

Transperitoneal laparoscopic pyeloplasty in the treatment of ureteropelvic junction obstruction

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Introduction. Laparoscopic pyeloplasty was first described by Schuessler. During the last decade, this technique has been developed in order to achieve the same results as open surgery, with lower rates of morbidity and complications. In this study we review our experience using laparoscopic pyeloplasty as the gold standard for the treatment of the ureteropelvic junction obstruction (UPJO).

Material and methods. We performed a retrospective review of 62 laparoscopic pyeloplasties carried out at our center. In the last 2 years we used 3 mm and 5 mm ports in order to achieve better cosmetics results. Demographic data is described and the functionality of the affected kidney and surgical data, among others were analyzed statistically. In the case of bilateral statistical tests were considered significant as those with p values <0.05.

Results. The most frequent reason for consultation was ureteral pain. Patients mean age was 40 years and 94% of them had preoperative renogram showing a full or partial obstructive pattern. The right side was affected in 61% of cases and the left in the remaining 39%. The presence of stones was observed in 12 patients and crossing vessels in 58% of cases. The average stay was 3.72 days. Post-surgery complications were observed in two patients. The operative time was 178 minutes. Mean follow-up was 45 months and a success was achieved in 91%.

Conclusions. The transperitoneal laparoscopic pyeloplasty has become the gold standard for the treatment of ureteropelvic junction stenosis in our center because of high success rate, shorter postoperative stay, and low intra and postoperative complications.

Key Words: pyeloplasty ◊ ureteropelvic junction obstruction ◊ gold standard

INTRODUCTION

The ureteropelvic junction obstruction (UJPO) is defined by a blockage of urine flow from the kidney to the proximal ureter. This blockage can result in increased backpressure in the kidney, hydronephrosis, and progressive impairment of renal function [1].

UPJO is the most common cause of prenatal hydronephrosis and occurs sporadically in 1 in 750–1500 live births. The frequency is higher in males compared to female 2:1, the left side is affected in approximately two thirds of patients, and is bilateral in 10–46% of cases [2].

In 1949, Anderson and Hynes described open dismembered pyeloplasty for treatment of UPJO [3]

since then it has been the main technique used for its high success rate. However, the classic lumbotomy access leads to an increased morbidity; this developed an important number of minimally invasive procedures such as antegrade [4] or retrograde [5] endopyelotomy, balloon dilatation, or acucise endopyelotomy [6]. Although these techniques are being used, their success rate is lower than open pyeloplasty [7].

The first laparoscopic pyeloplasty was described by Schuessler et al. [8] in the early 90s. During the last decade, laparoscopic pyeloplasty has been evolving in order to achieve the same results as open surgery, with lower rates of morbidity and complications [9]. We started to perform laparoscopic pyeloplasty at

our center in 2004 and since then it has become the technique of choice for the treatment of UPJO. In this study we reviewed our experience following this technique.

MATERIALS AND METHODS

A retrospective review of 62 laparoscopic pyeloplasties carried out at our center from March 2004 to June 2012 was done. The data have been analyzed statistically at the biostatistics department in our center with the SAS Enterprise Guide 3.0 program. Different data are described, such as symptomatology

at diagnosis, patients age, function of the affected kidney using isotopic renogram values, presence of kidney stones, crossing vessels, operative time, length of stay, intraoperative and postoperative complications, and findings in follow-up. Success rate was measured in terms of clinical improvement reported by the patient, radiographic improvement in intravenous urography (IVU) demonstrated by appearance or upturn in the excretion of contrast, and the resolution of obstructive pattern in the diuretic renogram.

Descriptive study results are shown in terms of absolute values, mean, standard deviation, and percentages. In the case of bilateral statistical tests, those with p values <0.05 were considered significant.

Technical description (Figure 1): In our center, after general anesthesia, the patient is placed at 45 degrees with the lateral opening centered on the operating table. After making pneumoperitoneum, we perform a transperitoneal approach with four ports. To obtain better cosmetic results, in the last two years we have evolved the port placement technique to a 5 mm trocar for the 30° view telescopic lens, a transumbilical trocar, and three work trocars of 3 mm. The colon is dissected along the avascular Toldt line and rejected medially to expose the homolateral ureteropelvic junction (UPJ). The mobilization



Figure 1. Left: Vision of the UPU through transperitoneal laparoscopic approach. Right: Catheterization using nephroscopy needle.

Table 1. Clinical data

Patients Number		62	
Mean age		40,03 ^a ±12.6 ^b	
		Patients Number (N)	Percentage (%)
Sex	Female	32	52
	Male	30	48
Diagnosis	Pain	39	63
	Radiologic finding	17	28
	Others	6	9
Side	Right	38	61
	Left	24	39
Crossing Vessels	Yes	36	58
	No	26	42
Stones	Yes	12	19
	No	50	81
Intra surgery complications		0	0
Immediate post-surgery complications		Reoperation (bleeding)	2
Surgical Time in minutes		178 (range 110–270).	
Hospital Stay		3.76 ^a days ±1.33 ^b	
Follow up in months		45 (range 6–96).	

