

# ORIGINAL ARTICLES

## Endourology

### A Comparison between Laparoscopic and Open Pyeloplasty in Patients with Ureteropelvic Junction Obstruction

SIMFOROOSH N\*, BASIRI A, TABIBI A, DANESH AK, SHARIFI-AGHDAS F, ZIAEE SAM, NOORALIZADEH A, HOSSEINI-MOGHADDAM SMM

*Urology/Nephrology Research Center, Shaheed Labbafinejad Medical Center, Shaheed Beheshti University of Medical Sciences, Tehran, Iran*

#### ABSTRACT

**Purpose:** To compare clinical and radiological outcomes, complications, and hospital stay in laparoscopic and open pyeloplasty.

**Materials and Methods:** From February 2002 to February 2003, 69 patients with ureteropelvic junction obstruction (UPJO) were assigned into two groups. Thirty-seven patients underwent transperitoneal laparoscopic pyeloplasty and 32 underwent open surgical pyeloplasty. Clinical symptoms were assessed before and after surgery, subjectively. Radiological assessment was also done three months postoperatively.

**Results:** Mean operative time was 3.2 hours and 2.2 hours in laparoscopic and open pyeloplasty groups, respectively. Intraoperative bleeding was trivial in both groups and no complication or conversion to open surgery occurred. Postoperative complication rates were 24% and 6% in laparoscopic and open pyeloplasty groups, respectively. Mean hospital stay was similar (6.2 days) in the two groups. Mean follow-up was 16.5 months versus 11.4 months. Clinical and radiological success rates were 89% and 83.8% for laparoscopy group versus 96.5% and 87% for open pyeloplasty group. Due to recurrence of stricture, repeated surgery was performed in 4 patients of laparoscopy and 1 of open pyeloplasty groups.

**Conclusion:** Laparoscopic pyeloplasty is a less invasive method with less pain, cosmetic advantages, no long incision, and outcome comparable with open surgery. Hospital stay is also not longer than that in open surgeries. Hence, laparoscopic pyeloplasty can be a substitute for skilled surgeons.

**KEY WORDS:** ureteropelvic junction, pyeloplasty, laparoscopy

#### Introduction

Common treatments of ureteropelvic junction obstruction (UPJO) consist of open surgical pyeloplasty, laparoscopic approaches, and endourologic methods.<sup>(1)</sup> Open surgery is the standard treat-

ment with more than 90% success rate.<sup>(2,3)</sup> Different methods are advocated, of whom dismembered pyeloplasty is the most accepted one. Nowadays, open pyeloplasty is still a popular approach, particularly in patients with long strictures, in cases accompanied with renal stone, and in those less invasive surgeries have failed. Nonetheless, this method is an invasive one with undesirable cosmetic outcome.

*Accepted for publication in August 2003*

*\*Corresponding author: Department of Kidney Transplantation, Shaheed Labbafinejad Medical Center, Boustan 9, Pasdaran, Tehran, Iran.  
email: simforoosh@iurtc.org.ir*

Endopyelotomy is a substitute method, but it is not popular among urologists due to a 10% to 30% lower success rate, comparing to open surgery and complications such as bleeding. It is usually performed using either antegrade or retrograde approach. This method is not recommended in cases with long stricture, aberrant vessel, or hydronephrosis.<sup>(4)</sup>

Trends toward less invasive surgeries have been increasingly considered. Since 1993, when the first laparoscopic pyeloplasty was performed, published reports have shown comparable results, complication rates, and recovery time with open pyeloplasty.

Eventually, laparoscopic pyeloplasty is less invasive and more successful rate than endoscopic approach, mostly performed using dismembered or Y.V.plasty methods.<sup>(5,6)</sup> Also, another method is Fengerplasty.<sup>(7)</sup> This study's aim was to compare the success rates of open pyeloplasty with laparoscopic one, in a prospective fashion.

