

Evolution in the treatment of the ureteropelvic junction obstruction syndrome. Laparoscopic *versus* open pyeloplasty

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Introduction The treatment of ureteropelvic junction has evolved considerably over the past 20 years, resulting in new surgical techniques, but traditional open surgery remains the gold standard treatment. Currently, less invasive techniques are used for the treatment of ureteropelvic junction obstruction. The purpose of our study is to compare the surgical and functional results between laparoscopic and open pyeloplasty performed at our department during the last 12 years.

Material and methods This is a retrospective review of 92 cases performed in a period of 12 years. Two groups were compared: 30 patients were treated with open surgery (OP) and 62 with a laparoscopic approach (LP). Demographics, clinical presentation, functionality of the affected kidney, presence of polar vessels, kidney stones, hospital stay, complications and functional results were statistically analyzed.

Results The mean age was 42 years. The most common clinical presentation was kidney or ureteral pain: 60% (OP) vs. 52% (LP). The right side was affected in 59%; presence of crossing vessels was 47% (OP) vs. 58% (LP); presence of kidney stones was 20% (OP) vs. 19% (LP), with an average hospital stay of 5.86 days (OP) vs. 3.36 days (LP) $p < 0.05$. Post-operative complications were observed in 3 (OP) vs. 5 (LP) patients, with a success rate comparable between groups.

Conclusions In our department, we recommend LP as the standard treatment for ureteropelvic junction obstruction because of the equal success rate compared to OP and the benefits of a minimally invasive surgery.

Key Words: open pyeloplasty ↔ ureteropelvic junction obstruction ↔ laparoscopic pyeloplasty

INTRODUCTION

Ureteropelvic junction obstruction (UPJO) corresponds to a dilatation of the pyelocaliceal cavities that appears before an obstacle located at the ureteropelvic junction, which causes an increased pressure in the kidney, hydronephrosis and progressive deterioration of renal function. It is considered the most common kidney malformation and its etiology may be congenital or acquired and may have an extrinsic or intrinsic cause. The eccentric obstruction conditions a ureteral fibrosis and this segment becomes aperistaltic. The role of polar vessels obstruction remains controversial. Acquired causes are due to lithiasic diseases, inflammatory or postoperative strictures, malignant diseases and extrinsic compressions [1].

The treatment of ureteropelvic junction obstruction has evolved considerably since 1949, when Anderson and Hynes described open dismembered pyeloplasty as the treatment of choice [2, 3]. New technologies, such as antegrade endopyelotomy, retrograde endopyelotomy, retrograde balloon dilatation or Acucise endopyelotomy, have been developed with the aim to improve morbidity of open surgery [1], but with the disadvantage that their success rate is lower than in comparison with the gold standard open surgery. The success rate of open surgery is over 90% according to different published series, but with the drawback of significant postoperative pain and long hospital stay [3]. Since 2004, laparoscopic pyeloplasty has become the reference technique in our department due to its low

morbidity and short hospital stay [4, 5]. The aim of our study is to compare surgical and functional results in short and medium term obtained using the open approach *versus* the laparoscopic approach in the treatment of the ureteropelvic junction obstruction.

MATERIAL AND METHODS

We performed a single center study. A retrospective review of 92 pyeloplasties performed during a 12 years period (from 1999 to 2012) was done. Diagnosis of UPJO included a history of flank pain, recurrent urinary tract infections and/or decreased renal function in combination with radiographic or renographic evidence of UPJO. Patients with incomplete clinical charts or those lost during follow up were excluded from the study.

Two groups of patients were observed: 30 patients treated using an open approach (OP) and 62 patients treated with a laparoscopic approach (LP). Most of the patients in the OP group were operated on between 1999 and 2004, and the LP group between 2004 and 2012. Demographics, clinical presentation, functionality of the affected kidney, presence of polar vessels and kidney stones, hospital stay, complications using Clavien–Dindo classification, surgical, clinical and functional results were compared statistically between groups. The follow up was carried out during at least a 2 years period.

