

## 31.1 Indications for Laparoscopic Approach to Ureteropelvic Junction Obstruction

Pyeloplasty is indicated in children with ureteropelvic junction obstruction, which is the most common cause of pediatric hydronephrosis. The etiology includes intrinsic obstruction due to stenosis of the pyeloureteric junction (scarring, hypoplasia) or secondary causes like aberrant lower pole vessels or kidney abnormalities (horseshoe, pelvic or duplex kidney). Symptomatic patients (pain, urinary tract infections), those with impaired renal function (<40%), serial loss in split function >10% or obstructive pattern on diuretic renograms require surgical intervention. The indications for laparoscopic pyeloplasty are the same as for the open approach. Several published studies comparing laparoscopic and open techniques suggest a shorter length of hospital stay [1–4], lower analgesia requirement [4, 5] and an equivalent success and complication rate [1, 3–6]. The laparoscopic approach is even viable for redo pyeloplasty [7].

## 31.2 Preoperative Workup and Considerations

Hydronephrosis is typically seen on prenatal ultrasound and confirmed postnatally. Especially in older children, evaluation of intermittent flank pain or urinary tract infection may reveal ureteropelvic junction obstruction. Mercaptoacetyltriglycine

**Supplementary Information** The online version contains supplementary material available at [https://doi.org/10.1007/978-3-030-58043-8\\_31](https://doi.org/10.1007/978-3-030-58043-8_31). The videos can be accessed individually by clicking the DOI link in the accompanying figure caption or by scanning this link with the SN More Media App.

G. Goetz · I. Martynov (✉) · M. Lacher  
Department of Pediatric Surgery, University Hospital of Leipzig,  
Leipzig, Germany  
e-mail: [illya.martynov@medizin.uni-leipzig.de](mailto:illya.martynov@medizin.uni-leipzig.de)

(MAG3) diuretic renography is needed in most cases to assess kidney function and diagnose those with functional significant obstruction. Preoperative enema and a Foley catheter to empty the bladder facilitate the intraoperative working space. Another advantage of the urinary catheter is to confirm the regular placement of the intraoperatively inserted double-J ureteric stent after filling the bladder with blue dye. Administration of perioperative antibiotics is warranted.

## 31.3 Anesthetic Considerations

Laparoscopic pyeloplasty is performed under general endotracheal anesthesia. A nasogastric tube should be in place for the duration of the procedure and removed afterward. Two peripheral intravenous catheters are sufficient without any need for central venous line. Relevant blood loss is not expected. Especially in infants prevention of hypothermia has to be addressed.

## 31.4 Operative Technique

### 31.4.1 Equipment

- 5 or 10 mm optical trocar (preferable balloon trocars)
- 5 or 10 mm 30° laparoscope
- 3 or 5 mm Maryland dissector
- 3 or 5 mm atraumatic grasper
- 3 or 5 mm needle holder
- 3 or 5 mm Metzenbaum scissors
- 3 or 5 mm hook monopolar cautery (grounding pad)
- Non-absorbable 4-0 polypropylene suture (to suspend the pylon)
- 5-0 or 4-0 braided polyglactin sutures (for the anastomosis)
- Double-J ureteric catheter

- Peel-away introducer set (for placement of ureteric catheter)
- Blue dye (for bladder filling)

