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# Transperitoneal versus retroperitoneal laparoscopic pyeloplasty in children: Randomized clinical trial

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## Summary

### Introduction

Laparoscopic pyeloplasty achieves good cosmetic and functional outcomes. Both transperitoneal and retroperitoneal approaches are used. No single study to date has compared the two approaches in a prospective randomized design.

### Objective

We present a prospective randomized comparison between both approaches in children in a trial to define which technique is better with regard to multiple factors including operative time, hospital stay, recovery of bowel movement, analgesic requirement and complication rate.

### Study design

In the period from June 2010 to September 2012, 38 children (25 boys and 13 girls) were operated laparoscopically. Children were randomized into Group I (19 children) operated by the transperitoneal approach, and Group II (19 children) operated by the retroperitoneal approach. Both groups were compared as regards to the operative time, anesthetic changes, and postoperative recovery.

A minimum sample size required was calculated to be 19 for each arm based on previous studies of laparoscopic pyeloplasty, using a mean difference in operative time = 40 min, effect size = 0.95, an alpha of 0.05 and power 80% and an online sample size calculator. Statistical analysis was performed using SPSS software using the Fischer exact test, chi square test and Mann–Whitney U test. The operative time was the primary endpoint for comparison between both approaches.

## Results

	Median age (years)	Median operative time (minutes)	Median hospital stay (hours)	Start oral feeding (hours)
Transperitoneal	6	150	48	16
Retroperitoneal	5	129	24	10
P value	0.437	0.010	0.002	0.000

## Discussion

Our series is the first in the literature that compares in a prospective randomized design the

transperitoneal and retroperitoneal laparoscopic pyeloplasty in children. Shouma et al. is the only prospective randomized study to compare both techniques in adult pyeloplasty. They had a significantly shorter operative time in the transperitoneal group however, the author in the discussion mentioned that he was at the start of the learning curve for retroperitoneoscopic pyeloplasty when he conducted his study, which affected the result of the operative time. Hence, as mentioned above, we stressed the importance of a single surgeon with adequate equal experience in both techniques.

The recovery of the intestinal motility and start of oral feeding were significantly faster in the retroperitoneal group compared to the transperitoneal group. In our opinion this can be explained by the absence of intraperitoneal manipulations and urine leakage in the peritoneal space. In their series of retroperitoneal pyeloplasty, El Ghoneimi et al. reported feeding after a mean of 1.4 days, however, in our series there was even earlier oral feeding. Shouma et al. reported no significant difference in the start of oral feeding in their adult series.

The limitations of our study are: the choice of the 40 min difference created a statistically significant difference in operative time between the groups which might not be considered a truly clinically important difference. In addition, the single author operating for both approaches, which might create a bias, however the author has sufficient experience in both approaches. Moreover, although there were significant differences in hospital stay and intestinal movement between the two groups, it is not clear if these were of clinical significance.

## Conclusion

Both transperitoneal and retroperitoneal approaches have high success rate. The shorter operative time,

shorter hospital stay, rapid recovery of intestinal movement and early resumption of oral feeding are in favor with the retroperitoneal approach.

## Introduction

Laparoscopic pyeloplasty achieves equal success rates to open pyeloplasty with regard to minimal morbidity, rapid recovery, and better cosmesis [1]. Both transperitoneal and retroperitoneal approaches are used with equal success rates [2–4]. However, there is a lack of randomized studies with a prospective design comparing the two approaches [5]. The present study was a prospective, randomized trial comparing the two approaches in children to test if the retroperitoneal approach, compared to the transperitoneal approach, has a shorter operative time, a more rapid recovery of intestinal movement, a shorter length of hospital stay and a comparable overall success rate.

## Materials and methods

In the present, prospective randomized study, 38 children aged 2 years or older (25 boys, 13 girls) were enrolled between June 2010 and September 2012. Approval was obtained from the University of Alexandria's ethical committee and parental informed consent was received. Children were randomized using closed envelope randomization into two equal arms: transperitoneal approach and retroperitoneal approach.

Malrotated kidneys, renal fusion anomalies and redo cases were excluded from the study. A stented dismembered pyeloplasty was performed on all of the children by the same surgeon (first surgeon). Anterior transposition of the UPJ was performed in the presence of a crossing vessel. Follow-up was undertaken every 3 months by ultrasound, and DTPA renogram in persistent hydronephrosis.

