International Surgery Journal
Gajbhiye R et al. Int Surg J. 2015 Feb;2(1):53-59
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: 10.5455/2349-2902.isj20150210

Research Article

Study of laparoscopic retroperitoneal pyeloplasty

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Received: 3 January 2015
Accepted: 21 January 2015

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ABSTRACT

Background: Pelvi-Ureteric Junction Obstruction (PUJO) is a common anomaly seen affecting children and adults. The structural wall is most of the times the main reason for obstruction while other causes like stones, infection etc. explain the remaining. Regardless of the cause, the end result is impedance in the normal flow of urine from the renal pelvis into the proximal ureter, resulting in caliectasis and hydronephrosis. There is a scarcity of data regarding feasibility of laparoscopic retroperitoneal pyeloplasty in connotation with the Indian background. The research aims to study the procedure its feasibility, success rates and complications.
Methods: This prospective study was carried out in the department of surgery of our hospital, over a period of 2 years from Nov 2011 to Nov 2013. Studies have been approved by the institutional ethics committee and Maharashtra University of health sciences, Nashik and have therefore been performed in accordance with the ethical standards laid down in the 1964 declaration of Helsinki and its later amendments.
Results: Out of the 25 patients, there were 14 (56%) males and 11 (44%) females. Male to female ratio was 1.2:1. Of these 13 (52%) were having right sided PUJO and 12 (48%) were having left sided PUJO. 12 (48%) patients were in the age group of 16-30 years, 7 (28%) in 31-45 years age group, 5 (20%) in 0-15 years group and one (4%) patient in 46-60 years age group. 24 (96%) had history flank pain on the affected side. Of this 9 (36%) had only flank pain as there presenting symptom. 11 (44%) had history of recurrent urinary tract Infection. Only one (4%) patient had only recurrent UTI history. 8 (32%) patients had mixed symptoms most commonly associated with flank pain. 6 (24%) patients had renal lump of which 5 (20%) had associated flank pain and 1 (4%) had both UTI and flank pain. The mean VAS score for pain preoperatively is 6.54 ± 1.18. On investigation the mean serum BUL and mean serum creatinine was 36.6 ± 18.7 mg/dl and 1.1 ± 0.59 µg/dl respectively.
Conclusions: Laparoscopic retroperitoneal pyeloplasty is a safe and feasible. It is associated with excellent patient outcomes with good patient satisfaction. It has direct approach to the target organ. Laying a platform this technique can also be expanded for more other procedure related to kidney and ureter.

Keywords: PUJO, Laparoscopic retroperitoneal pyeloplasty, Safe and feasible

INTRODUCTION

Pelvi-Ureteric Junction Obstruction (PUJO) is a common anomaly seen affecting children and adults. The structural wall is most of the times the main reason for obstruction while other causes like stones, infection etc. explain the remaining. Regardless of the cause, the end result is impedance in the normal flow of urine from the renal pelvis into the proximal ureter, resulting in caliectasis and hydronephrosis. This may lead to progressive deterioration of renal function and, thus, requires intervention to relieve the obstruction and restore the normal flow of urine. Advances in endoscopy have flourished the approaches for management of this

condition like laparoscopic pyeloplasty, robotic-assisted laparoscopic pyeloplasty etc. Historically, open pyeloplasty has been the standard treatment for congenital or acquired PUJO in adults and children, with overall success rates of 90% to 100%.[1] Since first described by Schuessler et al. in 1993, laparoscopic pyeloplasty has emerged as a valid technique to correct PUJO with a success rate of more than 95%.[2] Transperitoneal access is the more popular approach for laparoscopic operation, as it provides a larger working space in which to manipulate the instruments and perform the anastomosis. Retroperitoneal access has also been described, but it is less popular because of the limited working space, especially in children but with more advantages as compared to the former.[3] There is a scarcity of data regarding feasibility of laparoscopic retroperitoneal pyeloplasty in connotation with the Indian background. In light of this, the research aims to study the procedure its feasibility, success rates and complications.