The data has been analyzed statistically at the biostatistics department in our hospital with the SAS Enterprise Guide 3.0 program. Descriptive study results are shown in terms of absolute values, mean, and percentages. In the case of bilateral statistical tests, a multivariate one way analysis was performed and those results with p values <0.05 were considered significant.

Techniques

Open [1, 3]: Traditionally, the treatment of the UPJO is based on open pyeloplasty. Anderson and Hynes are the first to describe this technique. This consists mainly of the ablation of the stenosed ureteral segment and the resection of a dilated pelvis portion in combination with an ureteropelvic anastomosis.

Laparoscopic

The technique used in our department was described by Gómez et al. [4]. After general anesthesia, the patient is placed at 45 degrees with the lateral opening centered on the operating table. After making a 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 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. From our point of view, it is the safest and the fastest way of antegrade catheterization. The anastomosis is performed with a 4/0Vicryl suture. At the end of the surgery, approach of the peritoneum and Gerota's fascia is done and usually a drain is left in the surgical bed to be removed 24–48 hrs later. A bladder catheter is left during the duration of 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

A total of 92 pyeloplasties were observed in two groups, 30 (OP) and 62 (LP), with no differences in demographics, clinical characteristics and complications found between groups (Table 1). The mean age was 38.46 years (OP) *vs.* 44.54 years (LP), the main reason for attending urgencies or outclinic in both groups was kidney or ureteral pain with or without urinary tract infections, the right side was affected in 57% (OP) *vs.* 61% (LP), polar vessels were found in 47% (OP) *vs.* 58% (LP), the presence of kidney stones was 20% (OP) *vs.* 19% (LP), with a complication rate of 6% (OP) *vs.* 3% (LP). Most complications were Clavien I or II. In the laparoscopic group only

Table 1. Clinical data

	LP	OP	P values
Number of Patients	62	30	–
Age	Mean: 44.54 years (range 34-60)	Mean: 38.46 years (range 35-63)	0.0681
Side			0.0650
Right (n/%)	38/61	17/57	
Left (n/%)	24/39	13/43	
Kidney Stones (n/%)	12/19	6/20	0.0778
Crossing vessels (n/%)	37/58	14/47	0.0548
Complications (n/%)	2/3	3/10	0.0856
Hospital stay	Mean: 3.76 days (range 2-5)	Mean: 5.86 days (range 3-8)	0.0362*

*statistical signification

1 patient had a Clavien III complication; it was a port site bleeding that was solved in the first 24 hrs using laparoscopic approach. There is no significant differences in the incidence of complications between OP (3/30 = 10%) vs. LP (2/62 = 3%) with a p value of 0.0856 (Table 2).

All laparoscopic procedures were performed using transperitoneal approach, with no conversion to open surgery. Only statistical difference between groups was found in mean hospital stay: 5.86 days (OP) vs. 3.76 days (LP) (Table 1).

The mean follow-up time in both groups was 45 months (range: 6–96 months). Success rate measured by clinical improvement: absence of pain reported by the patient in the outclinic and no urinary tract infections using urinary culture, 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 renography is shown in detail on Table 3. No statistical differences were found between groups was archived in 90% (OP) vs. 91% (LP) with a p value between groups >0.05.

Table 2. Complications

	LP*	OP*	P values
Clavien I	1/60 (Wound infection)	3/30 (1 Non controllable pain with analgesics & 2 Wound infection)	0.0745
Clavien II	0/60	0/30	–
Clavien III	1/60 (port site bleeding)	0/30	0.256
Clavien IV	0/60	0/30	–
Clavien V	0/60	0/30	–
Total	2/60	3/30	0.0856

*n of complications/total of patients

Table 3. Surgical results

	LP*	OP*	P values
Clinical improvement	93.3% (28/30)	95% (59/62)	0.258
Appearance or upturn in the excretion of con-trast in IVU	90% (27/30)	91% (56/62)	0.156
Diuretic renography values at 2 years			
Functional uptake ratio	44.80 %	42.17 %	0.247
Spontaneous excretion	35.14 %	34.54 %	0.547
Furosemide excretion	51.60 %	50.23 %	0.854
Total excretion	52.20 %	50.52 %	0.456
Excretion time	2.95 mins	3.38 mins	0.098

