

Laparoscopic Pyeloplasty in Paediatric Age Group with Standard Adult Sized Laparoscopic Instruments

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ABSTRACT

Most paediatric patients attend Urology Outpatient Department with diagnosis of pelviureteric junction obstruction. Nowadays laparoscopic pyeloplasty is increasingly been used for the pelviureteric junction obstruction in paediatric patients. In the present case series, four paediatric patients of pelviureteric junction obstruction with age group of six, seven, eight and 12 years underwent laparoscopic pyeloplasty with adult sized laparoscopic instruments with ports size of 5 mm and 10 mm. Outcomes were measured in terms of mean operative duration, mean hospital stay and complications and improvement in Glomerular Filtration Rate (GFR). Mean operative duration was 211 minutes, mean blood loss of 96.25 mL and mean hospital stay was 5.75 days. Mean preoperative and mean postoperative GFR (at three months) were 53.19 mL/min and 55.35 mL/min respectively. In postoperative period one patient had increased drain output of more than 250 mL up to postoperative day three. All four patients had minor complications like postoperative fever on postoperative ileus which were managed conservatively. Mean postoperative follow-up duration was six weeks when Double-J (DJ) stent was removed. All patients had good outcome in terms of being asymptomatic and decreased hydronephrosis on follow-up renal ultrasonography and increased function of operated kidney on renal scan at three months. Based on intraoperative and postoperative observations, adult sized laparoscopic instruments can be used with ease with changes in port position and length of instrument inserted, adult sized laparoscopic instruments can be a useful armamentarium for paediatric laparoscopic pyeloplasty in cases of unavailability or intraoperative instrumental damage.

Keywords: Diethylenetriamine pentaacetate scan, Pelviureteric junction obstruction, Renal ultrasonography

INTRODUCTION

Pelviureteric Junction Obstruction (PUJO) is one of the most common causes of obstructive uropathy in children. Anderson Hynes dismembered pyeloplasty is the gold standard surgical treatment for PUJ obstruction with very high success rate. Nowadays laparoscopy via transperitoneal [1-8] or retroperitoneal approach [9-11] has overcome the open approach.

Unavailability or intraoperative dysfunctioning or damage of paediatric laparoscopic instruments may need an open pyeloplasty. Such a scenario can be avoided. In present article the authors share their experience of Laparoscopic Pyeloplasty (LP) with adult size laparoscopic instruments in four children with Pelviureteric Junction (PUJ) obstruction based on mean operative duration and blood loss, intraoperative difficulties, complications and mean hospital stay, improvement in renal function on renal scan and follow-up.

CASE SERIES

Four patients of paediatric age group attended the urology Outpatient Department (OPD) with PUJ obstruction [Table/Fig-1]. Preoperatively,

they were evaluated using ultrasonography, renal function tests, urine culture. Contrast Enhanced Computed Tomography scan of Kidney, Ureter, and Bladder (KUB) region (CECT-KUB) was done in three patients and Intravenous Pyelogram (IVP) in one. Functional assessment of renal function and confirmatory diagnosis was made by a diuretic renogram in all four cases [Table/Fig-1].

Indications for surgery were symptomatic patient with hydronephrosis on CECT-KUB and IVP with confirmatory diagnosis on Diethylenetriamine Pentaacetate (DTPA) scan. Kidney with obstructive pattern on DTPA scan underwent pyeloplasty. Preoperative mean GFR of affected kidney was 53.19 mL/min. All four patients had sterile urine culture and normal blood parameters. The following parameters were recorded i.e., operative time, blood loss, duration of analgesics, intra/postoperative complications, hospital stay, symptomatic relief, and improved function on DTPA scan. All patients were posted for operation after written consent from respective parents after explaining the procedure and its complications and need to follow-up.