METHODS

This prospective study was carried out in the department of surgery of our hospital, over a period of 2 years from Nov 2011 to Nov 2013. Studies have been approved by the institutional ethics committee and Maharashtra University of health sciences, Nashik and have therefore been performed in accordance with the ethical standards laid down in the 1964 declaration of Helsinki and its later amendments. Approval from was taken before commencing the study. After informed and written consent, the study participants were interviewed and examined according to the preformed and pretested proforma. Laparoscopic Retroperitoneal Pyeloplasty (LRP) was performed in patients who presented to surgery OPD with either flank pain and or UTI and were investigated with USG and IVP and diagnosed to have PUJ obstruction. Patients with obstruction from malignancy, no fitness for anaesthesia, renal failure, uncorrected coagulopathy, morbid obesity, retroperitoneal fibrosis and previous multiple abdominal surgeries were excluded from the study. With all preoperative investigations and proper preparation and consent, all patients went with following procedure. The patient is placed in a flank position i.e. classical lateral position with the affected side up and secured to the surgical table. The first incision was given at the level of the mid axillary mid-way between subcostal margin and iliac crest. Digital separation of fat was done in the retroperitoneal planes. An adequate space was created in the retroperitoneum either using CO_2 or balloon dilator. A 10 mm anchoring trocar was placed at this site for the telescope 0^o after creation of a retroperitoneal space. Three ports guided by a spinal needle were then placed. One 10 mm trocar was placed sub costally along the posterior axillary line for the assistant, two 5 mm trocar subcostally along posterior axillary line and along iliac crest in anterior axillary line for the surgeon. PUJ mobilized. The obstructed segment was excised. Reduction pyeloplasty was done when required. The ureteric end was spatulated. A double J stent was inserted using a per cutaneous puncture and introduced antegradely in the ureter and the pelvis. The anastomosis was performed using a vicryl 3-0 suture in a continuous fashion. The anastomosis was done anterior to any crossing aberrant vessel. A 16 fr drain was introduced through the posterior axillary line port site and fixed. Average blood loss was calculated by measuring the number of soaked gauze pieces used. A single soaked gauze piece of 4 inch size amounted to a blood loss of 12.5 ml. Catheter was removed after 24 hours. Drain was removed after 48hrs only if the total output was <100 ml in 24 hours and patient discharged the next day. Patients were followed up at 6 weeks, 3 and 6 months postoperatively. DJ stent removed at first follow up under cystoscope guidance. Symptomatic pain assessment was done each time during follow up. Ultrasonography was done at every follow up. Renal scan was done for patients with non-visualization of kidneys on IVP before surgery.

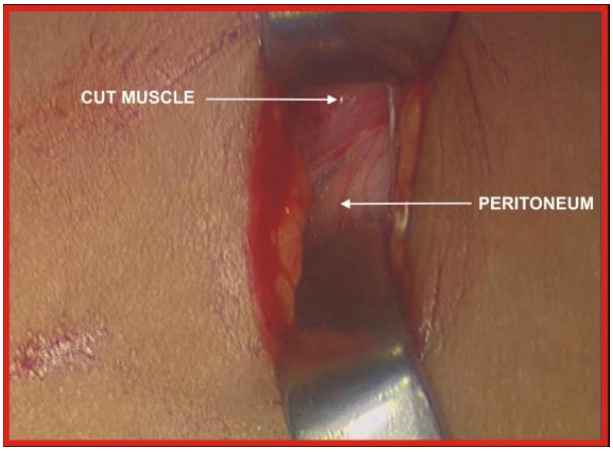

Figure 1: Showing the initial skin incision, the quadratus lumborum has been dissected and the initial retroperitoneal space been entered. The peritoneum is seen in the figure.