^aMean, ^bStandard deviation

Table 2. Results of several series of laparoscopic pyeloplasty

Author	N	Age	Approach	Mean surgical time	Success %	Complications %	Follow up (months)
Turk et al. [14]	49	34	Transperitoneal	165	97.7	2	23
Soulie et al. [15]	55	35	Retroperitoneal	185	88	12.7	14
Janetschek et al. [16]	67	36	Transperitoneal/ Retroperitoneal	119	98	3	25
Moon et al. [17]	170	36	Retroperitoneal	140	96.2	9.4	15
Inagaki et al. [18]	147	36	Transperitoneal	246	95.6	8.5	24
Our series	62	40	Transperitoneal	178	91	3	45

of the UPJ should be done with great care, identifying the possible existence of polar vessels. Once the opening and resection of UPJ is performed, in most cases we perform percutaneous ureteral catheterization with needle–nephroscopy trocar according to the technique described by Alonso et al. [10] (Figure 1). From our point of view it is the safest and the fastest way of antegrade catheterization. The anastomosis is performed with 4/0Vicryl suture. At the end of surgery approaching the peritoneum and Gerota's fascia is done and usually a drain is left in the surgical bed and is removed 24–48 hrs later. Bladder catheter is left during the hospital stay; it is removed 24–48 hrs after surgery. Staples are placed in the skin wounds. The ureteral catheter is removed in 4–6 weeks.

RESULTS

There have been a total of 62 laparoscopic transperitoneal pyeloplasties over a period of eight years. We used 3 mm and 5 mm trocars in 10 of them. Clinical data are summarized in Table 1. The most frequent reason for consultation was ureteral pain with or without urinary tract infections (63%). The mean patient age was 40 years, 52% of patients were female, and 94% of patients had a preoperative diuretic renogram demonstrating total or partial obstructive pattern, defined as a delay, or not spontaneous excretion and / or stimulated with diuretic. The right side was affected in 61% of cases and the left in the remaining 39%.

Notably, two patients had horseshoe kidneys and two patients had undergone previous minimally invasive procedures (balloon or acucise endopyelotomy). The presence of stones was only observed in 12 patients (19%) and crossing vessels in 58% of cases. The average stay was 3.72 days. Regarding complications, there were no intraoperative complications. The need for blood transfusion was observed only in two patients, one of them needed reoperation; finding at surgery was a port site bleeding. The opera-



Figure 2. Left: IVU showing UPJO in left kidney. Right: IVU 6 months after surgery showing contrast excretion.

tive time was 178 minutes (range 110–270). The mean follow-up of our patients is 45 months (range 6–96) in which the success rate was recorded in 91% of cases, expressed in terms of clinical improvement, measured by patient satisfaction in the first review and later ones, improved excretion of contrast by the affected kidney in intravenous urography (IVU) (Figure 2) done at 6 months and resolution of obstructive pattern in the affected kidney renogram at 6 months (Figure 3), defined as improvement in excretion with diuretic (furosemide) from an average of 20% in the preoperative renogram to 50% ($p = 0.0091$) in the right kidney surgery and from 23% to 54% ($p = 0.0079$) for the left kidney excretion respectively; and an improvement in total excretion from 23% in the preoperative renogram to 54% ($p = 0.0061$) in the right kidney surgery and 22% to 52% in the surgically treated left kidney ($p = 0.0022$).

DISCUSSION

Urologic laparoscopy has evolved into an efficient and widespread surgical modality. Laparoscopic reconstructive surgery is still in an early stage, al-

though the first reports date back to the 90s. In 1993, Schuessler et al. [8] made and reported the first laparoscopic pyeloplasty. At first, the technical difficulties involved endoscopic suturing, affecting negatively in the results, with prolonged surgical times and a low success percentage [9], but today, laparoscopic pyeloplasty has been completely replaced endourology in treatment of UPJO.

Laparoscopic pyeloplasty has achieved similar results compared to the reference method represented by an open surgery, but offers the advantages of the minimally invasive surgery [11]. As in other areas of surgery, there are no randomized controlled studies [12]. Bestard Vallejo et al. [13] in their study published in 2009 reported a similar rate of success between open pyeloplasty (100%) and laparoscopic pyeloplasty (93%).

Table 2 summarizes the results of some of the largest published series on laparoscopic pyeloplasties including ours. As reflected in the table, there are no major differences between them in terms of mean age, operative time, success rate and complications. We found in some series different laparoscopic approaches of UPJO. The approach of choice depends on the previous surgical experience of the surgeon and his training. In our center, we started with laparoscopic urologic surgery in 2002 and in our experience we prefer the transperitoneal approach for the UPJO.

