RESULTS OF CADAVERIC RENAL ALLOGRAFTS

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Since 1963, 30 cadaveric renal allografts have been performed in 28 patients. The first 4
patients were treated with a variety of immunosuppressive drugs and died predominantly
as a result of drug toxicity and infection (Marshall et al., 1966). This report deals with 24
patients grafted since January, 1965, of whom 20 are alive with a functioning graft (Kincaid-
Smith et al., 1967).

Donors

All donors were less than 55 years of age and died either from spontaneous or traumatic
intracranial haemorrhage. With care in donor selection we have thus far avoided the grafting
of a non-viable kidney. Urinary infection, impaired renal function and prolonged hypotension
were considered contraindications to the use of a donor. When possible, radiology was used
to confirm normal renal function and anatomy.

Times of warm ischaemia ranged from 23 to 101 minutes, and of total ischaemia from 60
to 213 minutes.

The kidney was perfused on removal with Dextran 40 in saline at 5° C, to which procaine,
papaverine and heparin had been added. When possible, both kidneys were utilized and this
occurred on 6 occasions.

Recipients

Recipients were all in end-stage renal failure, needing recurrent dialysis for survival. Bi-
weekly, overnight 14 hour Kiiil dialysis was used in the majority of patients. Three were
grafted after preparation by recurrent, repeated puncture peritoneal dialysis because of
financial and spatial restrictions with haemodialysis. The average waiting time on dialysis
was eleven weeks. During preparation every effort was made to have patients fit and well.
Minor complications were sufficient to take patients off standby for operation. Haemoglobin
levels were maintained above 10.0 g per 100 ml, and patients lived at home or in temporary
residence near the hospital between dialyses. One patient died of hyperkalaemia while awaiting
transplantation and another had a paradoxical cerebral embolus from her A.V. shunt during
a declotting procedure. She remains hemiparetic and hemiplegic and still anephric.

Splenectomy was not used, and bilateral nephrectomy was performed prior to transplant-
atlon if there was urinary infection or malignant hypertension.

Immunosuppression

Routine immunosuppression consisted of azathioprine (3 mg/kg) in a constant dose from
the time of grafting. Prednisolone 100 mg/day was given in the 1st week, reducing slowly
to 10 mg/day by 5 to 6 months. Local irradiation was used on days 1, 3, 5 and 7, after
transplantation.
TABLE I
Results from January 1965

<table>
<thead>
<tr>
<th>Time since operation</th>
<th>Total patients</th>
<th>Alive</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 6 weeks</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>More than 6 months</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>More than 1 year</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>More than 2 years</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Threatened rejection was treated with prednisolone 300 mg on the 1st day, the dose then being reduced quickly to a level above the dose at which rejection occurred. Local irradiation and Actinomycin C daily for 1-3 days were also used. All rejection episodes were reversible except for 2 patients in whom early massive rejection resulted in a non-functioning kidney. Closed needle biopsy was used on 16 occasions without complication, and was an important aid to the diagnosis of rejection when clinical and biochemical indices were equivocal.

Early postoperative course

Immediate renal function occurred in all but 2 patients who had relatively long ischaemic times. Dialysis was necessary after operation in these patients. Peritoneal dialysis was preferred, to avoid risk of haemorrhage.

Survival

Of the 24 patients who have received transplants over the last 2½ years 20 are alive with a functioning kidney (Table I). None of these has received a second transplant. Two patients have survived more than 2 years, 6 of 8 operated on more than 1 year ago are well, and 12 of 15 patients grafted more than 6 months ago are well. There has been only one death in the past 15 patients receiving grafts.

Most patients were discharged on the 10th postoperative day and all survivors returned to work or to active home duties within a few weeks of the operation.

All survivors described a marked improvement in well-being compared with the time spent on dialysis. Loss of pruritus and improvement in sexual function were two prominent features.

The 4 deaths all occurred within 6 weeks of operation (Table II). Two were in patients with non-functioning kidneys due to massive early rejection. One patient died 19 days after a third attempt at transplantation. Another patient died from septicaemia and cerebral

TABLE II
Analysis of deaths

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Kidney</th>
<th>Time of death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complications of rejection</td>
<td>1st graft rejected</td>
<td>Day 19</td>
</tr>
<tr>
<td></td>
<td>2nd graft failed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3rd graft rejected</td>
<td></td>
</tr>
<tr>
<td>2. Septicaemia with cerebral abscesses</td>
<td>Good function</td>
<td>Day 42</td>
</tr>
<tr>
<td>3. Septicaemia</td>
<td>Rejected and removed day 8</td>
<td>Day 35</td>
</tr>
<tr>
<td>4. ? Septicaemia</td>
<td>Impaired function after severe rejection</td>
<td>Day 41</td>
</tr>
</tbody>
</table>

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abscesses, and the 4th death occurred after an illness characterised by dysphagia and wasting. All 12 patients from the 6 double transplants have survived. On 3 occasions the course has been similar in each of the recipient pair, although rejection episodes have appeared at different times. The other 3 pairs have had quite dissimilar courses (e.g., one of a pair—no episodes of rejection; the other—4 severe episodes).