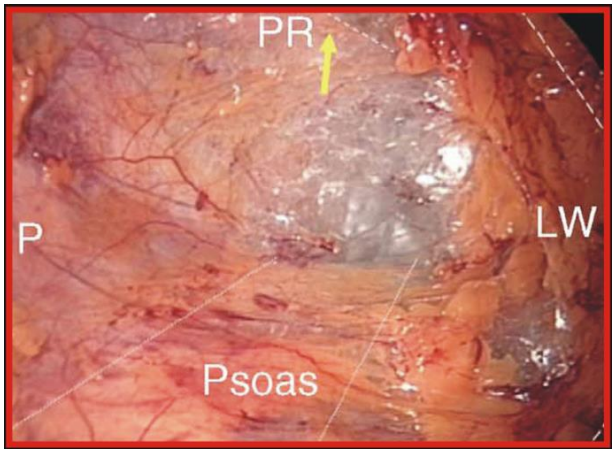

Figure 2: Intra operative view showing the reflected peritoneum (PR) above, the Psoas muscle below and lateral wall (LW).

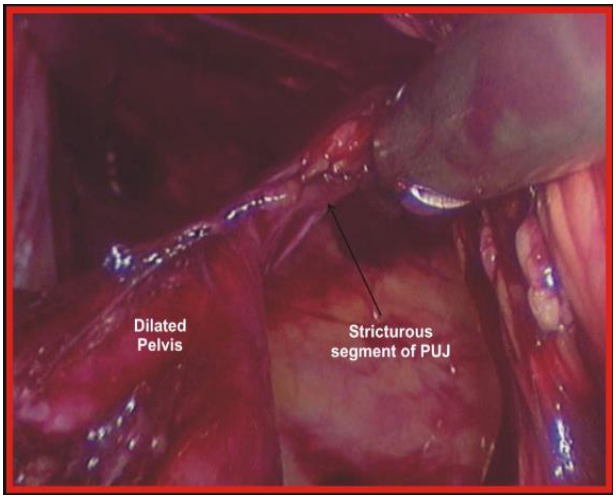

Figure 3: The dissection of retroperitoneum ids complete with completely dissected pelvis and ureter.

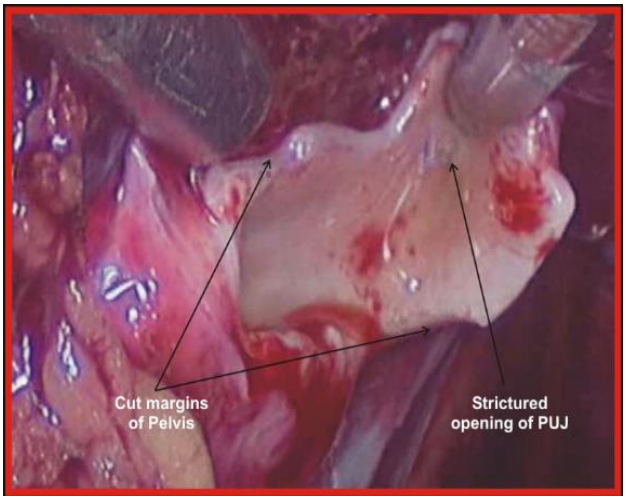

Figure 4: The renal pelvis has been. The arrow points at the strictured opening of ureter.

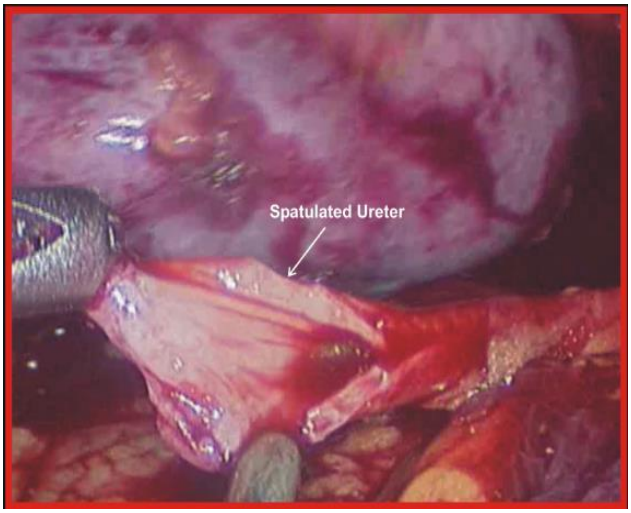

Figure 5: The ureter being spatulated for anastomosis with the pelvis.