### 31.4.2 Positioning

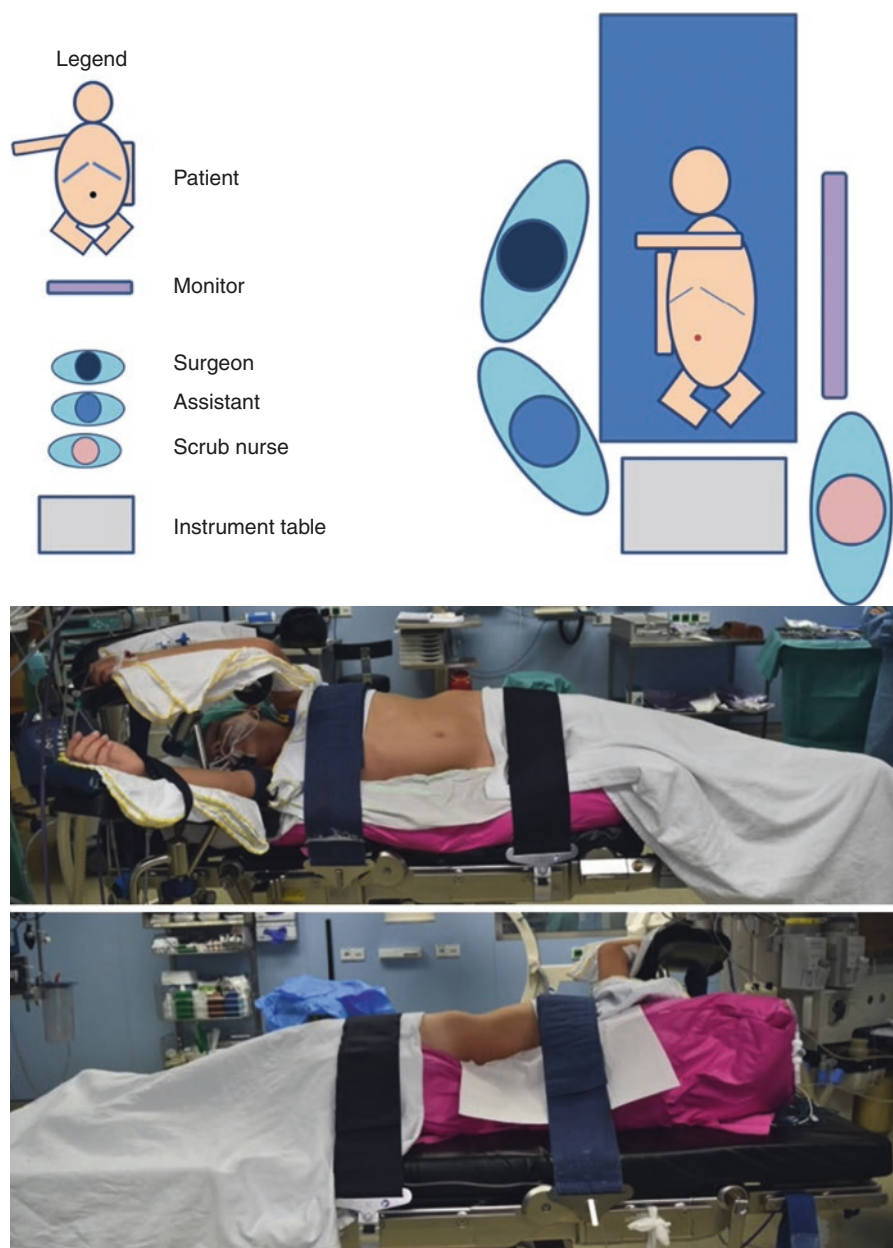
Half-supine ( $45^\circ$ ) positioning on a vacuum mattress with the patient placed at the contralateral rim of the table. Thus, the ipsilateral side is elevated and by further tilting the table to the contralateral side, an excellent intraoperative exposure is achieved. The patient should be secured by tape to the bed to allow safe tilting of the table to the contralateral side during the procedure. The contralateral arm is tucked to the side and

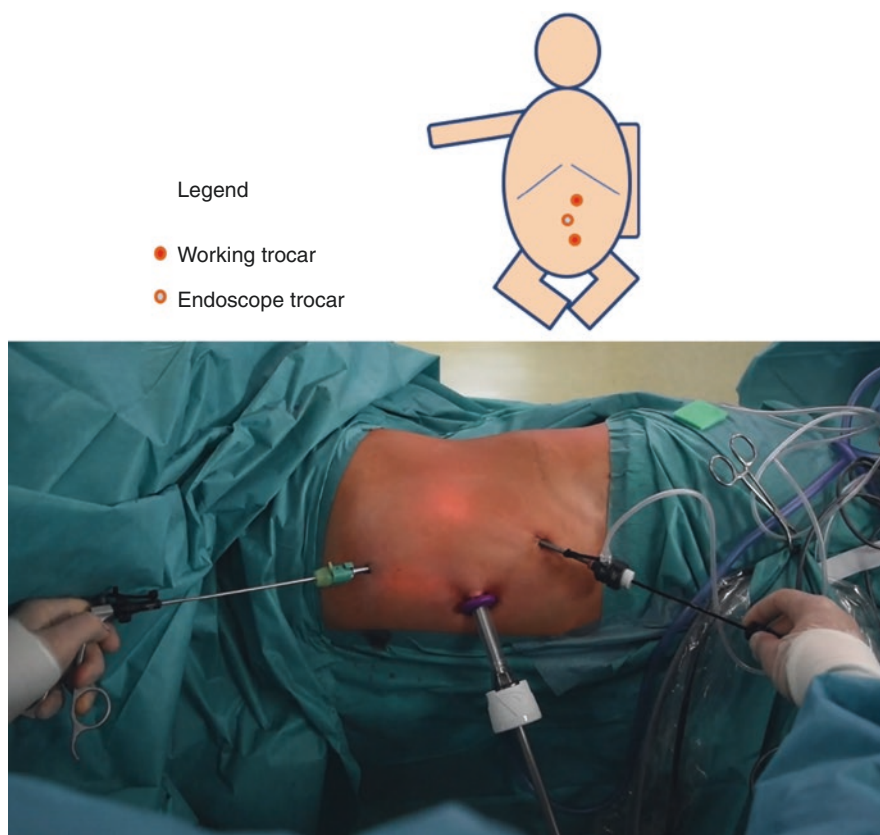
the ipsilateral one in  $90^\circ$  above the head without stretching of the brachial plexus. The surgeon stands on the contralateral side while the first assistant (camera holder) sits next to him. The scrub nurse stands on the ipsilateral side. The monitor is placed ipsilaterally. The abdomen and flank is prepped and draped from the nipples to the symphysis (Fig. 31.1).

