e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(1); 215-226

Original Research Article

Comparative Study of Laparoscopic versus Open Pyeloplasty in the Management of Primary Uretero-Pelvic Junction Obstruction

Guda Manohar[1], Augustine Shitiri[2], Amrit Preetam Panda[3], G. Manogna[4]

[1]Associate Professor, Department of Urology, Guntur Government Medical College. Andhra Pradesh.
[2]Post Graduate, Department of Urology, Andhra Medical College, Visakhapatnam.
[3]Post Graduate, Department of Urology, Guntur Government Medical College, Andhra Pradesh.
[4]M.B.B.S , Rangaraya Government Medical College, Andhra Pradesh.

Received: 10-11-2022 / Revised: 28-12-2022 / Accepted: 05-01-2023
Corresponding author: Dr Guda Manohar
Conflict of interest: Nil

Abstract

Pelvi-ureteric junction obstruction (PUJO) is a functional or anatomic obstruction of urine flow from the renal pelvis into the ureter. The causes of PUJO are congenital, acquired, intrinsic and extrinsic. Pelvi-ureteric junction obstruction ultimately will lead to hydronephrosis which can progress to permanent renal impairment. The standard procedure to relieve obstruction is open, laparoscopic or robotic pyeloplasty.

In our study 30 patients with primary PUJO were randomised into two groups of 15 each using a computer-generated randomised table. Anderson Hynes Open pyeloplasty was performed on 15 patients, and laparoscopic pyeloplasty was performed on 15 patients. Both procedures were compared for efficacy in terms of subjective outcomes (post-operative pain, activity level) and objective outcomes (operative time, complications, recovery time/hospital stay, improvement in renal function, cosmesis, success rate). Standard inclusion and exclusion criteria were followed.

Laparoscopic pyeloplasty has a comparable success rate to open pyeloplasty and is an effective minimally invasive treatment option for PUJ obstruction. Laparoscopic pyeloplasty is emerging as the new standard of care for PUJ obstruction.

Keywords: PUJO, open pyeloplasty, laparoscopic pyeloplasty, renal scintigraphy,

Introduction

Pelviureteric junction obstruction (PUJO) management has been a challenge for centuries. A functional or anatomic obstruction of urine flow from the renal pelvis into the ureter is defined as Pelviureteric junction obstruction (PUJO). Primary ureteral obstruction in children usually occurs at the ureteropelvic junction or the ureterovesical junction. Obstruction of the ureteropelvic junction is the most common congenital ureter abnormality [1]. It is more common in boys than in girls in children (5:2 ratio). In adults, however, it has been established that it is more common in women than in men. It is more common on the left side in unilateral cases than on the

right (5:2 ratio). Bilateral obstruction occurs in 10–15% of cases, with infants being especially vulnerable [2].

There are various causes of PUJO ranging from congenital, acquired, or intrinsic and extrinsic causes.

Intrinsic obstruction can be caused by congenital stenosis of the PUJ, the PUJ valve, a PUJ polyp, or a high ureter insertion into the renal pelvis. The most common cause of PUJO is congenital stenosis of the PUJ, which causes muscularis hypertrophy and fibrous hyperplasia in the PUJ. The stenosis is usually no more than 2 cm long, with a lumen diameter of 1-2 mm. The PUJ valve is a congenital muscle plica. PUJ polyp resembles a sunflower. The high ureter insertion is usually accompanied by congenital stenosis of the PUJ. It could be congenital or secondary to kidney malrotation.

Extrinsic obstruction is frequently caused by crossing lower pole renal vessel(s) or ureter entrapment by a vessel or fiber rope, preventing urine from flowing down the ureter. Pelvic-ureteric junction obstruction ultimately will lead to hydronephrosis which can progress to permanent renal impairment. Hence, early recognition of the disease has to be done and to be treated at the earliest.

Functional obstruction: It is frequently caused by asymmetry of the ureteral wall musculature or increased collagen deposition in the absence of intrinsic or extrinsic 6 obstruction in the UPJ. Functional obstruction can cause abnormal peristalsis through the UPJ, increased intrarenal back pressure, collecting system dilation, and hydronephrosis.