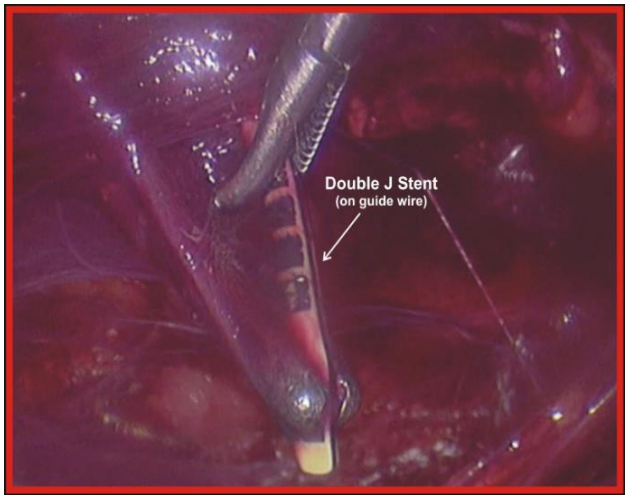

Figure 6: Percutaneous insertion of the DJ sent with subsequent antegrade progression into the ureter.

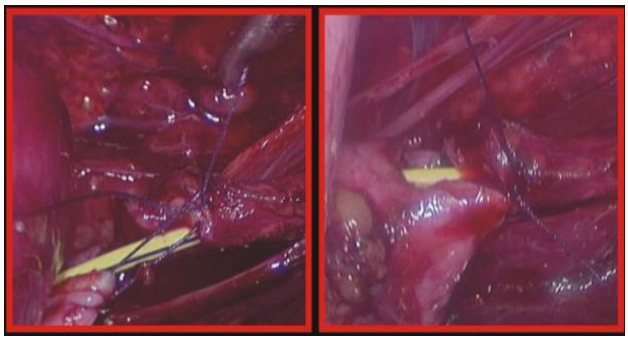

Figure 7: The anchoring suture being taken with bites in the renal pelvis and the ureter.

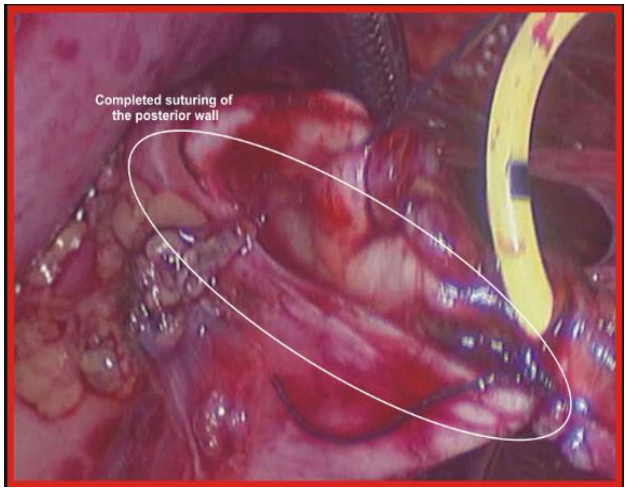

Figure 8: Showing completed suturing of the posterior wall of anastomosis.

