. Double J catheters were removed 4-6 weeks after the operation. At the end of the 3rd month, Patients underwent routine ultrasounds and diuretic renograms and 32 cases were asymptomatic, hydronephrosis was markedly regressed in US, and ureteropelvic obstruction was improved in renal diuretic scintigraphy (Figure 2). In one case only, obstruction continued to the postoperative 6th month..

Discussion

Since the first open pyeloplasty was performed in 1949, this technique has had caught success rate of over 90%. Yet the necessity for an extensive lumbotomy incision, bad cosmetic results, greater risk of higher nerve injury, longer healing and hospitalization periods, and greater analgesic requirements have formed the basis for investigation into less invasive methods, and thus the antegrade endopyelotomy technique has been defined (4). However, the long-term success rate of this technique dropped to 70% in patients with severely deprived renal functions, with a UP stenotic segment longer than 2cm and with the presence of crossing vessel. Moreover, its applicability to selected cases has accelerated the innovations because of its higher success rates. In the early of 1990's laparoscopic pyeloplasty was described (5). As a result of ever advancing technology laparoscopic pyeloplasty has achieved a success rate that is similar to open surgery, and it has been recommended by EAU as a first-line treatment in UP stenosis along with open surgery (6).

Pyeloplasty can be performed with either the transperitoneal or the retroperitoneal approach. Although the transperitoneal approach provides a larger operating area in terms of dissection and suturing, the retroperitoneal approach enables a safer reach to the ureteropelvic area without irritating the peritoneum. Zhu et al. reported a faster reach to the UP area with the retroperitoneal approach, but they reported a shorter anastomosis suturing and shorter total surgery time with the transperitoneal approach (7,8). In this study, despite the increased risk of damage to intraperitoneal organs and prolonged ileus, we preferred the transperitoneal approach since it provided a larger surgical area. (9). We think that since the retroperitoneal approach provides a narrow working area for the surgeon, it should be performed either by more experienced surgeons or at institutions where learning curve has been completed. We experienced intraperitoneal adhesions in two cases due to previous surgeries. However, we performed the procedure laparoscopically with careful placement of trocars and adhesiolysis.

In studies, in which open and robotic laparoscopic pyeloplasty techniques are compared, it can be seen that robotic surgery requires a longer time than the laparoscopic technique. The surgery time in our study is compatible with other study results described in the literature (10). The anastomosis time in our study is shorter when compared to retroperitoneal techniques, which is also compatible with findings recorded in the literature (11). Among the factors that shorten the anastomosis suturing period, continuous suturing instead of intermittent suturing, and the preference for the robotic method due to its advantageous three-dimensional features instead of the classical method and the completion of a learning curve could need to be mentioned (12). In a meta-analysis in which laparoscopic pyeloplasty and robotic or open pyeloplasty techniques were compared, it has been shown that there was no significant difference between success rates, bleeding risk and complications (10). The need for narcotic or non-narcotic analgesic after laparoscopic surgery has been found to be lower than for the open pyeloplasty technique (13). In our study, the median need for narcotic analgesics was 21.5 ± 4.8 mg (15-30), which is compatible with what appears in the literature.

Double J-catheter application timing for patients with planned laparoscopic pyeloplasty is a point for discussion. Some authors argue that pre-operative ante grade double J catheter application may not prolong the surgery time (14). Preoperative stent application may complicate pelvic visualization and dissection by decompressing the renal pelvis. We think preoperative cystoscopy and retrograde pyelographies are necessary in order to investigate the presence of other negative factors in the bladder or distal ureter that interrupt indication for pyeloplasty. For this reason, we performed retrograde double J catheterization in all of our cases preoperatively (10).

The most important reason for the formation of UP stenosis is the presence of aberrant vessels. Crossing vessel incidence in the literature was reported to be between 50-70% (15). We observed aberrant vessels in 19 patients (57.6%) in our study. It has been advised that even though aberrant vessels are the most common cause of UP stenosis, other causes should be kept in mind (16). Richstone et al., histologically evaluated tissue specimens of patients with and without vessel compression. They did not demonstrate any pathological finding in 43% of them (17) when there is presence of an aberrant vein, it should be carefully dissected from the artery. If there is a suspicion that the vein might contribute to UP stenosis, it should be obliterated (18). In our study, only one case recurred 6 months after surgery, but 32 patients showed improvement in ultrasonic and renographic findings. Even though the short-term success rate is 97%, limited data in the literature for the long-term success rate may lead us to think that

this rate might decrease. However, studies show that failure after laparoscopic pyeloplasty is mostly reported within first two years. Indeed, in our study, the mean follow up time greater than two years revealed no prominent decrease in the success rate (19). The most important factors that determine the success of surgery are the lack of tension in an anastomosis, good drainage, and efficient adhesiolysis. In the literature, it has been stated that the success rate of laparoscopic pyeloplasty is from 92-100% (20). Although some researchers advocate that only objective criteria would suffice, we think that the most important success criterion is symptomatic relief rather than diuretic renography and Whitaker test in follow up controls (21).

Conclusion

At the beginning of the laparoscopy era it was believed that this technique required a long learning curve, but laparoscopic pyeloplasty is now regarded as one of the safest and the most reliable minimally invasive technique used today due to its short hospitalization time, low post-operative morbidity rate, and better cosmetic results. Moreover it has been shown that even if performed by physicians who have only moderate experience, it produces favorable long-term results.

Conflict of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical issues: All Authors declare that Originality of research/article etc... and ethical approval of research, and responsibilities of research against local ethics commission are under the Authors responsibilities. The study was completed due to defined rules by the Local Ethics Commission guidelines and audits.

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