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The management of secondary pelvi-ureteric junction obstruction – a comparison of pyeloplasty and endopyelotomy

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Objective

- To review our experience in the management of secondary pelvi-ureteric junction obstruction (PUJO) comparing endopyelotomy with pyeloplasty.

Patients and Methods

- We retrospectively analysed our database of 58 patients having undergone operative management of PUJO after failed primary management, including 41 with failed pyeloplasty and 17 failed endopyelotomy.
- Outcomes included mercapto-acetyltriglycine (MAG3) drainage capacity, symptomatic control and need for further intervention. Success was defined as freedom from failure in all three.

Results

- Patients undergoing secondary pyeloplasty had better outcomes than endopyelotomy for symptomatic success (87.5% vs 74%), resolution of obstruction on MAG3 renography (96% vs 74%), and no need for further intervention (96% vs 71%).
- Overall success was 87.5% for pyeloplasty compared with 44% after secondary endopyelotomy.

Conclusion

- Outcomes of pyelopasty for secondary PUJO were superior when compared with endopyelotomy.

Keywords

secondary pelvi-ureteric junction obstruction, endopyelotomy, pyeloplasty

Introduction

PUJ obstruction (PUJO) has traditionally been managed with open pyeloplasty, but as minimally invasive surgery advanced, practice migrated initially towards endopyelotomy, and subsequently to laparoscopic and robotic pyeloplasty.

Endopyelotomy success rates in our institution have previously been reported as 70% [1] compared with 92% [2] for transperitoneal laparoscopic pyeloplasty. Others report success rates for pyeloplasty varying between 75% and 98% [3–5]. Laparoscopic and robotic pyeloplasty have been deemed to be as good as the traditional 'gold standard' open pyeloplasty. Success rates for endopyelotomy vary hugely in the literature (41–100%) [3–7].

When operative management has failed patients have what is classified as secondary PUJO. Management of these cases is technically more challenging and success rates are typically lower. It had been our practice to carry out endopyelotomy after failed pyeloplasty and vice-versa. After recognising the long-term limitations of endopyelotomy [1,2,5] and considering our technical success in redo pyeloplasty as a salvage procedure for tertiary PUJO we saw the need to review. We present our experience in the management of secondary PUJO with a series of 58 patients.

Patients and Methods

We reviewed our PUJ database of >350 cases and identified 59 patients as having undergone operative management of PUJO after failed primary intervention. One patient was lost to follow-up. Hence, a total of 58 patients were included in the study. Analysis of prospectively collected data from our database was performed and information was confirmed via review of notes and radiology results.

Data collected included basic patient demographics, operation details, pre- and post-operative symptoms, pre- and post-operative mercapto-acetyltriglycine (MAG3) diuretic renogram results, need for further intervention and complications.

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Choice of intervention was dependent on the patient's co-morbidities but also varied with time. While in initial cases endopyelotomy was favoured after pyeloplasty and vice-versa, pyeloplasty was chosen as the treatment option in more recent cases, irrespective of the type of primary operation. There were no set criteria for choice of intervention.

All cases were carried out under the care of experienced consultant surgeons. Endopyelotomy was carried out in an antegrade manner in four patients and retrograde in 30. Given the length of time involved in this study, our technique evolved from antegrade to retrograde endopyelotomy. Antegrade endopyelotomy was carried out as described by Ramsay et al. [8]. Retrograde endopyelotomy was composed of the following steps: an initial retrograde study; endoluminal ultrasound (US) to identify any crossing vessels or high insertion; rigid and/or flexible ureteroscopy; incision of the PUJ to fat using a holmium laser at 10 W; further retrograde study to confirm extravasation; and placement of a stent for 8 weeks.

All laparoscopic pyeloplasties were performed via a transperitoneal route by dismembering the PUJ and making the anastomosis anterior to any crossing vessels with a combination of interrupted and running polyglycolic acid sutures (dismembered Anderson-Hynes pyeloplasty). The kidney was mobilised when required. A stent was placed for 4–6 weeks.

The decision for further intervention was based on changes in renal function, obstruction on MAG3 renogram, or continuing bothersome symptoms.

We currently routinely follow patients up with symptom review and US at 3 months. Provided they are asymptomatic and the US shows an improvement in hydronephrosis, we carry out a MAG3 diuretic renogram at 12 months to determine radiographic outcomes. Symptomatic patients and those with significant hydronephrosis undergo renography sooner.