Acquired obstruction is caused by fibrosis caused by ischemia from previous ureteral surgery, stone impaction, or traumatic injury, or by lymphadenopathy. UPJO can also be caused by high grade VUR. VUR can cause ureteral elongation, tortuosity, and kinking, which can lead to UPJO.

Clinical findings differ depending on the patient's age at the time of diagnosis. Many cases are now diagnosed while still in utero. These are mostly intrinsic lesions, and many of them resolve on their own. Intermittent flank pain, hematuria, and recurrent urinary tract infections (UTI) or a flank mass can all occur in children. Adults with UPJO may experience symptoms such as back and flank pain, UTI, and/or pyelonephritis. A few patients may develop complications such as calculi, trauma to the enlarged kidney, or (rarely) hypertension caused by increased renin secretion as a result of collective system compression of the renal artery, as well as symptoms of renal insufficiency. In addition, abdominal pain caused by a traumatic rupture of the renal pelvis is a rare but potentially fatal complication. The majority of cases diagnosed in adults are extrinsic lesions, which are more common in females, but it is unclear whether they arose from intrinsic problems earlier in development

Surgical Management

Types

1. Dismembered pyeloplasty-Anderson Hynes pyeloplasty

- Approaches are-
- Open approach
- Laparoscopic (Transperitoneal/Retroperitoneal) approach
- Robotic assisted laparoscopic Pyeloplasty

2. Non-dismembered pyeloplasty-

Fenger plasty, Foley y-v plasty, Flap techniques, Culp-Deweerd flap, Scardino-Prince flap, Davis intubated ureterostomy

Indications for open pyeloplasty include:

PUJO with presence of one of the following factors-Glomerular filtration rate(GFR) of

the affected kidney side<40%,Increasing anterior posterior diameter of the renal pelvis on serial examination, Symptomatic obstruction(Flank /abdominal Pain, nausea), Recurrent infection, calculi or progressive loss of Renal function. PUJO caused by aberrant vessel(s), PUJO caused by high insertion of ureter, PUJO treated unsuccessfully by endourologic management, Horse shoe kidney or pelvic ectopic kidney accompanied by PUJO.

Contraindications: There are no absolute contraindications to open pyeloplasty except the usual surgical contraindications (untreated coagulopathy, active infections and patients medically unfit for surgery etc.)

Indications and contraindications for laproscopic pyeloplasty - Same as for open pyeloplasty

The first successful dismembered pyeloplasty was performed by Trendelenburg in1886, and Kuster performed the first successful reconstructive procedure for PUJO in 1891. For many years, open pyeloplasty (OP) has had a long term success rate of more than 90% and has been the gold standard for surgical treatment of ureteropelvic junction (PUJ) obstruction [3]. Apart from open pyeloplasty, various minimally invasive procedures such as endopyelotomy, acucise catheter incision, balloon dilatation, and laparoscopic pyeloplasty(LP) have evolved over the last two decades as a new treatment approach for PUJ obstruction. However, the success rate of these minimally invasive options is about 10–30% lower than that of open pyeloplasty, making them difficult to replace the open pyeloplasty procedure.

Laparoscopic pyeloplasty, which was first described in a case series by Schuessler *et al* in1993 [4], is another minimally invasive procedure that has comparable results to open pyeloplasty for pelvi-ureteric junction (PUJ) obstruction. Several large case series and nonrandomized comparisons on laparoscopic pyeloplasty have been conducted, with success rates exceeding 90%, which differs very little from the success rates for open dismembered pyeloplasty, the gold standard procedure for this condition [2]. But this new, technically complex procedure, on the other hand, comes with a steep learning curve. Laparoscopic pyeloplasties can be performed through transperitoneal and retroperitoneal approaches with each having their merits and demerits. Despite the fact that laparoscopic pyeloplasty is technically complex and has a steeper learning curve, it has been demonstrated that it provides lower patient morbidity, shorter hospitalisation, and faster convalescence, with reported success rates comparable to open pyeloplasty (90 percent or higher) in the hands of experienced laparoscopic surgeons.

