



# Laparoscopic Management of Intrinsic Ureteropelvic Junction Obstruction (UPJO)

# 51

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## 51.1 Introduction

Ureteropelvic junction obstruction (UPJO) is the most common cause of hydronephrosis in infants and children. Since Anderson and Hynes described their technique of open dismembered pyeloplasty through a retroperitoneal approach, this has been considered the gold standard in surgical care for UPJO. When in 1995 Peters reported on the first pediatric laparoscopic pyeloplasty, a new era for laparoscopy in pediatric urology began. For the first time reconstructive surgery on the upper urinary tract was hereby implemented. Meanwhile pyeloplasty in children either by a laparoscopic or a retroperitoneoscopic approach has become an established technique to operate on UPJO in infants and children. The aim is to propose practical clinical guidelines for the current gold standard of laparoscopic dismembered pyeloplasty.

## 51.2 Current Status and General Aspects of Laparoscopic Dismembered Pyeloplasty

Meanwhile advantages of laparoscopic upper urinary tract surgery in children and infants are widely acknowledged as well as accepted. Compared to

the former gold standard of open pyeloplasty [1], the minimally invasive approach offers a superior cosmesis, while functional results proved to be at least equal both in children and infants. The length of hospitalization could be decreased, and there might be additional advantages such as less post-operative pain (nn). Apart from those issues, laparoscopic dismembered pyeloplasty offers superior visualization of the anatomy, accurate anastomotic suturing, and thus precise reconstruction of the UPJ which promises good functional results. Therefore laparoscopic transperitoneal dismembered pyeloplasty can be considered as the gold standard for surgical treatment of intrinsic UPJO.

## 51.3 Indications for Surgery of Intrinsic UPJO

Intrinsic UPJO is defined as a defect of the smooth muscle of the ureter, consecutively leading to an obstruction of the UPJ. Indication for surgery is given when:

- Differential renal function (DRF) of the affected side below 40%
- Decrease of DRF, documented in more than just one examination, such as a renal scintigram or a MRI, respectively
- Relevant urodynamic obstruction in renal scintigram or MRI, respectively
- Recurrent urinary tract infection (UTI) and/or pyelonephritis

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- Subjective patient complaints, such as flank pain
- Special anatomical condition such as horseshoe kidney along with obstruction

The aim of surgery is to maintain DRF and to improve urinary drainage.

## 51.4 Preoperative Diagnostic Work-Up

Preoperative diagnostic work-up includes:

- Ultrasound
- Diuretic renal scintigram
- MRI

To indicate an intravenous pyelography is meanwhile obsolete and should be restricted to very rare and complex indications only.

## 51.5 Preoperative Preparation

Informed consent is obtained from all patients or their parents, respectively, prior to surgery. General anesthesia with muscle relaxation is provided. A Foley catheter is inserted in order to control urinary drainage as well as provide an empty bladder during laparoscopy for improved working space and view. Perioperative single-shot antibiotic therapy is administered according to the weight of the patient and to local preferences, respectively. The patient is prepped and placed according to local standards and following the rules of asepsis.

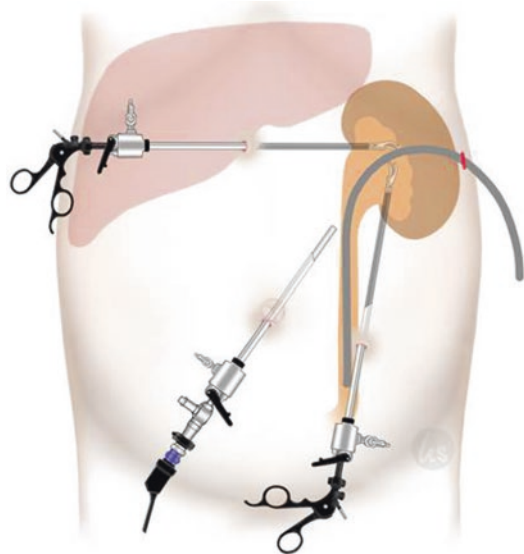
## 51.6 Positioning and Ergonomics

The patient is placed in supine position. The flank of the affected side to operate on is slightly elevated with a gel pad or similar. According to the specific operating theater specification and setup, respectively, the screen is positioned on the side of the patient who will be operated on in order to provide the surgeon with a view in direction to

