

Laparoscopic Redo Pyeloplasty After Failed Open Surgery

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Purpose: To report our experience in treating patients with failed previous open pyeloplasty by transperitoneal laparoscopic pyeloplasty.

Materials and Methods: Eleven patients with previous failed open pyeloplasty were reviewed, all of whom had undergone transperitoneal laparoscopic pyeloplasty. All procedures were performed by a single team. Depending on the anatomic situation, either dismembered or a flap technique was utilized. Subsequent follow-up was by ultrasonography initially, and diuretic renal scintigraphy and/or intravenous urography at least 12 months after the re-operation. Data were collected from the medical records.

Results: The study group consisted of 7 men and 4 women with the mean age of 41.4 years (range, 27 to 55 years). Mean operation time was 208 minutes (range, 165 to 250 minutes) and mean hospital stay was 3.6 days (range, 3 to 5 days). Mean follow-up was 24.1 months (range, 12 to 42 months). The overall success rate for these salvage laparoscopic pyeloplasties was 90.9%. Only one female patient developed dull flank pain 3 months after stent removal. There was no conversion to open surgery. None experienced major complications or required blood transfusion.

Conclusion: Laparoscopic pyeloplasty can be a valid and feasible option in treating patients with failed prior open pyeloplasty.

Keywords: laparoscopy, ureteral obstruction, reoperation, salvage therapy, treatment failure

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INTRODUCTION

Ureteropelvic junction obstruction (UPJO) may lead to hydronephrosis and progressive renal function impairment if left untreated. Open pyeloplasty has become the gold standard for treatment of primary UPJO, with success rates exceeding 90%.⁽¹⁾ Although failure of pyeloplasty is uncommon; however, it can occur even years after the initial open procedure.⁽²⁾

Management options for secondary UPJO continue to evolve.⁽³⁾ Until recently, endopyelotomy and open surgery were the only appropriate

modalities for management of recurrent UPJO. Secondary open pyeloplasty is associated with significant difficulty and increased morbidity with variable success rates of 37.5% to 71.4%, which are uniformly lower than primary surgery.^(4,5) Endopyelotomy, once recommended as the initial salvage method of choice for failed UPJO repair,⁽⁶⁾ was later shown to be even inferior to open re-operation in outcome. Laparoscopy has recently been adopted as another alternative.^(2,5,7) Therefore, we have continued our research for a sufficiently effective,

yet less morbid option. We hereby report the midterm results of our experience with laparoscopic secondary pyeloplasty.

MATERIALS AND METHODS

This retrospective study was carried out on 11 patients who had undergone transperitoneal laparoscopic pyeloplasty as salvage for prior failed open retroperitoneal pyeloplasty between February 2005 and January 2008.

The patients presented to our center with lateralized flank symptoms or routine radiologic follow-up pointing to recurrent or unresolved UPJO following open pyeloplasty. Ureteropelvic junction obstruction was individually confirmed by diuretic renal scan, using diethylene triamine penta acetic acid (DTPA) and further clarified anatomically by an intravenous urography. Patients with urinary obstruction, defined as evacuation T1/2 on diuretic renogram exceeding 20 minutes after 1mg/kg lasix infusion, were offered to choose between a second open procedure or laparoscopy (Table 1).

In all the patients consenting to laparoscopic salvage pyeloplasty, the procedure was performed by transperitoneal approach. As with any re-operative procedure, extra attention was paid to avoid inadvertent organ injury during entry, including

