

First dialysis in Australia and Queensland experiences of renal replacement therapy

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Abstract

The first dialysis in Australia took place at the Royal Brisbane Hospital on the 10th of February 1954 under the supervision of Dr Dique. Developments in haemodialysis, vascular access, epidemiology and transplantation from the perspective of a pioneering Queensland nephrologist are presented.

"The patient had been drinking wine with his mates on a coal wharf on the Brisbane River when a train shunted in reverse around a corner and ran over him."

First dialysis in Australia

Pride of place for providing the first dialysis in Australia rests in the Royal Brisbane Hospital. In 1954 Dr Dique developed a dialysis machine consisting of cellophane tubing wound around wooden slats. Blood under arterial pressure flowed down the inside of this tubing while the outside was bathed in 150 litres of an electrolyte and sugar solution. This first dialysis in Australia took place at the Royal Brisbane Hospital on the 10th of February 1954.

In February 1962 a patient with a bleeding peptic ulcer received a mismatched blood transfusion at a country hospital. Acute renal failure followed, and as the transfused red cells were being broken down, there was very high serum potassium. Dr Dique's machine was borrowed from the across the river, and the first dialysis at the Princess Alexandra occurred on February 4th 1962. While this prototype machine was very ingenious, it had a few drawbacks. It was not possible to sterilise the cellophane tubing fully, and it relied on the patient's blood pressure to drive the blood through the tubing.

Travenol developed a commercial dialysis machine in the early 1960s which they called the Kolff Twin Coil Dialysis Machine. One of these machines was purchased by the Women's Auxiliary of this hospital in 1963. This machine is in the Princess Alexandra Hospital museum. It was first used on the 29th of April 1963. The patient had been drinking wine with his mates on a coal wharf on the Brisbane River when a train shunted in reverse around a corner and ran over him. Dr Stewart Pegg cut down on the vessels to provide access to the circulation, and Dr Kevin Murphy supervised the dialysis.

The Kolff twin coil dialyser had a significant dead space, and had to be primed with a unit of blood for each dialysis. It was suitable for the treatment of patients with acute renal failure, who would either die or get better within a few weeks. It was not the optimum machine for treating patients with chronic renal failure, in whom recovery of renal function would never occur.

In 1968 a Drake Willock machine was obtained. This machine used Kiil plates - flat cellophane envelopes which had a large surface area and a small dead space which did not require being priming

Key Words

history, kidney, renal, nursing, dialysis, transplant

with blood before use. These Kiil plates were assembled by hand. The cellophane sheets were cheap, but the assembly was labour intensive. Dialysis technicians were employed to build the Kiil plates. With practice, they got the time down to 10 minutes, with very few leaky dialysers.

In 1968 both acute and chronic dialysis were carried out in the Intensive Care Unit, on the seventh floor of the Hospital. Of the four patients who started dialysis for chronic renal at this hospital in 1968, one is alive today. He has a functioning transplant (his second) and normal renal function.

In 1970 the definitive treatment for chronic renal failure was renal transplantation. Gordon Clunie was appointed as reader in surgery and director of the renal transplant unit in 1968. Trefor Morgan was appointed as director of the renal unit in 1969 but returned south in 1971.

I was appointed as a full time renal physician in 1971. My appointment letter made it clear that I was not the boss of the renal unit - I was answerable to the Director of the Transplant Unit. In theory this could have presented difficulties, but both Gordon Clunie and I had trained in Edinburgh and got on well together so there were no significant turf wars! Edinburgh had had a devastating Hepatitis B epidemic in 1969-70 leading to the death of three staff members and eight patients so another condition my appointment was that I should be Australia antigen negative. Luckily I was.

Author Details:

Dr James J.B. Petrie B.Sc. MB Ch. B., M.D. FRACP, FRCPE is a Visiting Renal Physician at Princess Alexandra Hospital and was Director of the PAH Renal Unit from 1971-1997.

