FIVE CASES AND FIVE UNUSUAL INDICATIONS FOR AUTOGENIC RENAL TRANSPLANTATION

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Five cases of renal autotransplantation representing different indications for the procedure are presented.

In the past, the development of techniques for kidney transplantation and ex vivo kidney preservation, indications have arisen for autogenic transplantation with or without in vivo reconstructive surgery. Several cases have been described earlier (Belzer et al., 1970; Gelin et al., 1970; Bergentz et al., 1973; Caine, 1973; Corman et al., 1973 a, b). In this communication we will present additional cases and five unusual indications for the procedure.

CASE REPORTS

Case 1
A 65-year-old male had a history of severe hypertension (210/130 mmHg). He had markedly elevated renin in peripheral venous blood. A proximal renal stenosis in the left renal artery was diagnosed. In 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 in the ensuing months it again rose to approximately 220/140 mmHg and excretory urography showed a nephrographic phase of the left kidney. Repeat arteriography demonstrated a severely stenosed by-pass (Fig. 1).

In November, 1973, he was referred to Colorado General Hospital and underwent an autotransplantation of the kidney to the left iliac fossa. After completion of the procedure the kidney was connected to a Waters perfusion machine and perfused for approximately one hour, using long extension tubes to 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 showed 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.
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 kidney with branches from both vessels supplying a tumor in mid-region of the kidney.

cyanotic portion of the ureter and kidney pelvis, including the area of narrowest margin to tumor tissue, was resected and an ureteropelvostomy was performed using 7-0 interrupted silk sutures. A nephrostomy catheter was placed. The resected portion of the kidney weighed 200 g. The tumor, a clear cell adenocarcinoma, measured 3.5 cm in maximal diameter.

The first postoperative day, urine was leaking through the drain site and urogram showed the leak to be renal. At re-exploration on the second postoperative day, it was issuing from an open calyx at the cut surface of the kidney. The leak was closed with fine chromic catgut reinforced with a flap of renal capsule and a nephrostomy catheter was placed. Following this procedure, there was a continued urine leak. The BUN rose to 96 mg %, requiring two dialyses before the remaining portion of the kidney had recovered sufficiently to lose BUN and serum creatinine. Eight days postoperatively, antegrade pyelography showed the drainage system of the kidney remnant to be intact. Gradually, over a 3-week period, the drainage declined and finally stopped. The BUN was then 30 mg %. Four months after surgery IVP shows a satisfactory graft and the kidney function likewise is satisfactory (Bun 25-30 mg%; serum creatinine 1.6 mg %) (Fig. 6).
Case 2
Six-year-old boy had a history of urinary 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).

Case 3
A 6-year-old boy had a history of urinary 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).
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 of the renal arteries with a history of severe hypertension. In 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 diseased right kidney was autotransplanted to the left iliac fossa using bench surgery technique and end-to-end anastomosis of the internal iliac arterial branches to their arterial branches from the main renal artery. This phase of the case was described earlier (Corman et al., 1973). Postoperatively the blood pressure fell but during the ensuing months rose again to 170/120 in spite of treatment with propranolol 80 mg/day. On repeat arteriograms, arterial branches to the transplanted kidney were patent but the left renal arterial stenosis was seen to be more extensive than had been appreciated in 1972 (Fig. 11). In April, 1973, the left kidney was autotransplanted to the right iliac fossa, again using bench surgery and intraoperative ex vivo...
CASE 4: PREOPERATIVE UROGRAPHY SHOWING THE RIGHT ILIAC FOSSA GRAFT AND A LYMPHOCELE.

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

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

DISCUSSION

One of the prime advantages of the renal autograft technique is that allows excision of vessel and arterial anomalies without interposition of autogenous or prosthetic graft material to re-establish continuity of blood or urine flow. The low incidence of technical complications makes this a safe alternative to conventional reconstruction. The first case illustrates these facts.

As shown by the second case, the advantage of in vitro bench surgery is that it allows precise excision and reconstruction in a bloodless field. Moreover, there is minimal blood loss for the patient. 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 36% 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 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 patent.
Aorto-inferior iliac artery anastomosis

The fourth case illustrates that removal, perfusion, and reimplantation is a method of kidney salvage if the organ is inadvertently damaged during surgery in the area. If necessary, in vitro reconstructive work can also be performed if reversible damage has occurred.

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

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