

McMaster experience with laparoscopic pyeloplasty

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Purpose: Laparoscopic pyeloplasty has been developed as a minimally invasive alternative to open pyeloplasty for the treatment of ureteropelvic junction obstruction (UPJO). Several series have been published with similar success rates for the two procedures. We present our initial experience with laparoscopic pyeloplasty.

Material and methods: A retrospective review of 29 consecutive patients (mean age 37 years) who underwent Laparoscopic dismembered Hynes-Anderson pyeloplasty in our institution between January 2001 to April 2003 was performed. All patients had flank pain with radiologic findings consistent with ureteropelvic junction obstruction and impaired drainage on diuretic renal scan. Patients were assessed at 6 weeks with an ultrasound and assessment of pain, then an intravenous pyelogram (IVP) and diuretic renogram were completed at 6 months along with a repeat clinical assessment.

Results: Twenty-nine patients underwent the procedure with one patient converted to an open procedure due to

difficulties with the anastomosis. Mean operating time was 225 minutes, which decreased with experience. Mean blood loss was 50 cc and no patient required transfusion. Mean hospital stay was 2.5 days. Mean follow-up was 12 months. Twenty-six patients had complete resolution of their pain and an improvement on ultrasound was demonstrated, but only six patients showed improvement in function on IVP or renogram at 6 months. In five patients with 25% or less differential renal function preoperatively, the function was worse or negligible despite complete resolution of symptoms. One patient developed stent migration requiring repositioning and another developed calcification on the distal end of the stent requiring cystolitholapaxy prior to stent removal.

Conclusions: In our experience, laparoscopic pyeloplasty offers excellent symptomatic relief in a minimally invasive fashion with low morbidity for adult patients with ureteropelvic junction obstruction. In patients with borderline function (25% or less) preoperatively and with a normal functioning contralateral kidney, nephrectomy should be a consideration.

Key Words: laparoscopy, ureteropelvic junction obstruction

Introduction

Ureteropelvic junction obstruction (UPJO) is a relatively common urological problem and can present in all age groups. It may be secondary to a crossing vessel in about half of the cases, from intrinsic stricturing or an adynamic segment of the ureter. Surgical intervention for UPJO has radically changed over the last several years, with the pursuit of methods

to reduce morbidity and hospital stay from open surgical intervention. Endopyelotomy has served the latter purpose, but on long term follow-up has not equaled the success of its open counterparts and patient selection has impacted significantly on the success rate.¹

Since its introduction by Schuessler in 1993,² laparoscopic pyeloplasty has been advocated as a minimally invasive alternative to open pyeloplasty with equivalent results. We review our experience with our first 29 consecutive laparoscopic pyeloplasty cases.

Materials and methods

A retrospective review of 29 consecutive patients who underwent laparoscopic pyeloplasty in our

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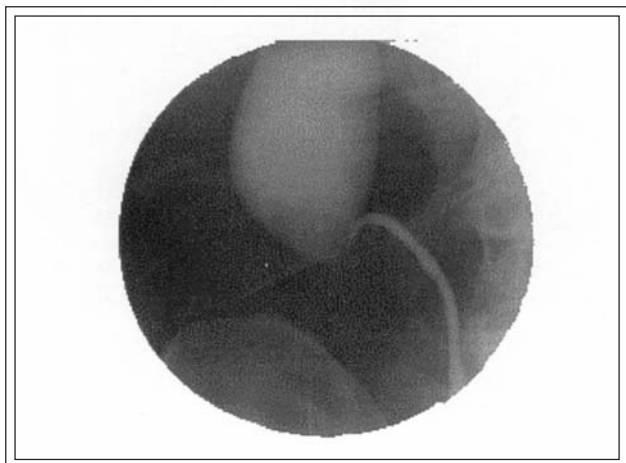


Figure 1. Retrograde pyelogram demonstrating right UPJO (same patient had left UPJO with non-functioning kidney).