A standard anesthesia protocol was used in all children as follows: all children received premedication; midazolam at a dose of 0.05 mg/kg bodyweight through an intravenous catheter; propofol at a dose of 2.0–2.5 mg/kg bodyweight; a muscle relaxant in the form of cisatracurium at a dose of 0.15 mg/kg bodyweight; and analgesia in the form of fentanyl at a dose of 2.0 Ugm/kg bodyweight.

All children were mechanically ventilated after insertion of an appropriately sized endotracheal tube. A nasogastric tube was inserted, and intraoperative monitoring was performed with a pulse oximeter, non-invasive blood pressure monitor, and an electrocardiogram; end tidal carbon dioxide (ETCO<sub>2</sub>) was monitored through a capnogram. In both approaches, the children were positioned in the lateral flank position.

In the transperitoneal group, open access was established through the umbilicus; a 5-mm port was inserted and insufflation was maintained at 12 mmHg, then two 3-mm trocars were inserted under vision, one midway between the anterior superior iliac spine and the umbilicus, and the other midway between the xiphisternum and the umbilicus.

In the retroperitoneal group, open access was established by a 0.5–1.0 cm incision in the midaxillary line below the last rib; gerota fascia was grasped and opened under vision; a 5-mm trocar was inserted and secured in place by a stitch in the sheath; insufflation was maintained at a pressure of 12 mm Hg; then, two 3-mm trocars were inserted, one in the costovertebral angle and the other in the anterior axillary line one finger above the iliac crest.

In both approaches, the basic principles of pyeloplasty were followed: dismembering of the UPJ, trimming of the renal pelvis, spatulation of the ureter after excision of the aperistalsis segment, anastomosis of the ureter to the pelvis by a 6/0 vicryl suture, and antegrade insertion of the double J (DJ) in all cases. The drain was left inside, through one of the ports, until it stopped leaking urine.

Both groups were compared regarding the following intraoperative anesthetic changes: heart rate, blood pressure, ETCO<sub>2</sub> changes, PH changes, O<sub>2</sub> saturation, and urine output. The operative time was calculated from the insertion of the first optic trocar until the end of the procedure. The recovery of bowel movement and toleration of oral feeding were compared in the two arms. Length of hospital stay (in hours) was calculated from the day of admission until discharge. Intraoperative and postoperative complications, as well as overall success rates (disappearance of the symptoms, regression of hydronephrosis, and increase in the renal parenchyma) in the follow-up period were also noted. Complications were reported according to the Clavien-Dindo classification system [6].

On the first operative day, an anesthetist assessed postoperative pain and analgesia every 4 h, and on the second day this was assessed every 6 h. Analgesia was established by giving all children paracetamol (Perfalgan) 15 mg/kg every 6 h, plus rescue analgesia in the form of the non-steroidal anti-inflammatory drug (NSAIDs) diclofenac sodium in a dose of 0.5–1.5 mg/kg every 8 h. Pain was assessed according to the pain score (Visual Analogue Scale in children older than 6 years and the Face, Legs, Activity, Cry, Consolability scale (FLACC) for younger children. Opioid analgesia was not required for any of the children.

Based on previous studies of transperitoneal and retroperitoneal laparoscopic pyeloplasty, a mean difference in operative time of 40 min, an effect size of 0.95, an alpha of 0.05 and power of 80% were used [7]. Using an online sample size calculator, statistical analysis was performed using SPSS software using the Fischer exact test, Chi-squared test and Mann–Whitney U test. The minimum sample size that was required was calculated to be 19 for each arm. The operative time was deemed to be the primary endpoint for comparison between both approaches.

## Results

The two groups were comparable, with no significant differences between them for the mean age, weight, gender distribution and clinical presentation (Table 1). There was no significant difference between the two groups concerning the intraoperative anesthetic changes and urine output (as shown in the Supplementary Data). There were no significant differences in the amount of rescue NSAIDs analgesia used in the first and second postoperative days between the two groups (Table 2).

The retroperitonoscopic approach was significantly shorter in operative time than the transperitoneal approach ( $P = 0.010$ ) (Table 3). The presence or absence of crossing vessels did not significantly affect the operative time, regardless of the approach utilized ( $P = 0.961$ ) (Table 3). The length of hospital stay was significantly shorter in the retroperitonoscopic group than the transperitoneal group

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