Case Report

Laparoscopic management of pelvi-ureteric junction obstruction caused by aberrant renal vessels in an adult

Chintan Sangoi[1], Prakashchandra Shetty[2], Abhijit Joshi[3]

From [1,3]Department of General and Laparoscopic Surgery, [2]Department of Urology, Dr. L H Hiranandani Hospital, Mumbai, Maharashtra, India

ABSTRACT

Pelvi-ureteric junction obstruction (PUJO) is not a rare clinical entity. It is indeed one of the common urological conditions presenting most commonly with hydronephrosis and pain. The most common etiology for patients suffering from acquired PUJO is the presence of calculus/calculi. An aberrant renal vessel (now termed as a vascular bar) is one of the causes in adults which are often missed on pre-operative investigations and is detected intraoperatively. We present herein the case of a 28 years old female who came with complaints of loin pain for 2 – 3 months. The workup investigations revealed only hydronephrosis without any calculi. Thus, a diagnosis of the primary PUJO was made. The patient was successfully managed by a laparoscopic pyeloplasty.

Key words: Aberrant renal vessel, Laparoscopic pyeloplasty, Pelvi-ureteric junction obstruction, Vascular bar

Pelvi-ureteric junction obstruction (PUJO) is a very common urological condition presenting most frequently with hydronephrosis and pain. The most common cause of acquired PUJO is the presence of calculus at the PUJ or upper part of the ureter. The other causative factors of PUJO are fibrosis, strictures, and rarely the presence of aberrant renal vessel/s. The patients with PUJO but with no obvious cause are labeled idiopathic. The new terminology used for the entity of an aberrant renal vessel crossing and obstructing the PUJ is "Vascular Bar" [1]. Approximately, one in seven neonates with antenatally detected hydronephrosis has PUJO, making PUJO one of the most common causes of congenital urinary tract obstruction, with an incidence of one in 1000 to one in 2000 live births. Interestingly, males are affected 3 times more frequently than females [2]. Intrinsic obstruction due to an adynamic stenotic segment at the PUJ is the most common etiology (75% of cases), with failure of peristalsis producing an incomplete, functional obstruction. Other causes include crossing vessels (20%), peripelvic fibrosis, abnormal ureteric insertion, fibroepithelial polyps, and anatomical variants, such as the retrocaval ureter, horseshoe, and duplex kidneys [2]. Although it is commoner in the pediatric population, it is also not rare in adults. The left side is affected twice as often as the right side [3].

CASE REPORT

A 27-year-old female patient presented to her family general practitioner (GP) with a history of intermittent dull aching right loin pain for 2–3 months. The pain was non-radiating and reportedly responded to analgesics, but only temporarily. There was no history of fever, hematuria, and burning micturition.

Her general condition was good and her vitals were stable. The per abdomen examination was normal. She was then subjected to investigations.

An ultrasonography (USG) scan of the abdomen revealed a right-sided hugely dilated renal pelvis without any obvious calculus. In view of the hydronephrosis noted on USG, an intravenous pyelography (IVP) was suggested by the GP. It revealed gross hydronephrosis of the right kidney with no excretion of contrast into the pelvis and ureter even in the delayed films (Fig. 1a). The patient was then referred to us for further management. We got her renal diethylenetriamine pentaacetate (DTPA) scan done and it revealed a right renal uptake of just 26%. She was then worked up for surgery-laparoscopic pyeloplasty (LP). All her routine investigations were within normal limits. Before inserting the scope, an ascending pyelogram was obtained which revealed a normal caliber ureter (Fig. 1b).

At laparoscopy, on mobilizing the PUJ, she was found to have aberrant renal vessels traversing and extrinsically compressing the PUJ (Fig. 1c). As expected, the renal pelvis was hugely dilated. After carefully dissecting the vessels off the PUJ, the PUJ was excised by transecting the upper ureter and the lower pelvis (Figs. 1d and 2a). The ureter was, then, splayed adequately thereby readying it for the anastomosis (Fig. 2b). The pelvis was, then, dissected and brought anterior to the aberrant vessel (Fig. 2c). The ureteropelvic anastomosis was, then, performed

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Correspondence to: Chintan Sangoi, Department of General and Laparoscopic Surgery, Dr. L H Hiranandani Hospital, Mumbai, Maharashtra, India. E-mail: dr.chintansangoi@gmail.com

using 3–0 Polydioxanone suture with simple interrupted stitches (Figs. 2d and 3a). On completing the posterior layer, a Double-J stent was inserted antegrade into the ureter and positioned optimally across the anastomosis (Fig. 3b). The anterior layer of sutures was then taken so as to complete the anastomosis (Fig. 3c and d). A 32-French Romson's tube drain was left *in situ* through the lowermost trocar site.