Complications

Steroid complications have been troublesome. They include Cushingoid facies, cataract formation, osteoporosis and avascular necrosis of a femoral head. All of these complications have improved after reduction of steroid dosage. Two patients have required gastrectomy for gastrointestinal haemorrhage. Nocardial lung infection in one patient responded to a prolonged course of sulphonamides. Four patients developed urinary fistulae in the initial weeks but all closed satisfactorily. The majority of patients have mild, easily controlled hypertension.

Discussion

The purpose of reporting this small series of cadaveric transplants is to demonstrate that with limited facilities in a large general hospital acceptable results can be achieved. Facilities for recurrent haemodialysis over most of this period have only enabled 2 patients to be treated at any time.

Although the numbers are small, valid comparison can be made with recent world-wide results which show a one year survival of about 30% (Murray et al., 1967). Our survival rate of 75% at one year is attributable to four factors. Firstly, care in selection of donor kidneys resulted in 100% viability as compared with 80% in reported series (Murray et al., 1967). Secondly, adequate preparation of recipients has enabled patients to leave hospital early after surgery, diminishing the risk of acquired drug-resistant infection. Thirdly, the use of local irradiation in the first weeks has been justified by overall experience (Murray et al., 1967) and appears to enhance survival. Lastly, by gradual reduction in steroid dosage in early weeks, and also after rejection episodes, we have attempted to obviate or minimise subsequent rejection. This has meant an overall reduced steroid dosage, as the number of rejection episodes has been relatively small. With this regime, 25% of our patients have never shown rejection compared with a registry experience of 11%.

Our results thus far equal or excel those from live donors. Whilst this is so we see little justification for continued use of live donors, unless tissue matching techniques can demonstrate a very close donor/recipient relationship.

Cadaveric kidney supply is our main limiting factor. In a 600 bed acute hospital our average waiting time of almost three months has kept the turnover slow, and has increased the stress on patients awaiting grafts.

Other particular problems inherent in a cadaveric programme are difficulties in tissue matching due to limitation of time, the large demands made on staff with an emergency surgical procedure and the necessity to use heparin in place of oral anticoagulants for the group of patients whose shunts clot excessively.

Patients after grafting are nursed in single rooms. Barrier nursing, limitation of visitors, positive pressure ventilation, ultraviolet light and early discharge have been used rather than elaborate sterilisation of the patient’s environment.

Infection has only been a problem where complications such as urinary fistula, wound haematoma and massive necrosis due to rejection have been predisposing factors.

Reports of infection from endogenous sources in units applying elaborate isolation facilities make their place doubtful in view of the expense involved.

By all criteria our haemodialysis has been adequate and with repeated transfusions to
maintain haemoglobin levels above 10 g/100 ml one would anticipate that our patients waiting operation would be free of uraemic symptoms. However, after grafting the subjective and objective improvement in general health was dramatic. Freedom from dietary and fluid restraints were much appreciated. There is no doubt which method of treatment our patients preferred.

The consequences of leaving an infarcted kidney in situ too long were seen in 2 of the deaths. If there is early anaemia we have favoured early diagnosis and have used radio-active renograms, biopsy and angiography to establish a positive diagnosis of tubular necrosis. Our low incidence of tubular necrosis contrasts with other experience (Straffon et al., 1966) and can only be attributable to better donor material, as our ischaemic times are by no means exceptional.

We have been generally dissatisfied with preparation by peritoneal dialysis. Longer dialysis times (average 3-3½ days per week), pain, infection and protein loss have been major drawbacks. Peritoneal dialysis has been necessary at times to provide a larger recipient pool when the haemodialysis programme was full.

Summary

A 75% survival rate at one year and an 80% survival at 6 months have been achieved in a cadaveric renal transplantation programme using recognised techniques. All survivors are leading near normal active lives. In view of our results the use of live donors does not seem justified except where close matching can be demonstrated between donor and recipient.

REFERENCES