Renal autotransplantation in patients with retroperitoneal fibrosis[1]

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Extensive loss of the ureter is a potential complication of surgery performed to relieve ureteral obstruction caused by retroperitoneal fibrosis. The authors describe four cases in which renal autotransplantation restored normal urinary drainage. The preoperative evaluation and technicalities of renal autotransplantation are reviewed. The advantages of this procedure, as compared to ileal substitution, for patients with extensive ureteral loss are discussed.

Index terms: Kidney, transplantation • Retroperitoneal fibrosis • Ureteral obstruction • Ureter, surgery

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Since the initial success reported by Hardy in 1963,[1] renal autotransplantation has been favorably employed in the treatment of various urologic disorders, including renal artery disease, extensive ureteral injury, bilateral or solitary renal malignancy, and advanced nephrolithiasis.[2] Yet, severe renal parenchymal disease, extensive aortoiliac occlusive disease, or retroperitoneal fibrosis have all been considered relative contraindications for this procedure. Retroperitoneal fibrosis may produce constricting fibrotic encasement of the inferior vena cava and/or iliac veins, which complicates the renal autotransplantation technique and may impair venous return from the autotransplant postoperatively.

Surgical ureterolysis is the primary treatment for patients with ureteral obstruction caused by idiopathic retroperitoneal fibrosis.[3] This treatment is generally effective, but

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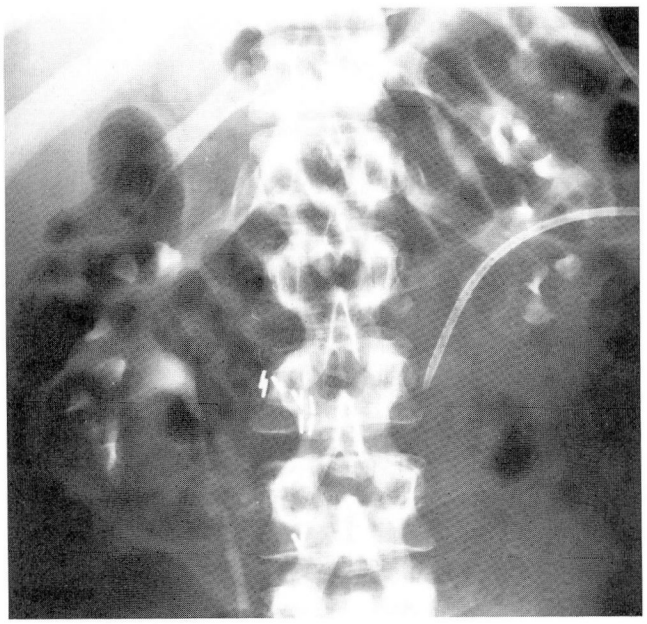


Fig. 1. IVP shows both kidneys functioning, with drainage of the left kidney via a nephrostomy tube.

ureteral injury with extravasation and/or obstruction is a potential complication which may lead to extensive loss of the ureter. We report 4 patients with prior surgery for retroperitoneal fibrosis who presented with extensive ureteral loss and in whom renal autotransplantation restored unobstructed, intact urinary drainage.