Table 1. Summary of findings in 11 laparoscopic redo pyeloplasties

Case	Age	Gender	Time since open pyeloplasty, month	Technique of		Pre-op DTPA scan T1/2 % renal function	Redo Technique	Operation time, min	Hospital stay, d	Postop DTPA T1/2, min	Follow-up, month	Complication	Incidental findings
				failed procedure	pyeloplasty								
1	27	F	40	Dismembered pyeloplasty	pyeloplasty	90	Hynes pyeloplasty	245	3	10	30	-	Lower pole vessel
2	32	F	24	Dismembered pyeloplasty	pyeloplasty	50	Flap plasty	241	4	65	18	Initial persistent obstruction relieved by ureteroscopic balloon dilatation	Fibrosis
3	52	M	55	Dismembered pyeloplasty	pyeloplasty	120	Flap plasty	170	3	10	12	-	Adhesions & Fibrosis
4	45	M	40	Dismembered pyeloplasty	pyeloplasty	60	Hynes pyeloplasty	250	5	7	42	4-day drainage	Crossing vessel
5	47	M	40	Dismembered pyeloplasty	pyeloplasty	60	Flap plasty	165	3	11	32	-	Adhesions & Fibrosis
6	45	F	39	Dismembered pyeloplasty	pyeloplasty	120	Flap plasty	180	4	14	18	-	Fibrosis
7	29	M	48	Dismembered pyeloplasty	pyeloplasty	40	Flap plasty	195	3	14	24	-	Adhesions & Fibrosis
8	42	F	52	Dismembered pyeloplasty	pyeloplasty	50	Hynes pyeloplasty	230	5	13	28	5-day drainage	Adhesion band
9	48	M	74	Dismembered pyeloplasty	pyeloplasty	60	Flap plasty	170	3	15	34	-	Adhesions & Fibrosis
10	33	M	46	Dismembered pyeloplasty	pyeloplasty	90	Flap plasty	190	3	12	15	-	Fibrosis
11	55	M	85	Dismembered pyeloplasty	pyeloplasty	90	Flap plasty	250	4	12	12	-	Adhesions & Fibrosis

*DTPA indicates diethylene triamine penta acetic acid; F, female; and M, male. T1/2 = 50% excretion time.

anticipatory mechanical bowel prep on the night before the surgery. Port placement was tailored to the patient's habitus, but typically involved 4 trocars, with the camera at the umbilicus and two working trocars at the midline or pararectus position. The fourth port, used for retraction by the assistant and subsequent drain placement, was placed on the anterior axillary line. To gain adequate exposure of the right renal hilum, we suspended the liver edge by placing the fourth trocar just below the xyphoid. Through it, a blunt tipped grasping instrument was introduced to support the inferior aspect of the liver, while attached to the parietal peritoneum overlying the costal margin.

As a rule, we created sufficient exposure to visualize the first few centimeters of the proximal ureter down to the lower pole of the respective kidney. This was crucial to rule out *de novo* extrinsic obstructing structures, such as an adhesion band, and indeed overlook primary ones at the outset. We then chose between Anderson-Hynes dismembered pyeloplasty and flap pyeloplasty, based on individual anatomic circumstances on a case by case basis. We preferred dismemberment when the strictured and presumably ischemic segment was short (Figure 1). As a rule, we avoided pelvic trimming whenever possible, and kept it to a necessary minimum otherwise. However, the extent of pelvic reduction at the initial open procedure

was not known, because the patients had been referred to our center and procedural details of their first operation were not available. The use of heat and cautery was deliberately avoided by utilizing *cold shears only* during all dissections close to the pelvis and the ureter, as far as technically possible. Suturing was done free-hand with absorbable 5-0 polyglactin suture over a single 4.8-F double J stent. A closed gravity drain was placed in proximity of the repair, and Foley drainage maintained for at least 48 hours. The drain was removed 24 hours after the urethral catheter, provided there was no leak. Pre-operative parameters, including operation time, hospital stay, success rate, and complications if encountered were recorded.

Success was defined as both symptomatic relief and resolution of obstruction on scintiscan. Patients were followed up by DTPA renal scan +/- intravenous urography in addition to subjective symptoms. Initial imaging follow-up began 6 weeks after stent removal and every 6 months with ultrasonography and DTPA +/- intravenous urography at 12 months and yearly thereafter unless dictated otherwise by symptoms or ultrasonographic findings (Figure 2).

