Renal autotransplantation following long segment iatrogenic ureteric injury

Ke Jia Teo, MD, Chin Tiong Heng, MD, David Consigliere, MD, Ho Yee Tiong, MD
Department of Urology, National University Hospital, Singapore

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The authors describe a case of iatrogenic right ureteric injury post duodenectomy and right hemi-colectomy. Renal autotransplantation was chosen as the treatment for the upper ureteric injury. This was successfully performed and the renal function of the transplanted kidney was subsequently preserved. The advantages and disadvantages of this approach are discussed.

Key Words: ureteric stricture, autotransplantation

Introduction

Renal autotransplantation -- the transplantation of the kidneys from one location to another within the same body-- was performed successfully for the first time in 1963.[1] This technique was later adopted as an alternative to in situ operation for renovascular disorders, ureteral strictures or transitional cell carcinomas of the upper urinary tract.[2] The authors describe a case of iatrogenic right ureteric injury post duodenectomy and right hemi-colectomy. Renal autotransplantation was chosen as the treatment for the upper ureteric injury. This was successfully performed and the renal function of the transplanted kidney was subsequently preserved.

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Address correspondence to Dr. Ho Yee Tiong, National University Hospital, 5 Lower Kent Ridge Road, Singapore 119 074

Case Report

Mr. Z was a 42-year-old man who presented initially in the outpatient clinic with a history of chronic right sided abdominal pain. He was also found to have a raised carcinoembryonic antigen (CEA) value of 8 ug/L. Colonoscopy showed a fungating tumor at the ascending colon, proximal to the hepatic flexure. Histology confirmed the diagnosis of high grade colonic adenocarcinoma. Mr. Z was subsequently sent for a staging computer tomography (CT) scan, which revealed locally extensive tumor with involvement of the D3 segment of the duodenum. He underwent an extended right hemi-colectomy and en-bloc resection of duodenum, with the construction of a duodenojejunostomy.

The patient recovered well from the initial operation. However, on the 7th postoperative day, Mr. Z developed fever and right flank pain. CT scans revealed no intra-abdominal abscesses, but the presence of an interval development of right severe hydronephrosis and

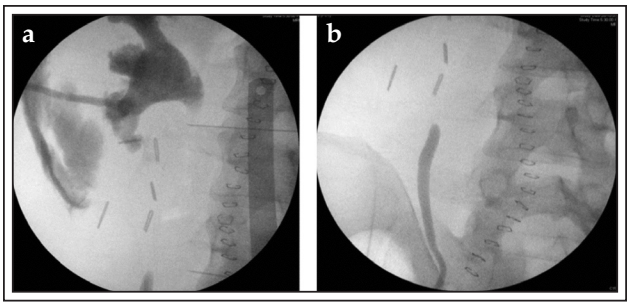

Figure 1a and 1b. Retrograde and antegrade pyelogram showing long segment stricture from the PUJ to the L4 level.

hydroureter. To treat his pyonephrosis, Mr Z underwent an insertion of right percutaneous nephrostomy (PCN) tube on the 9th postoperative day.

Retrograde pyelogram done 2 days after the insertion of the right PCN showed a complete obstruction at level of L4, while anterograde contrast injection showed a complete obstruction just below the right pelvic-ureteric junction, Figure 1a and 1b. The impression was that of right upper ureteric long segment injury post duodenectomy and right hemi-colectomy. The decision was made for the patient to maintain his PCN tube in situ for adjuvant chemotherapy of his confirmed colorectal adenocarcinoma (pathological stage T3, N0, M0). His creatinine was 143 umol/L postoperatively and it was 107 umol/L post insertion of PCN tube.

This was complicated by multiple episodes of blocked PCN tube and recurrent urinary tract infections. He was subsequently referred for reconstruction of his urinary tract so that he can be free of the PCN tube.