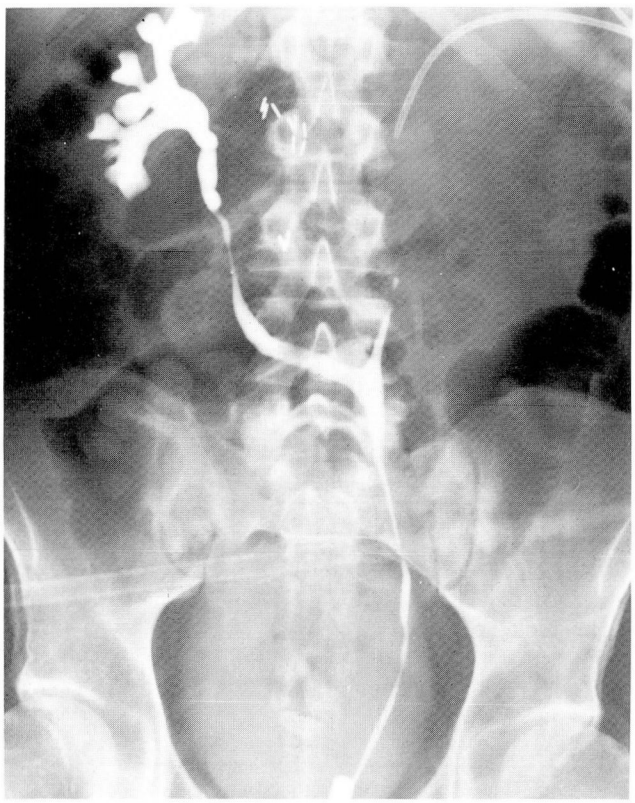
Case reports

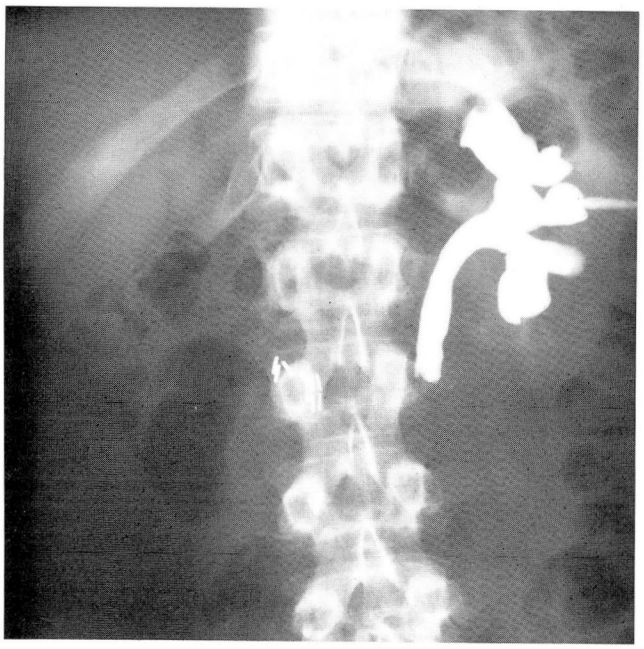
Case 1. A 23-year-old white man had suffered recurrent episodes of superficial thrombophlebitis in the upper and lower extremities since he was 13 years old. In 1976, a thrombectomy of the left leg was performed due to deep venous thrombosis, and systemic anticoagulation with warfarin (Coumadin) was initiated. Nonetheless, the patient had three episodes of pulmonary emboli within the next year which necessitated clipping of the inferior vena cava.

In early 1981, right hydronephrosis developed, and an open nephrostomy was done; a biopsy of tissue surrounding the ureter showed retroperitoneal fibrosis. In June 1981, a right-to-left transureteroureterostomy was performed, and the nephrostomy was removed. In September 1981, a follow-up intravenous pyelogram (IVP) revealed left hydronephrosis proximal to the ureteral anastomosis. A left ureterolysis, which was unsuccessfully attempted, was complicated by postoperative urinary extravasation from the upper left ureter. Insertion of a left nephrostomy tube resulted in gradual resolution of the urinary drainage. The patient was then transferred to the Cleveland Clinic for further management.

An IVP showed that both kidneys were functioning promptly (*Fig. 1*). The right kidney appeared to drain adequately through the transureteroureterostomy without obstruction—an observation confirmed by retrograde pyelography (*Fig. 2A*). A left antegrade pyelogram through the indwelling nephrostomy tube demonstrated complete ureteral obstruction 4 cm below the ureteropelvic junction (*Fig.*

A





B

Fig. 2. A. Retrograde pyelogram reveals unobstructed drainage of the right kidney through the transureteroureterostomy, above which the upper left ureter is obstructed.

B. Left antegrade pyelogram reveals complete obstruction of the upper ureter.

2B). An aortogram revealed single renal arteries bilaterally. A left femoral venogram could not be obtained due to total occlusion of the left femoral vein. A right femoral venogram demonstrated occlusion of the right external iliac vein with an extensive collateral pelvic venous circulation and reconstitution of the right common iliac vein distally (*Fig. 3*). Despite prior clipping of the inferior vena cava, the transit time of the injected contrast material was normal due to the extensive collateral pelvic and retroperitoneal venous circulation.

In December 1981, the left kidney was autotransplanted into the right iliac fossa. Care was taken not to interfere with the transureteroureterostomy. End-to-end anastomosis of the renal artery to the hypogastric artery and end-to-side anastomosis of the renal vein to the right common iliac vein restored the vascular supply to the left kidney. A ureteroneocystostomy was then done along with a psoas "hitch" of the bladder to remove tension from the anastomosis.

The patient had an uneventful postoperative recovery, and he has remained asymptomatic. A follow-up IVP obtained 21 months after the operation revealed unobstructed function of the renal autograft and a normal-appearing right kidney (*Fig. 4*). The patient's current serum creatinine level is 1.3 mg/dL.