RESULTS

The participants consisted of 7 men and 4 women with the mean age of 41.4 years (range, 27 to 55

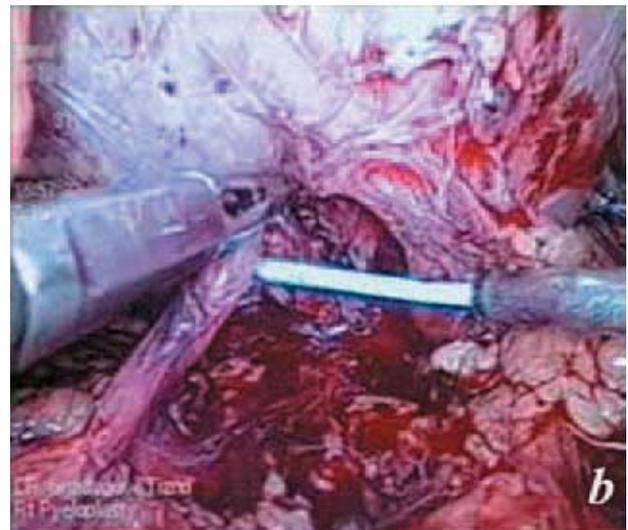
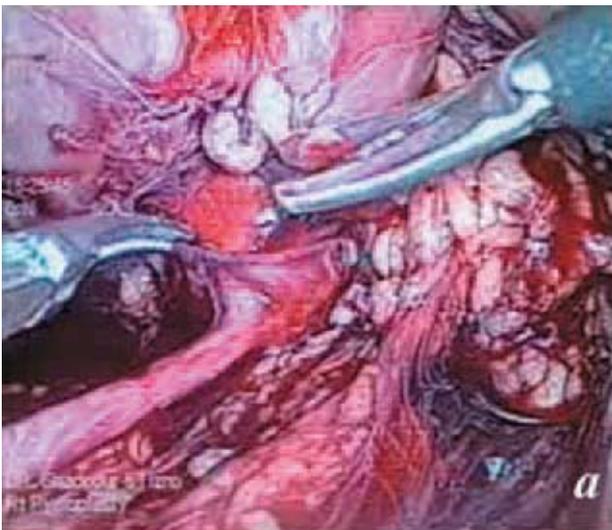


Figure 1. a) Freeing secondary adhesions at a redo right transperitoneal laparoscopic pyeloplasty case, b) Antegrade stent placement through the freed ureter prior to completing the dismembering.

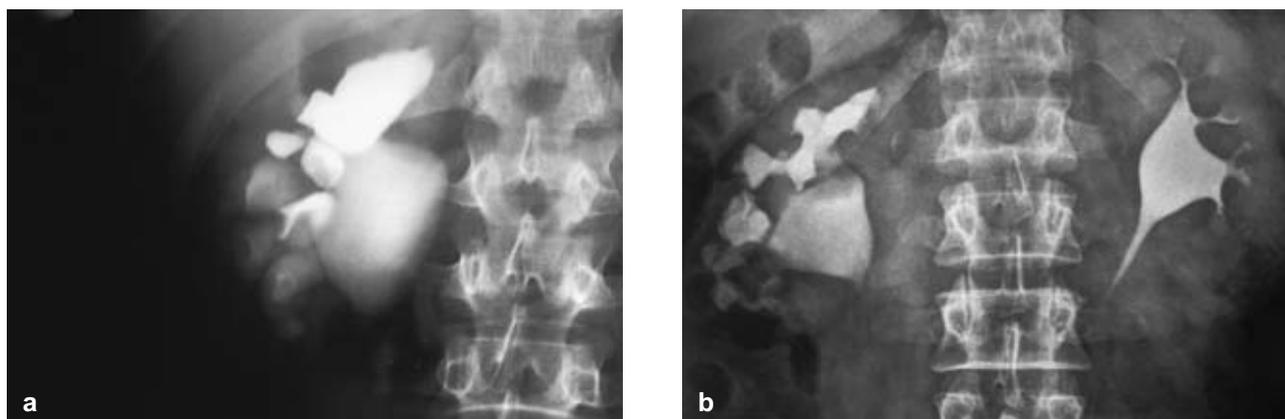


Figure 2. a) Pre-operative intravenous urogram displaying anatomical impression at the proximal ureteral segment corresponding to the bands in Figure 1, b) Postoperative image at one-year follow-up confirming funneling and relieved pressure effect.

