# Five years' experience of laparoscopic-assisted dismembered pyeloplasty versus open dismembered pyeloplasty

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***Purpose*** **Pyeloplasty for ureteropelvic junction obstruction (UPJO) in children has traditionally been performed using an open technique. However, the large lumbar incision in open pyeloplasty necessitates several weeks before a return to normal activity and requires significant tissue retraction to expose the field; hence, the damage is often more than that anticipated. We present our long-term experience with laparoscopic-assisted pyeloplasty in the treatment of UPJO, to evaluate the feasibility, safety, and long-term outcome of this technique in children.**

***Patients and methods*** **In total, 40 children with UPJO requiring operative repair were included in the study. Twenty patients with UPJO were randomly selected to undergo open dismembered pyeloplasty (group A) and the remaining 20 patients to undergo laparoscopic-assisted dismembered pyeloplasty (group B) at the Pediatric Surgery Department between January 2013 and December 2017. All patients were followed-up for 5 years postoperatively. The outcome was measured by the ultrasonography and diuretic renography with resolution of obstructive symptoms.**

***Results*** **The mean laparoscopic procedure time was 25 min. There was a slight relationship between age and operative time. No major perioperative complications occurred in any cases. Renal pelvic anterior–posterior diameter at postoperative ultrasonography significantly decreased ($P < 0.05$). Postoperative split renal function on diuretic renography significantly improved. Overall, successful resolution of UPJO was observed in all patients.**

***Conclusion*** **Laparoscopic-assisted pyeloplasty appears to be a safe, feasible, and effective alternative to open pyeloplasty in children. There are shorter operative times in the laparoscopic-assisted pyeloplasty and shorter overall hospitalization. It avoids large lumbar incision and gives excellent functional and cosmetic results.** ***Ann Pediatr Surg*** **14:236–240 © 2018 Annals of Pediatric Surgery.**

**Annals of Pediatric Surgery** 2018, **14**:236–240

**Keywords: laparoscopy-assisted pyeloplasty, minimally invasive surgery, ureteropelvic junction obstruction**

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**Received** 18 July 2018 **accepted** 19 August 2018

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## Background

Ureteropelvic junction obstruction (UPJO) is the most common cause of pediatric hydronephrosis, occurring in 1 per 1000–2000 newborns. With a success rate of about 94%, the Anderson–Hynes dismembered pyeloplasty is the gold standard for the repair of UPJO [1]. Laparoscopic pyeloplasty in children is a demanding surgical procedure. Because of the technical complexity and the doubts with regard to long-term success, it is performed only by few centers with adequate expertise in advanced pediatric laparoscopy. Laparoscopic-assisted dismembered pyeloplasty (LADP) is a minimally invasive method for repair of UPJO that can be easily performed by the surgeon with basic experience in laparoscopy [2].

## Patients and methods

This is a prospective study including 40 patients, all of whom were diagnosed with congenital UPJO with a pelvic anteroposterior diameter in the transverse plane of more than 20 mm and renal function less than 40%.

Twenty patients with UPJO were randomly selected to undergo open dismembered pyeloplasty (group A) and the remaining 20 patients to undergo laparoscopic-assisted dismembered pyeloplasty (group B).

Preoperative assessment in the form of abdominal ultrasound was carried out for all patients for measurement of antero-posterior pelvic diameter, differential renal function using diuresis renogram and ascending cystourethrogram to exclude vesicoureteral reflux. Ultrasound was repeated at the postoperative third and sixth months, and all cases were submitted to diuresis renography at the 12 month after surgery.

### Inclusion criteria

All patients with hydronephrosis diagnosed as having UPJO with anteroposterior pelvic diameter more than 20 mm and renal function less than 40%, patients with increasing hydronephrosis, more than 10% decrease in renal function in bilateral cases and persistence of grade 3 after 3 years of follow up were included in the study.

### Exclusion criteria

Patients with ureteral dilatation (Vesico-Ureteric Reflux), renal function more than 40% and acquired and recurrent cases were excluded from this study.