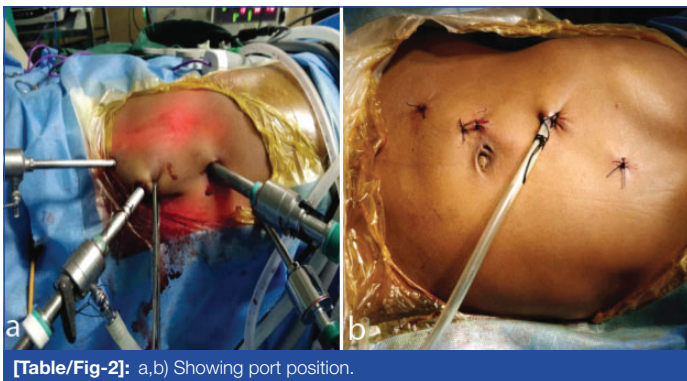
Intraoperative broad-spectrum antibiotic ceftriaxone as per body weight was given to all four patients. Under general anaesthesia,

Variables	Case 1		Case 2		Case 3		Case 4	
Clinical features (chief complaint)	Right flank intermittent, non progressive and dull pain since 1.5 years		Intermittent, non progressive left flank pain since two years		Left sided hydronephrosis on ultrasonography done for abdominal distension by a paediatrician		Finding of right sided hydronephrosis on ultrasonography after complaining of right flank pain	
Age (years)	6		8		12		7	
Side of PUJ obstruction	Right		Left		Left		Right	
CECT abdomen/IVP	CECT-Right sided gross hydronephrosis with abrupt narrowing at PUJ. Calculus in lower calyx right kidney		IVP-left sided gross hydronephrosis with pooling of contrast in pelvis with delayed excretion with narrowing at PUJ		CECT- left sided gross hydronephrosis with abrupt narrowing at PUJ		CECT-Right sided gross hydronephrosis with abrupt narrowing at PUJ. Lower pole vessel and intrarenal pelvis	
GFR (mL/min) (RK/LK)	50.44	58.43	57.33	52.67	57.43	53.26	56.42	54.26
Differential function (%) (RK/LK)	46.33	53.67	51.74	48.26	52.75	47.25	51.26	48.74

[Table/Fig-1]: Showing chief complaints with patient characteristics with radiological and Diethylenetriaminepentacetate (DTPA) scan findings.

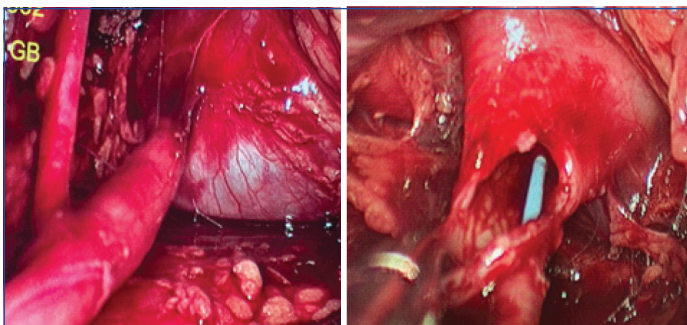
CECT: Contrast enhanced computed tomography; PUJ: Pelviureteric junction; IVP: Intravenous pyelogram; GFR: Glomerular filtration rate; RK: Right kidney; LK: Left kidney

perioperatively retrograde ureteric catheter (4 Fr) insertion was done in all four patients. An adequate size foleys catheter was then inserted. All four children were operated via transperitoneal approach in flank position. Two cases had left side and two cases had right sided PUJ obstruction [Table/Fig-1]. The usual port placement included; a 10 mm camera port was put just lateral to the umbilicus by open technique in all children. Intra-abdominal pressure was kept 10 mm of Hg. Two additional working ports: one 10 mm and one 5 mm were placed thereafter [Table/Fig-2a,b]. Three were standard ports and fourth one for retraction of liver [Table/Fig-2a,b]. Fourth port was done in two cases on right side for retraction of liver and extra fifth port in the patient with intrarenal pelvis for retraction of kidney parenchyma for better visualisation of renal pelvis [Table/Fig-1]. Instruments used were Maryland forcep, hook with monopolar cautery, bowel grasper, right angled forcep, needle holder, Ligasure, and 30 degree lens. Colon was reflected medially, renal pelvis and upper ureter were dissected free from the surrounding tissue [Table/Fig-3].