Case 2. A 48-year-old white man was evaluated in December 1980 for renal insufficiency; ultrasound revealed bilateral hydronephrosis. In February 1981, the left ureter was explored, and biopsy of the surrounding scar tissue revealed retroperitoneal fibrosis. A left ureterolysis and left nephrostomy tube placement were done. One month later, the right ureter was explored; a proximal ureteral stricture was excised, and a right nephrostomy tube was inserted. Three months later, a bilateral antegrade pyelogram revealed obstruction of both lower ureters. In September 1981, a bilateral ureterolysis with deep biopsy again demonstrated retroperitoneal fibrosis. One month later, open surgical drainage of a left perirenal abscess was done.

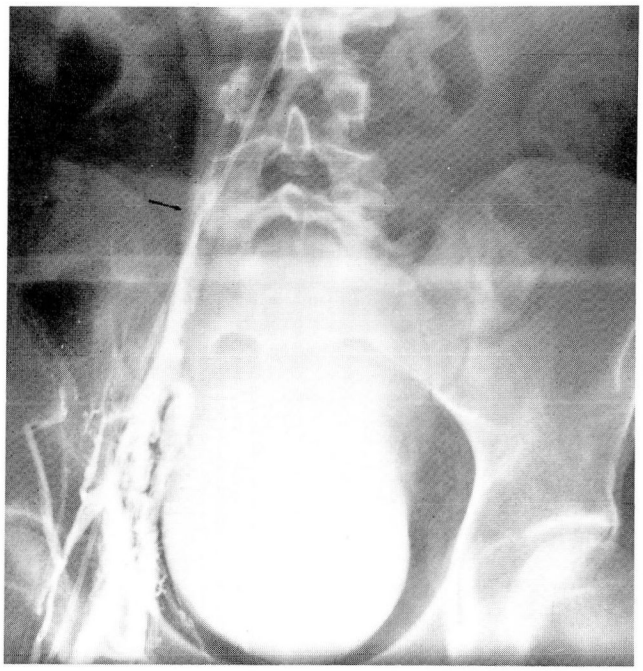


Fig. 3. Right femoral venogram demonstrates occlusion of the right external iliac vein with extensive venous collaterals and reconstitution of the right common iliac vein (*arrow*).

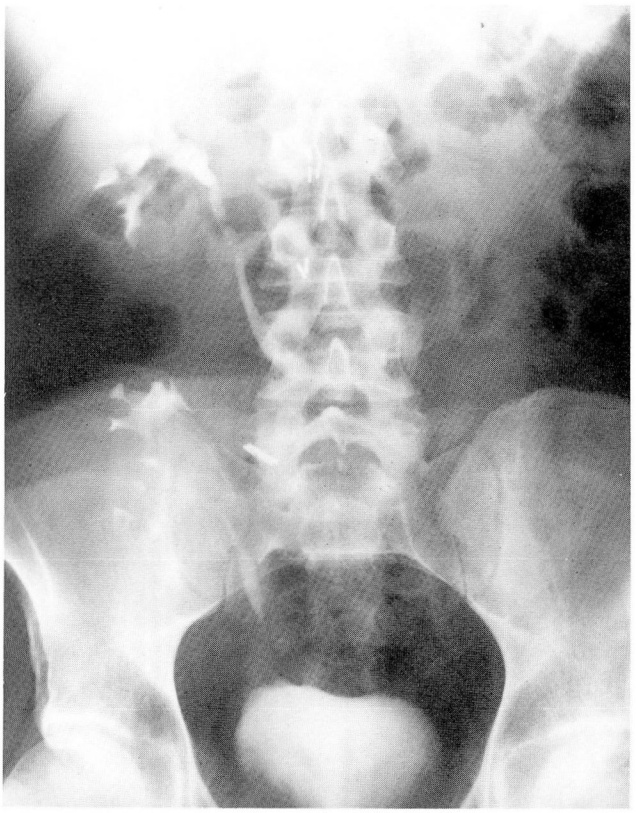


Fig. 4. Postoperative IVP reveals excellent unobstructed function of the renal autograft and the right kidney.

In February 1982, the right nephrostomy tube was removed. At that time, a left nephrostogram showed minor extravasation of contrast material from the upper left ureter; the nephrostomy tube was left in place. In May 1982, a left nephrostogram showed complete obstruction of the left ureter at the site of the previously noted extravasation. A retrograde pyelogram demonstrated no filling of the left ureter above the pelvic brim and an unobstructed right ureter. An IVP at this time also showed that both kidneys were functioning with mild calyceal clubbing bilaterally. The patient's serum creatinine level was 1.9 mg/dL. He was then referred to the Cleveland Clinic for further management.