### Operative technique

#### *Group A*

The skin incision is made on the tip of the 12th rib. Thereafter, the muscles are divided. The peritoneum is identified and retracted medially. Gerota's fascia is then encountered and opened longitudinally to gain exposure to the perinephric space (Fig. 1).

1687-4137 © 2018 Annals of Pediatric Surgery DOI: 10.1097/01.XPS.0000546336.13967.0c

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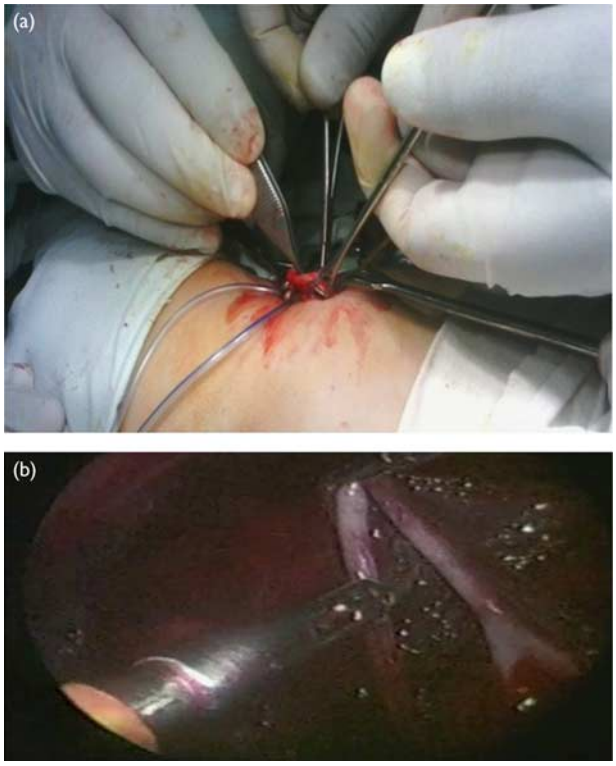
**Fig. 1**

Gerota's fascia encountered and opened longitudinally, exposure of renal pelvis and upper ureter.

**Fig. 2**




(a, b) Technique of open dismembered pyeloplasty.

Exposure to the UPJ is attained. The renal pelvis is dissected free of the surrounding peripelvic tissue (Fig. 1). The UPJ itself is excised; the proximal ureter is spatulated on its lateral aspect. The apex of this lateral spatulated aspect of the ureter was brought to the inferior border of the pelvis while the medial side of the ureter was brought to the superior edge of the pelvis. The anastomosis was performed with 5/0 suture size running absorbable sutures placed full thickness through the ureteral and renal pelvis walls in a watertight manner (Fig. 2). Thereafter, an indwelling ureteral stent was left and a nephrostomy catheter was inserted (Fig. 2). The stent was removed 4 weeks later. The nephrostomy catheter was removed on the 14th postoperative day. Before its removal, the nephrostomy enables us to monitor the flow control of the anastomosis by means of radiography contrast imaging.

### *Group B*

Surgery was performed with lumbar padding to hyperextend the trunk obliquely. Three ports were used in all children, a 5-mm umbilical camera port and 3-mm working ports along the anterior axillary line in the subcostal and iliac regions. The kidney was exposed after reflecting the colon medially. After complete laparoscopic mobilization of the UPJ (Fig. 3), the renal pelvis and the proximal ureter, a stitch was placed to hitch the redundant pelvis to the abdominal wall.

**Fig. 3**

Complete laparoscopic mobilization of the UPJ.

The UPJ was then easily exteriorized from the port site after 2 cm lateral extension of the wound (Fig. 4).

With loupe magnification, a formal dismembered Anderson–Hynes repair was then performed through the small incision using 5/0 polydioxanone. Antegrade stenting was performed after completing the posterior layer of the anastomosis, the new UPJ was dropped back into the peritoneal cavity and the wound was closed (Fig. 5).