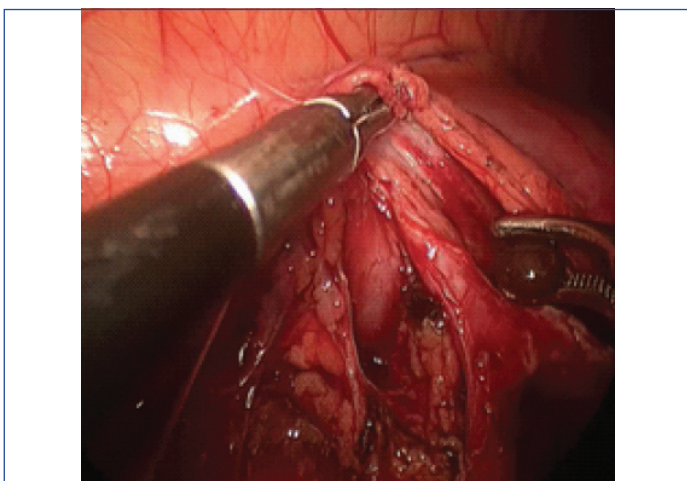


[Table/Fig-2]: a,b) Showing port position.

Crossing vessel was not identified in any of four cases however lower pole vessel was found in one patient with right PUJ obstruction [Table/Fig-1,4]. Pelvis was cut medially and ureter was spatulated laterally. An 8 mm calculus was found in lower calyx of right kidney (case1), which was extracted out with Maryland forcep [Table/Fig-5].



[Table/Fig-3]: Showing Pelviureteric Junction obstruction with intrarenal pelvis and lower pole vessel. [Table/Fig-4]: Showing double J stent with posterior wall anastomosis. (Images from left to right)



[Table/Fig-5]: Stone extraction with Maryland forcep.

Two-sutures were used for uretero-pelvic anastomosis at most dependant part of the cut renal pelvis; the first suture was placed at apex of the spatulated ureter using 4-0 vicryl was then used for continuous suturing of the posterior anastomosis. Another 4-0 vicryl was used to place the second suture at the cut end of ureter and the corresponding site in renal pelvis which was later used for continuous suturing of the anterior anastomosis. The remaining vicryl suture was used for the closure of the remaining renal pelvis after excision of redundant pelvis. A trans-anastomotic double J ureteric stent [Table/Fig-4] was placed in ante grade manner over a guide wire via subcostal port after posterior layer was sutured. Ryle's tube (18 Fr) was put in all the patients through one of the 5 mm working ports as an abdominal drain [Table/Fig-2b]. A 10 mm ports were closed vicryl 2-0 and rest were stapled and antiseptic dressing was applied at all port sites.

All patients were maintained on intravenous antibiotics (second generation cephalosporin) and analgesics as per body weight and were monitored for vitals, urine output and drain output monitoring postoperatively. Foley's catheter was removed on postoperative day three except in case 1 [Table/Fig-6] where it was removed after removal of abdominal drain i.e., on postoperative day eight. Abdominal drain was removed after drain content was minimal in all patients except in one patient (case 1) as drain content was more than 250 mL up to postoperative day three, when it decreased after changing per urethral Foley's catheter to larger lumen foley's catheter of 10 Fr. Drain was removed on postoperative day seven in this case.

Parameters	Case 1	Case 2	Case 3	Case 4
Duration of surgery (min)	240	180	174	250
Mean blood loss (mL)	120	85	90	90
Drain removal (postoperative day)	7	5	5	5
Analgesic use (days)	5	3	3	3
Foley's removal (postoperative day)	8	3	3	3
Hospital stay (days)	8	5	5	5
Postoperative GFR (mL/min) of operated kidney at 3 months	52.62	55.78	55.82	57.19

[Table/Fig-6]: Postoperative parameters of patients.

Patients were discharged on oral antibiotic course of five days with oral analgesic and advise for regular change in dressing at port site along with information about double J stent in situ and its related complications like mild pain and dysuria and mild haematuria. Double J stent was removed after six weeks. All four patients were followed-up on Outpatient Department (OPD) basis after six weeks with an ultrasonography of abdomen and urine culture report. First follow-up DTPA scan was done after six weeks of double J stent removal and thereafter every six monthly. Mean postoperative GFR of affected kidney was 55.35 mL/min.

