Chapter 4
Ureteropelvic Junction Obstruction

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Name of Procedure

Pyeloplasty.

Lay Description

Ureteropelvic junction obstruction is the most common cause of hydronephrosis in infants. It occurs in 1 in 500–1250 live births. It accounts for almost 50 % of neonatal hydronephrosis cases. It is a narrowing of the outlet from the renal pelvis, whether intrinsic or extrinsic, which prevents urine from emptying out of the kidney efficiently. The diagnosis is may be found on workup of prenatal diagnosis. In older children, symptoms may be what bring the diagnosis to light. Older children may present with episodic flank or abdominal pain and/or cyclical vomiting. Twenty-five percent of children may have hematuria. Some patient will present with hypertension, thought to be a renin-mediated hypertension [1].

A diuretic renogram is used to confirm the diagnosis of obstruction in almost all patients. In these cases, the patient is sometimes followed by serial ultrasounds to monitor for changes in the degree of hydronephrosis, to determine if findings on imaging are a clinically significant obstruction and if surgery is required. Surgery is performed in the setting of pain, infection, loss of renal function or worsening hydronephrosis.

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Intended Benefit

The goal of surgery is to remove the area of abnormal narrowing and improve drainage of urine out of the kidney. The ultimate goal is to avoid deterioration of renal function in the obstructed kidney. The success rate of correcting the obstruction, with pyeloplasty, is over 90 %, and as high as 98 %. Adult series have demonstrated persistent success of the surgery in 5–15 year follow-up studies.

Technique

There are multiple approaches that can be used to access the kidney and ureter. Once the abdomen is entered, the kidney is mobilized so that the renal pelvis and ureteropelvic junction is exposed. Care must be taken to look for a crossing lower pole vessel, which may be the cause of the obstruction, rather than an intrinsic narrowing of the ureter itself. The most commonly performed repair is a dismembered pyeloplasty. In this repair, the renal pelvis is opened and the apex of the future ureteropelvic junction marked with a stitch, which can also be used for traction. The pelvis is examined to ensure the new ureteropelvic junction will be in a dependent position, for optimal drainage of urine. The proximal ureter is then mobilized and the dysplastic segment excised sharply. The normal appearing ureter is then spatulated, to allow for a larger funnel when reconstructing the new ureteropelvic junction. The ureter and renal pelvis is then reapproximated in a running fashion or interrupted fashion with absorbable suture. Prior to completion of the closure, a ureteral stent of some form is placed, per surgeon preference. Sometimes a drain is placed around the ureteropelvic junction repair rather than in the repair. Again, this is by surgeon preference.

Comparisons comparing the safety and advantages of different approaches have been studied extensively. Varda et al. [2] examined outcomes and cost of open vs laparoscopic vs robotic approaches in pediatric pyeloplasties and found the difference in complication rates between the different surgical approaches was not statistically significant. There are differences in length of stay, need for analgesics postoperatively in the different modalities, with an advantage in the laparoscopic and robotic group. A 2011 meta-analysis [3] also demonstrated no difference in success rates, but confirmed an advantage of shorter hospital pain, decreased pain medication requirement with laparoscopic and robotic surgical approaches. Operative times have been shown to be lower with robot-assisted pyeloplasties when compared to standard laparoscopic pyeloplasties [4].

The use of internal vs external stenting has been reviewed extensively, without demonstration of superiority of one method over the other. Multiple studies have shown no difference in long-term outcome [5]. Lee et al. [6] demonstrated equal outcomes when using an internalized double-J stent and externalized nephroureteral drains. A 70 % higher rate of bacterial colonization with indwelling stents has been reported, with an associated increase in the risk of urinary tract. In unstented/perinephric drain group, a higher rate of urine leak and ileus was seen, although this did not quite reach statistical significance [7].

Postoperative Expected Course

The patient is typically admitted overnight, with an indwelling urethral Foley catheter, to maximize drainage of urine downstream. Pain management for the first night often involves intravenous medications, along with additional medications given for control of bladder spasms, from the Foley catheter and the ureteral stent, if present. If the patient is tolerating enteral nutrition and abdomen is not abnormally distended, the Foley catheter is removed the following day and the patient is instructed to urinate on a regular, scheduled basis. Medications to minimize bladder and ureteral spasms are continued, sometimes on a scheduled basis. The patient can often be discharged home the day after surgery, with a perinephric drain or ureteral stent/drain in place.