An aortogram revealed a single right renal artery and two left renal arteries with normal-appearing iliac arteries bilaterally. A venogram demonstrated a completely occluded left common iliac vein, a normal right common iliac vein, and an unobstructed inferior vena cava (*Fig. 5, A* and *B*). The left kidney was autotransplanted into the right iliac fossa; extracorporeal repair of the two renal arteries was done via an end-to-side anastomosis of one to the other. The renal artery was anastomosed end to end to the hypogastric artery, and the renal vein was anastomosed end to side to the right external iliac vein. Urinary continuity was restored by a direct anastomosis of the proximal ureter to the bladder.

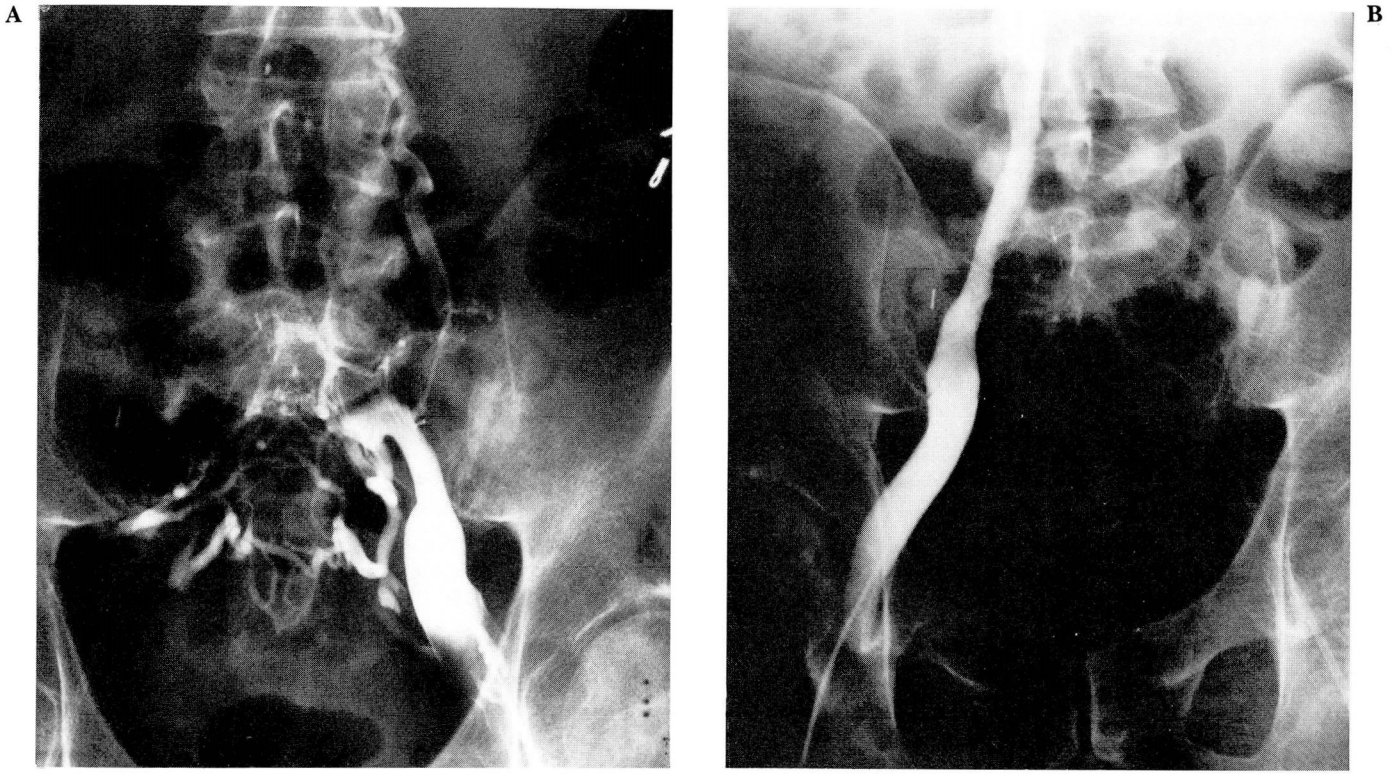


Fig. 5. A. Left femoral venogram shows complete occlusion of the left common iliac vein with drainage via pelvic venous collaterals. **B.** Right femoral venogram shows patent right external iliac and common iliac veins with free flow into the inferior vena cava.