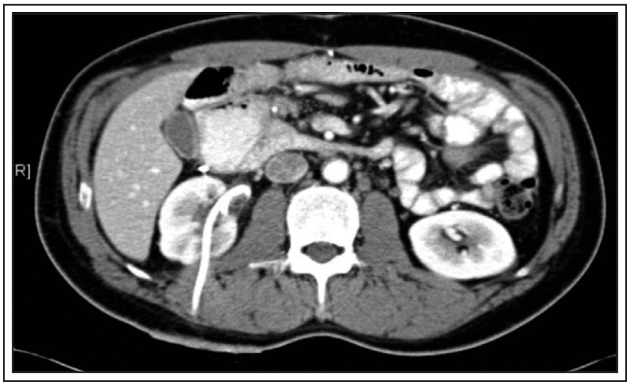

Figure 2. Computer tomography of abdomen and pelvis showing the right PCN in situ with no hydronephrosis. No disease recurrence noted at follow up after chemotherapy.

A CT scan performed 9 months after the initial hemi-colectomy showed no recurrence of disease and no periaortic lymphadenopathy. The kidney showed no hydronephrosis with the PCN tube in situ without any perinephric haematoma, Figure 2. Treatment options including ileal interposition as well as open auto transplantation of the right kidney was presented to the patient who subsequently chose autotransplantation.

Operative procedure

Following anesthesia, patient was placed in the lithotomy position. Cystoscopy was first performed and a retrograde pyelogram performed to confirm the stricture. The right ureteric orifice was cannulated with a 6 French ureteric catheter, which was passed up to the area of stricture to facilitate identification of the distal ureter. This was secured externally to a Foley catheter. The patient was then repositioned to supine and a midline laparotomy incision was made. A careful exploration was performed with no evidence of recurrent disease. Dense adhesions were noted intraperitoneally and careful adhesiolysis was performed. The large bowel was reflected medially and the duodenum kockerised to expose the retroperitoneal right kidney and ureter, the inferior vena cava along its entire length up to and above the level of the renal hilum. The lower ureter distal to the site of the stricture/obstruction was identified by the presence of the T6 catheter. Minimal dissection of this healthy distal ureter was performed to preserve its blood supply, but adequate mobilization was carried to ensure it will reach the new kidney position after autotransplanting. Four centimetres of the right upper ureter from L2 to L4 level was found to be obliterated from previous surgery and surrounded by dense adhesions. The right kidney was first dissected completely free within the Gerotas fascia down to the hilum. At the hilum, there were two renal arteries and one renal vein that supplied the right kidney. The renal vessels were clamped and transacted to maximize their length for later re-implantation.

Once the kidney was removed, it was immersed in crushed ice and flushed with HTK solution. The first warm ischemic time was 1 minute and the kidney was perfused with HTK solution for 10 minutes. Backbrench preparation of the kidney involved dissection of the hilum for vascular anastomosis and this involved reconstructing the two renal arteries by anastomosing side to side the two spatulated arteries to form a single opening using 7/0 prolene. The single renal vein was transacted with a cuff of vena cava to facilitate lengthening of the short right renal vein. The ureter

was difficult to locate due to adhesions at the area of stricture. Careful retrograde dissection was performed, and confirmation of the located ureteric lumen involved performing a backbench retrograde x-ray with contrast and fluoroscopy around the bench table.

Following benchwork, the kidney was reimplanted intraperitoneally in the right iliac fossa where the distal ureter can easily reach the dissected proximal part of the kidney. End to side anastomosis was performed between the renal vein and right external iliac vein; and between the renal artery and right common iliac artery using 6/0 prolene. Good kidney perfusion was confirmed after the vascular clamps were removed. After autotransplanting the right kidney to a lower pelvic position, it was easy to perform a tension-free spatulated end to end uretero-uretero anastomosis over a size 6 French DJ stent with 5/0 PDS. The stent was subsequently removed in the post-operative period 6 weeks later. The cold ischaemic time was 2 hours 45 minutes and the anastomotic time was 36 minutes. Total operative time was 8 hours 32 minutes.

