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345

FIVE CASES AND FIVE UNUSUAL INDICATIONS FOR AUTOGENIC RENAL TRANSPLANTATION

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...t. Five cases of renal autotransplantation repres... five different indications for the procedure are pre... and discussed.

...quent to the development of techniques for ... kidney transplantation and *ex vivo* kidney ...vation, indications have arisen for autogenic ... transplantation with or without *in vitro* re... uctive surgery. Several cases have been de... earlier (Belzer et al., 1970; Gelin et al., ... Bergentz et al., 1973; Calne, 1973; Corman et ... 3*a*, *b*). In this communication we will pre... additional cases and five unusual indications ... procedure.

CASE REPORTS

Case 1

A ...year-old male had a history of severe hypertension ... 1972 (210/130 mmHg). He had markedly elevated ... of renin in peripheral venous blood. A proximal ... stenosis in the left renal artery was diagnosed. ... another hospital, he received a saphenous vein by-pass ... from the aorta to the left renal artery in February, ... His blood pressure improved postoperatively but ... the ensuing months it again rose to approximately ... mmHg and excretory urography showed a de... nephrographic phase of the left kidney. Repeat ...raphy demonstrated a severely stenosed by-pass ... 1).

...ovember, 1973, he was referred to Colorado Gen... ...spital and underwent an autotransplantation of the ...ney to the left iliac fossa. After completion of the ... the kidney was connected to a Waters perfusion ... for approximately one hour, using long extension ... the operating field. Since the ureter was not interrupted, it was occluded with a sponge-rubber-shod clamp during the perfusion to prevent blood from the ureteral vessels from entering the perfusate. Postoperatively he became and remained normotensive (140/80 mmHg). Postoperative arteriography and urography show satisfactory arterial and ureteral anatomy (Fig. 2). The kidney function is normal and unchanged.

Case 2

A 52-year-old female had the left kidney removed in 1951 because of renal stones. In December, 1973, a renal cell carcinoma was diagnosed after she had noticed a lower right quadrant mass. No metastases were detectable. Her kidney function was normal with a creatinine clearance of 80 cc/min. Renal arteriography demonstrated a double renal artery blood supply with apparent blood supply to the tumor in the mid-region from both arteries (Figs. 3 and 4). In January, 1974, the kidney was approached through a right paramedian extraperitoneal incision. There were no palpable retroperitoneal lymph nodes. The kidney was removed with a maximal length of renal vessels. The ureter was left uninterrupted. The kidney was perfused with Perfadex® solution and was then connected to a Waters perfusion machine using long extension tubes to the operating field. A soft, foam-rubber-coated clamp was placed on the ureter.

The lower artery and the branches from the upper artery supplying the tumor with blood were identified, tied off and injected with methylene blue solution distal to the ligatures. The area of the kidney thus demarcated was then resected. There was no extension of tumor beyond the lines of resection, as determined by frozen section. Approximately one-third of the kidney was left after the resection. With the perfusion machine working intermittently, numerous small blood vessels on the cut surface of the kidney were suture ligated. The calyceal openings were closed with fine chromic catgut (Fig. 5).

The kidney remnant was then autotransplanted to the right iliac fossa. The vessel and ureter clamps were removed after 4 hours and 25 min cold ischemic time. A

Fig. 1. Case 1: Aortography shows stenoses of both ends of the by-pass graft, particularly at the proximal anastomosis.

Fig. 2. Case 1: Arteriography 3 months postoperatively. The end-to-side anastomosis of the renal artery to the left external iliac artery is patent.

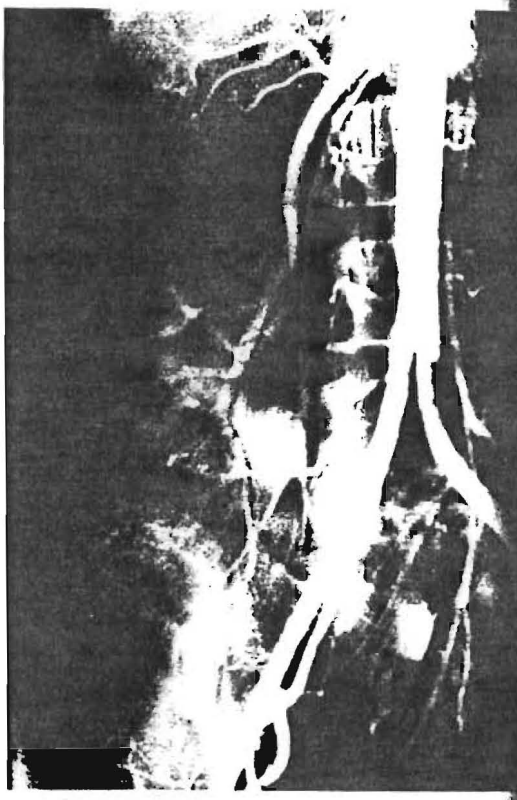

Fig. 3. Case 2: Double renal artery supply to right kid with branches from both vessels supplying a tumor in mid-region of the kidney.

