

Belfast (Dublin)

An Extract from the late Prof. M.G.McGeown's J.Cleery Ferguson Lecture to the Royal College of Physicians of Ireland.

By the time (1958) the MRC Grant could not be extended longer, the Royal Victoria Hospital had commenced its scheme for research Fellows. I was fortunate enough to get the only RVH Fellowship, just vacated by John Weaver.

With a young family, I was not free to get the "Been to America" qualification. Just as it began to look as though research posts were yet another dead end, a new avenue opened up.

In 1948 Graham Bull had arrived at Hammersmith Hospital from Cape Town. With the late Malcolm Milne, Russell Fraser, A.M. Joekes, and Borst they began to use Kolff's rotating drum kidney. By Bull's accounts dialysis treatment with the original model was a formidable task. It took several hours to prepare the apparatus, and six hours for the treatment. The patient often developed rigors and even convulsions. To avoid its use, he and his colleagues developed the so-called "conservative treatment". This was based on careful control of fluid and electrolyte balance, provision of calories as pure carbohydrate and fat to spare breakdown of body tissue with its resultant production of nitrogen and potassium. Patients with renal failure are very prone to develop infection and were isolated to avoid hospital borne infection. The diet later became famous as the Bull-Borst Diet. In theory the treatment could be used anywhere and doubtless saved many lives worldwide. Many patients with acute renal failure recovered their kidney function within a week or 10 days, and conservative management was sufficient to save them, but for those with more severe kidney failure, it was not sufficient. Moreover the diet of glucose or lactose and oil increased the patient's nausea due to uraemia, and they developed sore mouths. They became very thirsty, but if they were totally anuric, fluid intake had to be restricted to 400ml daily. Cardiac arrest from a high potassium level was a serious risk.

One day in 1958, Professor Bull called me to his room. He had with him Mr. John Megaw. Mr. Megaw saw specialisation in urology beckoning, but was hesitant about giving up general surgery – in fact he never did so. The event which led to his visit was a patient we had just treated in the Royal Belfast Hospital for Sick Children. This was the son of a well-known consultant gynaecologist who, seriously injured in a road traffic accident, developed acute renal failure. Conservative treatment appeared to be insufficient, and the boy was transferred to Hammersmith Hospital in the belief that without artificial kidney treatment he would die. Ironically he began to produce urine during the journey to Hammersmith. This event led to questions being asked in the Stormont Parliament, followed by a

statement urging that Northern Ireland should have an artificial kidney. Megaw saw this opportunity to enhance the image of the Belfast City Hospital, hence his visit to Bull. Until Megaw's momentous visit to him in 1958, Bull had maintained that most patients with acute renal failure would recover with conservative treatment, and that the population of Northern Ireland was not big enough to justify an artificial kidney. Megaw wanted to set up an artificial kidney unit at the Belfast City Hospital and was looking for someone with suitable training to undertake this. Bull knew that I desperately wanted a post which gave more contact with patients – I already ran a special clinic for patients with kidney stones. I had never seen an artificial kidney and he knew this, but silenced my objections by explaining to Megaw how my training and experience suited me for the project.

Some weeks later, with the late Mr. Megaw and Mr. John Storey, I set off on visits to see the two models of artificial kidney then available. The first visit was to Leeds General Infirmary where the late Dr. Frank Parsons demonstrated his rotating drum kidney. He reiterated the problems described by Bull, while I became more and more disenchanted with the whole idea. We then visited the RAF Renal Unit at Halton, headed by the late Ralph Jackson, later Air Vice-Marshal Sir Ralph, who showed us the twin coil kidney. This appeared to be much simpler in use and very efficient. Jackson assured me that my laboratory background was a good preparation. What I needed was a suitable isolation room, the twin coil artificial kidney, and a technician to assist me in preparing the equipment, weighing out chemicals and so on. He could arrange for me to stay for a short period in Halton to see how it was set up and used. He advised that I should wait until our equipment arrived, and I had time to do mock set-ups before the visit.

The twin coil artificial kidney was ordered and plans were made to remodel Ward 9 in the Main Block of the Hospital to include a two-bed Renal Unit. A technician, Maurice Bingham, was recruited from the Biochemistry Laboratory. The artificial kidney arrived in early June 1959 but Ward 9 was not yet ready and we were given a small store room in which to store it. It happened that a GP refresher course was being held in the City Hospital two days later. Mr. Megaw insisted that I should set up the artificial kidney and demonstrate it to the GPs. I had seen a twin coil kidney once, Maurice Bingham had never seen one. We read the accompanying booklet, and proceeded to set it up, using red ink to mimic the blood circuit. Mr. Megaw and the assembled GPs seemed suitably impressed.

