

ORIGINAL RESEARCH

Laparoscopic Transperitoneal Pyeloplasty For ureteropelvic Junction Obstruction in Paediatric population

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ABSTRACT

Background: The Ureteropelvic Junction Obstruction (UPJO) is one of the most prevalent genitourinary abnormalities in children. (UPJO) is considered as the most common cause of congenital hydronephrosis. Pyeloplasty is the main treatment method for patients with (UPJO) [5]. An ideal treatment should have the highest success rate and be minimally invasive. There are many techniques for (UPJO) repair, but the Dismembered Anderson Hynes pyeloplasty remains the gold standard and laparoscopic reconstruction [8]. Laparoscopic Anderson-Hynes pyeloplasty has become the gold standard in many pediatric centers. **Objectives:** To Assess the Safety and Efficacy of laparoscopic Trans Peritoneal Pyeloplasty in Children with (UPJO). **Methods:** The study included 30 consecutive cases of congenital unilateral (UPJO) with Split Renal Function (SRF) <40% managed during the 24-month period from November 2020 to November 2022. All the patients were properly evaluated before proceeding for procedure. **Results:** In our study the mean age of patients was 6.4 years. Most of the children affected were males (76.7%) and involvement of Left (UPJO). The commonest cause of pelvi-ureteric junction obstruction was an abnormal proximal segment (53.3%) followed by crossing vessel (20%). The pre-op Antero posterior Pelvic Diameter (APPD) on ultrasonography was in range from 21mm to 50mm, with a mean pre op APPD of 36.26mm. Most of the patients (83%) had a pre-operative differential renal function in the range of 31-40% (34.8%). Mean operative time was 99.06mins. Mean post op APPD was 27.38mm and DRF was 40.72%. 96% of the patients had an indwelling catheter in situ for a period of less than one week. Out of total 30 patients anastomotic drain was kept for 3 weeks in 28 patients (83.34%). Mean hospital stay in days was 7.53 days. **Conclusion:** Laparoscopic Trans Peritoneal Pyeloplasty is a safe and effective, minimally invasive procedure in pediatric patients with (UPJO), characterized by good surgical efficiency, reduced complications, and faster recovery and satisfactory followup results.

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INTRODUCTION

The ureteropelvic junction obstruction (UPJO) is one of the most prevalent genitourinary abnormalities in children. (UPJO) is considered as the most common cause of congenital hydronephrosis. The incidence of congenital hydronephrosis due to (UPJO) is one in 2000 children, where the ratio of affected boys to girls is 2-3:1. A UPJO occurs more frequently on the left side, and bilateral hydronephrosis occurs in 20-39% of affected patients [1]. The main issue with this obstructive disorder is the progressive deterioration in kidney function, which can lead to renal unit loss. The advent of prenatal ultrasound (US) has brought the diagnosis even earlier, before symptoms occur. Thus, treatment has been proposed at younger ages. The optimal time of surgery is based on a number of factors: the hydronephrosis grade, the drainage pattern of diuretic renography, the differential renal function

(DRF) deterioration, and obstruction-related symptoms [2]. Ureteropelvic junction obstruction (UPJO) may either have intrinsic or extrinsic cause with the former being the most common etiology. Intrinsic causes include Ureteral hypoplasia due to the presence of classical "adynamic segment", High insertion of the ureter into the renal pelvis, Kinks or Valves produced by in foldings of the ureteral mucosa and musculature. Extrinsic Causes create an abrupt angulation and compressing the UPJ, which leads to obstruction of urine flow and progressive hydronephrosis. It includes crossing vessels, ureteral folds that occur at the level of the UPJ, benign lesions such as fibro epithelial polyps, urothelial malignancy, stone disease, and post inflammatory or post-operative scarring or ischemia. Pyeloplasty is the main treatment method for patients with UPJO [5]. An ideal treatment should have the highest success rate and be

minimally invasive. Open pyeloplasty meets the first criterion but not the second (minimal invasiveness), whereas endourology techniques only guarantee the second one [6]. Minimally invasive techniques, both endoscopic and percutaneous ones, involving the incision of UPJ are performed with low morbidity, although they are associated with lower success rates than conventional surgery in previous studies. There are many techniques for (UPJO) repair, but the Dismembered Anderson Hynes pyeloplasty remains the gold standard for surgical reconstruction [3]. Laparoscopic Anderson-Hynes pyeloplasty has become the gold standard in many pediatric centers. Laparoscopic Pyeloplasty for UPJO can be performed through both the trans peritoneal and retroperitoneal approaches, and either approach is associated with a high success rate and a low complication rate. Trans peritoneal approach has a wider working space that provides a shorter operative time and lower conversion rate, while retroperitoneal approach has rapid recovery of intestinal movement and early resumption of oral feeding [4].