RESULTS

Out of the 25 patients, there were 14 (56%) males and 11 (44%) females. Male to female ratio was 1.2:1. Of these 13 (52%) were having right sided PUJO and 12 (48%)

were having left sided PUJO. 12 (48%) patients were in the age group of 16-30 years, 7 (28%) in 31-45 years age group, 5 (20 %) in 0-15 years group and one (4%) patient in 46-60 years age group. 24 (96%) had history flank pain on the affected side. Of this 9 (36%) had only flank pain as there presenting symptom. 11 (44%) had history of recurrent urinary tract Infection. Only one (4%) patient had only recurrent UTI history. 8 (32%) patients had mixed symptoms most commonly associated with flank pain. 6 (24%) patients had renal lump of which 5 (20%) had associated flank pain and 1 (4%) had both UTI and flank pain.

The mean VAS score for pain preoperatively is 6.54 ± 1.18. On investigation the mean serum BUL and mean serum Creatinine was 36.6 ± 18.7 mg/dl and 1.1 ± 0.59 µg/dl respectively. Of this only 2 (8%) had creatinine values more than 2 mg/dl. On ultrasonography all patients had a dilated pelvicalyceal system in which 11 (44%) had predominantly grade II hydronephrosis, followed by grade III hydronephrosis in 9 (36%) patients and grade I in 5 (20%) patients. Renal stones were present in 6 (24%) of the patients. On IVP, 10 (40%) had a normally functioning kidney. 12 (48%) had delayed excretion of the dye whereas 3 (12%) had no excretion of the dye and had a non visualizable kidney. The mean total duration of surgery defined as the time from induction of anaesthesia to the time of last port closure was 130.2 min in a range 90-200 min (Table 1).

Table 1: Intraoperative findings.

Intra operative findings	Range	Average
Duration of surgery (min)	90-200	130.2
Duration of Anastomosis (min)	10-35	19.16
Average blood loss (ml)	40-150	66.8
Aberrant vessel found	4 (16%)	

There was no significant difference in operative times when compared from left to right side. The mean time required for anastomosis was 19.16 min in a range of 10-35 min. The average blood loss was 66.8 ml in the range of 40-150. In 9 (36%) patients an aberrant vessel was found crossing ventrally to the ureter. Dismembered pyeloplasty was done anterior to this vessel in all the cases.

There was no hematoma formation either in the anterior abdominal wall or peri-renal, no injury to surrounding structures like the vascular pedicle or the kidney itself. In none of the procedures the retroperitoneal approach was abandoned and converted to either transperitoneal or open routes. The average hospital stay was 5 days. The mean VAS score of pain on the 1st and 3rd postop day was 8 and 4 respectively. Only 4 patients were there on the 7th day and there VAS score for post op pain was an average of 3. Urinary leak as evident on urine present in the drain was present in 2 (8%) of the patients (Table 2).

Table 2: Post-operative findings.

Post-operative parameters	Range	Average
Post op NBM (hours)	4-8	5.32
Post op mobilization (hours)	4-6	6.28
Urinary catheter removal		
Hours	41-211	67.28
Days	2-9	3.04
Abdominal drain removal		
Hours	90-260	115.96
days	4-11	5
Post op hospital stay		
Hours	100-304	139.92
days	4-12	5.56
Urinary Leak	2 (8%)	