cyanotic portion of the ureter and kidney pelvis, inclu the area of narrowest margin to tumor tissue, was rese and an ureteropyelostomy was performed using 7–0 in rupted silk sutures. A nephrostomy catheter was placed. The resected portion of the kidney weighed 20 The tumor, a clear cell adenocarcinoma, measured 5.5 in maximal diameter.

The first postoperative day, urine was leaking thro the drain site and urography showed the leak to be re At re-exploration on the second postoperative day, u was issuing from an open calyx at the cut surface of kidney. The leak was closed with fine chromic catgut reinforced with a flap of renal capsule and fat nephrostomy catheter was placed. Following this pro dure, there was a continued urine leak. The BUN ros 96 mg %, requiring two dialyses before the remain portion of the kidney had recovered sufficiently to lo BUN and serum creatinine. Eight days postoperatively antegrade pyelography showed the drainage system of kidney remnant to be intact. Gradually, over a 3-we period, the drainage declined and finally stopped. BUN was then 30 mg %. Four months after surgery IVP shows a satisfactory graft and the kidney funct likewise is satisfactory (Bun 25–30 mg %; serum creatin 1.6 mg %) (Fig. 6).

Fig. 4. Case
vein is uniny

Fig. 5. Case
kidney during

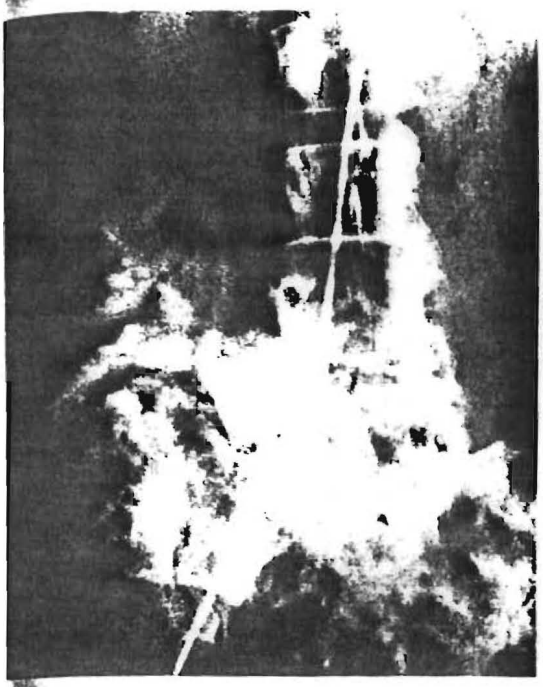

Fig. 4. Case 2: The tumor is well encapsulated. The renal [illegible] is uninvolved.

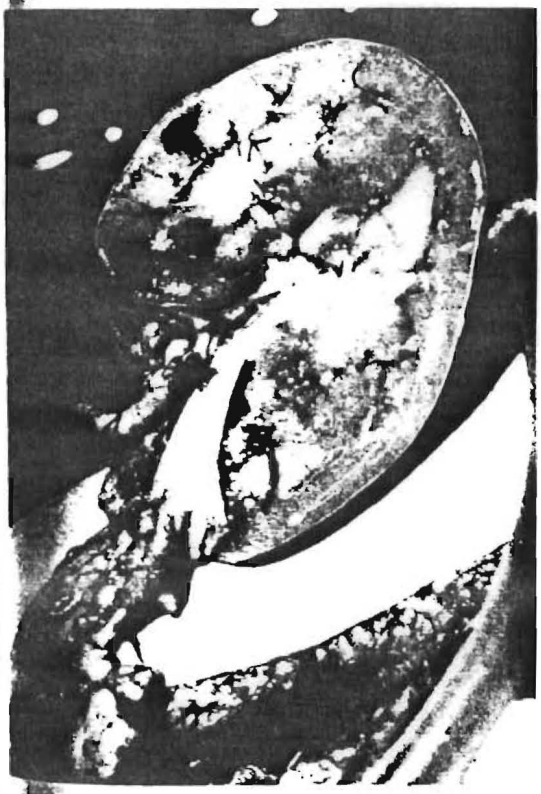

Fig. 5. Case 2: The remnant of the upper third of the [illegible] during the *in vitro* resection.