### Materials and Methods

In a clinical trial from February 2001 to February 2003, 69 patients with UPJO were assigned into two groups. Thirty-seven patients underwent transperitoneal laparoscopic pyeloplasty and 32 underwent open surgery. The first group included 23 males and 14 females and the latter included 20 males and 12 females. Mean age was 18.2 (range 5 to 38) and 23.1 (range 5 to 67) years, respectively. None of the patients had a previous surgical intervention for his or her current complaint. Mean weight was 48.7 kg and 47.3 kg, respectively. The patients who were visited at the clinics of the study researchers were assigned in the first (laparoscopy) group and the ones who were visited at the clinics of the study cooperators were assigned in the second (open) group. The type of operation was selected according to surgeon's preference. Preoperative evaluations were done using IVP and diuretic renogram. Moreover, laboratory tests including urinalysis, urine culture, BUN, and creatinine were also done. Patients with a kidney function of 10% or less were excluded from the study. The assessment for any probable aberrant vessel was not done before the operation. All the cases were symptomatic prior to surgery, of whom 29 were right sided and 40 were left sided.

Transperitoneal operation was done in laparoscopy group using three trocars, placed in 10 cm from umbilicus, 5 cm superior to umbili-

cus, and 10 cm on midaxillary line in the opposite of umbilicus. In open group, dismembered pyeloplasty was done with subcostal incision. Stent was placed by cystoscopy in open group and intraoperatively in laparoscopy group. Anastomosis was made with polyglycolic 4.0 suture. Foley catheter and drain were inserted and removed after 48 hours. Regular diet was initiated at the first postoperative day. Stent was removed after four weeks and IVP was done three months after the operation.

Physical examination was made postoperatively and compared with that before the procedure considering pain and clinical signs. Improvement was defined as patent ureteropelvic junction or decrease in severity of hydronephrosis in IVP. It would be considered as failure in treatment if symptoms and signs were subsided but the degree of hydronephrosis did not decrease. Fenger or close dismembered methods were used in laparoscopy group depending on the surgeon's decision. In cases with aberrant vessels, vein was freed and clamped and artery was freed, transported, and fixed to perirenal fat or renal pelvis, if any.

Chi-square and Fisher's exact tests were used for statistical analysis of data and a P value of lower than 0.05 was considered as significant.

### Results

Surgical operation was done successfully in all patients with no intraoperative complication or necessity of blood transfusion, intra-or post-operatively. Mean follow-up was 16.5 months in laparoscopy group and 11.4 months in open group, which were significantly different ( $p=0.006$ ).

Symptoms before the treatment were pain (86.8%), urinary tract infection (25%), nausea and vomiting (12%), and hematuria (4.2%) (table 1). Of the patients, 18 (47%) and 7 (21.7%) had aberrant vessels in laparoscopy and open groups respectively ( $p<0.05$ ).

Of the patients in laparoscopy group, 18 and 19

**TABLE 1.** Symptoms before and after the operation in laparoscopy and open groups

Symptoms	Laparoscopy	Open	Total
Pain	34 (89%)	27 (84%)	61 (86.8%)
Urinary tract infection	11 (29%)	7 (22%)	18 (25%)
Nausea and Vomiting	1 (2.66%)	7 (22%)	8 (12%)
Hematuria	2 (5.3%)	1 (3.1%)	3 (4.2%)

**TABLE 2.** Mean and Standard deviation of operative time

Surgery	Operative time (hours)	Standard deviation
Fenger (laparoscopy)	3.1	0.6
Dismembered (laparoscopy)	3.3	0.6
Open surgery	2.2	0.53

**TABLE 3.** Postoperative complication rates in laparoscopy and open groups

Complications	Laparoscopy	Open	Total
Urinary tract infection	5 (13.5%)	2 (6.2%)	7 (0.1%)
Urinary leakage	3 (10.1%)	–	4 (5.8%)
Collection	1 (6.2%)	–	1 (1.4%)

underwent Fenger and dismembered pyeloplasty, respectively. Dismembered pyeloplasty was done in all of the patients in open group. Mean operation time (consisting of cystoscopy, DJ stent placing, and surgical repair) was 3.2 hours in laparoscopy group and 2.2 hours in open group ( $p=0.00$ ) (table 2).

Hospital stay was 6.2 days for both groups. Surgical complications occurred in 9(24%) and 2(6.2%) of the patients in laparoscopy and open

groups, respectively ( $p<0.05$ ).