years). Seven patients had presented with chronic dull flank pain after primary surgery while 3, including one with coexisting flank pain, had complained of lower urinary tract symptoms. Two remaining asymptomatic patients had been diagnosed on routine follow-up imaging. These patients had presented with recurrent obstruction at an average of 49.3 months (range, 24 to 85 months) after their initial open pyeloplasty. The failed initial technique had involved dismemberment in all 11 subjects.

Mean operation time was 208 minutes (range, 165 to 250 minutes) and mean hospital stay was 3.6 days (range, 3 to 5 days). Technically, the obstruction was amenable to treatment by dismembering alone in 3 patients. The other 8 had longer stenotic segments and required flap pyeloplasty to procure a dependable caliber throughout the involved portion. Two subjects were found to have an impinging crossing vessel, and were treated by dismemberment. Fibrosis and/or periureteric adhesions seemed to be the cause in the remaining two-thirds of patients. No subject required conversion to open surgery or blood transfusion. No major complication, including persistent leak (beyond the first week), visceral or vascular injury, or symptomatic infection was encountered in the subjects.

Laparoscopic redo was considered as a failure in 1 female patient, who presented with persistent dull pain 3 months after removing her stent. Diethylene triamine penta acetic acid renography revealed significant obstruction

at the ureteropelvic junction once more. On ureteroscopic evaluation using an 8-F semi-rigid scope, a thin translucent epithelial diaphragm was found to be the cause for continued obstruction. This was probably resulted from early superficial adhesion of an otherwise healthy suture line. Balloon dilation over a guidewire and re-stenting with two 4-F indwelling catheters side by side for four weeks solved the clinical problem. Her flank pain resolved and did not recur. Subsequent imaging was also consistent with effective resolution of UPJO.

The mean follow-up of the patients was 24.1 months (range, 12 to 42 months). Considering the single incident of initial failure, the overall success rate for these salvage laparoscopic pyeloplasties was 90.9%.

DISCUSSION

Ureteropelvic junction obstruction has enjoyed excellent surgical treatment outcomes consistently above 90%^(4,8) since Anderson and Hynes first described dismembered pyeloplasty more than 50 years ago.⁽⁸⁾ Open surgical pyeloplasty by their technique remains the gold standard to which newer techniques must be compared.⁽¹⁾

Despite observed success in relieving obstruction, functional improvement after UPJO repair is less certain.⁽⁹⁾ One study looking at renal function before and after pyeloplasty showed no improvement in patients with pre-operative renal function of less than 20%.⁽¹⁰⁾ In another

study, only 2 of 10 patients with pre-operative renal function less than 30% improved after the repair.⁽¹¹⁾

The flank incision is inherently painful; thus, the search for decreasing morbidity and hospital care costs associated with this invasive approach has persuaded innovations directed toward developing less invasive techniques, while preserving the already excellent success rate.⁽¹²⁾ Application of endourologic techniques to the management of UPJO has proved to be beneficial toward decreasing the length of hospital stay and time to return to pretreatment activities. However, success rates have not been comparable to classic open surgical intervention.⁽¹²⁻¹⁴⁾ Therefore, along with the growing application of various techniques for treatment of UPJO; there has been a steadily growing number of patients who have “failed primary intervention”.⁽⁵⁾ Additionally, despite its high success rate, primary open pyeloplasty may also fail.⁽²⁾ Regardless of the initial technique, options for addressing recurrent UPJO include surgical pyeloplasty and retrograde or antegrade endourologic intervention.^(2,4,5,10,15) There are also a limited number of reports on the application of laparoscopy.