Fig. 6. Case 2: Excretory urography 4 months postoperatively. The ureteropyelostomy (*ARROW*) is patent without residual urine leak.

Case 3

A 6-year-old boy had a history of uninary tract infections since birth. Posterior urethral valves with bilateral dilated ureters and ureteral reflux were diagnosed at the age of 5 months. The valves were resected and he had bilateral nephrostomies. Later, bilateral cutaneous loop ureterostomies were done. Closure of the cutaneous ureterostomies and bilateral ureter neo-implantations were performed at 4 years of age. Repeated infection coupled with the kidneys already damaged at birth had left the patient with an almost nonfunctioning right kidney and a compromised and hydronephrotic left kidney (Fig. 7). There was still reflux of urine into dilated ureters bilaterally. Creatinine clearance was 55–60 ml/min. An autotransplantation of the left kidney was performed in February, 1974. The dilated ureter was tailored before it was reimplanted with the creation of a submucosal tunnel by the technique of Politano-Leadbetter. End-to-side anastomoses to the aorta and common iliac vein were used. Postoperatively the patient did well, with unchanged kidney function. The bladder urine was noninfected. However, postoperative IVP showed a relative ureter obstruction and persistence of renal pelvic dilatation. A pyelostomy catheter was placed under fluoroscopy 4 months postoperatively and after another 4 weeks ureteroneocystostomy was again performed by a modified Paquin-Marshall technique (Starzl, 1964). The patient is now in satisfactory condition early postoperatively (Fig. 8).

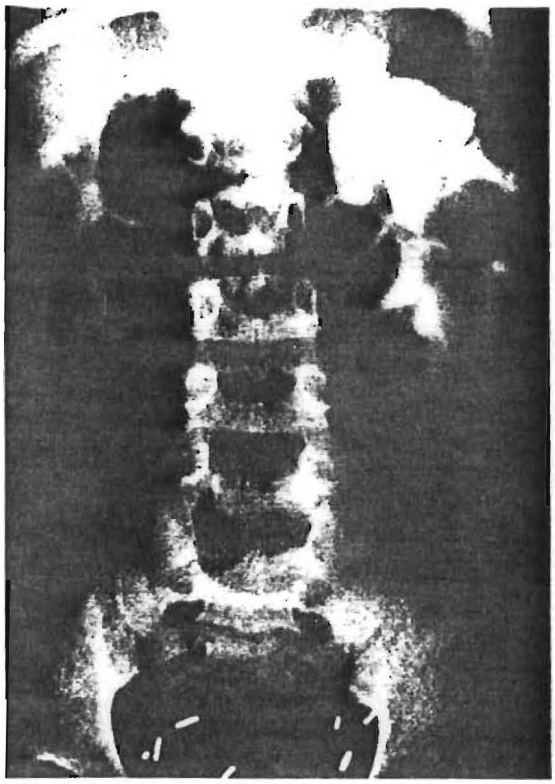

Fig. 7. Case 3: Preoperative urography shows that nearly all of the patient's renal function is derived from the left kidney.

Case 4

A 30-year-old male had a 6-year history of chronic glomerulonephritis. He was on dialysis for 3 years before he was transplanted with a D-matched kidney from his brother in April, 1973. His own kidneys were removed. He had initial good kidney function but 2 months postoperatively he was readmitted because of a suspected lymph collection around the kidney (Fig. 9). At surgery, a normal kidney was found but there was a lymphocele pocket with 100 cc of fluid behind the kidney. It was decided to turn the kidney medially and during the mobilization for this the kidney turned blue and after this had no palpable arterial pulse. The patient was heparinized and the kidney was rapidly removed. Blood clots could be removed from the transplant artery with a Fogarty catheter and the kidney was then cooled and rinsed with heparin containing Ringer's lactate solution by retrograde perfusion through the renal vein. When the kidney had a satisfactory pale color and coolness, it was preserved at +4°C and refrigerated without further perfusion. The kidney was then transplanted to the other iliac fossa and was revascularized after 20 min warm and 170 min cold ischemic time. A uretero-ureteral anastomosis was used. Ten months later the kidney is functioning satisfactorily (serum creatinine 1.4 mg %; BUN 20 mg %) (Fig. 10).