Postoperative complications during the follow-up period in laparoscopy group consisted of urinary tract infection in 5, urine leakage in 3, and collection in one, all treated with non-surgical measures. In open group, two patients developed febrile urinary infection, which were hospitalized and treated medically (table 3). Clinical success rate was 89% in laparoscopy and 96.5% in open groups and radiological improvement was 83.8% and 87.5% respectively, whit no significant statistical difference ( $p=0.46$ ) (fig 1,2). It should be noted that clinical improvement was assessed based on the patient's opinion, pain or other symptoms, urinalysis considering hematuria, and urine culture. Radiological assessment was done using the latest IVP or renal scan, and postoperative ultrasonography in comparison with that before the operation.

Four out of 37 patients underwent reoperation in laparoscopy group, one due to collection in operation site, not responded to conservative treatments, and three due to symptomatic recurrence of stricture. Two patients were asympto-



**FIG.1.** A 35-year-old male with UPJO, **A:** before laparoscopic pyeloplasty, **B:** after the operation



**FIG.2.** A 25-year-old female with UPJO, **A:** before laparoscopic pyeloplasty, **B:** after the operation

matic, but without improvement in radiology and renal scan, who were followed.

In open group, one patient experienced pain, in which investigations showed recurrence and reoperation was considered. In open group, 2 asymptomatic patients had still obstruction in imaging modalities with increased hydronephrosis. They were followed conservatively.

### Discussion

Open surgery has been known as the gold standard treatment for UPJO with more than 90% success rate.<sup>(2,3)</sup> Due to postoperative pain, long-term recovery, and long incision in open pyeloplasty, several less invasive methods have been proposed, including antegrade and retrograde endopyelotomy; nevertheless, their success rates are 10% to 30% lower comparing to open pyeloplasty, particularly when aberrant vessels, kidney function impairment, or severe hydronephrosis are present.<sup>(4,8)</sup> On the other hand, bleeding occurs in 3% to 11%, requiring blood transfusion.<sup>(9,10)</sup>

Laparoscopic pyeloplasty has been recently advocated as an alternative in the treatment of UPJO. We decided to compare laparoscopy and open pyeloplasty through this study. Most previous reports have not considered such a comparison and few studies have compared these two approaches retrospectively. Bauer and coworkers compared laparoscopic and open pyeloplasty in 70 cases, retrospectively.<sup>(11)</sup> In 2001, Soulie performed a study to compare laparoscopic retroperitoneal pyeloplasty with open surgery.<sup>(12)</sup> However, to our best knowledge, our study is the first prospective clinical trial in the respective issue. At present, two techniques, namely, dismembered and Fenger (Heinke Mikulicz) are the most common ones used in laparoscopic pyeloplasty that we applied both in our patients. There was no definite criterion to select the technique in our study and it depended on the surgeon's decision intraoperatively. Clinical and radiological success rate was similar, with no statistically significant difference between the two groups (90% clinically improvement and 85% radiologically improvement). Eden reported 50 cases of laparoscopic pyeloplasty of which two led to open conversion and one developed late recurrence.<sup>(13)</sup> A study by Jarrett and colleagues showed decreased the degree of hydronephrosis in 96% of 100 patients undergone laparoscopic pyeloplasty,<sup>(14)</sup> and Soulie reported 88.5% and 89.3% success rate in

laparoscopy and open pyeloplasty groups, respectively.<sup>(12)</sup>

Hospital stay was the same for both groups, but operation time was longer for laparoscopy, which may be probably due to the cystoscopy and ureteral stent insertion. However, operation time did not differ significantly from the group with Fenger technique to the one with dismembered techniques. Our results were acceptable when compared to other studies; Jarrett reported an average operation time of 4.2 hours in 100 patients<sup>(14)</sup> and this it was 2.45 hours in Eden's study.<sup>(15)</sup>

The results of Fenger and dismembered pyeloplasty were similar. The surprising point was the higher rate of aberrant vessels in laparoscopy group (47% versus 21.7% in open group). Consonant with our study, Jarrett detected aberrant vessels in 57% of the patients<sup>(14)</sup> and Bauer reported a rate of 80% in laparoscopy group and 38% in open group.<sup>(11)</sup>

Postoperative complications were significantly more in laparoscopy group (24% versus 6.2%), which may be due to difficult intracorporeal suture technique and promoting skills may improve it. Complication rate has been around 12% in different studies.<sup>(14,16)</sup> Conversion to open surgery did not occur in our cases and no intraoperative complication or need to transfusion was observed. In Soulie's study, 5.4% of cases required conversion to open surgery.