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**Fig. 4**

Exteriorized UPJ from the port site after two cm lateral extension of wound.

**Fig. 5**


(a, b) Technique of (laparoscopic-assisted dismembered pyeloplasty). Arrow refers to ureteric and nephrostomy tube.

The study discussed and approved for clinical study by the ethical research committee of pediatric surgery department Al-Azhar University. ethical approval clearly explained to the patient's family, A written consent obtained before enrollment into study.

## Results

A total of 40 patients, aged 4 months to 3 years, underwent Anderson–Hynes dismembered pyeloplasty at the Pediatric Surgery Department (Al-Hussien and Sayed-Galal) Hospital, Al-Azhar University, between January 2013 and December 2017.

The left and the right sides were affected in four (10%) patients, and 36 patients were unilaterally affected (90%). Twelve patients were asymptomatic and diagnosed on routine antenatal ultrasound evaluation and 28 patients presented with an abdominal mass. The mean age of the patient was 18.40 months and ranged between 6 and 36 months. No significant difference was found in terms of preoperative features.

Postoperatively, there was a decrease in mean anteroposterior diameter, but without any significant difference between the two groups in preoperative parameters and postoperative anteroposterior pelvic diameter measured at the third and sixth months (Table 1).

There was a significant improvement in renal drainage in both groups. Although the postoperative parameters presented on the diethylene triamine pentacetic acid renography at the 12th month after surgery were better in group A, the difference between the groups was statistically insignificant ($P > 0.05$) (Fig. 6 and Table 2).

As regards secondary outcome, the operative time in LADP (group B) was shorter. The mean laparoscopic procdure time was 25 min. There was a slight relationship between age and operative time. Some operations take only 110 min. The operative time in group B ranged between 110 and 130 min. The mean operative time in group B was 120 min. Operative time in group A ranged between 140 and 160 min. The mean operative time in group A was 144.5 min.

Shorter operative time in group B was due to rapid laparoscopic access and less time consumed in wound opening and closure.

The postoperative analgesic requirement was minimal; cosmetic results and patient satisfaction were better in group B. The postoperative period was uneventful in all patients, and mean postoperative hospital stay was 3.2 days (range, 2–5 days) in group B. All children were active and feeding normally by the second day. None of the patients had any significant postoperative complications.

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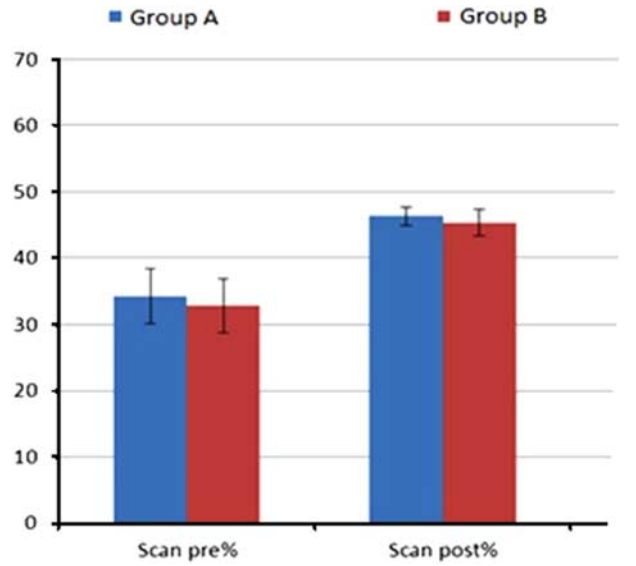
**Table 1 Differences between group A and group B as regards preoperative and postoperative APPD**

| | Group A (mean ± SD) | Group B (mean ± SD) | *t* test | |
|---|---|---|---|---|
| | | | *t* | *P* value |
| APPD preoperatively (mm) | 45.20 ± 3.22 | 42.60 ± 4.14 | 2.195 | 0.055 |
| APPD postoperatively at the 3rd month | 17.7 ± 1.8 | 16.20 ± 1.41 | −0.672 | 0.510 |
| APPD postoperatively at the 6th month | 10.6 ± 1.70 | 10.2 ± 1.61 | −1.411 | 0.162 |

No statistically significant differences.
APPD, antero-posterior pelvic diameter.