Aims and Objectives

To compare the efficacy of open versus laparoscopic pyeloplasty in the treatment of primary pelvi-ureteric junction obstruction (PUJO) in terms of subjective outcomes (post-operative pain and activity level) and objective outcomes (operative time, complications, recovery time/hospital stay, improvement in renal function, cosmesis, and success rate).

Methods and Materials

The current study was a two-year prospective randomised control trial comparing laparoscopic pyeloplasty and open pyeloplasty for the treatment of primary ureteropelvic junction (PUJ) obstruction at the Department of Urology, King George Hospital, Visakhapatnam. Thirty patients were evaluated and operated on for primary PUJ obstruction as part of our study. Before beginning our research, we obtained ethical approval from the Institutional Ethics Committee.

Data source: From January 2020 to December 2021, all cases of primary PUJ Obstruction of any age group who attended the Department of Urology, King George Hospital, Visakhapatnam were included in our study group.

Method of collection: The sample size was 30 patients.

Procedure for sampling: A total of 30 patients were chosen and randomised into two groups of 15 each using a computer-generated randomised table. Open pyeloplasty was performed on 15 patients, and laparoscopic pyeloplasty was performed on 15 patients.

Study Population:

A. Inclusion criteria: All cases of primary PUJO in all age groups were clinically and/or radiologically diagnosed (including both symptomatic and asymptomatic patients).

B. Exclusion criteria:

- Patients suffering from secondary PUJO.
- Patients with long segments of PUJ obstruction in which a normal caliber proximal ureter cannot be brought without tension to the renal pelvis.
- Patients with urinary tract infection and a large pelvic capacity.
- Laparoscopic surgery contraindications in general (e.g. morbid obesity, major bleeding disorders, unacceptable anesthesia risks, patients who do not tolerate the pneumoperitoneum).
- Patients who are unable to undergo surgery due to coexisting medical conditions
- Re-operations or failed pyeloplasty

Methodology

Patients were evaluated based on the history, physical examination, renal sonography, and renal scintigraphy to diagnose primary PUJO. Patients and their parents (in the case of children) were counselled regarding postoperative infection, bleeding, failed pyeloplasty, the need to convert to open surgery in the case of laparoscopic pyeloplasty, damage to other viscera, and adhesion formation.

Preoperative Evaluation and Preparation

Routine investigations were done (complete blood counts, Liver function test, Renal profile, coagulation profile, Blood glucose, urine routine and microscopic examination, ECG and chest X ray examination, Ultrasound scan abdomen, Diethylenetriaminepentaacetic Acid Technetium-99m (99mTc-DTPA), intra venous urogram (IVU) , magnetic resonance urography(MRU)- in patients who are at high risk of radiation and contact exposure, such as children, pregnant women, and patients with renal insufficiency)

RGP done preoperatively to confirm the diagnosis and demonstrate the exact site and nature of obstruction before surgery. If urine C/S shows UTI, antibiotic was given according to sensitivity prior to surgery. A physician/paediatrician was consulted about prior fitness. Covid-19 infection was considered at the start of the pandemic and RTPCR was done for all patient preoperatively, and patients who tested positive, surgery was postponed.

Follow up:

Indwelling stent was removed after 6 weeks from the day of surgery. Pain and activity score as per Nadler scale was assessed during that time. DTPA scan was performed 3 months after surgery and the GFR/min was recorded. Follow up period for each patient was at least for 3 months.

Results

The study included 30 patients with primary PUJO who visited the department of urology at KGH between January 2020 and December 2021. They were divided into two

groups of 15 patients each, with 15 undergoing Anderson Hynes open pyeloplasty and 15 undergoing laparoscopic pyeloplasty. The following results and observations were done at the conclusion of the study.

Age: The mean age in the open pyeloplasty group was 25.5 years ranging from 6 months to 51 years. The mean age observed in the laparoscopic pyeloplasty group was 27.26 years ranging from 2 years to 56 years.

Sex Incidence: Out of 15 patients,12 patients were male and 3 patients were female with a sex ratio of 4:1 in the open pyeloplasty group, while 11 patients were male with 4 patients were female in the lap pyeloplasty group with a sex ratio of 2.75:1.