MATERIALS AND METHODS

After obtaining the ethical clearance from the Institutional Ethical committee, the present observational study was conducted in the Postgraduate Department of General Surgery, Government Medical College Srinagar over a period of two years. The study included 30 consecutive cases of congenital unilateral (UPJO) with Split Renal Function SRF <40% managed during the 24-month period from November 2020 to November 2022. After proper evaluation of the patient the procedure was done under general anesthesia with patient placed supine on the edge of table with affected side slightly elevated by towels to about 30 degrees. The patient was prepared with exposed surgical field from the costal margin above till mid-thigh below. The surgeon and assistant (camera man) stand at the normal side while placing the monitor at the affected kidney site. Intraoperative access was obtained with open placement of a 5-mm umbilical port. Two 3- or 5-mm instruments (according to the patient's age) are placed, one of which lies in the mid-epigastrium and the other in the lower abdomen below umbilicus in midline. For left-sided procedures, the ureteropelvic junction (UPJ) is accessed via a trans-mesocolic approach. While on the right side, the retrocolic approach is preferable. The retrocolic is accessed by mobilizing the colon to the level of the hepatic flexure. The renal pelvis is mobilized from the surrounding tissues, anteriorly, medially and posteriorly. The ureter is carefully dissected free of attachments to avoid affecting its vascularity. Before the renal pelvis was sectioned, a suture (hitch stitches) are placed percutaneously. The stitch was placed through the abdominal wall just below the costal margin and then passed through the upper pole of the renal pelvis, passed back through the abdominal wall,

and secured by a hemostat. Incision of the renal pelvis was done at the dependent point where an anastomosis with the ureter should be placed. Immediate suction of the urine should be done to avoid the potential risk of urinary peritonitis. The ureter was partially incised by a small transverse cut just below the UPJ to open its lumen then spatulated with straight scissors on its lateral aspect till we could have a good caliber of the ureter (that can accommodate the insertion of a closed laparoscopic instrument inside the lumen). The anastomosis begins at the vertex of the spatulated ureter with the most dependent part of the renal pelvis. The posterior aspect of the ureteral-pelvic anastomosis is initiated with two to three interrupted sutures (5/0 vicryl), which can be then completed by running sutures. After completion of the posterior wall, the double J catheter is inserted with the help of guidewire then the anterior portion of ureteral- pelvic anastomosis is completed in a manner similar to the posterior wall over the double J catheter. We use Double J stent in all children. Redundant pelvis is resected if the pelvis is greatly dilated. Thereafter, the pelvis is closed with running sutures. A suction drain is left as perinephric drain at the site of the anastomosis that emerged from the lower port site. A bladder catheter is left in place during hospitalization. Oral intake is started as soon as the patient is recovered from anesthesia.

STATISTICAL ANALYSIS

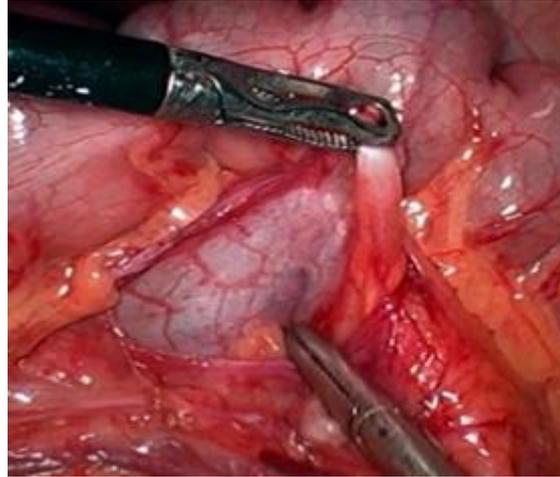
Statistical analysis was performed using the statistical package for social sciences (SPSSversion21). Qualitative variables were analyzed using Chi-square Test/Fischer Exact Test while quantitative variables were subjected to unpaired t-test and Mann-Whitney Tests. Data was expressed as mean, standard deviation(SD),and range. Pearson's or Spearman's correlation test were used and a P< 0.05 was taken as statistically significant.

