Endopyelotomy - a Minimally Invasive Surgical Option for Pelvi-ureteric Junction Obstruction : a Study Of 34 Cases

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Abstract

We performed antegrade endopyelotomy in 34 cases in the last 2½ years. In all cases standardized antegrade percutaneous method was used. A single guide wire and a cold knife were used to perform the endopyelotomy. Nephrostomy tube was retained for 48 hours and the repair stented for 6 weeks. Patients were followed up at 3 months, 6 months and 1 year post-operatively for subjective improvement and objectively by DTPA scans/IVU and ultrasound. The population included 2 bilateral cases, one horseshoe kidney and 3 children. The patient's age ranged from 9-59 years, average 32 years. There were 21 males and 13 females. 28 renal units were primary and 8 were secondary pelviureteric junction (PUJ) obstruction. Follow up period was 3-28 months. Most cases had significant symptomatic and functional recovery postoperatively. Five cases presented with urinary tract infection, which regressed after treatment. At 3rd month postoperatively the DTPA/IVU scan was equivocal in 7 cases. In these, a RGP was done which in every case showed a patent PUJ. In 5 cases that were still symptomatic, 6-8 weeks of further stenting produced symptom regression. Two cases failed and needed revision, one by open pyeloplasty and the other by endopyelotomy. Our success rate overall in these cases followed upto 1 year post operatively is 91.6%. We conclude that endopyelotomy is successful across a wide spectrum of cases.

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Introduction

Pelviureteric junction (PUJ) obstruction is defined as a functional or anatomic obstruction to outflow of urine from the pelvis to the ureter, which if left untreated leads to deterioration of the affected kidney's function. The problem is commonly encountered in day-to day clinical practice. These patients are often asymptomatic. They are commonly diagnosed on the basis of incidental ultrasound performed for unrelated conditions. On other occasions, they present with episodic haematuria, pain or urinary tract infection. Rare presentations are hypertension or azotaemia, from bilateral affection or in cases of solitary kidney.

Aetiologically the cases are of two groups - primary and secondary PUJ obstruction. The exact cause of primary PUJ obstruction is unknown. Some theories are deficiency of smooth muscle at the PUJ [1], persistence of Chwalle's Membranes [2], persistence of foetal folds of Ostling, crossing lower polar vessels etc [3]. The secondary cases are more common and are a sequel to pyelolithotomy, previous attempts at repair of pelviureteric obstruction etc. The treatment options available for the management of these cases include open pyeloplasty, laparoscopic repair, the Acucise Device Balloon cautery incision and endopyelotomy.

Endopyelotomy is a minimally invasive option for the management of these cases. The principle was laid down as late back as 1940 in the operation of "Intubated Ureterotomy" devised by Davis. The procedure needs a small incision about 1.5-2 cm. The operative time is short, usually about 40-50 minutes. Consequently, it is associated with less morbidity. The procedure can be performed either by the antegrade nephroscopic approach or by the retrograde ureteroscopic approach. We present our experience in endopyelotomy done with a single guide wire, using the antegrade method and analyse our results for the 34 cases we performed in the last 2½ years.

Material and Methods

In the last two years we have operated on 34 cases. In these, 36 operations were done with two cases being bilateral. Preoperative evaluation of all patients included an IVU, ultrasound of the kidney, ureter, bladder region and DTPA scan in addition to routine investigations for fitness for a major operative procedure. In all cases the procedure was done in a standardized manner using the antegrade percutaneous method. First, the anatomy of the PUJ was delineated by means of a retrograde pyelogram. Thereafter, a guide wire was passed retrograde through the obstructed segment. Access for the pelvi-calyceal system was established through the mid or the upper calyx. The previously

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passed guide wire was then recovered from the percutaneous nephrostomy and used as a through and through working guide wire. Then the pelvi-ureteral junction was serially dilated with ureteral dilators to about 14Fr, adequate to accommodate the 14 Fr endopyelotomy stent.

The incision on the strictured segment was made in the lateral position and extended beyond the strictured area into the normal ureter for about 1 cm. The repair was then stented with an endopyelotomy stent for 6 weeks. For this, we used a 7/14- endopyelotomy stent in most cases. When it was not available, an ordinary 6Fr Double J stent was used. A nephrostomy tube was placed in all cases. Post operatively, the nephrostomy tube was removed on the second day and the patient discharged on the third day. The endopyelotomy stent was retained in all cases for 6 weeks.