Laterality: 10 patients in the open pyeloplasty group had affected left side and 4 patients on right side. In the lap pyeloplasty group, 9 patients had affected the left side and 6 on right side. only 1 patient had bilateral involvement in the open pyeloplasty group.

Associated anomalies: Crossing vessel was present in 1 case in open pyeloplasty group and 3 cases in laparoscopic pyeloplasty group. Solitary kidney was present in 1 case in open pyeloplasty group and 0 case in laparoscopy group.

Symptoms: The most common complaint in both groups was pain. Other symptoms include mass per abdomen with or without pain.

Pain is present in 11 patients in open pyeloplasty group (73.3%) and 13 patients in lap pyeloplasty group (86.66%).

Mass per abdomen Is present in 2 cases in open pyeloplasty group(13.33%) and 1 patient in lap pyeloplasty group(0.06%)

Both symptoms are present in 2 cases in open pyeloplasty group(13.33%) and 1 patient in lap pyeloplasty group(0.06%)

Postoperative complications

4 patients in the open pyeloplasty group and 3 patients in the laparoscopic pyeloplasty group developed complications as shown below.

Complications: open pyeloplasty group - wound infection in 3 cases and post operative fever in one case.

Lap pyeloplasty group: post operative ileus in 2 cases and post op fever in 1 case.

Assessment of Subjective outcomes

The assessment of pain and activity level were assessed both preoperatively and post-operatively using pain analog scale and activity questionnaire of Nadler *et al*. Following outcomes were noted as shown below

Table 1: Assessment of Pain and activity level pre-operatively and post operatively in both open and laproscopic pyeloplasty group

Parameters	Open Pyeloplasty (n= 15)		Laparoscopic Pyeloplasty (n= 15)		Student's Unpaired 't' test (p-value)	Student's paired 't' test (p-value)	
	Mean	±SD	Mean	±SD		OP	LP
1. Pain							
Pre-operative	64	7.48	60	5.77	0.1122(NS)	**<0.0001(S)**	**<0.0001(S)**
Postoperative	15.33	4.94	10.33	2.87	**0.0021(S)**		
2. Activity Level							
Pre-operative	49.67	4.08	52	4.4	0.1468(NS)	**<0.0001(S)**	**<0.0001(S)**
Post-Operative	91	3.25	94.33	1.7	**0.0016(S)**		

Assessment of Objective outcomes

The following objective outcomes-(operative time, time when oral feeds were started, time when drains were removed and hospital stay) were studied and the results obtained are as shown in the table below.

Table 2: Assessment of objective outcomes studied in both open and laparoscopic pyeloplasty groups

Parameters	Open Pyeloplasty(n=15)		Laparoscopic pyeloplasty(n=15)		Student's Unpaired't' test(p-value)
	Mean	±SD	Mean	±SD	
Operative time(minutes)	133.33	10.59	172	16.61	**<0.0001(S)**
Time when oral feeds were started (days)	2.47	0.72	1.73	0.57	**<0.0001(S)**
Time when surgical drains were removed(days)	3.6	0.88	2.27	0.57	**<0.0001(S)**
Hospital stay (days)	6.13	0.96	4.73	0.68	**0.0001(S)**

Table 3: Renal function outcome assessment both pre-operatively and post-operatively

Parameter	Open pyeloplasty (n=15)		Lap pyeloplasty (n=15)		Student's unpaired 't' test (p-value)	Student's paired 't' test(p-value)	
	Mean	±SD	Mean	±SD		Open pyeloplasty	Lap pyeloplasty
GFR/min on DTPA scan							
Pre-operative	28.27	4.86	27.27	3.54	0.5247(NS)	**<0.0001(S)**	**<0.0001(S)**
Post-operative	49.53	4.77	50.33	4.3	0.6334(NS)		

Discussion

With a success rate of more than 90%, open surgery has been the gold standard for the treatment of PUJO. Laparoscopic pyeloplasty is a minimally invasive procedure for repairing PUJO. In this study, open pyeloplasty was compared to laparoscopic pyeloplasty in terms of subjective and objective outcomes in primary PUJO.

Many studies have been conducted to compare both procedures in secondary PUJO [4,5]. However, only a few studies have been conducted to compare open and laparoscopic pyeloplasty in primary PUJO [6,7].