Inclusion and exclusion criteria were similar for all the patients. Most background variables such as weight, degree of hydronephrosis, aberrant vessels, or the involved renal unit did not impact on patient selection and the outcome. The results of Fenger and dismembered pyeloplasty were similar. However, Fenger method requires lower level of skill. Twelve out of 18 patients with Fengeroplasty had aberrant vessels which were freed, transferred upwards, and fixed intraoperatively. On the other hand, the advantages of laparoscopy such as cosmetic results, less pain, and earlier resumption of normal daily activities are indispensable. But, laparoscopic pyeloplasty is totally dependent on a great talent in suturing.

### Conclusion

Laparoscopic pyeloplasty is a less invasive method with less pain, cosmetic advantages, no long incision, and outcome comparable with open surgery. The operation time was acceptable in our study when compared with other reports and it

can be similar with open pyeloplasty if cystoscopy and stent placing are eliminated. Hospital stay is also not more than in open surgeries. Hence, laparoscopic pyeloplasty can be a substitute for skilled surgeons.

### Editorial Comment

Regarding the desirable results of laparoscopic pyeloplasty reported in this study, it seems that more experience can also decrease reoperation to a comparable rate to that in open pyeloplasty.

### References

1. Carr MC. Anomalies and surgery of the ureteropelvic junction in children. In: Walsh PC, Retik AB, Vaughan ED Jr, Wein AJ, editors. *Campbell's Urology*. 8<sup>th</sup> ed. Philadelphia: WB Saunders; 2002. p. 1995-2004.
2. O'Reilly PH, Brooman PJ, Mak S, et al. The long term results of Anderson Hynes pyeloplasty. *BJU Int* 2001 Mar; 57(4): 287-9.
3. Lowe FC, Marshall FF. Ureteropelvic Junction obstruction in adults. *Urology* 1984; 23: 33.
4. Chen RN, Moore RG, Kavoussi LR. Laparoscopic pyeloplasty. Indications, technique, and long-term outcome. *Urol Clin of North Am* 1998 May; 25(2): 323-30.
5. Kavoussi LR, Peters CA. Laparoscopic pyeloplasty. *J Urol* 1993; 150: 1891-4.
6. Schuessler WW, Grune MT, Tecuanhuey LV, Preminger GM. Laparoscopic dismembered pyeloplasty. *J Urol* 1993; 150: 1795-9.
7. Janetschek G, Peschel R, Bartsch G. Laparoscopic fengerplasty. *J Endourol* 2000 Dec; 14(10): 889-93.
8. Van Cangh PJ, Wilmart JF, Opsomer RJ, et al. Long term results and late recurrence after endoureteropyelotomy: a critical analysis of prognostic factors. *J Urol* 1994; 151: 934-7.
9. Kletscher BA, Segura JW, LeRoy AJ, et al. Percutaneous antegrade endoscopic pyelotomy: review of 60 cases. *J Urol* 1995; 153: 701-3.
10. Brooks JD, Kavoussi LR, Preminger GM, et al. Comparison of open and endourological approaches to the obstructed ureteropelvic Junction. *Urology* 1995 Dec; 46(6):791-5.
11. Bauer JJ, Bishoff JT, Moore RG, et al. Laparoscopic versus open pyeloplasty assessment of objective and subjective out come. *J Urol* 1999 Sep; 162(3 PT1): 692-5.
12. Soulie M, Thoulouzan M, Seguin P, et al. Retroperitoneal laparoscopic versus open pyeloplasty with a minimal incision: comparison of two surgical approaches. *Urology* 2001 Mar; 57(3): 443-7.
13. Eden CG, Sultana SR, Murray KH, et al. Extraperitoneal laparoscopic dismembered fibrin-glued pyeloplasty medium term results. *Br J Urol* 1997 Sep; 80(3): 382-9.
14. Jarrett TW, Chan DY, Charambura TC, et al. Laparoscopic pyeloplasty: the first 100 cases. *J Urol* 2002 Mar; 167(3): 1253-6.
15. Eden CG, Cahill D, Allen JD. Laparoscopic dismembered pyeloplasty: 50 consecutive cases. *BJU Int* 2002 Oct; 88(6): 526-31.
16. Soulie M, Salomon L, Patard JJ, et al. Extraperitoneal laparoscopic Pyeloplasty: a multi centric study of 55 Procedures. *J Urol* 2002 Jul; 166(1): 48-50.