In one case of primary PUI obstruction, a guide wire could not be passed retrograde, as there was inadvertent creation of a false passage in the ureter at its lower end during the performance of RGP. Classically, failure of passage of a guide wire retrogradely is an indication for abandoning endopyelotomy. In this case, under guidance of a pyelogram obtained by injection of intravenous contrast, a mid calyceal puncture and establishment of tract was done. Thereafter, methylene blue was injected via the ureteral catheter retrogradely and this was seen squirting out of a narrow PUI. The stenosed PUI was then cut in the conventional manner by endopyelotomy. Patients were followed up at 3 months, 6 months and finally at one year. Apart from a subjective assessment for symptom regression they were also objectively analyzed by diuretic DTPA scan or IVU and ultrasound abdomen.

Results

Table 1 shows patient profile; follow up period was 3-28 months.

Table 2 shows distribution of cases based on functional state of the kidneys

Table 3 shows Postoperative assessment of outcome

There was one case of horseshoe kidney, 2 bilateral cases, and 3 children. The outcome at assessment 3 months postoperatively was as follows :

5 cases presented with urinary tract infection, which regressed after treatment. In the majority of cases there was

Table 1

Patient profile

Age	Average - 32 years Range - 09-59 years
Sex	21 Males : 13 Females
Aetiology	Primary PUI-28 cases Secondary PUI-8 cases

Table 2

Distribution of cases based on functional state of the kidneys

	Mild Hydronephrosis	Moderate Hydronephrosis	Severe Hydronephrosis
Primary PUI Obstruction	2	23	3
Secondary PUI obstruction	0	8	0

Mild Hydronephrosis - On IVU grade 1 and 2 hydronephrosis and more than 40% relative function on DTPA scan; Moderate hydronephrosis - On IVU grade 3 hydronephrosis and 20-40% relative function on DTPA scan; Severe hydronephrosis - On IVU grade 4 hydronephrosis and less than 20% relative function on DTPA scan

Table 3

Postoperative assessment of outcome (at 3M postoperatively)

Status	DTPA/IVU	Symptomatic Status
Improved	28/36 (77%)	30/36 (83%)
Equivocal	7/36 (20%)	5/36 (14%)
Deteriorated	1/36 (3%)	1/36 (3%)

significant functional and symptomatic improvement. In 7 cases (2 cases of secondary PUI obstruction and 5 cases of primary PUI obstruction) the post operative DTPA/IVU scan at 3 months postoperatively was equivocal. In these, a RGP was done which in every case showed a patent PUI. In the 5 cases that were still symptomatic, a further 6-8 weeks period of stenting produced adequate symptom regression. Follow up DTPA/IVU scan after one year confirmed patency of the pyeloplasty in these cases. In the 2 cases of primary PUI obstruction, post operative DTPA scan was equivocal. Of these, one is still on follow up and is asymptomatic 6 months postoperatively. In the other case, the repeat DTPA scan at 6 months postoperatively showed a deterioration as compared

Table 4

Comparative results

Study	Patient no.	Prim PUI	Sec PUI	% success overall	% success success primary	% success success secondary	Follow up months
Meretyk 1992[4]	23	12	11	78	75	91	2-39
Kletscher 1995[5]	50	39	11	88	90	82	4-40
Combe 1996[6]	49	37	12	78	75	84	3-36
				At 3 months	100	87	
Present series	34	28	8	at 6 months 91%	96% 96% [27/28]	87% 87% [7/8]	3-28

Fig. 1: Preoperative IVU shows obstructed PU Junction and hydronephrotic kidney

Fig.2: Postoperative IVU shows drainage of dye and decompressed pelvicalyceal system

to that done at the 3rd post operative month. The IVU was also showing a narrowing at the PUJ. The failed repair was revised by a repeat endopyelotomy. In one case of secondary PUJ obstruction, there was functional deterioration in the DTPA done at 3 months. Revision was done by open pyeloplasty. Our success rate overall in those cases followed up upto one year post operatively is 91.6% (33 cases).

Discussion

The present series of 34 cases in which 36 endopyelotomies were done is one of the largest published Indian series so far. The other large series on endopyelotomy reported to date by an Indian group is "Optimum duration of splinting after endopyelotomy" of 29 cases reported earlier [7]. The success of endopyelotomy in the management of PUJ obstruction is borne out by the many recent articles on the subject. Table 4 shows comparative results

Initially only secondary PUJ obstructions were being managed with endopyelotomy mainly with the aim of avoiding an open procedure [8]. We however chose both primary and secondary PUJ obstructions. We found the procedure to be equally successful in both categories of cases. The degree of hydronephrosis and the renal function are interlinked issues for assessing the appropriateness for endopyelotomy. High grade hydronephrosis and poorly functioning kidneys are associated with poor results of about 50-60% [9,10]. We had 3 cases of severe hydronephrosis, all being primary PUJ obstructions and in all of these endopyelotomy was successful. Though it is a known fact that success in these cases is lower at about 54% [11], we feel that it is worth doing a trial of endopyelotomy in them, as the results of pyeloplasty are also likely to be similarly compromised in this group.