There were 15 open pyeloplasty patients and 15 lap pyeloplasty patients among the 30 patients.

The mean age of the patients in our study in both the open and lap pyeloplasty groups was 25.5 years (from 6 months to 51 years) and 27.26 years (from 2 years to 56 years), which was comparable in both groups. Krishna SM *et al* [8] found a similar age distribution in their studies, with a mean age of 25.8 years and 29.33 years in the open and laparoscopic pyeloplasty groups, respectively. Males outnumbered females in both the open and laparoscopic groups, with a sex ratio of 4:1 and 2.75:1, respectively, which was comparable to the sex incidence of 2:1 reported in the literature.

In our study, there were 29 cases of unilateral PUJO, with 19 patients (63.33 percent)

affected on the left side and 10 patients (33.33 percent) affected on the right side. The open pyeloplasty and lap pyeloplasty groups had a laterality incidence of L: R of 2.5:1 and 1.5:1, respectively, which corresponds to the 2:1 finding in the literature. Only one patient had bilateral involvement, and was part of the open pyeloplasty group.

The most presenting complaint in both groups was flank pain accounting for 11 patients (73.3%) in the open pyeloplasty group as compared to 13 patients (86.66%) in the lap pyeloplasty group. Other complaints in our study were mass per abdomen in 2 patients (13.33%) in open pyeloplasty and 1 patient (<1%). 3 patients (13.33%) had both flank pain and mass per abdomen in the open pyeloplasty group as compared to 1 patient (<1%) in the Lap pyeloplasty group.

Crossing vessels were seen in one OP patient and three LP patients. As seen in our study, the identification of crossing vessels was higher in laparoscopic surgery than in open surgery [9]. This difference may be due to the minimal mobilisation of the kidney required during the laparoscopic procedure to access the PUJ, as opposed to the open pyeloplasty, which requires the entire kidney to be mobilised and rotated medially to expose the pelviureteric segment. A single kidney was found in one of the patients in the open pyeloplasty group. During the study, no other associated anomalies were discovered.

The mean operative time in the open pyeloplasty group was 133.33±10.59 min while the mean operative time in the Laparoscopic Group was 172±16.61 min (p value<0.0001). This finding was significant and comparable to other studies in the literature [10,11].

Table 4: Comparison of mean operative time between present study and other studies.

Study	Mean Operative time (minutes)		P value
	Open pyeloplasty	Lap pyeloplasty	
Bansal *et al.*	122	244	0.00
Simforoosh *et al.*	140	210	<0.05
Umari *et al*	143	274	<0.05
Present study	133.33	172	<0.0001

There was a significant difference in the mean operative time of 38.67 minutes in the comparative groups more in the laparoscopic group. Many published literature reports longer operative time in the LP group. However, Zhang *et al* reported a shorter operative time in lap pyeloplasty.

LP, though, has operative steps similar to those in open pyeloplasties, such as dissection, transection, and suturing. But it is a complex and difficult procedure requiring careful ureteral dissection and considerable proficiency in intracorporeal suturing.

Hence, Proper Standardization of a surgeon's steps and techniques with introduction of additional techniques specific for laparoscopic surgery will help to overcome the difficulties and enhance the performance.

The operative time decreased significantly with increasing surgeon's experience and standardization of the operative steps as noted in the last 5 cases where the mean operative time was 158 ±5.1 minutes as compared to 179.2 ±15.93 minutes in the first 10 cases (p value<0.05, the student's paired "t" test). Piyush Singhania *et al* also found a

similar significant correlation of operative time to surgeon experience in his study and concluded that the average operating time for the first 7 cases was 4.36 hours and it decreased to an average of 3.14 hours for the next 7 cases.

The average blood loss in the lap pyeloplasty group was 90 cc as compared to 150 cc in the open pyeloplasty group which was significantly lower. However, there was no need for blood transfusion in both the operative groups.

There was no case of open conversion in our study unlike Soulie *et al* who reported the open conversion of retroperitoneal lap pyeloplasty in 5.4 % of cases [9-11]. This might be due to the following reasons-all the surgeries were performed by a single experienced surgeon and the versatility of the surgeon to laparoscopic procedures and intracorporeal suturing and knotting.

