22. Murray, J. E., Reid, D., Harrison, J. H. and Merrill, J. P.: Successful Pregnancies Following Human Renal Homotransplantation. N. Engl. J. Med., 269:341, 1963.
23. Murray, J. E., Sheil, A. G. R., Moseley, R. V., et al.: Analysis of the Mechanism of Immunosuppressive Drugs in Renal Homotransplantation. Ann. Surg., 160:449, 1964.
24. Murray, J. E. and Wilson, R. E.: The Role of Organ Transplantation in Biological Research. Ann. N.Y. Acad. Sci., 129, 1:585, 1966.
25. Murray, J. E., Wilson, R. E., Tilney, N. L., et al.: Five Years' Experience with Immunosuppressive Drugs; Survival, Function, Complications, and the Role of Lymphocyte Depletion by Thoracic Duct Fistula. Ann. Surg., 168:416, 1968.
26. Penn, I., Halgrimson, C. G. and Starzl, T. E.: De Novo Malignant Tumors in Organ Transplant Recipients. Transplant. Proc., 3:773, 1971.
27. Schwartz, R. and Dameshek, W.: Drug Induced Immunological Tolerance. Nature, 183:1682, 1959.
28. Simonsen, M., Bremann, J., Gammeltaft, A., et al.: Biological Incompatibility in Kidney Transplantation in Dogs. Acta. Pathol. Microbiol. Scand., 32:1, 1953.
29. Starzl. T. E., Marchioro, T. L., and Waddell, W. R.: The Reversal of Rejection in Human Renal Homografts with Subsequent Development of Homograft Tolerance. Surg. Gynecol. Obstet., 117:385, 1963.
30. Tilney, N. L., Hager, E. B., Boyden, C. M., et al.: Treatment of Chronic Renal Failure by Transplantation and Dialysis: Two Decades of Cooperation. Ann. Surg., 182:108, 1975.
31. Wilson, R. E., Hager, E. B., Hampers, C. L., et al.: Immunological Rejection of Human Cancer Transplanted With a Renal Allograft. N. Engl. J. Med., 278:479, 1968.
32. Zukoski, C., Lee, H. M. and Hume, D. M.: Prolongation of Functional Survival of Canine Renal Homografts by 6-Mercaptopurine. Surg. Forum, XI:470, 1960.

Discussion

Dr. Fuad J. Dagher (Baltimore, Maryland): The outstanding transplant work initiated at the Peter Bent Brigham Hospital a quarter of a century ago opened the doorway to clinical transplantation as a therapeutic modality for patients with end-stage kidney disease. At this Bicentennial Commemoration, the Brigham's transplant contribution should be considered part of the American Heritage.

(Slide) This book *Give and Take*, written by Dr. Francis D. Moore in 1964, illustrates in essence what has been going on in the field of transplantation. The paper we have just heard summarized well the overall transplant experience at the Brigham, i.e. the results of these kidney transactions over the past 25 years.

As shown by the survival curves, the authors recognized that progress in this field is definite, but unfortunately slow.

At the University of Maryland Hospital we are newcomers to this field, and in 1968 we performed our first and only kidney transplant operation for that year. Since then, we have performed 108 transplants in 102 patients, ranging in age between 11 and 59 years, with a mean age of 32 years.

Our results between 1968 and the present time are very similar to those presented here for the same period of time. Approximately 45% of our cadaveric renal allografts were lost within the first year from acute rejection which was nonresponsive to steroid pulsing. An additional 30% were lost in the next two years. Living related transplants, however, particularly those between HL-A identical siblings, have had better results. The 5-year kidney survival in this group is over 75%.

Of the complications we encountered, sepsis led the list. Of interest, we had one patient who developed generalized skin infection with purulent exudates caused by a very bizarre organism of the algae group, named Prototheca. This unusual infection has not been reported in kidney transplant patients but only in a few nonimmunosuppressed patients, particularly those working with marine life. Six patients developed significant polycythemia, requiring periodic phlebotomies; approximately 70% of our patients developed hypertension, with a diastolic pressure of over 100 mm Hg, necessitating the use of antihypertensive drugs for the first year or two. After that, and for some reason, the blood pressure came down to within normal levels.

As to the cause of death in kidney allograft recipients, sepsis remained the major problem. The mortality rate due to sepsis was similar to that shown by the Brigham group.

It is obvious, however, that for further progress and for a major breakthrough in this field we should more closely with the immunobiologists.

Finally, I would like to ask Doctor Tilney the following questions: Has any of your transplant patients shown evidence of polycythemia and/or high blood pressure; if so, how do you explain their development? And what is the status of diabetic patients with end-stage kidney disease? Do you recommend transplantation as a therapeutic modality for them?

Dr. William Stubenbord (New York, New York): We have analyzed our own results from the New York Hospital, where over the past 12 years we have had experience with over 500 transplants. Superimposing our data on Dr. Tilney's, they fit almost exactly. Reviewing 326 cadaver transplants, our three-year graft survival rate is about 30%, and at the present time we see no reason for increased optimism in the near future.

Dr. Nicholas L. Tilney (Closing discussion): We have had no trouble with polycythemia. We have certainly had trouble with anemia. We no longer do routine preoperative nephrectomy of the native kidneys. Even though these kidneys don't work they still make erythropoietin which improves the anemia of the dialysis patient.

We certainly have had our share of patients with hypertension, although most of the hypertension that arises acutely following kidney transplantation seems to decrease after a few weeks or months, and can be controlled more easily with medication. We certainly take out the native kidneys if there is hypertension preoperatively, feeling that this to be an important prophylactic measure.

As to the diabetic population, the Minnesota group has had a vast experience with these patients. They have done kidney transplants in more than 60 diabetics. They transplant the kidney before the diabetics go into dialysis, and thus are presumably dealing basically with a more healthy population than our particular diabetic transplant population, which now numbers about 15 patients.

There are good reasons for transplanting diabetics. It does serve to rehabilitate them and once they have a well-functioning kidney and are on stable doses of steroids, their blood sugar seems to remain a bit more quiescent than on chronic dialysis.

Also, diabetic neuropathy seems to improve rather dramatically. We don't know whether the neuropathy of the uremic diabetic is a combination of uremic plus diabetic neuropathy, but with a well-functioning kidney, often these people who had terrible foot drop and neuropathy before can walk around quite well after transplantation.

Certainly with steroid pulses, their blood sugar may need adjustment and, obviously, the threat of infection, especially systemic fungemias, is always present.

Dr. Joseph E. Murray (Closing discussion): I would like to reemphasize the influence of surgeons in the area of transplantation biology.

There have been ups and downs in our past experience, but I am confident that the next twenty-five years will see continuing, solid progress.