The postoperative course was uncomplicated, and an isotope renal scan demonstrated excellent perfusion and function of the autotransplant. An IVP demonstrated unobstructed functioning of the autotransplanted kidney. Six months postoperatively, the patient remains asymptomatic with a serum creatinine level of 1.7 mg/dL.

Case 3. A 45-year-old white man complained of right back pain in January 1979; an IVP showed right hydronephrosis. Right ureteral exploration revealed dense scar tissue surrounding the mid-portion of the right ureter. Biopsy results showed retroperitoneal fibrosis, and a right ureterolysis was done. Postoperatively, urine drainage from the right flank resolved gradually. Three months later, an IVP demonstrated a poorly functioning right kidney and mild hydronephrosis of the left kidney. The patient was thus referred to the Cleveland Clinic.

The physical examination revealed a fixed, firm palpable mass in the right lower quadrant. The patient's serum creatinine level was 1.7 mg/dL. A right retrograde pyelogram showed extravasation of contrast material into a paraureteral pseudocyst with absent filling of the more proximal ureter due to obstruction (*Fig. 6*). A computed tomographic (CT) scan of the abdomen revealed some function of the hydronephrotic right kidney, suggesting that it was salvable. An aortogram showed single renal arteries bilaterally. The femoral venogram and inferior vena cavogram findings were normal.

A left ureterolysis and right renal autotransplantation were performed. The right kidney was placed in the left iliac fossa with end-to-end anastomosis of the renal artery to the hypogastric artery and end-to-side anastomosis of the renal vein to the external iliac vein. A ureteroneocystostomy was then done. The patient's recovery was uncomplicated, and a postoperative isotope scan showed satisfactory perfusion and function of the autotransplanted kidney. One year later, an IVP revealed excellent function of both kidneys without evidence of obstruction (*Fig. 7*). The patient's serum creatinine level at that time had improved to 1.2 mg/dL.

Case 4. A 30-year-old white woman was evaluated in February 1982 for a urinary tract infection and migraine headaches. She had been taking methysergide for two years for the latter complaint. An IVP showed a non-functioning left kidney and moderate right hydronephrosis with a medially displaced right ureter. A CT scan suggested retroperitoneal fibrosis. The patient underwent bilateral ureterolysis and a left ureteroureterostomy for severe fibrosis involving the left ureter. Adjunctive steroid therapy was administered postoperatively. Findings of a pathologic study of excised tissue adjacent to the ureters revealed retroperitoneal fibrosis.

In June 1982, an IVP demonstrated a still non-functioning left kidney; right hydronephrosis had become more severe. Surgical re-exploration revealed severe fibrosis of the right ureter at a higher level than had been noted previously. A ureterolysis was repeated, and steroid therapy continued. In December 1982, the patient was re-evaluated for right flank pain, and an IVP demonstrated severe hydronephrosis of the solitary functioning right kidney with stenosis of the proximal right ureter. A percutaneous right nephrostomy tube was inserted, and two months later, the patient was transferred to the Cleveland Clinic.

At this time, the patient's serum creatinine level was 2.3

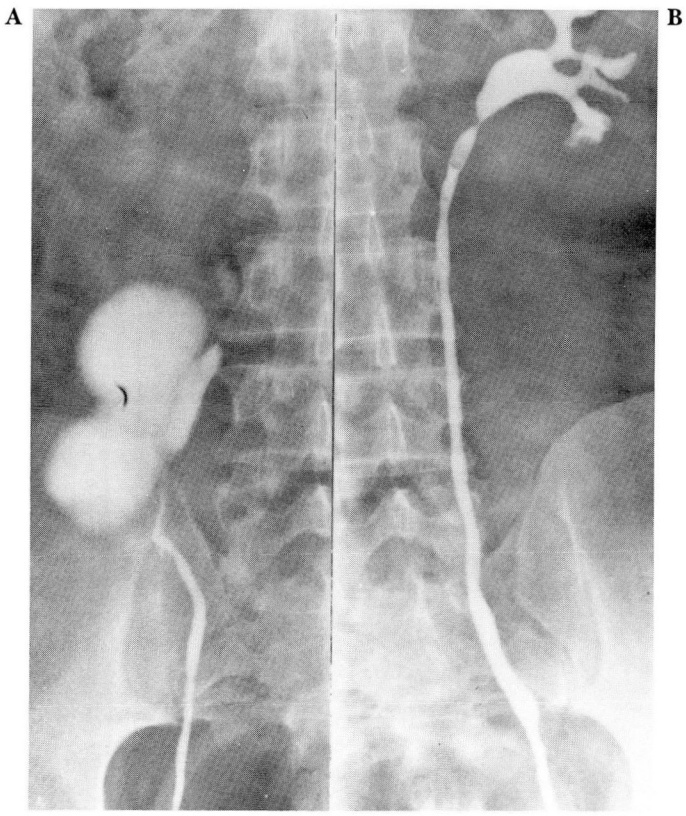


Fig. 6. A. Right retrograde pyelogram shows extravasation of contrast material into a paraureteral pseudocyst with absent filling of the more proximal ureter due to obstruction.

