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Endoluminal balloon dilatation for pelvi-ureteric junction obstruction in children: an effective alternative to open pyeloplasty

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Abstract *Objective:* Pelvi-ureteric junction obstruction (PUJO) is one of the commonest causes of paediatric urinary tract obstruction. Open pyeloplasty has always been the reference standard treatment with variable results. Recently, attention has turned to minimally invasive procedures. We reviewed our 8-year experience with endoluminal balloon dilatation to ascertain whether this procedure is an effective minimally invasive alternative.
Patients and methods: The hospital databases, case notes, and radiology records of 14 patients who underwent 15 balloon dilatations for PUJO were examined. Patient demographics, clinical presentation, radiological investigations, operative details, morbidity and follow up were noted.
Results: The median age was 10.5 years (range 19 months to 14 years); 33% female and 66% male. Nine primary dilatations, five dilatations following open pyeloplasty, and one re-dilatation were performed. The median stenting time was 44 days (range 1—63 days) and the median in-patient stay was 2 days (range 1—17). There were six minor complications due to blocked stents, misplaced stents, or stents falling out. All patients were followed up at 12 months, and nine had further follow up. The median length of follow up was 44 months (range 22—75). Median diameter of the renal pelvis and MAG3 drainage scores improved from 34 to 16 mm and 4 to 3, respectively, from pre-dilatation to most recent follow up. At the most recent follow up, none of the patients had symptoms attributable to PUJO.

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Conclusions: Our results suggest that, using specialized techniques and a multidisciplinary surgeon-radiologist approach, balloon dilatation can be an effective alternative to open pyeloplasty.

Introduction

Pelvi-ureteric junction obstruction (PUJO) is one of the commonest causes of urinary tract obstruction in children. The underlying cause can be intrinsic to the PUJ, or due to external compression from aberrant vessels. Presentations include antenatal diagnosis on routine ultrasound, pain, urinary tract infection, palpable abdominal mass, urolithiasis and haematuria. Management can be non-operative [1]; however, if renal function deteriorates or symptoms become troublesome surgical intervention is indicated.

Historically, the Hynes—Anderson open pyeloplasty [2] has been the reference standard for the treatment of PUJO with reported success rates varying from 67% [3] to 95.5% [4]. In the minimally invasive era, attention has turned to laparoscopic pyeloplasty, endopyelotomy and endoluminal balloon dilatation as possible alternatives. Endoluminal balloon dilatation of PUJO was first described in 1982 [5], and is now well documented in the adult practice as a retrograde urological procedure [6—8]. Proponents of this technique claim that it is quick, cost effective and associated with minimal morbidity as compared to the open approach [5,6].

We reviewed our experience with endoluminal balloon dilatation for PUJO in children to ascertain whether this procedure could be an effective minimally invasive alternative to open pyeloplasty.

Patients and methods

A retrospective review was performed of the hospital databases, case notes, and radiology records of patients who underwent balloon dilatations for PUJO in the Royal Hospital for Sick Children, Edinburgh over an 8-year period. Information was collected on patient demographics, clinical presentation, radiological investigations, operative details, morbidity and follow up.

Ultrasonography was used to measure renal dimensions and colour Doppler studies to detect crossing vessels, the presence of which would necessitate an open procedure. MAG3 diuretic renography was used to assess drainage, with furosemide administered to all patients simultaneously with the radioisotope at a dose of 0.5 mg/kg to a maximum of 10 mg. We used a scoring system (Table 1) to quantify drainage in terms of time to half-counts of MAG3 in the renal area, allowing us to show improvements in drainage where this could not be calculated; for example, in a completely obstructed or very slowly draining system.

Operative technique

In this series, three operative approaches were used: antegrade, retrograde, and combined. All procedures were performed in the operating theatre under a general anaesthetic by a single surgeon—radiologist team. All nephrostomies were performed using a micropuncture technique with a 21G needle and 0.18 guidewire. Access was achieved via nephrostomy in the antegrade approach, and cystoscopy in the retrograde approach. In the combined approach, a guidewire was inserted at cystoscopy via the vesico-ureteric junction (VUJ) and advanced in a retrograde manner to the renal pelvis. It was then grasped and extracted using rigid

Table 1 Improvement in renal drainage and pelvic dilatation

Timing of investigation	MAG3 drainage median score (range)	Median AP renal pelvis diameter in mm (range)
Pre-dilatation	4 (3—6)	34 (22—50)
12-month follow up	3 (1—6)	22 (5—36)
Final follow up	3 (2—4)	16 (8—26)

MAG3 drainage score was devised as follows: 1, normal (time to half counts <15 min); 2, 15—30 min; 3, 30—55 min; 4, falling curve in 55 min but too slow for time to half counts calculation; 5, level curve 55 min; 6, rising curve. Antero-posterior (AP) renal pelvis diameter was measured objectively by ultrasonography.