*(% n/total)

DISCUSSION

UPJO is the most common congenital malformation of the ureter; described as an incidence rate of 5 cases per 100,000 habitants [3]. Still to this day, dismembered pyeloplasty as described by Anderson and Hynes in 1949, remains as the most widespread technique with success rates exceeding 90%. Surgical repair of UPJO include numerous treatment options, such as different types of open pyeloplasty, antegrade or retrograde endopyelotomy and laparoscopic pyeloplasty. Open pyeloplasty is currently the gold standard treatment due to its high success rate [6, 7].

However, the procedure involves major drawbacks concerning the approach (lumbotomy) necessary to perform the surgery, including significant postoperative pain, prolonged convalescence and aesthetic aspects (scarring). Also, this approach may be limited in some categories of patients such as the obese. All of these difficulties have led to the development of minimally invasive techniques over past last twenty years [1, 8–15].

Although anterograde or retrograde endopyelotomy have been extensively studied, these procedures have been shown to be less effective during long term follow up, as well as having the inability to treat the extraureteral obstruction. These results are attributed to the lack of the ablation of the adynamic stenosed segment. However, these techniques have a success rate near to 80%, but this is still lower in comparison to the open pyeloplasty. Also, these techniques have major drawbacks in kidneys with high ureters implantations, in important hydronephrosis or in the presence of polar vessels, where their effectiveness has shown to decrease up to 50% [10–13].

Since Schuessler et al. in 1993 described the first laparoscopic pyeloplasty (14) this procedure has evolved in order to achieve the same results as open surgery, with lower rates of morbidity and complications [7, 8, 15]. Laparoscopic pyeloplasty may be done using transperitoneal or retroperitoneoscopic approach. The retroperitoneal approach has many advantages such as presenting a shortcut into the renal pelvis, less possibilities of intra-abdominal organs injuries and lower risk of intraperitoneal extravasation of urine in the case of fistulas [6].

However, this approach requires working on a smaller field and presents a major difficulty in the case of ureteral transposition due to polar vessels. There are no statistically significant differences in the literature between these two approaches therefore, surgeon preferences and experience remains the main determinant of choice for the procedure [17]. From our point of view, the transperitoneal approach offers

the technical advantages of a wider operative field, with better view of anatomical references, allowing easier ureteral transposition for selected cases and also making possible the treatment of associated kidney stones [4, 18].

Our study has several drawbacks: 1) it is a retrospective analysis so there is lack of randomization, 2) short cohort of patients, and 3) no long term results regarding follow up. However, our results are a validation that laparoscopic dismembered pyeloplasty has the same success and complication rates in comparison to open surgery. For many urological procedures, laparoscopic access has been shown effective in reducing morbidity, postoperative length of stay, time of incorporation to working life, and improving the aesthetics of the scar, while not compromising the functional results of conventional open surgery. New advances in this area include the development of other techniques such as surgery through laparoendoscopic natural orifices (Natural orifice transluminal endoscopic surgery [NOTES]) and through surgery laparoendoscopic single port (laparoscopic-endoscopic single site surgery [LESS]). NOTES, in its strictest sense, implies not using any abdominal port. The obvious disadvantage of this type of surgery involves the complete loss of triangu-

lation, partial loss of visibility, insufficient traction and a serious conflict of space. Laparoscopic surgery using small ports is another step towards gaining better cosmetics results. In our department, we have experience with these small caliber instruments and laparoscopic pyeloplasty seems feasible to reproduce without compromising the surgeon comfort. As a retrospective study we were not able to access post-operative pain data or quality of life using questionnaires, but it might be interesting for further studies. Currently, in our department we consider the laparoscopic pyeloplasty as the technique of choice in cases of UPJO.

CONCLUSIONS

Laparoscopic pyeloplasty is the standard treatment of UPJO in our department due to same surgical results, less hospital stay and better aesthetics results when compared to open surgery. Open surgery may have a place in the UPJO treatment for example in laparoscopic surgery failures or in very complex cases.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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