B. A left retrograde pyelogram demonstrates medial displacement of the ureter typical of retroperitoneal fibrosis.

mg/dL. A Hippuran renal scan demonstrated an afunctional left kidney. A right antegrade pyelogram showed complete obstruction of the right ureter just below the ureteropelvic junction. An aortogram showed two arteries supplying the right kidney. The femoral venogram and inferior vena cavogram findings were normal.

In April 1983, the right kidney was autotransplanted into the left iliac fossa. Following removal of the kidney, the two right renal arteries were repaired extracorporeally into a single vessel. The newly fashioned renal artery was anastomosed end to end to the left hypogastric artery, and the renal vein was anastomosed end to side to the left external iliac vein. A vesicopyelostomy was performed in conjunction with a psoas hitch of the bladder.

Postoperatively, the patient experienced nonoliguric acute tubular necrosis with a peak serum creatinine level of 7.0 mg/dL, which resolved gradually without dialysis. An isotope renal scan showed satisfactory perfusion to the autotransplanted kidney, and a cystogram showed free vesicorenal reflux without obstruction or extravasation. Two months postoperatively, an IVP revealed excellent unobstructed function of the autograft (*Fig. 8*). Six months after the operation, the patient was asymptomatic with a serum creatinine level of 2.4 mg/dL.

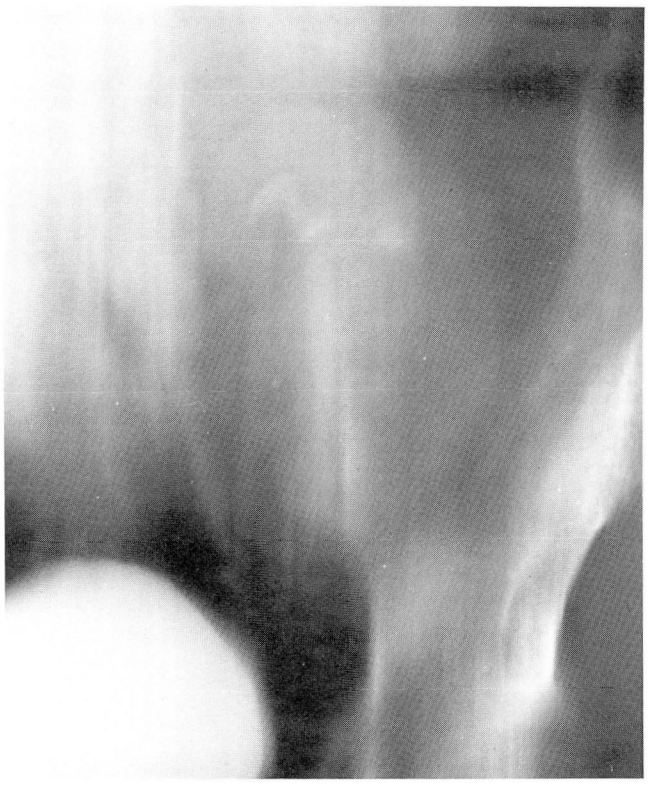


Fig. 7. Postoperative IVP demonstrates functioning of the renal autotransplant in the left iliac fossa.

Discussion

Retroperitoneal fibrosis, described by Ormond in 1948,[4] may be idiopathic or secondary to a variety of conditions, such as methysergide ingestion, malignancy, inflammation, or infection. Retroperitoneal fibrosis often causes ureteral obstruction and consequent renal dysfunction. Ureterolysis with lateral placement of the ureters has been the definitive treatment, although some authors have advocated corticosteroids for initial or adjunctive therapy.[3,5–8] Although ureterolysis is generally effective, ureteral injury and/or reobstruction have occurred in some patients.[9] These may cause extensive loss of the ureter which cannot be regained by conventional methods such as a ureteroureterostomy, transureteroureterostomy, ureteroneocystostomy, or the use of a Boari bladder flap. In this event, renal autotransplantation and ileal interposition are the two options to restore urinary drainage and salvage renal function.[10]