They were re-catheterized and managed conservatively. All the patients came to OPD for follow up at 6 weeks. All the patients had DJ stent in situ which was removed at 6 weeks. 9 (36%) patients complained of flank pain intermittent type and or associated with increased frequency or burning micturition on the operated side. The average VAS score was in the range of 3 to 8 with a mean of 4.11. There was a significant improvement in pain using Z test Z = 4.48, P = 0.0001 compared to pain preoperatively and post op at follow up. The no. of patients decreased from 24/25 to 9/25. Other symptoms were increased frequency of micturition and burning micturition in 6 (24%) and 5 (20%) of patients. Hematuria was seen in a single patient. On USG 12 (48%) had no hydronephrosis, 7 (28%) had grade I hydronephrosis and 6 (24%) patient has grade II hydronephrosis. At 3 months 4 patients had intermittent flank pain of mean VAS score of 1.3. Significant difference in Pain improvement was seen with Z = 5.96, P = 0.0001. None had any history of burning micturition. 4(16%) patients had Hydronephrosis with grade I in 3 (12%) and grade II in 1 (4%). IVP done at 3 months follow up showed a normally excreting non dilated renal pelvis in 22 patients, and delayed functioning in 3 patients. These 3 were the same patients who had shown non visualisation on IVP preoperatively. Amongst these 3 one patient had dilated pelvis with grade II hydronephrosis. At 6 months only one patient had history of flank pain**.** 3 patients (12%) all of them were female patients had history of UTI in the form Cystitis with burning micturition. The USG KUB of these patients was normal in all the cases showing normal pelvicalyceal system except in the patient presenting with pain who had grade II hydronephrosis. IVP was done for this patient and demonstrated a persistent dilatation of the pelvicalyceal system and delayed excretion of the dye suggested an Anastomotic stricture. Renal scan of this patient showed a minor improvement from 30% preoperatively to 45% post operatively. IVP of the two patients who had delayed functioning at 3 months follow up was normal anatomically with normal functioning kidney. Renal scan for these two patients showed improvement in renal function from 29% and 33% to 84% and 90 % respectively.

DISCUSSION

The initial retroperitoneoscopic approach to pyeloplasty was first reported by Janetschek and colleagues (1996).[4] This eye catching event was received well and many studies were carried all around the world. We describe below such landmark studies in detail.

Zhang et al. (2005)[5] studied 50 patients with a mean age of 23 years (range 4 to 55) who underwent retroperitoneal laparoscopic dismembered pyeloplasty. Of the 28 male and 22 female patients, 27 had UPJ obstruction on the right side and 23 on the left side. 21patients were symptomatic, presenting with mild to moderate flank pain; 4 of these patients had concomitant urinary tract infection. Twenty-nine patients were asymptomatic, and the UPJ obstruction was discovered incidentally by renal ultrasonography or computed tomography.

All operations were completed laparoscopically without conversion to open surgery. The mean operating Time was 81.6 minutes (range 55 to 180) for all cases, 104 minutes for the first 15 cases and 72 minutes for the last 35 cases. The mean blood loss was 12 mL (range 5 to 50). An aberrant artery vessel crossing on the dorsal side of the UPJ was observed in 6 patients, and all the vessels were transposed ventrally to the UPJ. Primary stricture as the cause of UPJ obstruction was noted in 44 patients. During a mean radiographic follow-up of 22 months (range 3 to 50), 98% of the patients demonstrated a patent UPJ and substantial decrease in hydronephrosis. Postoperative complications occurred in 2 patients.

Bachmann et al (January, 2006)[6] in their study of 47 cases of retroperitoneal pyeloplasty comprising 26 female and 21 male patients and 28 right-sided and 19 left-sided pyeloplasties. The major symptom was flank pain followed by urinary tract infection. In 44 (94%) patients, an Anderson-Hynes pyeloplasty was performed. A crossing vessel was identified in 26 (55%). In three (6%) patients with a small renal pelvis, a Fenger pyeloplasty was performed. Median operating time was 180 min (70-360) with an average estimated blood loss of 100 ml (0-600).

Two (4%) conversions to open surgery were required because of scarring after previous endopyelotomy and massive obesity resulting in a limited working space. The postoperative complication rate was low. Leakage of anastomosis with reinsertion of the stent during early follow-up seen in 2 (4.3%) cases. Other complications were Urinary tract infection after stent removal in 1 case (2.1%), Wound hernia in 1 (2.1%), Wound infection in 1 (2.1%) and Recurrent stenosis requiring open reoperation in 1 (2.1%). In two patients, a calculus was removed. The reoperation rate because of restenosis was 2% (n = 1).