the operating field. Additional monitors are placed meaningfully around the patient to facilitate view for the assistant surgeon, scrub nurses, anesthetists, and others, respectively. To provide an ergonomic posture for the surgeon, the monitors may be positioned rather low, so that the surgeon is more looking downward such as in an open procedure. Surgeon's position is on the opposite side of the patient, while the assistant surgeon driving the camera is standing or rather seated on the same side, with both the surgeons looking in direction to the side of the operating field. The scrub nurse is standing across at the patient's opposite side.

## 51.7 Instrumentation

The conventional approach for laparoscopic pyeloplasty is a three-trocar access to the abdomen, with one 5 mm trocar at the umbilicus as for a 5 mm scope, as well as 2–3 mm working ports in the upper and lower abdomen of the affected side, respectively. As in general triangulation should be the goal with respect to the renal pelvis to operate on (see Fig. 51.1).



**Fig. 51.1** Trocar sites for laparoscopic transperitoneal pyeloplasty (left-sided)

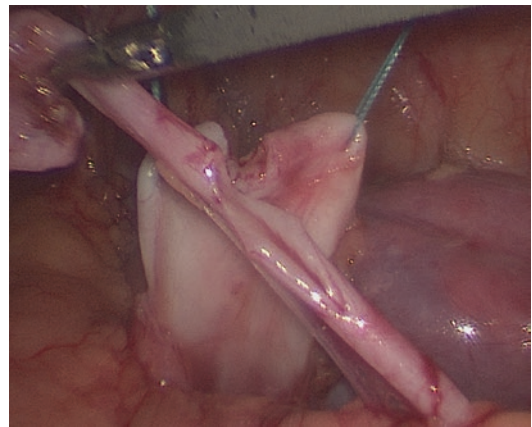
## 51.8 Technique

Surgical steps of laparoscopic transperitoneal pyeloplasty are defined as gaining access to the affected kidney, either through a retro-colonic or a trans-mesocolic access to Gerota's fascia. Following the incision of the fascia as well as of the fatty capsule of the kidney, a blunt/sharp dissection leading to the pyelon is carried out. When the pyelon becomes visible and is identified a direct attempt should be made to grasp it and then further dissect it out, again using a blunt and/or sharp technique with electrocautery, scissors, harmonic or similar devices respectively. When the renal pelvis has been sufficiently exposed, thus the UPJ has also been dissected out, two transabdominal hitching sutures will help to expose the pyelon in order to perform the resection of the UPJ. Those should be placed with care, safely sparing the renal hilar vessels, and the caudal one placed behind the UPJ, so the resection of the UPJ can be carried out in front of the hitching suture (see Fig. 51.2).

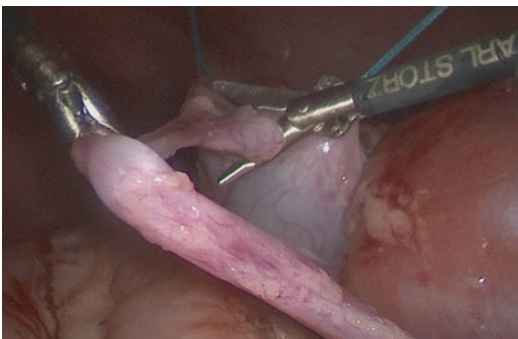
Following the resection of the UPJ, the ureter now is incised but not cut completely at a level safe below the UPJ and then spatulated on his lateral aspect in order to provide a sufficient length of ureteral wall for achieving a wide side-to-side anastomosis (see Fig. 51.3).