The patient had an uneventful post-operative recovery. The drain was removed and she was discharged on a post-operative day (POD) 3. On her POD 10 outpatient department visit, all her wounds had healed well. The D-J stent was cystoscopically retrieved after 3 weeks. A USG abdomen done 3 months after the stent removal revealed no increase in hydronephrosis as compared to the pre-operative scan. A DTPA scan done after 1 year revealed no significant holdup of the dye. The glomerular filtration rate (GFR) marginally increased from pre-operative 18 to 23. She was advised to get once annual repeat DTPA scans done for 2 more years, but was lost to follow-up. At the time of writing this paper, a telephonic interview was conducted with the patient 89 months after her surgery. She continues to be asymptomatic.

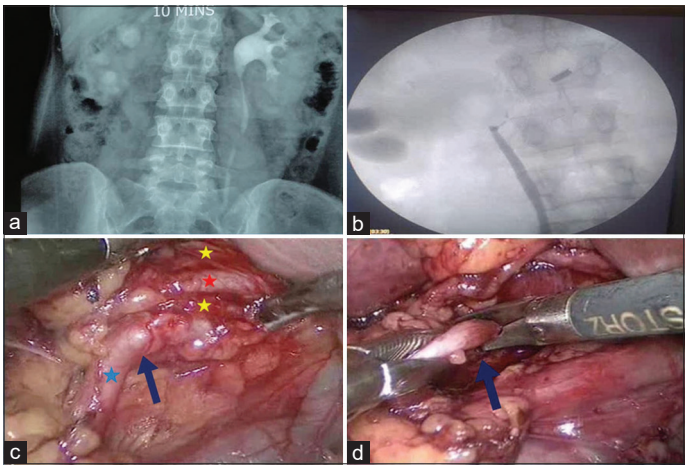

Figure 1: (a and b) Pre-operative tests. (c and d) Operative pics. (a) Pre-operative intravenous pyelogram showing grossly dilated right renal calyces with no excretion of contrast beyond; (b) intraoperative right ascending pyelogram showing normal caliber ureter with no distal obstruction; (c) anatomy after initial dissection shows aberrant vessel (red asterisk), dilated pelvis (yellow asterisks), PUJ (blue arrow) and normal ureter (blue asterisk); and (d) transection of ureter distal to the PUJ in progress (blue arrow)

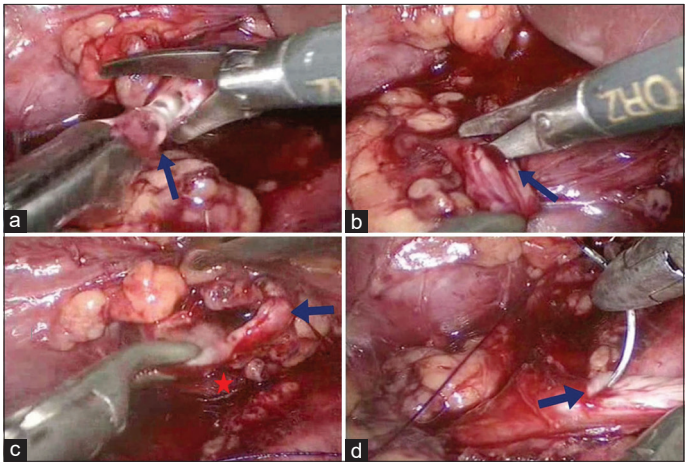

Figure 2: Operative pics. (a) Transection of pelvis proximal to the PUJ with gush of urine (blue arrow); (b) splaying of the ureter in progress (blue arrow); (c) dissection and mobilization of the proximal pelvis (blue arrow) anterior to the aberrant vessel (red asterisk); and (d) initiation of the anastomosis anterior to the aberrant vessel – 1st stitch being taken at the corner of the splayed ureter (blue arrow)

DISCUSSION

An aberrant renal vessel is one of the rarest causes of PUJO. A vessel crossing the PUJ is not really an aberrant or accessory vessel. It is actually a lower polar segmental artery. Hence, "aberrant vessel" is a misnomer and it's appropriate to call it a "vascular pedicle" [4].