Byrant et al. (2008)[7] in there series of 67 cases of retroperitoneal pyeloplasty for diagnosed cases of UPJ obstruction, consisting of 36 males and 31 females with 30 right and 37 left sided PUJ obstruction. They adopted a retroperitoneal approach using a proprietary dilating balloon introduced via a midaxillary subcostal 12-mm incision. This technique creates a space prior to the introduction of a primary port and two secondary 12-mm ports subcostally in the anterior- and posterior-axillary line. The mean operative time was 153 min. The surgical complications were classified as either intraoperative or postoperative, and the latter are tabulated as major or minor complications which occurred within either 30 or 90 days following surgery.

The two conversions to open procedures occurred due to a failure to progress with the anastomosis in one patient, and fibrosis causing failure of progression of dissection in another patient. During the first 30 days following surgery, three patients (5%) had developed major complications from surgery. Seven other patients developed minor 30-day complications including wound infections, poor pain control, a peri-renal hematoma managed conservatively, hematuria requiring readmission, palpitations, and phlebitis. Over 30% (16/53) of patients suffered from stent symptoms including frequency of micturition, loin pain and hematuria. The mean follow-up in this series was 16 months; radiologic de-obstruction was seen in 61/65 patients (94%) and 57/63 patients (90%) were rendered pain-free.

A total of 4/63 (6%) patients had further surgery during the follow-up period, including 2 patients who had re-obstructed, one of whom underwent an open nephrectomy while another patient underwent a successful redo laparoscopic (flap approach) pyeloplasty.

Chuanyu et al. (2009)[8] studied 150 patients which included 96 males and 54 females, with mean age 28 years (range 16-37). The UPJO was on the left side in 111 cases and on the right side in 39 cases. The major complaint was loin pain followed by urinary tract infection. All patients underwent dismembered retroperitoneal pyeloplasty. The operating time was 95-190 minutes (average 105 minutes). The estimated blood loss was 20-80 mL (average 35 mL). The postoperative hospital stay was 6-12 days (average 7.4 days). In 70 (46.7%) patients, a crossing vessel was encountered and preserved. The urinary leakage in 2 cases disappeared on the 11th and 12th day after the operation, respectively.

The follow-up was done 12-24 months, with an average of 16 months. Data from 147 cases revealed various degrees of hydronephrosis relief and renal function improvement. Success rate was 98%. Stenosis of anastomosis occurred in 3 cases, and the subsequent hydronephrosis was presented 3 months postoperatively.

The present study had a marked influence from all these pioneers for LRP. A comparison with the above authors is depicted in Table 3.

Table 3: Comparison of studies.

Authors	Patients (No.)	Operative time (min)	Hospital stay (days)	Complications (%)	Follow up (mo)	Success (%)
Zhang et al. (2005)	50	81.6	7.6	3.6	22	98.0
Bachmann et al. (2006)	44	180	8	7	26	-
Byrant et al. (2008)	67	153	3	20	16	94
Chauanyu et al. (2009)	150	105	7.4	5	16	98
Present study (2013)	25	130	5.5	8	6	96

Though the number of cases in our study were less still most of the results we obtained had similar and positive results. Nearly all studies mentioned above had many common surgical features intraoperative and postoperative as well. Our study is also unique in being among the few studies reported with such a procedure performed in India. This usage thoroughly signifies the exploitation of this technique for procedures other than just PUJO.

CONCLUSION

Laparoscopic Retroperitoneal pyeloplasty is a safe and feasible. It is associated with excellent patient outcomes with good patient satisfaction. It has direct approach to the target organ. Laying a platform this technique can also be expanded for more other procedure related to kidney and ureter.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee and Maharashtra University of health sciences, Nashik

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DOI: 10.5455/2349-2902.isj20150210
Cite this article as: Gajbhiye R, Tirpude BH, Bhanarkar H, Fidvi A, Shamkuwar A. Study of laparoscopic retroperitoneal pyeloplasty. Int Surg J 2015;2:53-9.