ORTHOTOPIC RENAL TRANSPLANT AND RESULTS IN 139 CONSECUTIVE CASES


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ABSTRACT

Although a commonly performed technique, heterotopic renal transplantation may be a cause of late graft failure owing to ureteral stenosis, urinary fistula and vesicoureteral reflux secondary to the immune response. The new retroperitoneal lumbar approach to the splenic vessels has allowed the orthotopic technique to be developed using the splenic artery or aorta, the renal vein and a pyelo-pyelic anastomosis. In this manner the renal graft is located in an anatomical position that is well protected, and with the recipient urinary tract the normal physiology is preserved with comparatively low complication and mortality rates. A third transplant attempt also is simplified. This method is the only alternative in some cases. Transplant ureter pathology symptoms are not observed. The results of 139 consecutive cases are presented.

Heterotopic transplantation of the kidney with urinary tract repair via ureteroneocystostomy is a common technique used by almost all surgical teams with a high rate of success. However, this should not be accepted as definitive because, as with any other technique, it can be modified and improved as needed. The procedure may not be ideal due to graft location into the groin, with a short, denervated and poorly vascularized ureter that also is devoid of a physiological vesicoureteral junction, which are causes of morbidity. The kidney and ureter also are exposed to the immune response, which seems to be responsible for vesicoureteral reflux, some cases of fistula, stenosis and urodynamic dysfunctions, all of which constitute well known signs of transplant ureter pathology. Impotence might occur when the hypogastric artery is used, thus, greatly decreasing the quality of life.

We developed a technique that greatly overcomes many of these drawbacks. Orthotopic renal transplantation is performed via an end-to-end splenorenal artery and renorenal vein anastomosis with a pyelo-pyelic anastomosis for urinary tract repair. We report our experience in 139 patients.

MATERIAL AND METHODS

From April 1978 to January 1987 orthotopic renal transplantation was performed in 139 chronic renal failure patients 11 to 67 years old (mean age 36 years). There were 37 cadaver and 102 living related transplant recipients. Simultaneous segmental or total transplantation of the pancreas was performed in 14 diabetic patients (10 per cent) with associated renal failure and in another 11 diabetics (7.9 per cent) only the kidney was transplanted.

The main etiology of renal failure was glomerulonephritis. All patients with failure secondary to vesicoureteral reflux were omitted from the study and only those with a normal urinary tract were included. In every recipient intravenous digital subtraction angiography with sequential planes was performed for determination of size and morphological characteristics of the splenic artery. Also, retrograde pyelography was done when a urinary tract abnormality was suspected.

Surgical technique. The patient is placed in a right lateral position (fig. 1). Nephrectomy is performed through a left posterolateral lumbotomy with 12th rib resection close to the vertebral articulation. Frequently, the recipient kidneys are small, and the artery is narrow and pathologically abnormal so it seldom is used. The renal vein, apparently of decreased diameter, always may be used, taking care to preserve the entire length with a ligature close to the parenchyma including its bifurcation, thus, permitting anastomotic spatulation of the vein if necessary and in this manner leaving a long pedicle. The vein is dilated along its entire length systematically and gently with a Fogarty catheter. The splenic vein has been used in exceptional cases. The recipient urinary tract is preserved, including the calices, by entering the renal sinus, always preserving the pelvis with its surrounding fat. The patency of the ureter always must be inspected by stenting and instillation of saline solution.

To find the splenic artery through the lumbar approach (fig. 2, A), the parietal peritoneum is pushed away from the anteromedial surface of the suprarenal gland (fig. 2, B). The splenic...
artery will be exposed immediately (fig. 2, C). Then, the posterior parietal peritoneum and Treitz's fascia are incised, and the splenic vessels lodged in the pancreatic-splenic omentum will appear (fig. 2, D). Anesthetic irrigation must precede dissection of the splenic artery, which is highly prone to angiospasm. In this sense the vasospasm that does not yield after section of the artery is solved by angioplasty.

With this technique the entire distal segment of the splenic artery is obtained, including the bifurcation, thus gaining a long pedicle necessary for repair of the urinary tract. This method avoids suture tension in the pyelo-ureteral anastomosis and also facilitates the vascular anastomosis. When 2 arteries in the graft are present both can be used. Monofilament 6-zero nylon is used for vascular suture. The vein is anastomosed with a running suture to produce eversion of the endothelial layer and the artery is anastomosed by an interrupted suture (fig. 3, A).