Case 5

A 25-year-old woman had bilateral medial fibroplasia o the renal arteries with a history of severe hypertension. I 1972, renin was 45.0 and 20.6 nanograms of angiotensin per ml plasma per hour in the right and the left ren venous blood, respectively. In 1972, the most disease right kidney was autotransplanted to the left iliac foss using bench surgery technique and end-to-en anastomosis of the internal iliac arterial branches to thre arterial branches from the main renal artery. This phase the case was described earlier (Corman et al., 1973). Pos operatively the blood pressure fell but during the ensui months rose again to 170/120 in spite of treatment wit propranolol 80 mg/day. On repeat arteriograms, branches to the transplanted kidney were patent but th left renal arterial stenosis was seen to be more extensiv than had been appreciated in 1972 (Fig. 11). In April, 197 the left kidney was autotransplanted to the right iliac fo sa, again using bench surgery and intraoperative *ex viv*

Fig. 8. Case 3: Antegrade pyelography 5 days postop tively. The left kidney has been moved downward and revised ureteroneocystostomy is patent. There is vesico-ureteral reflux.

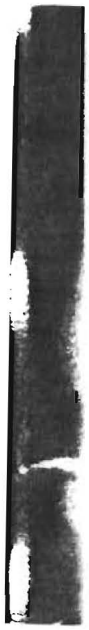

Fig. 9. C iliac foss

renal art X-ray we ain per ches Post antih periphera arteriogr showed t late films The kidn pressure

of t technique eteral logenous continuit of techni tive to c illustrate sho be sion a Moreove ient. Ar (Case 2)

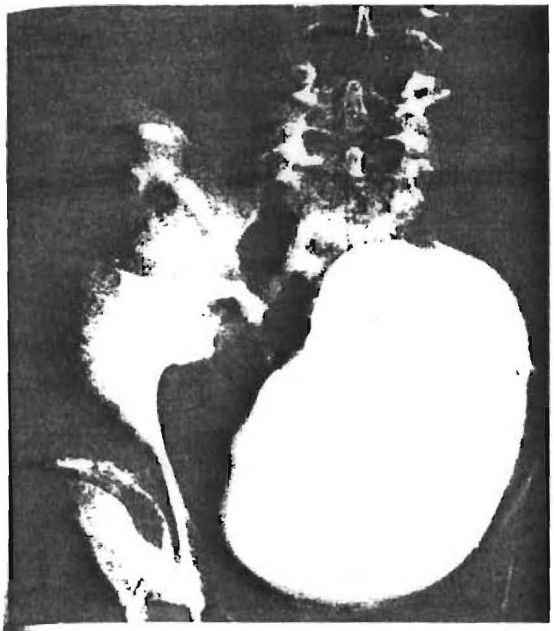

Fig. 9. Case 4: Preoperative urography showing the right iliac fossa graft and a lymphocele.

Fig. 10. Case 4: Postoperative urography showing the graft transferred to the left iliac fossa with ureteroureterostomy.

...al arteriography (Fig. 12). All lesions visualized by ...ray were resected and three arterial anastomoses were ...in performed to the right internal iliac artery and its ...nches. The kidney was revascularized after 5 hours 35 ...n. Postoperatively, the patient was normotensive with... antihypertensive treatment (130/80 mmHg). Renin in ...ipheral venous blood was 5.0 ng Ag/ml/hr (normal). An ...eriogram 6 weeks after the second autotransplantation ...wed that all 6 arterial anastomoses were patent and on ... films nondistended ureters could be seen (Fig. 13). ... kidney function is normal and unchanged. The blood ...ssure is 120/70 mmHg.

DISCUSSION

...e of the prime advantages of the renal autograft ...hnique is that it allows excision of vessel and ...teral anomalies without interposition of au...enous or prosthetic graft material to re-establish ...tinuity of blood or urine flow. The low incidence ...echnical complications makes this a safe alterna... to conventional reconstruction. The first case ...strates these facts.

...s shown by the second case, the advantage of *in ...o* bench surgery is that it allows precise ex...ion and reconstruction in a bloodless field. ...reover, there is minimal blood loss for the pa...nt. An alternative approach for this kind of case (Case 2) is nephrectomy, hemodialysis, and possibly subsequent kidney transplantation. Institutional dialysis and cadaveric transplant in this age group carries a 48% and 56% 5-year mortality, respectively (Proc. EDTA, 1972). Furthermore, there is a highly significant additional risk of the development of metastases in these circumstances. It is now well recognized in allogenic transplantation that immunosuppressive drugs increase the chances for *de novo* as well as metastatic malignancy (Penn & Starzl, 1973). Finally, the quality of life is also of considerable importance. Life with one's own kidneys is vastly superior to one of dialysis or to one of dependence on immunosuppressive drugs to retain an allograft.