Radiological success was defined as improved drainage without deterioration in function. Symptomatic success was defined as either complete resolution of symptoms, or partial resolution not requiring further intervention. Overall success was defined as (i) symptomatic success; (ii) radiological success; and (iii) no need for further intervention.

Ethical approval was not required in our institution for review of current practice.

Results

Patient demographics are shown in Table 1 and the characteristics of first and second operations are summarised in Table 2.

Overall, 22 of the failed primary pyeloplasties were carried out via an open approach. In all, 14 of the 16 failed primary laparoscopic pyeloplasties used a retroperitoneal approach, while two were transperitoneal. Both conversions were originally attempted via a transperitoneal approach. All laparoscopic secondary pyeloplasties were transperitoneal.

Figures 1 and 2 describe the pathway of second and third operations based on previous interventions and success based on need for further operative intervention. Overall, 45 patients (77.6%) had a successful outcome from their secondary intervention. As we did not have precise dates of presentation

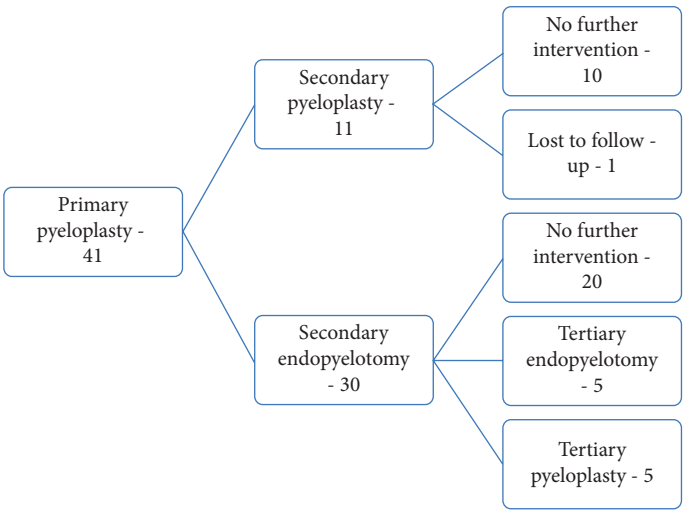
Table 1 Patient demographics.

Variable	Secondary endopyelotomy	Secondary pyeloplasty	Overall
No. of patients	34	24	
Gender, *n*:			
male	13	12	25
female	21	12	33
Mean (range) age, years	36.1 (15–68)	37.9 (17–66)	36.7 (15–68)
Affected side, *n*:			
right	14	14	28
left	20	10	30

Table 2 Operation details.

		Primary, *n*	Secondary, *n*
Pyeloplasty	Total	41	24
	Laparoscopic:	18	21
	retroperitoneal	14	0
	transperitoneal	2	20
	converted	2	1
	Open	22	3
	Unknown	1	0
Endopyelotomy	Total	17	34
	Retrograde	5	30
	Antegrade	8	4
	Unknown	4	0

Fig. 1 Primary pyeloplasties.



or development of symptoms, we defined the time to failure as time between operations. The mean time to failure was 33.9 months (39.2 months for pyeloplasty, 20.7 months for endopyelotomy).

The mean follow-up from time of secondary intervention was 38.8 months (50.3 and 28 months for endopyelotomy and pyeloplasty respectively). The mean time between second and third operation, if applicable, was 16.9 months.

In all, 11 patients (19%) required a third therapeutic procedure, one (4%) after secondary pyeloplasty and 10 (29%) after secondary endopyelotomy. Two patients were left with a non-functioning kidney, one of whom was symptomatic and underwent nephrectomy, while the other patient was managed conservatively.

Secondary pyeloplasty was more successful for symptom relief and radiological improvement than secondary endopyelotomy irrespective of primary procedure (Table 3). Overall success (both radiological and clinical success) was 87.5% for secondary pyeloplasty and 44% for secondary endopyelotomy (Fig. 3).

Four patients developed complications after their secondary procedure, two after pyeloplasty (8.3%) and two after endopyelotomy (5.9%). Those after endopyelotomy were both UTIs. The pyeloplasty related complications were obstruction from blood clot and anastomotic leakage, both requiring nephrostomy tube placement. Two deaths occurred during the follow-up period, both unrelated to renal problems.