### 31.4.3 Trocar Placement

A 5 or 10 mm optical trocar is introduced through the umbilicus and capnoperitoneum is established (pressure 8–10 mmHg, flow 4 l/min—depending on the patient age). The  $30^\circ$  scope is introduced and further trocars are placed

**Fig. 31.1** Positioning of patient, surgeons and monitors

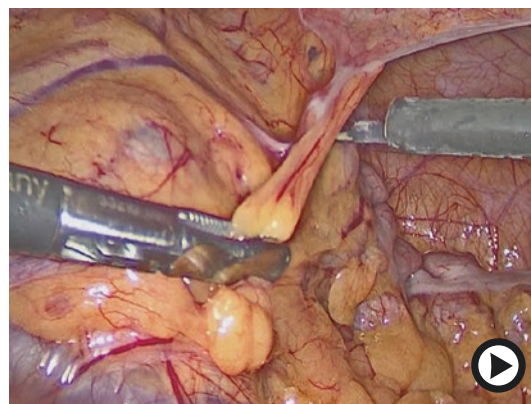


**Fig. 31.2** Trocars in place

under direct vision. One 3 or 5 mm trocar in the epigastrium and one 3 or 5 mm trocar in the lower ipsilateral quadrant, avoiding the epigastric vessels. Thus, a triangular working access to the ipsilateral kidney is achieved (Fig. 31.2).

#### 31.4.4 Operative Milestones

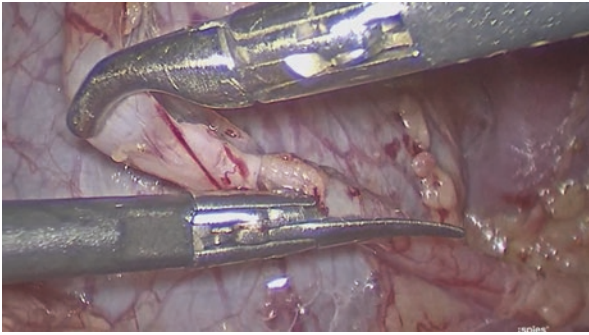
After placement of the trocars, the table is maximally tilted to the contralateral side to allow the small intestine moving away from the operating field. The ascending or descending colon is pulled medially by an atraumatic grasper and the parietal peritoneum is incised laterally with the monopolar hook cautery. After full mobilization of the colon (Milestone 31.1), the Gerota fascia with the underlying kidney is identified. In most cases the dilated pylon is already seen through the fascia. Then, the pylon is grasped and after further mobilization suspended to the abdominal wall with 1–2 percutaneous 4.0 polypropylene sutures on a large needle. The ureteropelvic junction is dissected (Milestone 31.2) and a possible aberrant lower-pole vessel is identified. It is important to dissect the proximal ureter only as far as necessary in order to respect the blood supply. In cases with an aberrant vessel, the ureter has to be completely mobilized behind the vessel. Then the ureter is grasped at the site of the stenosis and twisted medially,