Also, there were no associated anomalies included in our study, hence avoiding complex anatomy in laparoscopic cases.

7 patients in total had post-operative complications. 4 patients (27%) in the open pyeloplasty group had complications (wound infection -3 and Postoperative fever-1). Only 3 patients (22%) in the laparoscopic pyeloplasty group had post operative complications (Paralytic ileus-2,Post operative fever-1). There was no incidence of urinary leaks in both operative groups mostly because of use of urinary DJ stent in all cases.

The mean time when oral feeds were started in the Laparoscopic pyeloplasty group was 1.73 ±0.57 days as compared to those in the open pyeloplasty group (2.47±0.72) which was significant. ($p<0.05$).

Table 5: Comparison of mean time to oral feeds in present study and other studies.

Study	Mean Time when oral feeds were started (days)		P value
	Open Pyeloplasty	Lap pyeloplasty	
Calvert *et al*.	3.04	1.62	<0.05
Present study	2.47	1.73	<0.001

The mean time to removal of surgical drains was 3.6 ±0.88 days in the open pyeloplasty group as compared to 2.27 ±0.57 days in the laparoscopic pyeloplasty group which was significant($p<0.0001$).

Both the mean time for starting oral feeds and time to remove surgical drain was significantly lower in the Lap pyeloplasty group as compared to the open pyeloplasty group despite longer mean operative time in the lap pyeloplasty group.

This may be due to increased Postoperative pain and increased surgical dissection in open pyeloplasty as compared to laparoscopic pyeloplasty.

The mean time of hospitalization for the open pyeloplasty group was 6.13 ±0.96 days as compared to 4.73 ±0.68 days with a significant difference of 1.40 days (p-value-0.0001). The operative mean of hospitalization in both cases was comparable to some studies described in the literature.

Table 6: Comparison of mean hospital stay in present study and other study.

Study	Mean Hospital stay(days)		P value
	Open pyeloplasty	Lap pyeloplasty	
Bansal *et al*	8.29 ±1.35	3.14 ±1.29	<0.01
Rehman *et al*.	6.59 ±1.64	3.97 ±1.16	<0.001
Present study	6.13 ±0.96	4.73 ±0.68	0.0001

The mean hospital stay in our study was more in the open pyeloplasty group with a significant difference of 1.40 days. This can be attributed to the early convalescence, early Surgical drain removal, and early start of oral feeding in the laparoscopic group.

The pain analogue scale and the activity questionnaire developed by Nadler *et al*. were used to assess pain and activity level both pre- and postoperatively. Pre-operative pain and activity levels were assessed in both groups just one day before surgery, and post-operative pain and activity levels were assessed after 6 weeks at the time of DJ stent removal.

The mean pain score recorded on the pain analog scale pre-operatively were 64 ±7.48 and 60 ±5.77 in open and lap pyeloplasty groups respectively (p-value-0.1122). The mean pain score recorded on the pain analog scale post-operatively at 6 weeks were 15.33 ±4.94 and 10.33 ±2.87 in open and lap pyeloplasty cases respectively(p-value-0.0021), was significant, which showed significant comparative pain reduction in the laparoscopic group as compared to open group. Both groups had a significant reduction in pain score as shown by significant p values in open pyeloplasty (<0.0001) and Lap Pyeloplasty (<0.0001) measured by the student's paired 't'-test.

The mean activity level recorded preoperatively on the Nadler scale was49.67 ±4.08 and 52 ±4.4 in open and laparoscopic pyeloplasty respectively (p-value0.1438). The mean activity level measured postoperatively scale was 91 ±3.265 and 94.33 ±1.7 in open pyeloplasty and Lap pyeloplasty respectively which was significant(p-value-0.0016), better in the laparoscopic pyeloplasty group. Both groups had significant improvement in activity level recorded on the Nadler scale with a significant p-value of <0.0001 measured by the student's paired 't-test.