In the literature, success rates are similar in the retroperitoneal and transperitoneal approach [19, 20]. However, there are advantages and disadvan-

tages to both approaches. The predominant advantage in the retroperitoneal approach is the reduced risk of intraperitoneal injury. Despite this, reduced working space can lead to problems in orientation, diminished vision, and difficulty surgical suturing, especially in obese patients. The transperitoneal approach is more familiar to most surgeons and offers advantages such as: 1) a much wider workspace that would allow easier addition of techniques as transposition of polar vessels or remodeling of the pelvis and resolution secondary lithiasis, and 2) anatomical landmarks allowing better guidance and more easily reproduce the steps of open surgery.

The presence of stones is recognized as a complication of the UPJO, and the diagnosis creates dilemmas regarding treatment. Inagaki et al. [17] have reported the presence in his series of kidney stones in 16% of patients, similar to our findings (19%).

In our center we have resolved most of the cases associated with kidney stones successfully with the use of laparoscopic instruments or even with the introduction of a flexible cystoscope through a trocar.

Few series have an average long-term follow-up as ours (45 months), it is not clear in literature how long these patients should be followed in reviews. Soulie et al. [15] in their study proposed a visit at one to three months after surgery with IVU, furosemide renogram, and annually with ultrasound for at least three years. We recommend the first visit a month after surgery and, after removal of the double J stent, performing basic analysis, IVU, and diuretic renogram. Followed by a visit every six months for the first two or three years with diuretic renogram to diagnose cases of treatment failure. The follow-up criteria are physician-dependent in many cases. Most of the re-stenosis cases are diagnosed in the first two years so it is important to emphasize the importance of following the review schedule to the patient and the need for the different complementary test.

Developments are focus on the techniques using laparo-endoscopic single-site surgery (LESS) [21], but this leads to significant problems due to the proximity of instruments: flexible instruments intersect and collide, making the surgery more difficult to perform. The performers of this technique emphasize the better cosmetic results and less pain that leads to a faster recovery of daily activities. Prospective and comparative trials are needed to see real differences between LESS and the conventional laparoscopic approach.

Results of robotic-assisted laparoscopic surgery have been reported by E. Garcia-Galisteo et al. [22] reflecting good success rate, concluding that the learning curve is lower, but the high costs is one of the obstacles for the development of this approach.

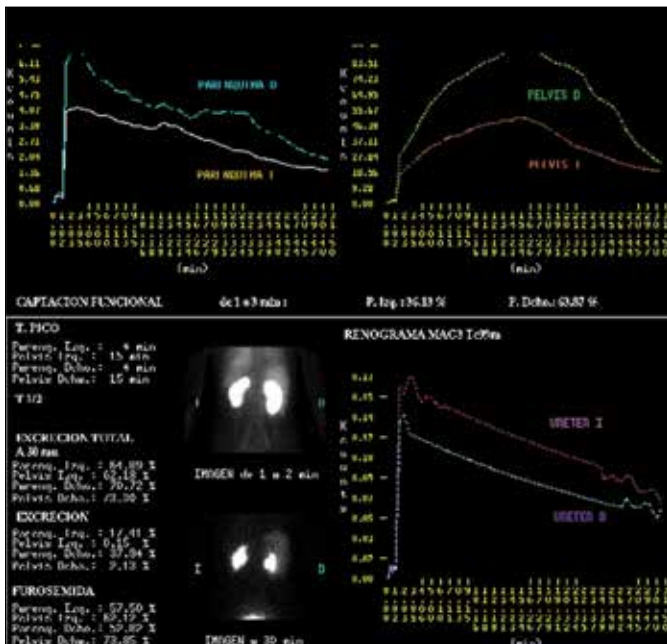


Figure 3. The same patient in figure 2. Diuretic isotopic renogram 6 months after surgery with non-obstructive pattern.

The development of high definition technology has improved the quality of the telescope lens of 5 mm, that is why we perform in our hospital since 2010 laparoscopic pyeloplasty with this equipment; also the evolution in 3 mm laparoscopic instruments leads us to use this technology in our center in order to reduce the degree of invasion and provide better cosmetic results to our patients.

CONCLUSIONS

Following the evolution of laparoscopic reconstructive surgery, transperitoneal laparoscopic pyeloplasty has become the gold standard for the treatment of UPJO in our department, in primary cases and in those where other techniques have been attempted, this is based in the high success rate, short hospital stay, and low intra- and postoperative compli-

cations. Follow-up should be frequent in the first two years, after that it's surgeon-dependent. The improvement in 3 mm and 5 mm equipment make this technique less invasive in order to obtain better cosmetic results.

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ABBREVIATIONS

UPJO – ureteropelvic junction obstruction
mm – millimeters
IVU – intravenous urography
UPJ – ureteropelvic junction
LESS – laparo-endoscopic single-site surgery

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