Correspondence to:

Dr James Petrie, Renal Unit, Princess Alexandra Hospital, Brisbane, Queensland. jimpetrie2@ozemail.com.au

In the early 1960s dialysis was only available for acute renal failure. A blood flow through the dialyser of at least 150 ml per minute was required, and to get this you had to cut down on a major artery and a major vein. Each cut down would give you between one and three dialysis. If you started with the left arm you could move to the other arm, then to a leg and then to the other leg. After six to twelve dialyses you had run out of vessels. Dialyzing patients whose renal function was not expected to recover was a pointless exercise; it simply delayed an inevitable death by a few weeks.

Quinton and Scribner (1960) published a report on keeping patients with chronic renal failure alive for over a year using a shunt made of Teflon and silastic for repeated dialysis. In 1965 Cimino and Brescia developed the use of an arterio-venous fistula created by joining (usually) the radial artery to a superficial arm vein (Cimino and Brescia 1966). The vein became distended and muscular and could be used for repeated venipuncture, supplying blood flow rates of well over 200 ml per minute. Access to the circulation was now no longer the limiting factor survival on dialysis. Dialysis machines however were in very short supply. In Brisbane, and in most other centres, dialysis was initially used to keep patients alive until a transplant kidney could be found. No patient with chronic renal failure who was unsuitable for transplantation was therefore accepted on dialysis. Age over 60 and a significant co-morbidity (such as diabetes or severe heart disease) were contraindications to transplantation and thus absolute contraindications to regular dialysis treatment.

Changes in epidemiology

In the 1950s the mortality rate from chronic renal failure was higher in Queensland than in any other state in Australia. There was an

epidemic of lead nephropathy. The use of lead based paints in houses was banned as early as 1923, but many old Queenslanders with peeling paint lingered on. A history of acute lead poisoning in childhood, small kidneys and gout suggested the diagnosis which was confirmed by measuring the excretion of lead in the urine after EDTA infusion. 38 patients with lead nephropathy were taken on to dialysis at PAH, the last being in 1997.

Just as the lead nephropathy epidemic was ending, another epidemic arose to take its place. Compound analgesics consisting of phenacetin, aspirin and caffeine became popular and analgesic nephropathy was born. Bex and Vincents moved from phenacetin to paracetamol but the epidemic continued. Many individuals took 12 to 14 Bex powders a day over one or two decades. In the period 1968 to the end of 1979, 355 patients were taken on to dialysis at PAH. 82 of these (23%) had analgesic nephropathy.

In 1979 legislation was passed in Queensland confining the sale of compound analgesics to pharmacies. You could no longer pick up your Bex or your Vincents at the corner store. From 1980 to 1989 17% of our new dialysis patients had analgesic nephropathy. From 1990 to 1999 the proportion fell to 8%. Of the 767 patients taken on to dialysis between 2000 and July 2007 5, or less than 1% had analgesic nephropathy. Our analgesic nephropathy patients are getting steadily older. The mean age of analgesic patients taken on before 1980 was 44. The mean age of those taken on after 2000 was 60.

Up till 1980, 1.4% of new dialysis patients had type 1 diabetes. For the decade 1980 to 1990 the proportion rose to 4.6%. It was 3.8% for the decade 1990 to 2000, and 3.5% for the period 2000 to 2007. Thus the incidence of end stage renal failure in type 1 diabetics seems fairly stable.

Type 2 diabetes is showing an inexorable rise. We took on no patients with type 2 diabetes before 1980. For the decade 1980 to 1990 type 2 diabetics comprised 1.9% of our new patients. For the decade 1990 to 2000 this was 4.7%. For the period 2000 to 2007, 17% of new patients had type 2 diabetes.

Transplantation

The first two transplants in Queensland were performed in 1969. One lasted five years. The second is still functioning to this day.

In Queensland in the 1960s and 1970 the law regarded an operation on an individual as an assault if the operation was not for the benefit of the person operated on. The purpose of the legislation was unclear. Perhaps it was meant to discourage vasectomies. A new Anatomy Act was passed in 1980 which enabled us to perform our first live related transplant in 1981 – a Rockhampton man donated his kidney to his brother. By April 2009 the number of transplants performed at the Princess Alexandra Hospital reached 3000.

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