Laparoscopic pyeloplasty introduced by Schuessler in 1993,⁽¹⁶⁾ has been shown to reduce hospital stay while offering success rates equivalent to open surgery in primary subjects. Excellent outcomes have been reported for both transperitoneal and retroperitoneal laparoscopic pyeloplasty.^(17,18) We have also achieved excellent results with the transperitoneal approach over the past 9 years, and continue to use it as the standard approach at our institution. Although most studies regarding laparoscopic pyeloplasty are in the context of primary repair, laparoscopic

pyeloplasty has recently been shown to have excellent success rates for persistent UPJO after a previously failed procedure.^(7,17,18)

Sundaram and colleagues studied 3 laparoscopic redo pyeloplasties with history of initial open pyeloplasty.⁽⁷⁾ They achieved 83% overall objective success for all 36 laparoscopic pyeloplasties, not differentiating between those failing open surgery and endopyelotomy. The authors concluded that salvage laparoscopic pyeloplasty can be performed safely with success comparable to primary open surgery (Table 2). We must keep in mind, however, that only three patients in that series had failed prior open pyeloplasty. The overall number of patients with persistent UPJO who have undergone salvage laparoscopic pyeloplasty and their follow-up are too limited to draw any firm conclusions. Inagaki and associates reported that of a total of 147 patients who underwent laparoscopic pyeloplasty, 25 had failed prior UPJO treatment. They stated a success rate of 84% in the salvage pyeloplasty cohort; however, technical characteristics of previously failed UPJO treatment were not specified.⁽¹⁸⁾

Basiri and coworkers reported 18 patients that underwent laparoscopic pyeloplasty after a failed open procedure. This report is, nevertheless, limited by short-term follow-up (14 months).⁽¹⁵⁾ Shapiro and colleagues reported 89% success in their experience with a small group of 9 salvage laparoscopic pyeloplasties. All patients had open pyeloplasty with a mean of 67.7 months elapsing from the failed primary procedure. Five of their patients underwent laparoscopic Anderson-Hynes, 3 Foley Y-V, and 1 Z-plasty. But as the authors explained, their study was affected by referral bias, retrospective nature,

Table 2. Comparison of representative laparoscopic repeat pyeloplasty reports with the present series

Study	Number of patients	Approach	Dismembered / Total	Mean operation time, min	Mean hospital stay, d	Follow-up, month	Success rate, %
Basiri et al ⁽¹⁵⁾	18	Transperitoneal	6/18	254 (150 to 450)	7.2	14.1 (4 to 25.5)	77.8
Sundaram et al ⁽⁷⁾	36	Transperitoneal	NA	372 (162 to 200)	2.9	10 (3 to 40)	83
Shapiro et al ⁽²⁾	9	Transperitoneal	5/9	204 (80 to 264)	2.1	66 (12 to 119)	89
Piaggio et al ⁽¹⁹⁾	6	Transperitoneal	5/6	290 (206 to 280)	2.5	7 (1 to 24)	80
Shadpour et al (present series)	11	Transperitoneal	3/11	208 (165 to 250)	3.6	24.1 (12 to 42)	90.9

*NA indicates not applicable.

and small sample size.⁽²⁾ Piaggio and Gonzalez performed a retrospective chart review of 10 consecutive patients undergoing re-operative pyeloplasty. They confirmed the feasibility of redo laparoscopic pyeloplasty in the pediatric population, and concluded that in experienced hands, pediatric redo laparoscopic pyeloplasty can be performed safely with a success rate similar to the open procedure.⁽¹⁹⁾ It may also provide faster recovery with decreased narcotic requirement and morbidity.⁽²⁰⁾