Various parameters observed and the postoperative complications are shown in tabular form in [Table/Fig-1,6,7].

Complications	Case 1	Case 2	Case 3	Case 4
Increased drain output	+ (>250 mL) ^a	-	-	-
Fever (>100°F) ^b	+	-	+	-
EUM stenosis ^c	+	-	-	-
Postoperative ileus	-	+	-	+

[Table/Fig-7]: Postoperative complications of patients.

a: Up to postoperative day 3 (managed by replacing with larger lumen Foley's catheter); b: On postoperative day 1 and 2 (managed with antipyretics after ruling out port site infection); c: External urethral meatus stenosis (managed with meatal dilatation)

DISCUSSION

Open Anderson Hyne's dismembered pyeloplasty is standard for PUJO management with success rate reaching 90%. LP is being minimally invasive and success rate comparable to open pyeloplasty [1-7] is now replacing open procedure and is now becoming a standard procedure.

Though paediatric laparoscopic instruments are available, but in cases of their unavailability or any damage to instruments during surgery may lead to cancellation or abandoning of the laparoscopic procedure making the child devoid of laparoscopic surgery as open surgery will be the only option left, so in this study all patients were operated for pyeloplasty by adult sized laparoscopic instruments. We used transperitoneal approach in flank position in all four patients. The most commonly described approach is transperitoneal [4-8] although retroperitoneal approach [9-11] is also used.

Standard port size of 5 mm and 10 mm were made [8]. Insufflation pressure was kept to 10 mmHg similar to that used in adults. Port position was adjusted as per the individual case because of the length and size of instrument. Approximately, one-third of total instrument size was inserted within abdominal cavity after insufflation. Intrarenal pelvis may cause some difficulty but using an additional port for kidney retraction might suffice for this. A solitary renal stone was encountered in case 1, which was removed using Maryland forcep without fluoroscopic guidance. However, in difficult cases fluoroscopy might be helpful for localisation of renal stone.

There was some difficulty while maneuvering instruments at this length and due to small intraperitoneal space that lead to increased operative time in this study. Currently, available laparoscopic instruments for adults cannot be used for children younger than three years [12]. In this study, all patients were above age of three years.

In this study, double J stent was placed antegrade in all four children however it is a matter of debate whether antegrade or retrograde stenting should be done [13]. A 10 mm port site was closed with vicryl 2-0 for sheath closure in order to prevent future port site hernia. No intraoperative and perioperative anaesthetic complication was noted in this study.

The overall mean estimated blood loss, mean operative time and mean hospital stay of this series are comparable to other series in children in this age group [5-7]; previous studies showed increased mean blood loss in cases with associated renal stones, however there was no higher blood loss in our patient with renal stone (case1). None of the patient had blood transfusion in peri-operative period. As no surgery is without complications, so do LP [14]. No major intraoperative complication was noted in our case series. Most of the complications in our study were minor and were managed conservatively. Out of four, one patient (case 1) had high drain output for more than five days probably due to improper drainage of urine by small sized foley's catheter (in our case 8 Fr), so adequate sized per urethral foley's catheter should be placed preoperatively as foley's catheter of lesser calibre can be blocked due to clots which may lead to increase drain output; two patients had low grade fever

(case 1 and 3) which were managed by antipyretics and stepping up antibiotics and two developed postoperative ileus (case 2 and 4) which were managed conservatively by early ambulation and one developed external urethral meatus narrowing (case1), managed by meatal dilatation after treating meatitis with local application antibiotic ointment.

The LP procedure is difficult in children due to the small size of abdomen providing lesser intraperitoneal space to work and also increased length and size of instruments (adult laparoscopic instruments). This being a series of few patients, the success rate cannot be compared to other studies due to less number of cases, however outcomes were more or less similar.

CONCLUSION(S)

Adult size laparoscopic instruments can be used in place of paediatric laparoscopic instruments with change in port position and length of instrument inserted at the time of unavailability or intraoperative instrumental damage.

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