**Fig. 6**




Comparison between group A and group B as regard renal scan %. The difference between both groups was statistically insignificant.

**Table 2 Difference between group A and group B as regards renal scan %**

| | Group A (mean ± SD) | Group B (mean ± SD) | *t* test | |
|---|---|---|---|---|
| | | | *t* | *P* value |
| Scan preoperatively % | 35.20 ± 4.2 | 33.80 ± 4.09 | 0.755 | 0.454 |
| Scan postoperatively % | 47.00 ± 1.44 | 46.00 ± 2.10 | 1.289 | 0.214 |

No statistically significant differences.

## Discussion

The surgical management of the UPJO has undergone revolutionary changes over the past few years. Traditionally, open retroperitoneal dismembered reduction pyeloplasty has been considered as the treatment of choice for UPJO with high success rates of over 95% [3].

Laparoscopy has become the preferred means of management for many urologic diseases, and open surgical procedures are recognized as the gold standard of practice and are being replaced by techniques that promise not only equivalent success rates but also reduced postoperative pain and a shorter hospital stay [4].

Laparoscopic pyeloplasty in children is still in its infancy. Because of the difficulty of intracorporeal suturing and the lack of space within the intraperitoneal cavity in children, the procedure is difficult to learn and is time consuming [5]. After an initial experience, it was even suggested that the laparoscopic approach not be performed in children younger than 6 months of age [6]. Moreover, handling fine suture material with present day laparoscopic instruments is still cumbersome. As originally described by Lee *et al.* [7], exteriorizing the anastomosis in LADP helps to overcome these obstacles. The technique is similar to the exteriorization of the bowel used in gastrointestinal anastomosis during small bowel resection [8].

Much less mobilization is needed for bringing it out through the flank. Duration of surgery is much less than for a contemporary series of pediatric laparoscopic pyeloplasty. As this procedure does not involve intracorporeal suturing, the learning curve is definitely much shorter than for a complete laparoscopic pyeloplasty [9,10].

At the end of the procedure, the anatomic line and orientation of the new UPJ can always be confirmed by laparoscopic visualization; in the event of a significant twist or rotation, the anastomosis may be redone, although this was never necessary in this series. With greater experience, stents and drain tubes may even be avoided, as the anastomosis is a watertight mucosa-to-mucosa approximation, as in the standard open dismembered pyeloplasty. Postoperative morbidity and hospital stay are minimal, and the cosmesis is comparable to laparoscopic procedures. LADP thus has all the advantages of a minimally invasive procedure, while the repair is meticulous and follows all the principles of open pyeloplasty [2].

Sonographic imaging and diuretic renography are the most common follow-up tools used to assess the release of obstruction [11,12].

Tong *et al.* [13] published findings that supported our results; the mean incision length (2 cm) and postoperative hospital stay (2.5 vs. 5 days) were better in the LADP group than in the open group ($P < 0.01$), while the mean operative time was shorter in the open surgery than in the LADP group (95.4 vs. 102.6 min).

Definite functional improvement in the operated cases was seen in all cases in our series. These results are thus comparable to that of open surgery, which is widely accepted as the gold standard for treatment of UPJO; more pediatric surgeons are likely to enter the realm of minimally invasive renal reconstructive surgery. In this context, LADP may be easily performed by the pediatric surgeons with basic laparoscopic training while achieving postoperative results that are equivalent to open or laparoscopic surgery performed by experts!

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## Conclusion

Laparoscopic reconstructive procedures in children are technically demanding. However, LADP is a hybrid technique that does not require advanced laparoscopic skills and yet has all the advantages of a minimally invasive surgery.

### Conflicts of interest

There are no conflicts of interest.

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