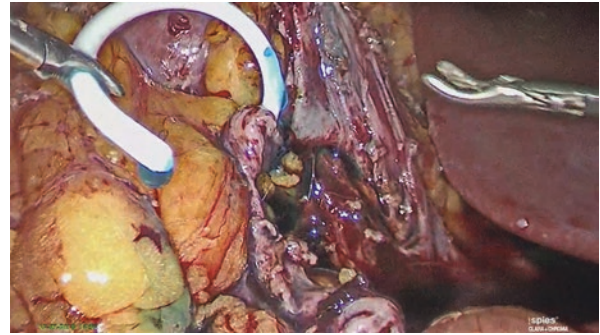
**Milestone 31.1** Mobilization of the colon (Video 31.1 Lap pyeloplasty). (► <https://doi.org/10.1007/000-2vt>)



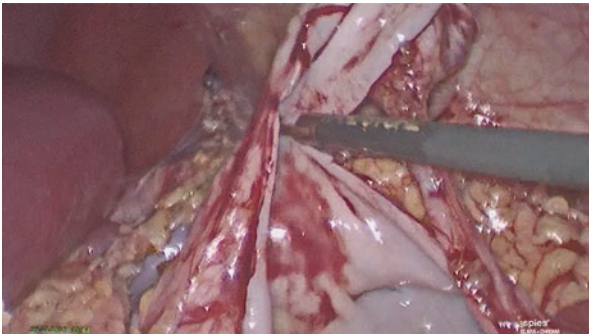
**Milestone 31.2** Dissection of the pyeloureteral junction



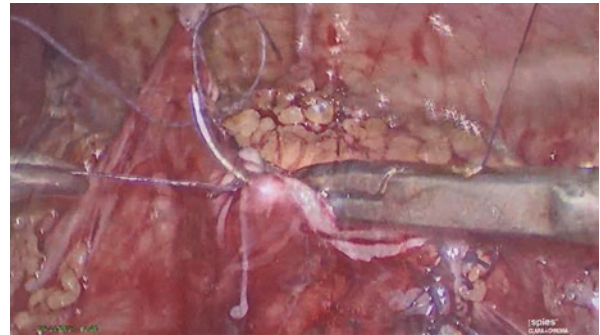
**Milestone 31.3** Spatulation of the ureter



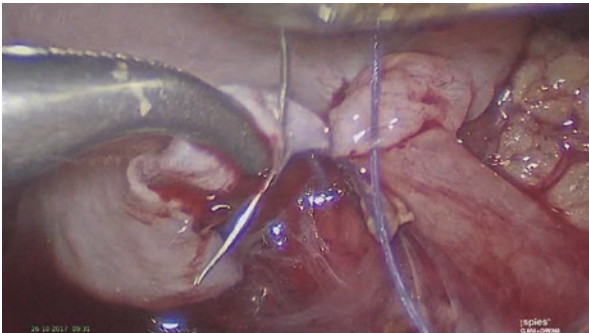
**Milestone 31.6** Placement of ureteric catheter



**Milestone 31.4** Resection of the pyelon



**Milestone 31.7** Completion of the anastomosis



**Milestone 31.5** Suturing the back wall of the anastomosis

allowing a half-diameter incision laterodorsal with the hook scissors. Now, one branch of the Metzenbaum scissors is inserted in the ureteric lumen and sufficient spatulation is performed (Milestone 31.3). After incision of the pyelon, a sucker is inserted to evacuate the pyelon. The incision is circumferentially completed with partial resection of the dilated pyelon (Milestone 31.4). Careful atten-

tion has to be paid to preserve the renal calices. In cases with an aberrant lower-pole vessel, the resected pyelon and proximal ureter are retracted under the vessels and placed anteriorly for the anastomosis. After ureteric transposition the posterior wall of the anastomosis is sutured with interrupted 5-0 or 4-0 braided polyglactin sutures at the lowest point of the pyelon (Milestone 31.5). The knots are tied extraluminally. A double-J ureteric catheter is inserted in an antegrade fashion over a guide wire, which is brought in via an introducer set and a stab incision in the upper quadrant (Milestone 31.6). Correct positioning of the distal catheter tip in the bladder is confirmed by backflow of blue dye, which is instilled intravesically via the preoperatively inserted Foley. The proximal tip is placed into the pyelon, which is flushed with saline several times using the laparoscopic suction-irrigator in order to avoid any residual blood clots, which may obstruct the ureteric catheter postoperatively. The anterior wall of the anastomosis is completed by either interrupted or running sutures (Milestone 31.7). Finally, the capnoperitoneum is released, the trocars are removed and the insertion sites are closed.