institution between January 2001 to April 2003 was performed. All patients had symptoms of flank pain with radiologic findings consistent with UPJO Figure 1 and impaired drainage on diuretic renal scan. Laparoscopic dismembered Hynes-Anderson pyeloplasty was the technique of choice and was completed with 2 x 10 mm ports and 2 x 5 mm ports. The anastomosis was completed using two different colored 4.0-vicryl sutures after transection of the renal pelvis, resection of the ureteropelvic junction and spatulating the proximal ureter laterally, as described previously.³ After completion of the posterior wall anastomosis and prior to completion of anterior wall anastomosis, a 5 Fr angiocatheter is placed through the 5 mm port in the upper abdomen down the ureter. A 0.035 guidewire was passed down to the bladder, and finally a double pigtail 6 Fr stent is advanced over the guidewire, with its position

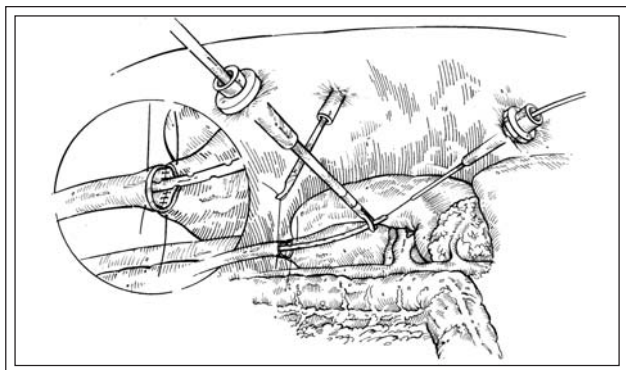


Figure 2 Antegrade stent insertion after completion of the posterior wall anastomosis with a double pigtail 6 Fr stent advanced over the guidewire.



Figure 3. IVP post laparoscopic pyeloplasty demonstrating patent right UPJ (the patient underwent simultaneous laparoscopic left nephrectomy for non-functioning kidney).

confirmed under fluoroscopy⁴ Figure 2. A 7 mm Jackson-Pratt drain was placed around the anastomosis at the end of the procedure and a foley catheter was left for 48 hours. The drain was removed the same day if there was no increase in drainage when the catheter was removed. Patients underwent stent removal at two weeks. They were assessed at 6 weeks with an ultrasound and assessment of pain. IVP Figure 3 and diuretic renogram were completed at 6 months along with repeat clinical assessment.

Success was defined as complete resolution of symptoms together with radiological improvement of hydronephrosis on ultrasound with a patent ureteropelvic junction on IVP or improved drainage or function on diuretic renogram.

Results

Twenty-nine patients Table 1 underwent the procedure with one patient converted to an open procedure

TABLE 1. Patient demographics

Gender	Male = 17	Female = 12
Side	Right = 13	Left = 16
Mean age	37 (16-71)	

because of difficulties with the anastomosis due to an intrarenal pelvis. Mean patient age was 37 (range 16-71) and mean hospital stay was 2.5 days (range 2-7 days). Mean operating time was 225 minutes (162-409 minutes). Mean blood loss was 50 cc (range 25-250 cc) with none of our patients requiring transfusion. Mean follow-up was 12 months (range 6-30 months). As illustrated in Table 2, 26 of the 28 patients who underwent successful laparoscopic pyeloplasty reported complete resolution of their pain. Pain was subjectively evaluated by a physician. One patient described mild discomfort, which persisted with no need for intervention and another persisted with the same level of pain as preoperatively despite resolution of obstruction radiologically. Her kidney was non-functional postoperatively and she underwent laparoscopic nephrectomy with complete resolution of her pain. 26 patients showed improvement in renal ultrasound findings at 6 weeks follow-up, but only six showed improvement in function on IVP or diuretic renogram at 6 months (21%). In five patients, all with renal function of 25% or less of overall function on preoperative renal scan, the function was worse or negligible despite complete resolution of symptoms. One of these patients had persistent hypertension, which was found not to be renin mediated.