Follow Up

Depending upon the type of drainage placed during surgery, the patient will either follow-up in clinic or in the operating room. If there is a perinephric drain or a nephroureteral drain, both of which would come out through the skin near the incision, the patient would return to clinic in 7–14 days, per surgeon preference, for removal of the drain. An indwelling stent is often left in place for a longer period of time, often 4–6 weeks. Indwelling stents require another visit to the operating room, for cystoscopy and removal of the stent from inside of the bladder.

Once the drain is removed, the patient will follow-up in the next 6–12 weeks with a renal ultrasound, to assess for hydronephrosis. It is not unexpected for some degree of persistent hydronephrosis postoperatively. The patient will have repeat renal ultrasounds to monitor for improvement of hydronephrosis over time, and also to monitor for worsening of hydronephrosis, which may signify failure of the repair and recurrent ureteropelvic junction obstruction. Some surgeons will repeat a nuclear renogram to functionally evaluate the drainage from the kidney after the surgical repair, to confirm success or failure of the surgery.

Risks and Complications

Risks of surgery include urinary tract infection, urine leak, stent or drain migration, and failure of the repair leading to recurrent ureteropelvic junction obstruction. The majority of complications present themselves in the first year after surgery [8].

Early Complications

The most common early post op complications are: urinary tract infections that occur approximately 3 % of the time, wound infections that can occur in about 2 % of patients even when prophylactic antibiotics are used and finally urinary leaks which are seen in 3–8 % of patients, typically more common in patients who do not have a ureteric stent placed [8]. The majority of the urinary leaks can be managed with observation and urinary drainage either with a bladder catheter or a wound drain. In rare occasions it is necessary to place a ureteric stent or a nephrostomy to help with drainage. A quick diagnosis is imperative as a urinary leak if left can lead to fibrosis and consequently a higher rate of surgical failure with restenosis.

Recurrent Stricture/Obstruction 0.8–3 %

When recurrence is examined at 1 year postop, the rate has been reported at 0.8–1 % [9]. The rate of recurrent obstruction increases as follow-up is extended but remains low [10]. Presentation is most often worsening hydronephrosis on follow-up. However patient may present with pyelonephritis or abdominal pain.

One retrospective review with 14-year follow-up found that the long-term risk of recurrent obstruction after an initial postoperative normal diuretic renal scan was very small. Young age at initial surgery, prolonged urinary diversion and missed diagnoses at time of initial surgery (crossing vessel) have all been found to be significant risk factors contributing to failure of the first pyeloplasty [8]. Several studies have noted a slightly increased complication rate with the dorsal lumbotomy approach, which was often statistically significant [11].

Hypertension

A Korean study [12] with post-pubertal follow-up of patients who underwent pyeloplasty found a 12.7 % rate of hypertension. The mean time to diagnosis of hypertension was 15.7 years with the number of cases diagnosed peaking between 15 and 20 years of age. In this study, cases of hypertension were defined as requiring hypertension, with baseline elevated renin aldosterone levels, consistent with a hypertension of renovascular origin.

Management of Recurrent Ureteropelvic Junction Obstruction

Endopyelotomy

Success rates of retrograde endopyelotomy have been reported to be between 20 and 60 % [13]. Faeber et al. [14] had initially reported a success rate of 80 %, with an antegrade approach, attributed to their use of the cold knife for incising the stricture, rather than cautery. The Toronto group demonstrated a lower success rate, of 13–52 % [15]. They found that length of stricture was important in success with this approach. Strictures with a mean length of 5.8 mm were successful. Mean ureteral segment length of 10.1 mm was associated with failure with endopyelotomy. One single institution review found three out of ten patient who underwent secondary endopyelotomy ultimately required redo pyeloplasty [16]. The success rate with a redo pyeloplasty is undisputedly better. However endopyelotomy is a safe option and may be desired by some families as a first step, as it is less invasive.

Redo Pyeloplasty

Published studies on open redo pyeloplasties report success rates of 75–100 %. Review of outcomes in a single institution for failed pyeloplasties demonstrated much greater success with redo pyeloplasty (92 %) or ureterocalicostomy (100 %) compared to endopyelotomy (13–52 %) [15, 17]. There had been a 2.5–4.5 year interval between the initial pyeloplasty and the secondary procedure. Piaggio et al noted success with redo pyeloplasty using a laparoscopic approach [18]. Leung et al. [19] also found that a redo pyeloplasty was superior to endoscopic interventions. They performed the redo procedure open, laparoscopically and robotically. There were redo pyeloplasties that required a third pyeloplasty in this study, resulting in a lower success rate of 50 % in their pyeloplasty group. They had only a 25 % success rate with endoscopic intervention for a failed initial pyeloplasty.

When counseling families, it will be necessary to advise them of the difference in outcome with secondary procedures, if complications arise and further intervention is needed.

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