Although ileal interposition has been the traditional method of ureteral replacement, autotransplantation offers several advantages.[2] Most significantly, autotransplantation maintains the

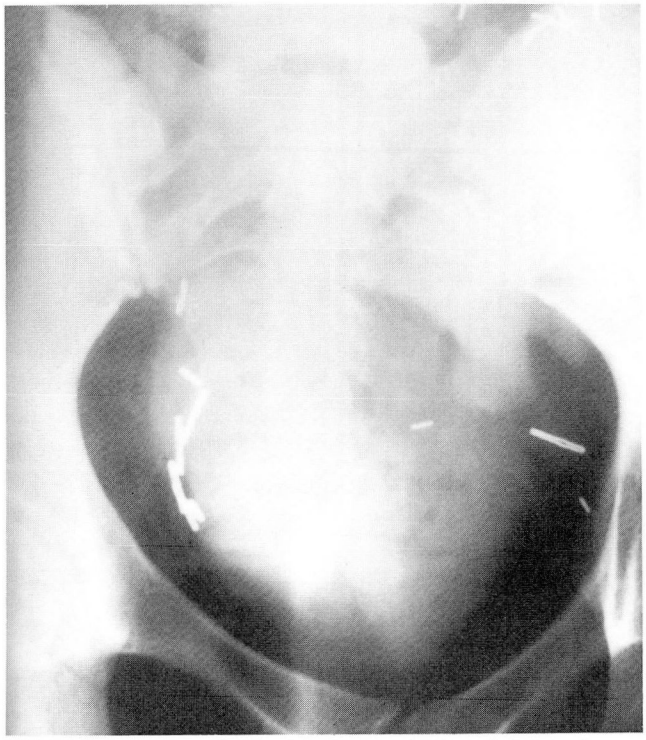


Fig. 8. Postoperative IVP shows functioning of the renal autograft with excellent drainage into the bladder through the vesicopyelostomy.

integrity of the urinary tract, thereby precluding problems such as mucous secretion and electrolyte reabsorption, which may follow ileal ureteral replacement. Postoperative bacteriuria and vesicorenal reflux, inherent deficiencies of the ileal ureter, can generally be prevented by autotransplantation. Approximately 25% of patients treated with an ileal ureter lose some renal function postoperatively. The initial data suggest that autotransplantation may preserve renal function more effectively in the long term. Finally, autotransplantation allows operative repair in the iliac fossa, away from the site of previous scarring and inflammation.

Surgeons have been reluctant to undertake autotransplantation in the presence of retroperitoneal fibrosis since the fibrotic process often involves the iliac vessels, particularly the veins, and may impede blood flow through extrinsic compression. Similar involvement of the inferior vena cava has also been observed. Even without vascular obstruction, the surrounding plaque may hinder mobilization of the iliac vessels preparatory to autotransplantation. Still, renal autotransplantation can succeed in patients with retroperitoneal fibrosis.

When renal autotransplantation is contemplated, the preoperative evaluation should include a CT scan to determine the extent of retroperitoneal and pelvic involvement in the fibrotic process. The performance of femoral venography and inferior vena cavography is necessary to document pelvic venous drainage since the iliac veins may have occluded silently. In this case, the venographic images are scrutinized for a large caliber pelvic vein that may be anastomosed to the renal vein during autotransplantation. Similarly, aortography and pelvic arteriography are performed preoperatively to evaluate the number and location of renal arteries as well as the status of the iliac arteries. The latter, though rarely compromised significantly by retroperitoneal fibrosis, may demonstrate occlusive atherosclerosis which, in turn, will influence the selection of an appropriate site for the renal arterial anastomosis.

Case 1 is particularly relevant to the issue of undertaking renal autotransplantation in the presence of pelvic venous obstruction. The patient had previously undergone plication of the inferior vena cava which, combined with extensive retroperitoneal fibrosis, occluded the left common iliac vein and both external iliac veins. Nevertheless, venography led to identification of a patent segment of the right common iliac vein to which the renal vein might be anastomosed. Autotransplantation was thus undertaken, and despite occlusion of the inferior vena cava, venous drainage from the autograft proved satisfactory through a network of collateral venous channels. Waltzer et al[11] recently reported another successful renal allotransplantation in a patient with complete occlusion of the inferior vena cava and extensive pelvic venous collaterals. Conversely, this case implies that should vena caval occlusion ensue after renal autotransplantation, concomitant development of collateral channels can maintain normal venous drainage from the renal autograft. In fact, this premise has been validated both experimentally and clinically.[12–14]

Palleschi and McAninch,[15] Linke and May,[16] and Munda et al[17] have each reported a patient with retroperitoneal fibrosis in whom renal autotransplantation succeeded. Our experience with the 4 patients described herein confirms that renal autotransplantation may offer an effective solution to the problem of extensive ureteral loss in these difficult cases.