In this series there were 31 adults and 3 children. The youngest patient we operated was a 9 year old boy.

There are only few series that report on the experience of endopyelotomy in a paediatric population and most utilised the technique in secondary PUJ obstruction [8]. The issue possibly remains one of limitations in instrument miniaturisation for use in the paediatric population. We found that the optical urethrotome could be used in all the paediatric cases after dilation of the PUJ. The role of crossing vessels in the causation of PUJ obstruction is controversial. Crossing vessels to the lower pole are often found in normal subjects in about 71.3% of population [8]. They are also occasionally associated causally to PUJ obstruction and are also reported to lower the success rate of endopyelotomy [9,10]. Many authors have reported on the need for preoperative screening for crossing vessels using Intraluminal Ultrasound or Spiral CT with a pick up rate ranging from 53-71% on Intraluminal Ultrasound [12] versus 79% on Spiral CT [13]. There are as many authors including the group of Smith AD who popularised endopyelotomy and have the largest experience in it, who feel that findings of crossing vessels preoperatively need not significantly influence the treatment. With proper endoscopic techniques the incidence of bleeding is low. Hence, the need to image for crossing vessels is left to the judgement and experience of the operating surgeon [14]. We did not screen any of the cases preoperatively and did not encounter any undue bleeding. In the case which endopyelotomy failed and was reexplored, periureteric fibrosis rather than a crossing vessel was found to be the cause of failure.

We performed all cases by the antegrade percutaneous method in preference over the retrograde method to avoid the need for preoperative ureteric stenting and dilation. Some authors recommend the use of two guide wires, one passed retrograde and recovered through the nephrostomy tract and one guide wire passed antegrade via the same nephrostomy tract. The

obstructed PUJ is then cut between the rails of these two guide wires [15,16]. In our series, all the cases were done with a single working guide wire. We also performed one without any guide wire, using methylene blue instillation retrogradely by a ureteral catheter to mark the PUJ. Though we don't recommend this manoeuvre routinely, it may be tried if failure of guide wire passage is a cause for abandoning the performance of endopyelotomy.

Various methods for performing the cut at the PUJ are described. Cold knives include the half moon endopyelotomy knife [14,16] or optical urethrotome knife. Others have used the monopolar cautery or bipolar cautery. Now there are reports of Ho Yag and Nd Yag Laser also being tried to make the cut [17]. In all the cases that we did, we used a cold knife - either an endopyelotomy knife or an Otis Urethrotome and found it to be adequate.

An inflated balloon placed retrograde and straddling the PUJ facilitates the process of cutting the PUJ by stretching it. It has also been made to push the PUJ up and invaginate it into the pelvis so that 2 layers are then cut. This may displace the PUJ away from crossing vessels and thus enhance safety [18]. In the case which was taken up for exploration and correction by open pyeloplasty for failure of endopyelotomy, we did not experience any undue difficulty on account of the previous endopyelotomy during the dissection.

Our excellent results are a reflection of our considerable experience and meticulous technique. We are careful to make the incision through the full thickness of the PUJ and also extend it for at least one cm proximally and distally into normal segment. Most failures occur in the first 2 months postoperatively. We also encountered one case of failed endopyelotomy in primary PUJ obstruction, which was equivocal at the 3rd postoperative month both symptomatically and on DTPA and IVU. On subsequent follow up, a repeat IVU and DTPA scan showed definite reobstruction at the PUJ and hence he was revised by endopyelotomy and remains well on 8 months subsequent follow up. What converts short term (1-3 year) success into a long term failure is not known. Most likely, there are multiple causes of PUJ obstruction and multiple factors are operative in a patient. Endopyelotomy just corrects one of them, the obstruction at the PUJ, but it does not increase the tone of a baggy pelvis or restrict the mobility of a hypermobile kidney [19]. So, it may be, that over a period of time some of these successful cases may restricture and result in a lower success rate overall. Since the majority of our cases were primary PUJ obstruction (28/36, 78%), our results in this group have

been excellent.

To conclude, endopyelotomy is a cost effective and minimally invasive option in PUJ obstruction. It has widespread applicability and is highly successful. Failed cases can easily be reoperated upon.

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