If there is a thin-walled artery that may place the anastomosis at risk, or for any other reason the splenorenal anastomosis does not provide enough blood flow, the anastomosis is repaired with a re-sutured and avenoaoic ostium anastomosis should be done (fig. 3, B). In the majority of the cases the urinary tract is repaired by a pyelo-ureteral anastomosis with interrupted 6-zero catgut suture, although a ureteroureteral anastomosis might be used with magnifying glasses to ensure utmost precision (fig. 3, C). Eversion of the mucosa and suture tension of the urinary tract should be avoided. The latter is achieved because of the much longer than normal, previously obtained pedicle. Urinary tract function is achieved with a minimum axial nephrostomy in most cases, while in others no type of urinary diversion is left. In the last 20 patients a Double-J ureteral stent was left (fig. 3, D). When the renal pelvis is small and intrarenal, the anastomosis is performed inside the sinus using ad hoc retractor.

<table>
<thead>
<tr>
<th>Analysis of results</th>
<th>No. Pts. (%)</th>
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</thead>
<tbody>
<tr>
<td>Altered splenic artery</td>
<td>5 (3.8)</td>
</tr>
<tr>
<td>Small diameter</td>
<td>3 (2.2)</td>
</tr>
<tr>
<td>Obstructive nature</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Vascular complications</td>
<td></td>
</tr>
<tr>
<td>Arterial stenosis</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Low blood flow</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Urological complications</td>
<td></td>
</tr>
<tr>
<td>Urinary fistula</td>
<td>4* (2.8)</td>
</tr>
<tr>
<td>Graft loss</td>
<td></td>
</tr>
<tr>
<td>Ureterocalicostomy</td>
<td>17 (0.7)</td>
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<tr>
<td>Rejection</td>
<td>6 (4.3)</td>
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<tr>
<td>Mortality</td>
<td>3 (2.2)</td>
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<tr>
<td>Sepsis</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Pancreatic fistula</td>
<td>1 (0.7)</td>
</tr>
</tbody>
</table>

* Three fistulas were in diabetic patients.
† Diabetic patient with simultaneous pancreatic graft.


RESULTS

The splenic artery was not used in only 5 of the 139 patients (3.6 per cent) due to atheroma formation in 2 and small diameter, thin arterial walls in 3, which had seemed to be of good caliber on preoperative intravenous digital subtraction angiography. This condition was solved with an aortorenal anastomosis at the ostium level (fig. 3, B). Arterial stenosis was observed in 2 patients (1.4 per cent) that caused hypertension and that was amenable to surgical repair. There was no venous or arterial thrombosis.

One case of low blood flow through the splenic artery due to persistent vasospasm and 1 with difficulties in venous return were resolved by transposition to the groin. The latter patient required reoperation. A total of 130 pyelo-pyelic and 6 ureteroureteral anastomoses, and 3 ureterocalicostomies was performed. There were 4 urinary fistulas (2.8 per cent): 2 at the pyelo-pyelic anastomosis, 1 at the ureteroureteral suture (all 3 due to technical failure) and 1 at the ureterocalicostomy owing to tissue necrosis.

There was no lymphocele formation, vesicoureteral reflux or ureteral obstructive complications. Transplant nephrectomy was done in 6 patients because of rejection and only 1 kidney was lost due to urological complications.

There was no case of post-transplant vasculogenic sexual impotence when potency had been present preoperatively. Three patients (2.2 per cent) died postoperatively: 2 of sepsis and 1 of pancreatic fistula (see table).

DISCUSSION

In 1950 Lawler and associates performed the first orthotopic renal transplant but the technique seldom was used later due to a high pancreatic risk. In our series most of the transplants performed were from living-related donors because of the transplantation and organ procurement regulations in effect when this program was started. In 23 years of experience with 602 heterotopic renal transplants, although different techniques were used, we have observed that some of the draw-
backs of this method include significant difficulties encountered by late reoperations secondary to vascular and/or urological complications, postoperative fibrosis and the risk caused by the narrowness of the iliac vessels, both of which might cause nephrectomy of a well tolerated graft.

With intravenous digital subtraction angiography a normal splenic artery was noted in 134 patients (96.4 per cent). Only in 3 patients (2.2 per cent) was this artery not used due to a narrow diameter and thin arterial walls. Two patients (1.4 per cent) in the 1-graft diabetic group had obstruction. These 5 patients were treated by an end-to-side renoaortic anastomosis. Two kidneys were transposed to the right lower quadrant due to persistent vasospasm after vascular release producing low output and perfusion in 1 patient, and to a difficult venous return in an 11-year-old patient with anuria and low radiotracer uptake on the perfusion scan. The operative findings were a marked cyanotic kidney, and vein and parenchymal congestion. Convalescence in both patients was uneventful.