Other options in patients with prior failed open pyeloplasty are repeated open pyeloplasty and endourologic procedures. Lim and Walker reported the results of repeated surgery for persistent UPJO in 10 patients. Satisfactory resolution was achieved by open redo with salvage rate of 75%, but as the authors mentioned, the overall number of patients is again too small to draw any firm conclusions.⁽³⁾ Ng and coworkers reported their experience with failed open surgery and antegrade or retrograde intervention for primary UPJO.⁽⁵⁾ Open operative salvage pyeloplasty achieved significantly better results, with overall success rate of 95% in contrast with 59.1% for endourologic salvage. Furthermore, the high success rate achieved by open salvage pyeloplasty was independent of whether the failed primary procedure was endourologic or open (94.1% and 100%, respectively). In contrast, endourologic salvage proved to be significantly more successful in the setting of failed open intervention compared to failed endourologic intervention, with success rate of 71.4% versus 37.5%, respectively ($P = .026$). Although some entertain the opinion that endourologic intervention is generally the most attractive procedure for patients with failed open pyeloplasty, it has become clear that endourologic failure portends further endourologic failure.

In our study, the overall success rate for redo laparoscopic pyeloplasty was 90.9%, which is compatible with literature. The only failure in our subjects occurred in a 32-year-old woman with flank pain, who was confirmed to have persistent stenosis 3 months after the secondary intervention. Rigid ureteroscopy easily confirmed and relieved a thin epithelial

adhesion at the anastomotic site. Subsequently, there has been no recurrence of symptoms and this cure was confirmed by dynamic imaging one year onward. Interestingly, she was our only patient who had less than 30% selective renal function on the affected side to begin with. This superficially agrees with Ortapamuk and colleagues' suggestion, that renal units with overall glomerular function of less than 30% frequently carry less desirable functional outcome.⁽²⁰⁾ The type of mechanical obstruction, ie, epithelial adhesion, encountered in our patient could have been facilitated by a poor functioning and possibly low flow (constantly coapted) anastomosis during the early phase of healing. This hypothesis must be further investigated.

As mentioned earlier, we intentionally avoided the use of cautery and other types of heat injury to tissues during the complex dissection. This may have contributed to the favorable outcome. The theoretic drawback of such an effort would be delayed bleeding and hematoma formation; neither of which was detected in these 11 patients. The relatively longer stenotic segment in patients undergoing reoperation significantly limits the proportion of cases amenable to dismembered (as opposed to flap) repair. As seen in Table 1, two of these 11 patients had failed due to oversight during the previous open retroperitoneal pyeloplasty, manifesting in a missed extrinsic vascular obstruction. These two subjects and another patient with a short thick adhesion band were the only three subjects correctable by Anderson-Hynes pyeloplasty. The possible implication of crossing vessels in refractory UPJO should not be taken lightly, as suggested by our present report, in which 18% displayed such an element. This observation is likely to be repeated at similar tertiary referral settings.

Failure of a very effective procedure, such as Hynes pyeloplasty, is exceedingly rare in experienced hands. Therefore, this series of failed pyeloplasty subjects sent-in from other hospitals where the procedure may be too infrequent to give the added benefit of accumulating experience, must encourage extra diligence. This should include scrutiny of the entire diagnostic and treatment process leading to that suboptimal result.

Our study may be limited by its retrospective nature and modest sample size, but is enhanced by comparing the surgical technique of initial and redo procedures, and more than two-year follow-up. The very promising response to a trivial intervention in our only failed subject may be copied in larger series making laparoscopic redo pyeloplasty an even more dependable and attractive alternative.

CONCLUSION

Clearly, for those with failed prior open pyeloplasty, the laparoscopic approach provides an attractive alternative. It brings minimal additional cosmetic detriment; with success rates comparable to open redo pyeloplasty, and by far surpassing the previous choice, ie, endopyelotomy. However, further large scale comparative studies are needed to draw final conclusion.

CONFLICT OF INTEREST

None declared.

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