Our study showed a significant reduction in pain score in lap pyeloplasty as compared to the open pyeloplasty group. Even the activity level measured on the Nadler scale was found to be significantly improved in the lap pyeloplasty as compared to open pyeloplasty. A similar study was performed by Srinivas *et al* [12] comparing both pain and activity level and concluded that pain and activity level was significantly reduced in the lap pyeloplasty group as compared to the open pyeloplasty group. Cosmesis was satisfactory in both the treatment groups even in those cases who developed wound infection postoperatively but the patients in the lap pyeloplasty group had much better cosmetic outcomes subjectively and objectively due to a negligible and short length of scar as compared to the open pyeloplasty group.

The GFR of the patients included in the study was measured by Tc 99m-DTPA diuretic scan preoperatively and postoperatively after 3 months. The mean GFR measured pre-operatively in the open pyeloplasty group was 28.27 ±4.86/ min and the Laparoscopic Pyeloplasty group was 27.27 ±3.54/ min(p value=0.5247) which was not significant. The mean GFR in the open pyeloplasty group was 48.26 ±5.82 and laparoscopic pyeloplasty was 49.53 ±7.82 (p value=0.6170) postoperatively which was

not significant. But there was a significant improvement in the mean GFR with a significant difference of -19.99 in Open Pyeloplasty and -22.26 in the laparoscopic pyeloplasty group with a p-value of <0.0001 in both groups as measured by student's paired "t" test.

The success rate in our study was 93.3% in the open pyeloplasty group and 86.67% in the laparoscopic pyeloplasty group [18,19]. Clinical success was determined by improvements in pain and other symptoms, as well as post-operative radiological evidence of improvement in hydronephrosis on ultrasound examination and improved GFR on renal diuretic scan with DTPA, both USG and DTPA diuretic scan measured at 3 months. 1 patient had a failure in the open pyeloplasty group and 2 patients in the lap pyeloplasty group. All of them underwent Redo pyeloplasty by open approach and are still on follow-up. Our success rate was comparable to many other studies described in the literature as shown below in the table [20,21].

Table 7: Comparison of Success rate in present study and other study.

Study	Total number of patients		Duration of follow up(months)	Success rate	
	OP	LP		OP	LP
Bauer *et al.*	35	42	15	100%	98%
Krishna SM *etal.*	18	19	12	100%	89%
Simforoosh *et al.*	32	37	11-16	83.8%	87.5%
Umari *et al*	25	24	40-70	90.5%	90.9%
Present study	15	15	3	93.3%	86.67%

Despite having a significant success rate comparable to other studies, the main drawback of our study was the short mean duration of follow up for our patients which was only 3 months as compared to other studies where the average duration of follow up was more than 12 months in all the studies mentioned in the table above. Long-term outcomes must be evaluated because PUJ obstruction can recur after a year or more postoperatively in some cases. Most researchers also recommend at least a one-year follow-up with a diuretic scan and IVP [13]. Jarrett *et al* [14] reported the results of 100 laparoscopic pyeloplasty with a mean clinical and radiographic follow-up of 2.7 and 2.2 years, respectively. He reported an overall success rate of 96% with no late failures (after 1 year).

Summary

Laparoscopic pyeloplasty has a comparable success rate to open pyeloplasty and is an effective minimally invasive treatment option for PUJ obstruction. Also, Laparoscopic pyeloplasty is associated with a significant reduction in overall morbidity, including pain control, blood loss, shorter hospital stays, and shorter time to convalescence and is cosmetically superior to open pyeloplasty. But longer operative time, steep learning curve, and requiring technical expertise like intracorporeal knotting during the procedure are the important factors to be dealt in lap pyeloplasty. But with the advent of advanced laparoscopic equipment's and also steady increase in worldwide laparoscopic experience and education, LP is emerging as the new standard of care for PUJ obstruction.

References

1. Smith and Tanagho's General Urology. 19th Edition. Disorders of the ureter and ureteropelvic junction: Barry A. Kogan: P576-579.