### 31.5 Postoperative Care

The nasogastric tube and the Foley catheter are removed in the operating room. Oral feeds can be started on the same day. The patient is put on prophylactic antibiotics and oral analgetics. An immediate return to normal activities without restrictions is allowed. The correct position of the double-J catheter is confirmed by ultrasound. Discharge can take place upon complete mobilization. Postoperative complications comprise urinoma, catheter-related issues like dislocation or temporary obstruction and recurrent stenosis.

### 31.6 Pearls/Tips & Tricks

1. In cases of massively dilated small intestines, which can easily hinder intraoperative sight in small infants, repeated relaxation by anesthesia can improve vision.
2. In cases of dilated large intestine despite application of a preoperative enema, single puncture with a small needle through the abdomen is a safe and sufficient mean to evacuate the trapped air.
3. In order to define an appropriate spatulation of the ureter in small infants, the closed Metzenbaum scissors is inserted intraluminally to show the ureteric diameter.
4. Starting the anastomosis at the lowest point of the pylon prevents any windsock effect or postoperative kinking, which may require redo pyeloplasty.
5. Vigorous flushing of the opened pylon with normal saline before completing the anastomosis may avoid any postoperative catheter obstruction due to blood clots.
6. Attention should be paid regarding the adequate size of the ureteric double-J. Too thin catheters may tend to dislocate whereas a catheter of large diameter may cause some degree of anastomotic tension with possible hypoperfusion of the ureteric wall. Also, the correct length should be chosen according to the size of the patient.
7. The stenotic part of the ureter with adherent resected pylon serves as a useful handle while manipulating and suturing the spatulated ureter. The final tissue resection may be completed at the end.
8. Completing the anastomosis in a running fashion saves operating time. A barbed suture may be helpful.

### 31.7 Pitfalls & Ways to Avoid

1. To avoid recurrent stenosis it is important to capture mucosa (especially on the ureteric site) when suturing. If there remains any uncertainty, the stitch should be repeated.
2. A moderate dilated pylon may be difficult to identify and dissect. Additional intravenous administration of fluids and furosemide may help dissection of the pylon.
3. In some cases, the intraoperative vision is hindered by the colon. Complete mobilization of the colon up to the colonic flexure can facilitate colonic mobilization.
4. Placement of a double-J catheter can sometime cause difficulties. Alternatively, a transrenal/transcutaneous stent can be inserted from the inside-out by transrenal puncture using a specially constructed spear.

### References

1. Mei H, Pu J, Yang C, Zhang H, Zheng L, Tong Q. Laparoscopic versus open pyeloplasty for ureteropelvic junction obstruction in children: a systematic review and meta-analysis. *J Endourol.* 2011 May;25(5):727–36.
2. Dingemann J, Ure BM. Systematic review of level 1 evidence for laparoscopic pediatric surgery: do our procedures comply with the requirements of evidence-based medicine? *Eur J Pediatr Surg.* 2013 Dec;23(6):474–9.
3. Goetz G, Klora M, Zeidler J, Eberhard S, Bassler S, Mayer S, Gosemann JH, Lacher M. Surgery for pediatric ureteropelvic junction obstruction-comparison of outcomes in relation to surgical technique and operating discipline in Germany. *Eur J Pediatr Surg.* 2019 Feb;29(1):33–8.
4. Piaggio LA, Corbetta JP, Weller S, Dingevan RA, Duran V, Ruiz J, Comparative LJC. Prospective, case-control study of open versus laparoscopic pyeloplasty in children with ureteropelvic junction obstruction: long-term results. *Front Pediatr.* 2017 Feb 1;5:10.
5. Cundy TP, Harling L, Hughes-Hallett A, Mayer EK, Najmaldin AS, Athanasiou T, Yang GZ, Darzi A. Meta-analysis of robot-assisted vs conventional laparoscopic and open pyeloplasty in children. *BJU Int.* 2014 Oct;114(4):582–94.
6. Chan YY, Durbin-Johnson B, Sturm RM, Kurzrock EA. Outcomes after pediatric open, laparoscopic, and robotic pyeloplasty at academic institutions. *J Pediatr Urol.* 2017 Feb;13(1):49.e1–6.
7. Abdel-Karim AM, Fahmy A, Moussa A, Rashad H, Elbadry M, Badawy H, Hammady A. Laparoscopic pyeloplasty versus open pyeloplasty for recurrent ureteropelvic junction obstruction in children. *J Pediatr Urol.* 2016 Dec;12(6):401.e1–6.