The idea behind leaving the resected part of the pyelon, UPJ, and proximal ureter, respectively, in place and not cutting them off completely is that this tissue may provide as a "handlebar" during the following suturing pro-

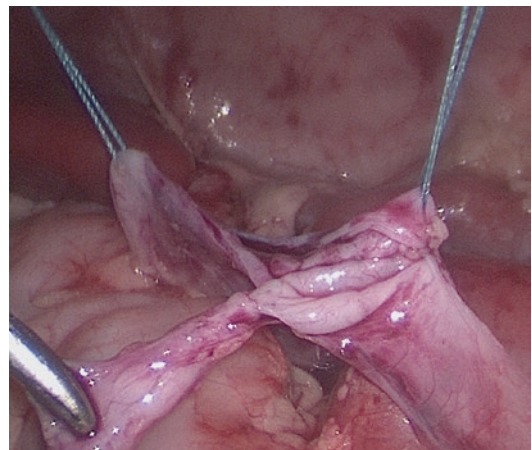
cess to achieve the anastomosis (see Fig. 51.4). Thus the ureteral tissue does not have to be grabbed and compromised by instrument manipulation. A side-to-side anastomosis is then carried out, starting with the back side. The anastomosis can be performed with either a single interrupted technique or a running suture as well. The single interrupted sutures will offer more safety in achieving a watertight anastomosis and may be more tissue-sparing as well. The running suture may allow a rather time-saving technique however requires constantly the application of tension to the thread in order to avoid loosening which might be the cause for urinary leakage later. Meanwhile



**Fig. 51.3** Aspect of the incised and spatulated ureter



**Fig. 51.2** Resection of UPJ, facilitated through two transabdominal hitching sutures



**Fig. 51.4** Using the resected part of the UPJ as a "handlebar" to drive the tissue during suturing

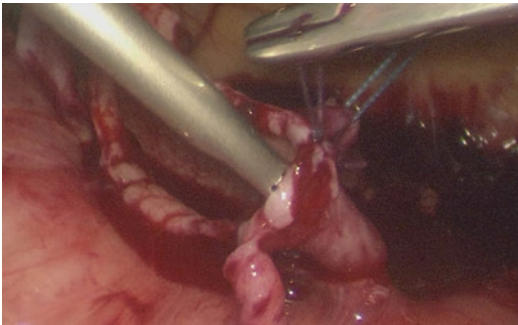
barbed sutures are available down to metric sizes of 4/0 that may facilitate performing a running suture in this setting. Otherwise we prefer to use braided sutures in sizes of 6/0 for infants and 5/0 for older patients. An inverting technique of suturing is recommended to avoid any suturing material to be exposed to intraluminal as this might cause crystallization at the thread with consecutive bacterial colonization. After completion of the back side, the patency of the anastomosis should be checked, before continuing the anastomosis of the front side (see Fig. 51.5).

When the front side of the anastomosis has been completed in the same fashion (see Fig. 51.6), the remaining open pyelon can be closed again using a running suture or “Z-type” single interrupted sutures. The final aspect should be confirming a wide side-to-side anastomosis with a newly created patent UPJ.

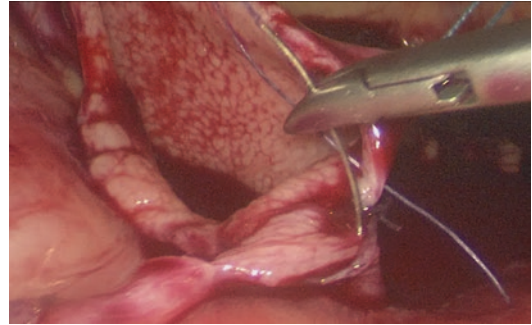
There is some ongoing discussion whether to stent the anastomosis and what kind of stent to use. We prefer using a transabdominal, trans-anastomotic stent technique. A 6-8 F stent is brought into the abdomen using a curved (custom-made) spear and then brought through the open pyelon and through an identified calyx, respectively, while puncturing the renal parenchyma brought out again through the abdominal wall laterally. The tip of the catheter is then pulled into the abdomen and finally is then introduced into the distal ureter. This allows an atraumatic technique that does not require a second general anesthesia to remove the stent like with the use of any kind of double-J stents (see Fig. 51.7).