2. Johnston JH, *et al*: Pelvic hydronephrosis in children: A review of 219 personal cases. J Urol 1977; 117:97–101.
3. Troxel S, Das S, Helfer E *et al*. J Urol. 2006;176:1073–1076.
4. Calvert RC, Morsy MM, Zelhof B, Rhodes M, Burgess NA. Comparison of laparoscopic and open pyeloplasty in 100 patients with pelviureteric junction obstruction. Surg Endosc 2008; 22:411-14.
5. Sundaram CP, Grubb RL, Rehman JA, Yan YA, Chen CA, *et al*. Laparoscopic pyeloplasty for secondary ureteropelvic junction obstruction. J Urol 2003; 169:2037-40.
6. Srinivas KK, Uppin IV, Nerle RB. A Prospective randomized controlled trial complains open pyeloplasty and laparoscopic pyeloplasty for ureteropelvic junction obstruction (PUJO): subjective outcome. J Clinical Diagnost Res. 2011 December; 5(8): 1601-5.
7. Bansal P, Gupta A, Mongha R, Narayan S, Kundu AK, Chakraborty SC, *et al*.Laparoscopic versus open pyeloplasty: comparison of two surgical approaches-a single centre experience of three years. J Minimal Access Surg. 2008 Jul;4(3):76
8. Sunil Krishna M, Moideen Nafseer TA, Benakatti Rajendra. Laparoscopic versus open pyeloplasty: an experience at a tertiary care centre. Int Surg J. 2018 Sep;5(9):3150-3155
9. Eden CG, Cahill D, Allen JD. Laparoscopic dismembered pyeloplasty: 50 consecutive cases. BJU Int 2001; 88: 526-31.
10. Singhania Piyush, Andankar Mukund G, Pathak Hemant R. Laparoscopic dismembered pyeloplasty: Our experience in 15 cases. World Journal of Laparoscopic Surgery, May-Aug 2009; 2(2): 6-11.
11. Soulie M, Thoulouzan M, Seguin P, *et al*. Retroperitoneal laparoscopic versus open pyeloplasty with a minimal incision: comparison of two surgical approaches. Urology 2001 Mar; 57(3): 443-7
12. Campbell's textbook of urology. Management of upper urinary tract obstruction. Stephen Y. Nakada, Sara L. Best. Twelfth Edition edition, vol. II. P1942-1962.
13. Schuessler WW, Grune MT, Tecuanhuey LV, Preminger GM. Laparoscopic dismembered pyeloplasty. J Urol 1993; 150: 1795-9.
14. Sen KK, Mohan C, Verma BS. Magnetic resonance urography in obstructive uropathy. Med J Armed Forces India. 2008; 64(2);145-7.
15. Srinivas KK, Uppin IV, Nerle RB. A Prospective randomized controlled trial complains open pyeloplasty and laparoscopic pyeloplasty for ureteropelvic junction obstruction (PUJO): subjective outcome. J Clinical Diagnost Res. 2011 December; 5(8): 1601-5.
16. P. Umari, A. Lissiani, C. Trombetta and E. Belgrano, Comparison of open and laparoscopic pyeloplasty in ureteropelvic junction obstruction surgery: report of 49 cases, Archivio italiano di urologia e andrologia. 2011; 83(4): 169-174.
17. Simforoosh N, Basiri A, Tabibi A, Danesh AK, Sharifi-Aghdas F, *et al*. A Comparison between Laparoscopic and Open Pyeloplasty in Patients with Ureteropelvic Junction Obstruction. Urology Journal. 2004;1(3)
18. Bauer JJ, Bischoff JT, Moore RG, Chen RN, Iverson AJ, Kavoussi LR. Laparoscopic versus open pyeloplasty: assessment of objective and subjective outcome. J Urol. 1999; 162: 692–695.
19. Klingler HC, Remzi M, Janetschek G, Kratzik C, Marberger MJ. Comparison of open versus laparoscopic pyeloplasty

techniques in treatment of ureteropelvic junction obstruction. Eur Urol. 2003; 44: 340–345.

20. Masatsugu Iwamura, *et al*. Laparoscopic pyeloplasty for ureteropelvic junction obstruction: Outcome of initial 12 procedures. International Journal of Urology 2004;11: 449-55.
21. Jarrett TW, Chan DY, Charambura TC, Fugita O, Kavoussi LR.Laparoscopic pyeloplasty: The first 100 cases. J Urol. 2002; 167:1253-56