Discussion

Our present overall success rates were 87.5% for secondary pyeloplasty and 44% for secondary endopyelotomy. While the secondary pyeloplasty success rate is consistent with other published reports (83–90.9% [9–11]), our success rates for secondary endopyelotomy are lower (66.6–87.5% [1,4,6,12–14]), although in keeping with the lower range of primary procedures [5]. In 1998, Jabbour et al. [12] concluded that endopyelotomy is in fact the treatment of choice after failed pyeloplasty, reporting success rates of 87.5% after a mean follow-up of 88.5 months. Di Grazia and Nicolosi [13] reported success rates of only 66.6% for six endopyelotomies performed after failed pyeloplasty, but argued that endopyelotomy is an alternative to pyeloplasty in view of its minimal invasiveness and hence acceptability to the patient. We also found that time to failure was less after endopyelotomy than after pyeloplasty, which further supports the choice of pyeloplasty in the management of secondary PUJO.

Fig. 2 Primary endopyelotomies.

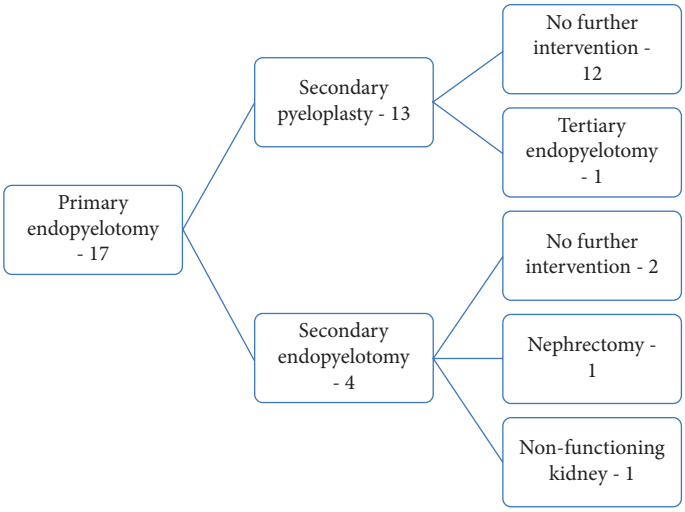


Fig. 3 Success rates. Symptomatic relief = Sx's; Radiological success = MAG3; No further intervention needed = Interv'n; and Overall comparing endopyelotomy (EP) and pyeloplasty (PP).

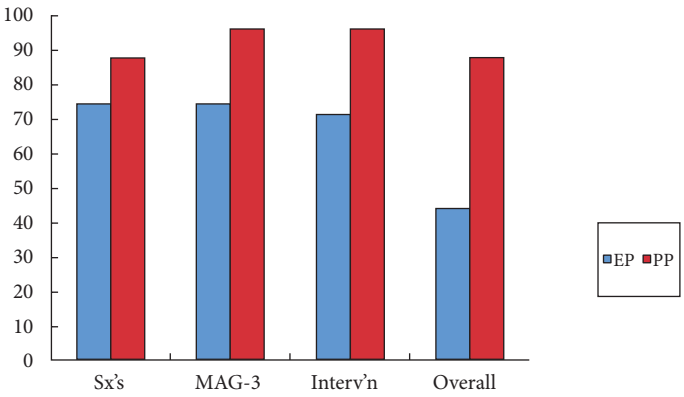


Table 3 Effect of secondary procedure on patient symptoms and MAG3 renogram.

	Obstruction on MAG3			Symptoms		
	Preoperative, *n*/*N* (%)	Postoperative, *n*/*N* (%)	RRR, %	Preoperative, *n*/*N* (%)	Postoperative, *n*/*N* (%)	RRR, %
Endopyelotomy	22/34 (65)	9/34 (26)	60	29/34 (85)	9/34 (26)	70
Pyeloplasty	22/24 (92)	1/24 (4)	95	22/24 (92)	3/24 (12.5)	86

RRR, relative risk reduction.

The primary operation was commonly not performed in our centre and exact details were hence generally not known. We can therefore not link success of secondary operation to particular aspects of primary operation. Park et al. [4] found that success of endopyelotomy was linked to the type of primary operation, being 100% after failed balloon dilatation, but only 57.1% after primary endopyelotomy. We identified redo-endopyelotomies as having the least favourable outcome with half of cases losing function of the affected kidney, although findings are limited in view of the small number of patients. El-Nahas et al. [6] studied prognostic factors affecting late recurrence for endopyelotomies in the management of secondary PUJO and identified repeat endopyelotomy as an independent factor. These findings are in keeping with the present results.