Postoperatively, patient made an uneventful recovery. His date of discharge was on the 6th postoperative day. Renal MAG 3 scan showed good perfusion of the transplanted kidney. Ultrasound Doppler of the kidneys showed patent renal artery and renal vein and there was no presence of renal artery stenosis. His postoperative creatinine level was 108 umol/L. Ultrasound performed of the autotransplanted kidney also showed no hydronephrosis. Clinical review at 1 year follow up showed normal creatinine levels and an intravenous urography done at 14 months postoperative showed flow of contrast down the ureter from the transplanted kidney into the bladder, Figure 3a and 3b.

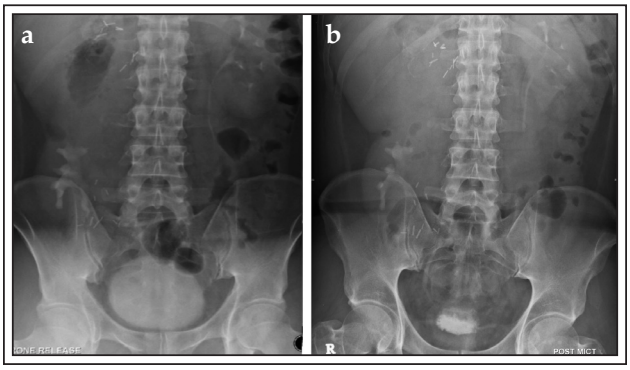

Figure 3a and 3b. Intravenous urogram (IVU) showing flow of contrast from the autotransplanted kidney to the bladder along the ureter 14 months post autotransplantation after release and post mictuation respectively.

Discussion

Renal autotransplantation was performed successfully for the first time in 1963.[1] The kidney was removed, perfused with cold glucose, and re-implanted in the iliac fossa. Autotransplantation is also, as seen in the above case, a viable option for the treatment of ureteral injuries, especially in the management of long upper ureteral injuries.[2-4] Right hemicolectomy has been known to carry a 2%-10% risk of injury to the ureters. The conventional surgical techniques used to treat less complicated or more distal ureteral damage are – ureteroneocystostomy with a Boari flap and psoas hitch. In long segment upper ureteral injuries, an alternative would be the replacement of the ureter for reconstruction of the urinary tract with a segment of ileum. The advantages of an ileal ureter over auto-transplantation include a technically less demanding procedure as a vascular anastomosis is not necessary. However, its disadvantages include mucous production, metabolic acidosis, propensity for bacteruria and the need for indefinite radiologic surveillance of the ileal segment. Hence, for a relatively young patient, we favor auto-transplantation as our treatment option as there is no risk of mucous obstruction and bacteruria.[5] Following a successful autotransplantation without vascular compromise, the risk of electrolyte abnormalities, and long term renal function deterioration will also be low.[5] In addition, as this patient had prior surgery including duodenectomy with resulting dense intraperitoneal adhesions, additional dissection to facilitate ileal interposition would also increase the risk of iatragenic bowel injury.

Postoperative complications specific to auto-transplantation include bleeding from the vascular anastomosis, renal artery or vein thrombosis and distal extremity embolisation -- these were not experienced by our patient. However, fear of vascular complications due to a lack of familiarity with the surgical technique is probably why renal auto-transplantation has been so rarely attempted. To facilitate the use of auto-transplantation as part of the urologist's armamentarium for the treatment of complex ureteric strictures and other conditions, it is important for urologists to continue to be involved in renal transplantation and for kidney transplantation to be part of urology residency or equivalent training programs.

Bodie et al reported excellent long term results of renal auto-transplantation.[6] He reported on 24 auto-transplanted kidneys in 23 patients in whom the primary indication was to replace all or a major portion of the ureter. There were no operative deaths

reported. Of the 24 autografts, 3 were ultimately lost (12%). In addition, Wee et al reported that renal autotransplantation enabled more successful pain relief in the early post-operative period and fewer long term complications due to the preservation of urinary tract integrity.[7] In conclusion, we believe that renal autotransplantation can be a safe and effective procedure to reconstruct the urinary tract. Although technically demanding, this procedure can be considered as an alternative method for the management iatrogenic upper ureteral injuries. □

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