History of dialysis and transplantation

Because you will be dependent upon an artificial kidney, peritoneal dialysis or a transplant, it may be of interest to read something about the development of these kinds of treatments. This is a short account of the way in which the practices of dialysis and transplantation have developed and grown over the years.

Haemodialysis

Renal medicine is a relatively new subject. In the early 1940s Dr W.J. Kolff, working in Nazi-dominated Holland, developed the first artificial kidney. By present-day standards it was very cumbersome and tedious to use. Kolff’s idea and the work stemming from it were the major steps forward in the treatment of kidney disease during the first fifty years of this century. The principle by which his machine worked is the same as used in all present-day haemodialysis machines.

After the Second World War, Kolff gave a number of his artificial kidneys to major hospitals in Europe and America. The first artificial kidney arrived in Great Britain in 1946. It was used, as were all the machines of that period, for the treatment of people who developed acute renal failure during the course of severe illnesses where return of normal renal function could be expected after the illness. The treatment of chronic renal failure by dialysis as it is understood today was not then thought of.

During the late 1940s and the early 1950s technical advances in the design of artificial kidneys were made but very few people
received treatment. The Korean war (1950–53) provided a stimulus to the use of the artificial kidney. Modified Kolff kidneys were used in field hospitals where kidney failure occurred as a complication of war wounds. At that time there was not a great deal of interest in chronic dialysis and only a few groups of private individuals continued making improvements in the design of artificial kidneys. At this time all artificial kidneys consisted of a large drum which was covered by a semipermeable membrane of cellulose acetate, thus providing a large surface area over which blood from the patient was brought into contact with dialysate. Across the semipermeable membrane waste products would pass from the patient's blood into the dialysate. Dr A. MacNeil in America had the idea of using several layers of cellulose acetate like a sandwich, the 'filling' of which was alternately blood and dialysate. In this way a large surface area of membrane was arranged more compactly. Many present-day dialysers are designed on modifications of this clever idea, which made the artificial kidney much less cumbersome. Nowadays the term artificial kidney is used loosely to cover the complete apparatus used for haemodialysis. Strictly the artificial kidney is only that part containing the semipermeable membrane and is more correctly called the dialyser. The other parts of the haemodialysis machine include pumps and monitoring systems.

Interest in dialysis for the treatment of acute renal failure gradually increased in the 1950s. The first unit in Great Britain was in Leeds, led by Dr F.M. Parsons.

The major difficulty of those days was the lack of a satisfactory system for taking blood from and then returning it to the patient. This problem prevented the development of chronic dialysis because it is not possible to dialyse a person repeatedly using his normal unmodified arteries and veins. The blood vessels clot when used a number of times and then cannot be used again. In 1960 an important contribution to dialysis was made by Dr B. Scribner of the University of Washington. He and his colleague Quinton developed the first adequate shunt. A shunt is an artificial connection between an artery and a vein in two halves which can be separated for dialysis (see page 52). The tube attached to the artery is used to lead blood to the machine. Blood is returned from the machine to the patient through the tube connected to the vein. When not being used for dialysis the two ends of the shunt are joined together. Silicone rubber is used for the connection because it is sufficiently flexible to