Conventional treatment of the 6-year-old child (Case 3) would have been a urinary diversion. The psychological trauma of an ileostomy in the pre-

Fig. 11. Case 5: *In vivo* left renal arteriography shows severe stenosis of the main renal artery with further disease in at least one primary division of the renal artery.

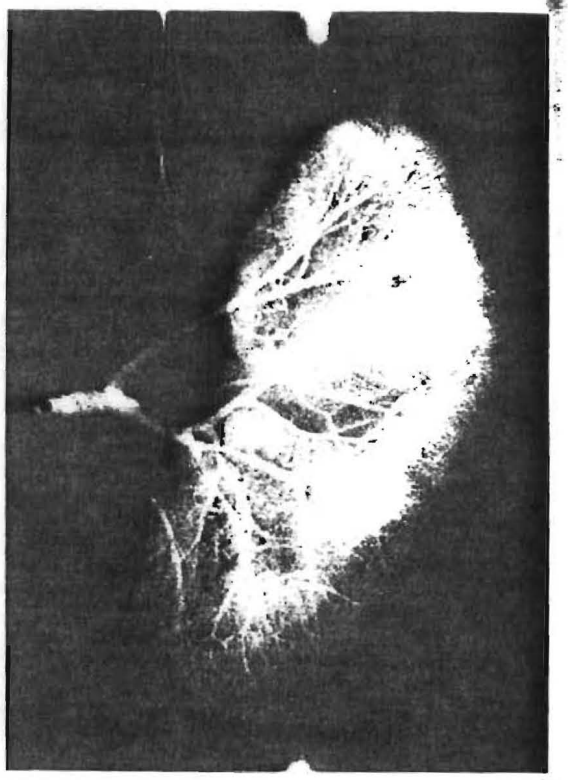

Fig. 12. Case 5: Intraoperative *ex vivo* left renal arteriography confirms the presence of medial fibroplasia in both primary divisions of the renal artery.

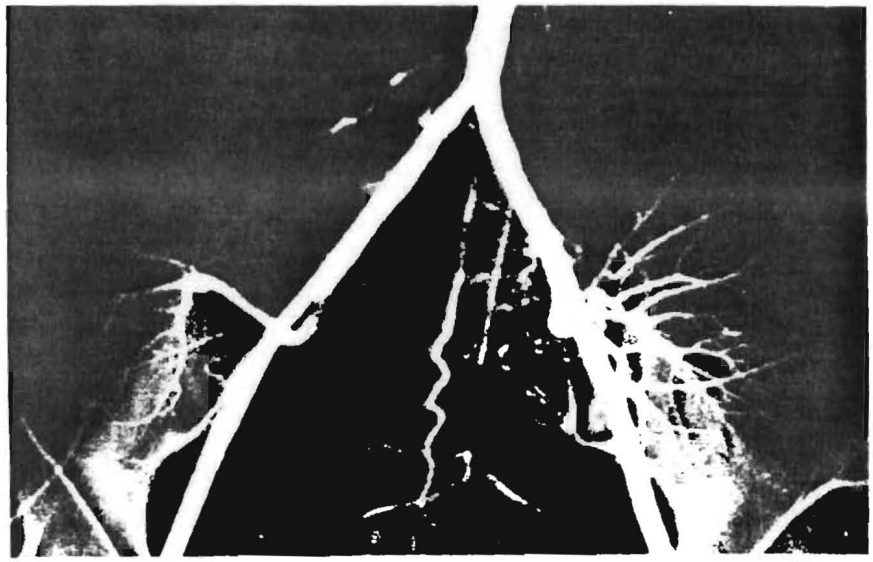

Fig. 13. Case 5: Aortography 6 weeks after the second autotransplantation. All six arterial anastomoses are patient.

ubescent child may be devastating. Consequently, was decided to perform an autotransplantation. hen the first ureteroneocystostomy failed, there as still enough length to do another reimplantaon.

The fourth case illustrates that removal, perfuon, and reimplantation is a method of kidney lvage if the organ is inadvertently damaged dur- surgery in the area. If necessary, *in vitro* reonstructive work can also be performed if reirable damage has occurred.

The fifth case points out that indications exist to rform bilateral autotransplantation. Bilateral autransplantation should always be done in two ps as the procedure is quite time-consuming and risk of an acute tubular necrosis in the autransplanted kidney is always present.

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