RESULTS

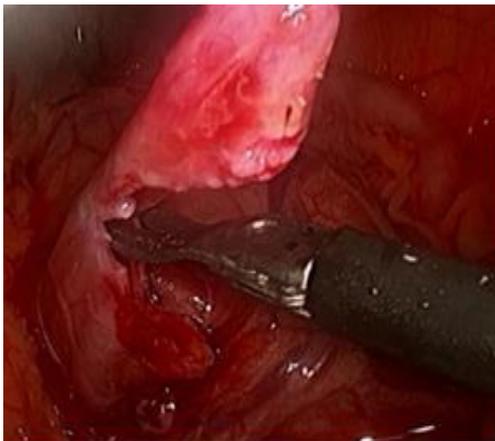
In our study patients aged between 1-14 years were enrolled, with mean age of 6.4 years. Most of the children affected were males (76.7%). Most of the patients in our study showed the involvement of left pelvi-ureteric junction and constituted 60% of the total study group. Subjects included in this study had a pre-op APPD on ultrasonography ranging from 21mm to 50mm, with a mean pre op APPD of 36.26mm. Most of the patients (83%) had a pre-operative differential renal function in the range of 31-40%. In our study majority of the patients were operated with in 1 hour to 2 hours. Mean operative time was 99.06 mins. The commonest cause of pelvi-ureteric junction obstruction in our study was a nabnormal proximal segment (53.3%) followed by crossing vessel (20%). Mean post op APPD was 27.38mm with a range of 20-37.7mm, and most of the patients (80%) had a renal pelvic diameter in the range of 21-30mm compared to preoperative diameter

where most of patients were in the range of 31-40mm. Mean post of DRF was 40.72% with a range of 22-46.12% compared with mean pre op DRF 34.8% with a range of 18.2-39.87%. In our study 96% of the patients had an in dwelling catheter in situ for a period of less than one week. Mean hospital stay indays was

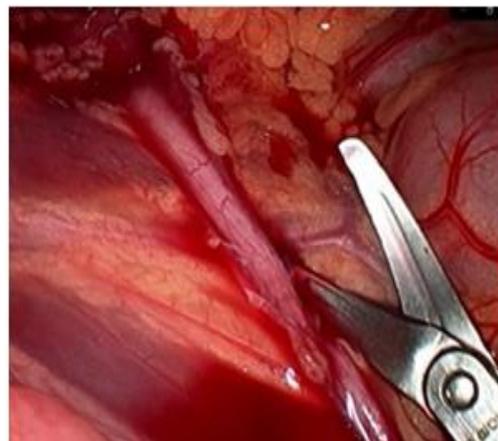
7.53days. Double J stent was kept in situ for a period of 3 weeks in majority of patients (83%), with a mean of time period of 3.3weeks. Majority of the patients had no intra op or post op complications, only 2 patients (6.7%) had anastomotic leak post operatively and one patient (3.3%) had a mal-placed stent.



