Case Report

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Appendix vermiformis as a left pyelo-ureteral substitute in a 6-month-old girl with solitary kidney

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ABSTRACT

Extensive ureteral loss in early childhood is a rare but dramatic event. We present the case of a 6-month-old girl with a iatrogenic extensive pyelo-ureteral loss and solitary kidney. She successfully underwent left ureteral substitution using the appendix vermiformis. Left ureteral reconstruction using the appendix vermiformis is a feasible procedure even in very small children.

Key words: Appendix vermiformis, ureteral substitution

INTRODUCTION

In 1912 Melnikoff first reported using the appendix vermiformis (AV) as a ureteral substitute.[1] Since then several case reports and small series of ureteral reconstruction, mostly in adult patients using the AV have been published. Pediatric experience is very limited.

CASE REPORT

A 3-month-old girl who underwent right nephrectomy for a cystic dysplastic kidney developed anuria and urosepsis postoperatively. On re-operation it was noted that significant parts of the right and left ureter were missing and had probably been accidentally removed. The anatomic details remained unclear. Various ureter reconstruction operation of the left ureter failed including extensive bladder mobilization a psoas hitch and a Boari-flap. In the mean time the kidney was drained through a double, free lying J tube travelling through the retroperitoneal space.

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With this clinical history, this was transferred to our institution. On a retrograde pyelography, a complete absence of the left ureter and pyelon [Figure 1] was noted. We performed a laparotomy and found extensive post-inflammatory changes and fibrosis in the retroperitoneal space. The double J catheter was removed and the pyelo-calyceal segment of the lower renal pole was exposed. The mesoappendix was mobilized and the appendix was transected at the base so that a trans-mesocolic transposition to the left ureter could be performed. The transposition was implanted in an isoperistaltic fashion, and PDS 6.0 interrupted sutures were used for the appendical-calyceal-pelvic anastomoses after spatulating the AV. Further we implanted the appendix into the bladder using a Liche-Gregoir technique and inserted a pediatric double J catheter. The postoperative course was uneventful and the girl was discharged on the 7th POD. The double J stent was removed 4 weeks later and a retrograde pyelography was performed [Figure 2] that showed a wide AV lumen without any stricture or stenosis and good peristaltic waves. Antibiotic prophylaxis with trimethoprim was stopped 3 months postoperatively. 3.5 years after discharge the infant continues thriving and developing normally. She is free of urinary tract



Figure 1: Preoperative retrograde pyelography showing complete loss of ureter and pyelon

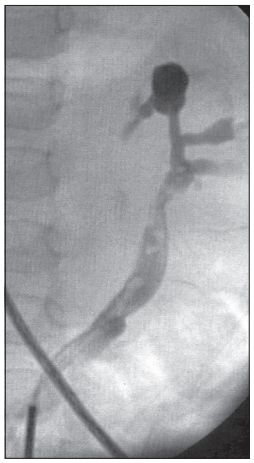


Figure 2: Postoperative retrograde pyelography showing interposition of AV without stricture and good peristalsis

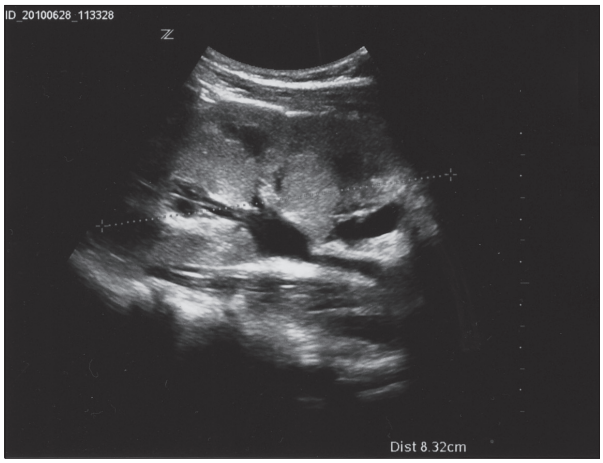


Figure 3: Ultrasound 3.5 years after appendix interposition showing a healthy kidney

infection and has a good renal function (creatinine 0.54 mg/dl). She is followed by ultrasound examinations every 6 months (ultrasound 3.5 years after operation, Figure 3).

DISCUSSION

A ureter loss is a devastating incident. Reasons for extensive ureteral loss include inflammation, tumour, trauma, radiation damage or retroperitoneal fibrosis.[2] Ureteric injury is a potential complication of any open abdominal surgery, laparoscopy and ureteroscopy. In urology, the most common procedure resulting in ureteral injuries is avulsion injury after ureteroscopy. However, with increasing knowledge and experience minimally invasive endoscopic procedures have become safe.[3]

Commonly encountered circumstances that potentially increase the risk of iatrogenic ureteral injury include prior surgery or trauma, inflammatory and neoplastic conditions and lack of awareness by the surgeon. Congenital ureteral anomalies also increase the risk of injury, particularly in the case of missed preoperative recognition. Ureteral duplication, renal ectopia and dystopia and complex urogenital malformations may lead to injury if unappreciated or failed to be diagnosed preoperatively, especially in small infants.[4] If unrecognized or unsuccessfully managed, ureteral trauma may lead to life-threatening conditions like urinoma, urosepsis and renal failure or to loss of the corresponding renal unit. In the largest review by Haitham *et al*. 60% percent of paediatric patients necessarily needed a ureteral substitution, suffered from postoperative complications after pyeloplasty and ureteral reimplantation.[5]

The best method for ureteric repair depends on the location, nature, extent and mechanism of the injury. A variety of surgical techniques have been described for the substitution of long ureteral segments. The first choice procedures make use of urinary tract tissue as seen in the psoas-hitch procedure, the Boari-flap procedure and transureteroureterostomy. In 1963, Hardy reported the first successful renal auto transplantation in severe ureteral injury.[6] If the ureteral loss cannot be repaired by intrinsic urinary tract tissues, partial or total replacement by gastrointestinal tissue is indicated. Bowel substitution includes colon, ileum and AV. Larger retrospective studies support ureteral reconstruction by interposing an ileal segment.[7] In 2003, a method of ileal interposition using the Yang-Monti technique was described and is now well established.[2,8]

Successful ureteral substitution with AV in adults and children involving the right, mid to distal ureter, right proximal ureter, pyeloureterostomy and for bridging the right renal pelvis to the left ureter has been reported.[5,8-12] Replacement of the left ureter bears the special problem of a long distance from the caecum to the left peritoneum depending on the length of the appendix and the mesoappendix.

The AV lumen is similar to the ureter and the length is adequate. Interposition of the appendix in an anti-refluxive manner is technically simple and feasible. Urinary stasis and absorption is negligible. Electrolyte abnormalities have not been reported so far. Restricted availability after appendectomy, post-inflammatory changes and fibrosis, missing length and a short mesoappendix may limit the use of the appendix.[8-13] General concerns using bowel in reconstructive urology, like recurrent urinary tract infection, tumor formation,

metabolic acidosis, urolithiasis and excessive mucous secretion, have not been reported so far, although long-time follow up is very limited in small existing series.

In general, vascularity of the AV is excellent, the length of the mesoappendix is rarely a limitation and mobilization of the appendix to the left side is easily performed. It can also satisfactorily used for other substitutions such as an appendicovesicostomy[14] or hepaticoportoappendicostomy[15] and in the majority of cases with satisfactory results.

We believe that left ureteral reconstruction using the AV is a feasible procedure even in very small children.

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