The causes of PUJO can be divided into congenital and acquired causes. Congenital causes include ureteral hypoplasia, high insertion of the ureter, aberrant crossing vessel/s, and malrotated kidney. Common acquired causes can be divided into intraluminal (stones, polyps, mucosal folds, and transitional cell carcinoma), intramural (iatrogenic fibrosis due to previous surgeries such as ureteroscopy, endopyelotomy, open pyelolithotomy, or failed repair of primary PUJO), and extramural causes (retroperitoneal fibrosis, lymphadenopathy – common in testicular cancer, lymphoma, etc., retroperitoneal mass such as sarcoma and freely mobile kidney causing positional obstruction).

Common symptoms in older children and adults are periodic abdominal pain (loin pain) usually after diuresis, vomiting, recurrent pyelonephritis, fever and uncommonly, abdominal mass, or hematuria secondary to infection [5,6]. On examination, some patients have loin tenderness in association with hematuria. Some experience a palpable lump over the back (palpable ptotic kidney). One of the rare presentations of PUJ, obstruction can be hypertension secondary to hyperreninemia. However, our patient simply presented with mild loin pain.

Correct pre-operative imaging is of utmost importance in these cases. The evaluation of a hydronephrotic kidney usually

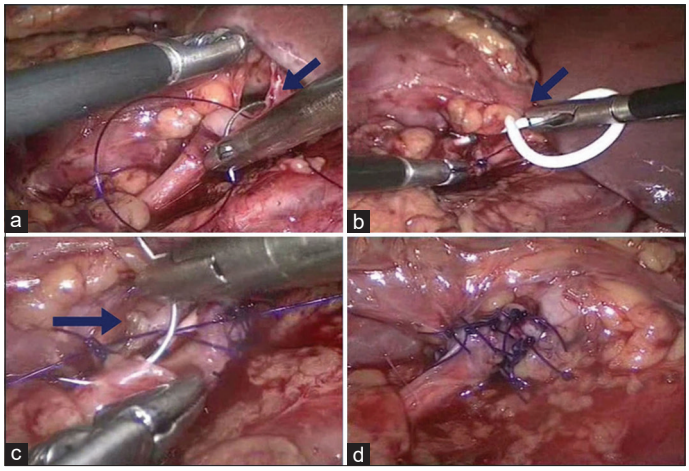

Figure 3: Operative pics. (a) Ureteropelvic anastomosis in progress: Stitch being taken through the pelvis (blue arrow); (b) intraoperative antegrade insertion of D-J stent after completion of posterior suture line, in progress (blue arrow); (c) anterior sutures being taken after insertion of D-J stent (blue arrow); and (d) end result