There were no intraoperative complications, but two patients had prolonged procedures (409 and 370 minutes consecutively), due to previous history of pyelonephritis in one patient and prolonged stenting in another. In one patient the stent migrated resulting

TABLE 2. Results

Mean operating time (min)	225 (162-409)
Mean blood loss (cc)	50 (25-250)
Mean hospital stay (days)	2.5 (2-7)
Mean follow-up (months)	12 (6-30)
Complete resolution of symptoms	26/28 (93%)
Improvement in post-op ultrasound	26/28 (93%)
Renal scan drainage improved post-op	26/28 (93%)
Renal scan function improved post-op	6/28 (21%)
Overall success rate (resolution of symptoms and improvement in drainage by imaging)	26/28 (93%)

in urinary leakage, which required repositioning and completely resolved, and another patient developed encrustation and calculus formation on the distal end of the stent necessitating cystolitholapaxy prior to stent removal. Urinary leakage was seen in one other patient, where a stent could not be passed intraoperatively, this was treated conservatively and subsequently resolved with no sequelae.

Discussion

Open pyeloplasty traditionally has been considered the “gold standard” for management of UPJO with a success rate of over 90%.⁵

In order to reduce morbidity and decrease hospital stay from open pyeloplasty, several minimally invasive techniques were developed including, endopyelotomy (antegrade, retrograde and Acucise), laparoscopic pyeloplasty (dismembered, Fenger). Since its introduction by Schuessler in 1993,² laparoscopic pyeloplasty has been advocated as a minimally invasive alternative to open pyeloplasty with equivalent results.

The presence of small intrarenal pelvis, poor renal function, active and/or untreated urinary tract infections and uncontrolled bleeding diatheses are contraindications to laparoscopic pyeloplasty.

Long-term follow-up in two large series of patients undergoing endoscopic endopyelotomy demonstrated a success rate of 85% with no difference in success rate between primary or secondary obstruction, leading the authors to place endopyelotomy as a first choice for correction of UPJO.^{6,7} In a more contemporary series, with long-term follow-up, endopyelotomy has demonstrated an overall success rate of 67% with secondary UPJO having higher success rate compared to primary UPJO (74% versus 65%). Mean time to failure was 15 months (range 1-79 months).⁹

We have shown in our series that laparoscopic pyeloplasty can be performed with minimal morbidity, minimal blood loss, reasonable operative time (average 3.7 hours), and short hospital stay. Our results (93% overall success rate) together with multiple contemporary series confirm the viability of this procedure. We recognize our short-term follow up (average 12 months) which poses a limitation to this study, but in a large series by Jarrett et al⁸ the success of laparoscopic pyeloplasty was durable, with a reported overall success rate of 96% with up to 6-year follow-up and no late failures (after 1 year).

The major morbidity associated with open pyeloplasty involves the incision with its associated pain, risk of nerve injury and associated intercostal

neuralgia as well as the risk of flank hernia. Laparoscopic pyeloplasty replicates the success of open surgery without the risks of a flank incision.

Laparoscopic pyeloplasty seems to redefine the gold standard approach for UPJO, as it combines the high success rate offered by open pyeloplasty and the advantages of a minimal invasive techniques, furthermore, its success rate does not seem to be affected by the presence of marked hydronephrosis, a crossing vessel, factors which significantly lower the success rates of endopyelotomy.^{1,7} Another limiting factor for endoscopic incision is the length of stricture, as stenotic areas longer than 2 cm are associated with consistent poor results with endopyelotomy¹ laparoscopic pyeloplasty allows for a high success rate independent of the etiology or severity of the obstruction.

