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The modified Barry technique to prevent vesicoureteric reflux in paediatric renal transplant recipients: Initial recipient outcomes

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Abstract *Objective:* We present the initial clinical results of the 'modified Barry technique' for the prevention of VUR in paediatric renal transplant grafts. Ours is the only centre in the UK using this technique, as confirmed in a questionnaire developed in our department.

Patients and methods: We retrospectively analysed data of 15 paediatric renal transplant patients (operated June 2006–November 2009) who had their vesicoureteric anastomosis performed using the modified Barry technique with a 2-cm submucosal anti-reflux tunnel. The original Barry technique involved the creation of a 4-cm tunnel; this was modified by us to reduce the risk of ureteric stenosis.

Results: At a median follow up of 23.7 months (6.3–39.4), the incidence of VUR was 7% (1/15). There was no evidence of postoperative urological complications, such as urinary leak, primary ureteric obstruction including anastomotic stricture/stenosis, transplant graft renal calculi and chronic rejection. At current follow up, graft and patient survival are 100%.

Conclusion: With the introduction of the modified Barry technique, the incidence of VUR in our series fell 10-fold to 7%, compared with our earlier study ($P < 0.0001$), without any urological complications. Although the initial results are encouraging, larger patient numbers and longer follow up are required to validate this technique further.

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Introduction

Kidney transplantation is the best option available for the treatment of end-stage renal failure (ESRF) at any age [1,2]. In the last 30 years there has been an increase in the number of paediatric renal transplants worldwide as a result of the enhancement of surgical, nephrological and immunological techniques. The distal ureter of the transplanted graft is prone to ischaemia and vesicoureteric reflux (VUR) following renal transplantation [3]. VUR is a risk factor in the development of acute pyelonephritis [4] and is currently being evaluated as a possible cause of paediatric renal graft damage.

Transplant graft reflux nephropathy (TGRN) secondary to VUR within the paediatric renal transplant graft can possibly cause scarring and premature graft loss [5]. A previous publication from our department [6] found that 37% of paediatric transplant grafts studied showed focal defects on post-transplant dimercaptosuccinic acid (DMSA) scans with appearances consistent with scarring secondary to a combination of urinary tract infections (UTI) and VUR. The incidence of VUR detected in this series was 70%. This publication [6] recommended more effective anti-reflux surgery for paediatric renal transplants, with subsequent investigations for reflux, continuing urinary antibiotic prophylaxis until VUR was excluded, and prompt treatment of urine infections in paediatric transplant recipients who do have VUR.

In a recent survey performed by our department [7], it has been confirmed that no definitive or standard technique is used for vesicoureteric anastomosis in paediatric renal transplantation in the UK. In our unit, we commenced using the 'modified Barry technique' in June 2006 with the aim to reduce VUR and TGRN in paediatric renal transplant patients. In this new technique a 2-cm submucosal anti-reflux tunnel is created instead of the standard 4 cm, in an attempt to reduce the risk of ureteric stenosis. We present the details of the technique and the initial outcomes.

Patients and methods

In June 2006, after detailed discussions between the departments of renal transplant, urology and paediatric nephrology, a decision was taken to commence anti-reflux vesicoureteric anastomosis in all paediatric renal transplants. From June 2006 until November 2009, 15 patients have had their vesicoureteric anastomosis performed using the 'modified Barry technique'. Prior to 2006, most of the surgical procedures performed for vesicoureteric anastomosis in paediatric renal transplantation in our unit used the 'direct onlay' (80%) or Lich–Gregoir (20%) technique. We noticed a high rate of TGRN in our patients [6], and also noted the current literature suggesting that the Lich–Gregoir technique was associated with urological complications [8] including ureteral leakage, haematuria and ureteric stricture formation.

Ureteric obstruction is a major cause of chronic allograft nephropathy, rejection and recurrence of the initial nephropathy [9]. Ureteric obstruction occurring beyond the first post-operative month remains common (2–7.5%) [10,11] and mostly related to ureteral stenosis. In view of the risk of ischaemia to the distal ureter and subsequent risk of ureteric obstruction due to stenosis, we shortened the length of the tunnel.

The median age at time of diagnosis of ESRF was 4 years (range 0.1–14). The median age of renal transplantation was 9 years (range 3–16). Eight (53%) of the patients were male. The aetiology of renal failure is summarized in Table 1. At the time of renal transplant, six (40%) patients were on haemodialysis, four (26%) on peritoneal dialysis and five (34%) were not on dialysis.

The 'modified Barry' vesicoureteric anastomosis technique was performed as follows. Upon completion of the vascular anastomoses the lateral wall of the recipient's bladder and prevesical fat was exposed. The peritoneum was dissected off the anterior lateral surface. Two bladder incisions were marked using Vicryl 3/0 stay sutures. The seromuscular layer was incised until the urinary bladder mucosa bulged into the incision. A 2-cm submucosal tunnel was created between the incisions. The ureter was then drawn within the submucosal tunnels, shortened and spatulated. A 4 Fr × 12 cm stent was inserted over a guidewire into the graft ureter. The incised ureter was anastomosed to the mucosa of the urinary bladder with a continuous 5–0 PDS suture. The muscular incision was then closed with interrupted absorbable sutures (Fig. 1). In the original 'Barry technique', two parallel incisions are made 3–4 cm apart. An anti-reflux tunnel is created between the two and the spatulated tip of the ureter is pulled through and anastomosed to the bladder mucosa with interrupted sutures. The difference between the 'modified Barry technique' and 'Barry technique' is the length of the submucosal tunnel.

All patients were prescribed cotrimoxazole 12 mg/kg for 6 months as prophylaxis against *Pneumocystis carinii* infection and so did not receive other routine urinary antibiotic prophylaxis. Urine microscopy and urine culture were performed at every clinic postoperatively. We defined a UTI as a culture growth of >10⁵ colonies of one species of bacteria per millilitre of urine. All patients underwent a DMSA scan within 2 weeks of their kidney transplant for which they were scanned anteriorly 2 h after receiving 1 MBq/kg of intravenous ^{99m}Tc-DMSA, which results in a radiation dose of 0.7 mSv [12]. In later scans, two additional oblique views were also taken.

All 15 patients also had a postoperative indirect cystogram with mercaptoacetyl triglycine (MAG3) to avoid urethral

Table 1 Aetiology of ESRF in 15 paediatric patients.

Diagnosis	N	%
1. Bilateral cystic dysplastic kidneys	4	26
2. Renal dysplasia	2	13
3. Congenital dysplastic horseshoe kidney with reflux	1	6
4. Haemolytic uremic syndrome	1	6
5. Infantile polycystic kidney disease	1	6
6. Intestinal nephritis	1	6
7. Juvenile nephrolithiasis	1	6
8. Membranous glomerular nephritis	1	6
9. Mineralocorticoid excess	1	6
10. Reflux nephropathy	1	6
11. Posterior urethral valve with renal dysplasia	1	6

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