References

1. Hardy JD. High ureteral injuries. Management by autotransplantation of the kidney. JAMA 1963; **184**:97–101.
2. Novick AC. Extracorporeal renal surgery and autotransplantation. [In] Novick AC, Straffon RA, eds. Vascular Problems in Urologic Surgery. Philadelphia, WB Saunders, 1982, pp 305–328.
3. Hewitt CB, Nitz GL, Kiser WS, Straffon RA, Stewart BH. Surgical treatment of retroperitoneal fibrosis. Ann Surg 1969; **169**:610–615.
4. Ormond JK. Bilateral ureteral obstruction due to envelopment and compression by an inflammatory retroperitoneal process. J Urol 1948; **59**:1072–1079.
5. Tressider GC, Blandy JP, Singh M. Omental sleeve to prevent recurrent retroperitoneal fibrosis under the ureter. Urol Int 1972; **27**:144–148.
6. Ross JC, Goldsmith HJ. The combined surgical and medical treatment of retroperitoneal fibrosis. Br J Surg 1972; **58**:422–427.
7. Oschner MG, Brannan W, Pond HS, Goodlet JS Jr. Medical therapy in idiopathic retroperitoneal fibrosis. J Urol 1975; **114**:700–704.
8. Mitchinson MJ, Withycombe JFR, Jones RA. The response of idiopathic retroperitoneal fibrosis to corticosteroids. Br J Urol 1971; **43**:444–449.
9. Cooksey G, Powell PH, Singh M, Yeates WK. Idiopathic retroperitoneal fibrosis, a long-term review after surgical treatment. Br J Urol 1982; **54**:628–631.
10. Stewart BH, Banowsky LH, Hewitt CB, Straffon RA. Renal autotransplantation: current perspectives. J Urol 1977; **118**:363–368.
11. Waltzer WC, Zincke H, Sterioff S. Renal transplantation: its use in a patient with systemic lupus erythematosus and complete occlusion of inferior vena cava. Arch Surg 1980; **115**:987–988.
12. Daouk AA, Crummy AB, Schulman EY, Kisen WA, Malek CH. Renal vein thrombosis in canine kidney transplants. Ann Surg 1972; **175**;35–40.
13. Lempert N, Erdman J, Ratnam M, Kasmody A. Experimental use of the vena cava clip in renal transplantation. J Surg Res 1974; **16**:277–282.
14. Schwartz GR, Banowsky LH, Peter ET, Blakely WR, Klingler EL. Inferior vena caval interruption in renal transplant recipients. Am Surg 1974; **40**:178–180.
15. Palleschi J, McAninch JW. Renal autotransplantation for retroperitoneal fibrosis. J Urol 1981; **125**:408–411.
16. Linke CA, May AG. Autotransplantation in retroperitoneal fibrosis. J Urol 1972; **107**:196–198.
17. Munda R, Mendoza N, Alexander JW. Renal autotransplantation for retroperitoneal fibrosis (letter). Arch Surg 1982; **117**:1615.

Commentary

Lynn H. Banowsky, M.D., Professor, Division of Urology; Chief, Section of Renal Transplantation, University of Texas, San Antonio; comments: The authors correctly point out that ureterolysis with either lateral placement of the ureters in the retroperitoneal or intraperitoneal spaces has a significant incidence of reobstruction. These failures present a difficult technical challenge that has been frequently resolved by ileal substitution or permanent nephrostomy-tube drainage, both of which are less than ideal.

Renal autotransplantation should not be viewed as "heroic" therapy for a patient after earlier ureterolysis and ureteral relocation have failed. The technical problems associated with the vascular anastomosis are no more formidable than those encountered when creating an ileal replacement for the ureter. The long-term complications of the autotransplanted kidney conceivably will be fewer than those occasioned by ileal substitution. When autotransplantation for retroperitoneal fibrosis is contemplated, both preoperative aortography and venography are necessary. The authors are to be congratulated for their fresh approach to treating the 4 patients they describe here and for demonstrating that even significant venous obstruction does not necessarily rule out a renal autotransplantation in the presence of retroperitoneal fibrosis.