In some adults with UPJO; severe and irreversible damage to the kidney will be present due to prolonged obstruction. In five of our patients, all with renal function of 25% or less of overall function on preoperative renal scan, the function was worse or negligible despite complete resolution of symptoms. One of these patients had persistent hypertension, which was not renin-mediated. Diuretic renogram can overestimate the amount of functioning parenchyma by picking up the isotope which is retained in the renal pelvis and counting this as evidence of function. Once obstruction is resolved, many of these kidneys show little or no function as the isotope no longer pools in the pelvis. Despite symptomatic relief with surgery, patients with renal function of 25% or less with a normal functioning contralateral kidney may be better served with laparoscopic nephrectomy to avoid the risk of infection or hypertension at a later date.

There is no consensus in the literature for an absolute cutoff value for renal function (i.e. 25%) before they should be offered laparoscopic nephrectomy over pyeloplasty. In our experience, we suggest the cutoff value of 25% below which laparoscopic pyeloplasty should not be offered. This suggestion needs to be further validated by larger series, which are ongoing.

We described earlier a technique for antegrade stenting⁴ through a 5 mm port located in the epigastrium after completion of the posterior wall of the anastomosis (Figure). Our technique has been helpful in facilitating dissection of the renal pelvis, as it remains distended and taut, allowing for easier visualization of crossing vessels and/or the site of obstruction. In addition, it eliminates the risk of dislodging the stent if placed in a retrograde fashion at the time of removal of the specimen. Initially we

stented our patients for 6 weeks, but due to stent morbidity, we reduced it to 2 weeks, with no episodes of acute flank pain due to obstruction.

Laparoscopic pyeloplasty is a procedure, which requires acquisition of special skills for laparoscopic suturing and intracorporeal knot tying resulting in prolonged operative times early in the series. Surgical skills need to be refined with a large number of laparoscopic cases initially and to be reinforced at regular intervals in order to maintain them at an appropriate level. Our first 14 cases had a mean operating time of 245 minutes compared with our latter 14 with a mean operating time of 205 minutes, which reflects the learning curve. The estimate of number of cases it would take to ascend the laparoscopic learning curve is surgeon-specific, and varies depending on the previous laparoscopic experience of the urologist. In our opinion, at least ten cases are minimum to ascend to plateau of the learning curve for laparoscopic pyeloplasty.

Conclusion

In our experience, laparoscopic pyeloplasty offers excellent symptomatic relief in a minimally invasive fashion with low morbidity for adult patients with ureteropelvic junction obstruction. In patients with borderline function (25% or less) preoperatively and with a normal functioning contralateral kidney, nephrectomy should be a consideration. □

References

1. Van Cangh P J, Nesa S. Endopyelotomy: prognostic factors and patient selection. *Urol Clin North Am* 1998;25:281.
2. Schuessler WW, Grune MT, Tecuanhuey LV et al. Laparoscopic dismembered pyeloplasty. *J Urol* 1993;150:1795.
3. Chen RN, Moore RG, Kavoussi L.R. Laparoscopic pyeloplasty: indications, technique, and long-term outcome. *Urol Clin North Am* 1998;25:323.
4. Obeid AA, Whelan JP, Piercey K, Kapoor A. Laparoscopic pyeloplasty with intra-operative antegrade placement of the double J stent. Abstract presented at 57th CUA meeting.
5. Persky L, Krause JR, Boltuch RL. Initial complications and late results in dismembered pyeloplasty. *J Urol* 1977;118:162.
6. Motola JA, Badlani GH, Smith AD. Results of 212 consecutive endopyelotomies: an 8-year followup. *J Urol* 1993;149:453.
7. Gupta M, Tuncay OL, Smith AD. Open surgical exploration after failed endopyelotomy: a 12-year perspective. *J Urol* 1997;157:1613.
8. Jarrett TW, Chan DY, Charambura TC, Fugita O, Kavoussi LR. Laparoscopic pyeloplasty: the first 100 cases. *J Urol* 2002;167:1253.
9. Cook A, Watterson JD, Nott L, Razvi H, Denstedt JD. Percutaneous antegrade endopyelotomy: Long-term results from a single institution. Abstract presented at 56th CUA meeting.