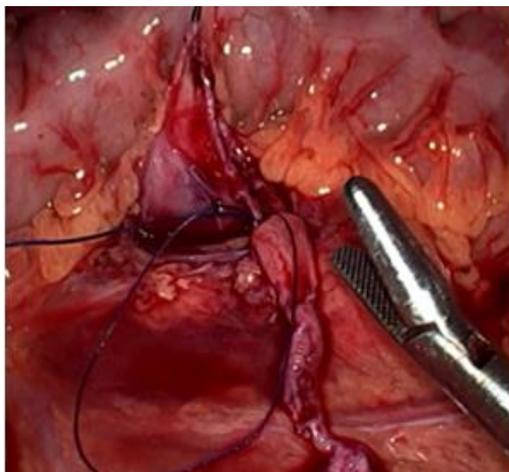
Pelvi-Ureteric junction



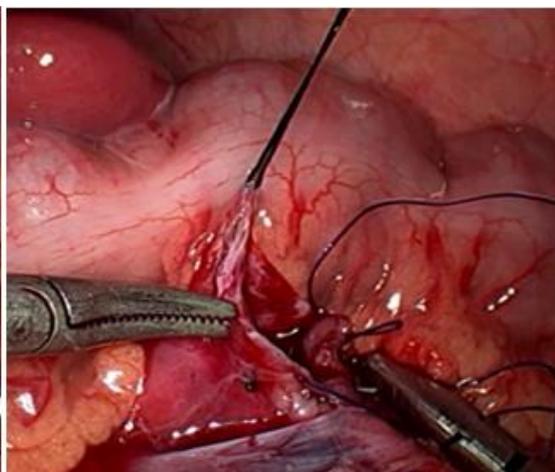
Pelvis Reduction



Ureter Spatulation



Anterior wall suturing



Posterior wall suturing

DISCUSSION

Laparoscopic Pyeloplasty provides a minimally invasive alternative to repair UPJO. The optimal age is one of the concerns for the application of LP in children. The mean age in our study group was 6.06 years with maximum subject being of age of 12 years and minimum of 1.8 years. Various studies, which compare laparoscopic pyeloplasty to open pyeloplasty, showed that the patients open group were younger than those in the LP group were. For example, Valla [5] and Piaggio [6] reported more young patients (younger than 1 year) in the OP group. The other authors, however, reported the patient ages in the LP group were similar or even less than those of the OP group. We concluded that age per se is not limiting factor to perform laparoscopic pyeloplasty if adequate expertise is available. In our study there were 23.3 % females and 76.7% males. Various internationally published studies published data with predominant patients of male gender. Cristiana Reis Leonardo et al⁷ in 2020 and Hany Emad Mohamed et al⁸ in 2022 also reported similar gender distribution, about 26% of female patients. Bao Q et al⁹ in 2022 also reported male predominance in study group with females constituting only about 14 %. As for sidedness is concerned there was PUJO on right side in 40% of patients making left sided more prevalent. V.V.S. Chandrasekharam¹⁰ in 2015 also reported prevalent left sidedness (76%). The important radiological parameter that we consistently looked in pre operative imaging was APPD of involved kidney. The mean APPD in our study was around 36mm. V.V.S. Chandrasekharam¹⁰ in 2015 also reported mean APPD of about 34mm in his study. Cristiane Reis Leonardo et al⁷ in 2020 also had mean APPD of 43mm in his study group. We also did functional scan preoperatively to evaluate the residual renal function in subjects. Mean pre-operative renal function in our study was 35%. V.V.S. Chandrasekharam¹⁰ in 2015 also reported mean renal function of about 22%.

In our study the mean operative time for laparoscopic pyeloplasty was around 99 minutes. The maximum time taken in our study was 2.5 hours. The average time in our study is consistent with various already published studies. V.V.S. Chandrasekharam¹⁰ in 2015 published his experience of laparoscopic pyeloplasty and reported mean operative time of 106 minutes. Cristiana Reis Leonardo et al⁷ in 2020 also published mean surgical time of 107 minutes (70-180min) from port insertion to port closure in his study patients.

After laparoscopic pyeloplasty, we also evaluated improvement in morphological as well as functional parameters of kidney such as post-operative APPD and post-operative renal function. Mean post operative APPD in our study was 27mm (compared with 36mm pre operatively) and post operative renal function was 40% (as compared to 35% preoperatively). V.V.S. Chandrasekharam¹⁰ in 2015 published his wide experience of Laparoscopic

Pyeloplasty and reported marked improvement in mean APPD from 34 mm to 10 mm and mean renal function from 22% to 35%. The marked improvement may be due to early intervention as mean age in V.V.S. Chandrasekharam's study was 3.8 years compared to our study where mean age was 6.06 years. Cristiana Reis Leonardo et al also reported comparable improvement in APPD in post-operative period (25 vs 40%). In our study 2 patients (6.6%) out of 30 patients developed anastomotic leak post operatively and both were managed conservatively. 1 patient (3.3%) had migrated stent in post operative period, which was removed after 3 weeks post operatively. Mean duration of Stent kept in situ was 3.3 weeks in our study. Cristiana Reis Leonardo also reported stent removal after a mean of 45 days.

CONCLUSION

Laparoscopic Transperitoneal Pyeloplasty is a safe and effective, minimally invasive procedure in pediatric patients with a good intermediate term success rate, minimal morbidity and gives excellent long-term results. Direct exposure of the uretero pelvic junction via the mesocolon saves time in children for left-sided PUJ obstruction. It is characterized by good surgical efficiency, reduced complications, faster recovery and satisfactory follow up results

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