Arterial stenosis at the spleno renal anastomosis causing arterial hypertension was present in 2 patients (1.4 per cent). Both were corrected by resection and reanastomosis. In some reports the incidence ranged from 2.7 per cent to 12 per cent.

At the beginning of our series 4 urinary fistulas were observed (2.8 per cent), of which 3 were corrected with reanastomosis and omentoplasty. Of the fistulas 2 were significant and occurred in long-term diabetics. The last graft with ureterocaliceal fistulas was lost. Those fistulas were secondary to a short vascular pedicle that produced tension throughout the anastomosis. For this reason we leave a long pedicle.

The presence of vesicoureteral reflux in general has been proportionally forgotten and the incidence has ranged from 4 to 64 per cent. Although some believe that vesicoureteral reflux is not harmful to the graft, Mathew and associates reported a 24 per cent incidence in cadaver donor transplants, with a graft survival rate of 41 per cent at 8 years when reflux was present and 76 per cent in nonrefluxive kidneys. They also emphasized the presence of proteinuria, microscopic hematuria and progressive renal failure, with biopsy findings similar to those of mesangiocapillary glomerulopathy, which is observed in only 2 per cent of the rejected, nonrefluxive kidneys. Severe vesicoureteral reflux associated with urinary tract infections represents a risk of renal damage with an annual graft loss rate of 7.4 per cent compared to 3 per cent in a nonrefluxive group. Reflux does not appear to depend exclusively on the reimplantation technique but it can be secondary to a transplant ureteral immunological reaction. As mentioned previously, vesicoureteral reflux is an important cause of late graft loss. However, to advocate a corrective antireflux operation in heterotopic renal transplantation is untenable due to ureteral fibrosis and short vessels. The fact that 4.3 per cent of the cases of adult renal failure are secondary to reflux is a good reason not to underestimate the condition.

Pregnancy might disturb the urodynamics of the urinary tract in kidneys transplanted into the pelvis, which also is more vulnerable to eventual trauma.

When used for revascularization, the hypogastric artery causes erectile dysfunction after an initial transplant in 10 to 40 per cent of the patients and in 65 to 100 per cent after a second transplant. In orthotopic renal transplantation this incidence is avoided by the use of the splenic artery, which is of better quality than the hypogastric artery in the renal failure patient and because atheromatous disease clearly is more prominent below the renal arteries.

The urological complication rate of our proposed technique is 2.8 per cent, which is better than has been reported previously by different British hospitals (12.5 per cent among 1,000 patients evaluated in 1981) not including vesicoureteral reflux. We observed that in the lumbar fossa repairs of vascular and urological complications, as well as transplant nephrectomy are easier, factors not always present with heterotopic renal transplantation. The pancreatic risk was 0.7 per cent in our series and, if planned, splenectomy can be done safely through the same incision.

The incidence of lithiasis in the renal graft is 1 to 5 per cent. In heterotopic renal transplantation with ureteroneocystostomy the management of lithiasis may be complicated. Nevertheless, in orthotopic renal transplantation, in which the proposed objective is to locate the graft in a close physiological area (figs. 4 and 5), extracorporeal shock wave lithotripsy (ESWL*) can be performed, as well as ureterorenal...

* Dornier Medical Systems, Inc., Marietta, Georgia.
oscopy or endourological maneuvers, since the ureteral meatus is left untouched. Two of our patients were treated adequately with ESWL and a Zeiss loop stone dislodger catheter. Also noteworthy is that the most important mechanisms of the urinary tract are preserved, namely the pyeloureteral junction, which coordinates ureteral peristalsis, and the ureterovesical junction, which avoids vesicoureteral reflux in a ureter that is not influenced by an immune response.

We do not advocate orthotopic renal transplantation as a routine procedure unless previous experience has been gained in retroperitoneal vessel approach and pyelo-zyallic anastomosis for urinary tract repair. The technique is indicated when a normal urinary tract and normal diameter splenic artery are present, although the latter is not absolutely necessary, since the aorta can be used. Nevertheless, orthotopic renal transplantation is the only possible approach if agenesis, thrombosis, or atheromatosis of the iliac artery is present. Nevertheless, a perfectly valid alternative.

Currently, renal transplantation must be individualized, which means that any technique should not be taken as a universal axiom but, rather, the method most suited to each patient should be selected to offer greater future security and quality of life. In this sense orthotopic renal transplantation is a perfectly valid alternative.

In summary, orthotopic renal transplantation places the kidney in a physiological position. It has a low mortality rate and a comparable technical result compared to heterotopic renal transplantation. Vesicoureteral reflux is avoided, and morbidity and the risk of iatrogenic impotence are decreased. The method is the only alternative in some patients.

REFERENCES