Other techniques include double-J stents, percutaneous nephrostomy stents, and others.

Following the completion of the pyeloplasty, the hitching sutures are removed, the kidney is repositioned, and the eventually mobilized bowel



**Fig. 51.5** Checking the patency of the anastomosis after completion of the back wall



**Fig. 51.6** Single interrupted suture of the front side anastomosis, using the resected UPJ as a “handlebar”



**Fig. 51.7** Placement of a transabdominal, trans-anastomotic ureteral stent [2]

is brought back to its original position. In a regular case, an additional drainage will not be required. The specimen of the resected pylon and UPJ, respectively, is removed from the abdomen along with one of the working ports.

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## 51.9 Postoperative Care

Antibiotic treatment is administered according to local guidelines; however, it may be adapted with regard to intraoperative findings. Oral feeding may be allowed the same day. The use of analgesics for postoperative pain control should be liberal and in general following international recommendations such as the WHO “Treatment Guidelines on Pain,” adapted to local requirements and guidelines. Patients can be discharged theoretically on day 1 or 2, respectively; however we tend to leave the trans-anastomotic stent for 7 days while the patient stays in the hospital. The question whether to put a stent in and if so how long those should stay remains to the preference of the surgeon as there is so far no evidence in favor for one of the mentioned methods.

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## 51.10 Discussion

Laparoscopic dismembered pyeloplasty has evolved to become the gold standard for the surgical treatment of intrinsic UPJO since a surgical first in 1995 by Craig Peters [1]. It has been proven to be safe, effective, and associated with a low complication rate with excellent functional results [3–10]. This is obviously also true for recurrent UPJO [11, 12]. Laparoscopic dismembered pyeloplasty on the same hand offers low morbidity due to the reduced surgical trauma, superior cosmesis, fast recovery, and quick return to daily and social activities. It has been therefore surpassed open pyeloplasty in many centers as the gold standard surgical management for UPJO.

Compared to open surgery, there have been implications coming along with minimally

invasive approach techniques. The most remarkable one is probably the less reduction of the renal pelvis as compared to the original technique described by Anderson and Hynes. However different authors considered a less reductive resection of the renal pelvis not to be determinative in terms of the functional result [13, 14]. Whether to use running or single interrupted sutures, respectively, remains to the preference of the surgeon. There might be some higher surgical efficiency with the running suture method [15]. One striking advantage of transperitoneal laparoscopic pyeloplasty is that the approach is a standard procedure for many indications in both pediatric surgery and urology. In addition it is applicable also for children below 1 year of age. There is sufficient evidence in literature that also in infants laparoscopic dismembered pyeloplasty has been proven to be a safe procedure providing the same functional outcomes as the open approach [16–18]. In comparing laparoscopic multiport pyeloplasty with single-site approaches such as the trans-umbilical approach, it could be demonstrated that although the cosmetic result with the single-site approach is satisfactory, the multiport access did affect the shape of the umbilicus; thus the cosmetic result was considered to be better [19]. Multiple studies were aiming to describe differences in between open, laparoscopic, and robotic pyeloplasties, respectively [20, 21]. All of those demonstrate that patients undergoing robotic-assisted laparoscopic pyeloplasty had a shorter hospital stay and less request of pain medication; however, there could be no difference shown in the success rates for open, laparoscopic, and robotic-assisted laparoscopic pyeloplasty, respectively. In conclusion and with regard to a higher cost associated with robotic pyeloplasty thus making it less available to the majority of patient population, laparoscopic pyeloplasty considered to be equally effective as all other available techniques should be considered as the true technique of choice for surgical treatment of intrinsic UPJO in children and infants.

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