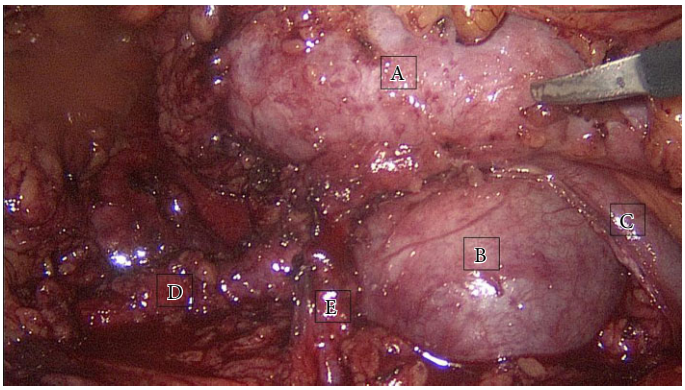
Redo-pyeloplasties did in fact have the best outcome in our institution and 10/11 cases were successful. The remaining patient was lost to follow-up. Reported success rates of redo-pyeloplasties are as high as 90.9% in the Shadpour et al. [11] study of 11 patients followed-up for a mean of 24.1 months, numbers similar to those reported by Eden et al. [15] in 11 patients. Sundaram et al. [9] report overall success rates of 83% for pyeloplasty in the management of secondary PUJO, although only three of their patients had previously undergone pyeloplasty.

Important factors determining the choice of intervention for secondary PUJO include availability of resources and surgeon ability. It is well recognised that pyeloplasty is more challenging after previous PUJ surgery in view of extensive fibrotic tissue [3,4,13]. Furthermore, an important complication of endopyelotomy is bleeding from crossing vessels. Patients who have undergone previous pyeloplasty would typically have had such vessels transposed during the initial operation; however, three of the present patients had not had this done at the time of primary pyeloplasty, making 'blind' cutting of the PUJ potentially risky (Fig. 4). This reinforces the role of preoperative vascular imaging to identify crossing vessels when considering endopyelotomy [16]. We carried out endoluminal US routinely as part of retrograde endopyelotomy [17]. The retrograde endopyelotomy approach also avoids having to deal with potential fibrotic tissue surrounding the PUJ due to previous pyeloplasty [13].

Several limitations apply to the present study. With secondary PUJO being a relatively rare disease entity, only 58 patients were treated over a 16-year period, hence explaining the small sample size. Primary interventions date back as far as 1986 while the first secondary intervention in the present study was performed in 1996.

Hence, despite all secondary operations being performed within our centre under the care of two lead surgeons, techniques and approaches to management have changed over this period making it impossible to achieve standardised approaches in the patients' management.

Fig. 4 Right-sided PUJO after two previous open pyeloplasties referred to us for tertiary management – a crossing vessel anterior to the PUJ is present (**A**, kidney; **B**, renal pelvis; **C**, renal vein; **D**, ureter; **E**, crossing vessel).



The length of follow-up between the two groups differed. Patients undergoing endopyelotomy had a longer length of follow-up than those undergoing pyeloplasty, an important fact when considering, that secondary pyeloplasties tend to fail later than secondary endopyelotomies. This can be explained by the fact that pyeloplasties were generally performed more recently. Further follow-up is required and we will continue updating our database.

The most difficult aspect in comparing studies is the lack of a standardised definition of success. Objective radiological success and subjective symptomatic success are not uniformly defined. Varkarakis et al. [3] defined success as a >50% improvement in pain, maintenance or improvement in renal function, and a half-life on diuretic scan of <10 min while Di Grazia and Nicolosi [13] only considered radiological outcomes in their success. Shadpour et al. [11] did consider both radiological and symptomatic outcomes in their definition of success but did not give exact criteria. Furthermore, symptomatic improvement is a subjective measurement. An agreed consensus for the routine and standardised assessment of PUJO management is needed to allow uniform reporting of outcomes.

In conclusion, it has become clear over recent years that laparoscopic pyeloplasty is a potential treatment option for secondary PUJO when performed by experienced surgeons. The present study confirms that pyeloplasty is superior to endopyelotomy in cases of secondary PUJO. We now routinely offer this to all patients medically suitable for major surgery irrespective of previous failed intervention, as we have identified high success rates in both primary and secondary cases.

Conflict of Interest

None declared.

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Abbreviations: MAG3, mercapto-acetyltriglycine; PUJO, PUJ obstruction; US, ultrasound/ultrasonography.