begins with renal sonography. The Society for Fetal Urology grading system is used to evaluate the severity of hydronephrosis. Grade 0 – No hydronephrosis and intact central renal complex seen on ultrasound, Grade 1 – only renal pelvis visualized, dilated pelvis on ultrasound, and no caliectasis, Grade 2 – Moderately dilated renal pelvis and a few calyces, Grade 3 – Hydronephrosis with nearly all calyces seen, large renal pelvis without parenchymal thinning, and Grade 4 – Severe dilatation of renal pelvis and calyces with accompanying parenchymal atrophy or thinning. Almost 20% of antenatally detected hydronephrosis is not found after birth. IVP gives information about the degree of dilatation of the affected renal pelvis in comparison to the contralateral side. The ureteric contour can be checked to see for dilatation or tortuosity in comparison to the opposite ureter. The excretory function of the affected kidney is compared to that of the normal kidney to see for the delay. Computed tomography urography is commonly used in adults versus pediatric populations due to exposure to ionizing radiation. Magnetic resonance urography (MRU), wherein a gadolinium-based contrast is used, has the advantage of preventing radiation. Functional MRU can be used to assess differences in renal function between the affected and the contralateral kidneys, based on renal volumes or glomerular filtration, and assess the renal excretion, by taking multiple images over 15 min. Retrograde pyelography is used to visualize the distal anatomy so as to rule out any more obstructions, especially when the ureter is not opacified in IVP and CT urography. Diuretic renography importantly determines the split function of each kidney and is considered the gold standard for the evaluation of the severity of PUJO. The most commonly used agent in renogram studies is technetium 99 m mercaptoacetyltriglycine (99 m Tc-MAG3), especially in the pediatric population. The kidney is considered to be significantly damaged if the split function in one of the kidneys is <40% of the total kidney function, while corelating with the half-life (T1/2) of the agent. In the adult population, other agents can be used, such as DTPA. Functionally significant obstruction is often diagnosed with diuretic renal scanning with no washout of isotope even after Lasix. Poorly functioning kidneys (<10% GFR) are often best treated with nephrectomy [7-9].

Complications of PUJO are recurrent urinary tract infection, chronic loin pain, formation of secondary renal stones, and partial or complete loss of kidney function. Several surgical treatment modalities have been widely reported and accepted for a case of PUJ obstruction. The most commonly performed surgical procedure is dismembered pyeloplasty with anastomosis performed anterior to the obstructing vessel. The success rate reported is also over 90%. Anderson-Hynes pyeloplasty (dismembered) is the most commonly performed procedure for PUJO. Pyeloplasty is indicated for the treatment of an ureteropelvic junction obstruction, if residual renal function is adequate (>10% GFR) [10]. This revision of the renal pelvis treats the obstruction by excising the stenotic area of the renal pelvis or ureteropelvic junction and creating a more capacious conduit using the tissue of the remaining ureter and renal pelvis. Examples of non-dismembered pyeloplasty are Y–V, inverted "U," and Culp's pyeloplasties [10]. A pyeloplasty can either be done by the robotic, open, laparoscopic, or retroperitoneoscopic route. The advantage of the retroperitoneoscopic route is direct and easy access, especially in an abdomen with multiple previous surgeries and scars. The disadvantage is its limited working space and high learning curve. The first LP was described by Kavoussi *et al*. in 1993 using the Anderson-Hynes technique on a young female (24 years old). Laparoscopy has provided the benefit of better magnification, but this approach does come with a steep learning curve in suturing techniques and tissue manipulation leading to longer operative times [11]. The suture techniques prove to be especially difficult in children due to smaller tissue and limited abdominal space available for instrument manipulation. The transperitoneal route is preferred, because it maximizes the internal working space and is far more ergonomic for intracorporeal suturing. Since the ureteropelvic anastomosis is the most important part of this procedure, the optimum ergonomics for effective suturing should not be compromised for the sake of adhering to an extraperitoneal route, especially since there is no evidence to suggest an advantage [12]. In spite of this, some centers prefer retroperitoneal approach, because they feel more confident with this technique and there are no other differences in terms of complications and conversions. Previous retroperitoneal surgery and previous percutaneous nephrostomy for drainage are usually considered to be contraindications for the retroperitoneoscopic approach [13]. The patients who are medically unfit for surgery are treated with other more conservative modalities such as DJ stenting and percutaneous nephrostomy. Medical management of PUJO entails antibiotic therapy for urinary tract infection, if present. Furthermore, it entails a close monitoring/surveillance of renal function in those patients who are undergoing a conservative line instead of surgery as well as those in their respective post-operative periods.

CONCLUSION

As seen in this paper, an accurate pre-operative diagnosis of a compressing vascular pedicle causing PUJO is rare. More often, it is found incidentally, intraoperatively. Yet as reported here, the condition can be managed satisfactorily through minimal invasive surgery. A laparoscopic approach is well established as the "gold standard" for the management of such patients. Due to a few comparative studies, the choice between the transperitoneal and retroperitoneal approach is quite subjective and depends on the experience and preference of the individual surgeon.

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