Meantime Dr. Eliahou from Israel, just finishing a year's attachment to Professor Bull's ward, came to persuade me to let him see the new kidney in action before he returned home. We persuaded Professor Welbourn to ligate the ureters of a dog, which after 48 hours became suitable uraemic. The first haemodialysis in Northern Ireland was carried out in the animal

theatre of the Department of Surgery. We managed to treat the dog with a short dialysis, enough to demonstrate a considerable fall in the blood urea concentration. Eliahou returned to Israel where he set up the Renal Unit in Tel Aviv, and later became a world expert on treatment of acute renal failure.

I now felt I was ready to visit Halton and see how dialysis should be carried out. However, the following week an elderly man was admitted in uraemia due to prostatism. He was semicomatose with a blood urea over 600mg/100ml. Megaw demanded that I should treat him by dialysis: "You dialysed a dog last week, you cannot let my patient die without trying". Maurice and I set up the twin coil kidney in Ava 2 theatre, and Eileen Martin, the technician in the Department of Medicine Laboratory, weighed out three sets of chemicals to make up three batches of dialysis fluid. In June 1959, in fear and trepidation, we treated our first patient. Mr. Megaw inserted the cannulae in the radial artery and the cephalic vein. My stepson, John Freeland, who had just got his driving licence, sat in my car in the courtyard to act as messenger. When I wanted to send a sample of blood or dialysis fluid to the laboratory I called him from the theatre window. The only untoward event was that I spoilt one batch of dialysis fluid and had to send John to the Department of Medicine Laboratory to get another set of chemicals. The patient wakened up and his blood urea fell from over 600 to about 200mg/100ml after six hours of treatment. Unfortunately he died within a week of a cerebrovascular accident.

From then on we were in business. Still without the accommodation in Ward 9, headquarters the storeroom in Ward 15, we became a travelling dialysis service. The hospital van took us and our equipment to the patient, frequently in the Royal Victoria Hospital. We dialysed many times in the classroom between Wards 1 & 2 and 3 & 4, in the old theatres between the surgical wards, and later in Ward 22 where Dr. Bob Gray was providing ventilation for patients with respiratory failure. There were always problems, plugs did not fit and there were difficulties with water supply. Our second patient recovered from post-natal renal failure after 36 days of virtual anuria. When I last saw her, more than 20 years later, she had normal kidney function. She had another uneventful and successful pregnancy. Another early patient with acute renal failure following an incompatible blood transfusion presented quite a problem as it was very difficult to find enough suitable blood to prime the kidneys for dialysis. About 250 units of blood were cross-matched to find the 15 or so units of compatible blood needed for her several treatments. She recovered to work in Wakehurst Wards at the City Hospital. Not all patients recovered but it seems, in retrospect, that in those early days the recovery rate from acute renal failure was higher than now. Now that patients with very grave injuries can be resuscitated, they may not survive the consequences of other injuries, even though supported until renal function has returned. And so I never got to Halton to see how dialysis should be done.

At this point, during a family holiday, we spent a night in Dublin, where we visited a friend of my husband, Professor O'Brien, head of the Department of Celtic Studies. During the evening his daughter arrived with her boyfriend, a medical student. Talking with him I learned that Jervis Street Hospital had recently obtained an artificial kidney, which he thought was operated by a Dr. Joe Woodcock. Next morning I phoned him and he invited me to meet him at the Gresham Hotel, as they did not have proper accommodation in the hospital. They had done their first haemodialysis in 1958, some months earlier than ours. They were then about the same stage as ourselves. A few months later a late evening telephone call preceded a visit from the Dublin urologist, Anthony Walsh, leading to an invitation to spend a weekend at his home in Dundrum. There I met William (Billy) O'Dwyer, the physician of the Jervis Street team. Late that Saturday night Tony called in to insert cannulae for a two-year old girl with undiagnosed renal failure. I remember that she was as white as a sheet and that her bladder was empty. It was difficult to maintain her blood pressure during dialysis, despite much transfusion, and we thought she might not survive. However, she recovered after several more treatments over the next 10 days. For all three of us it was a first encounter with acute haemolytic uraemia syndrome which had recently been described. That episode was the beginning of lifelong friendships with Bill, Tony and their wives. In 1961 when the birth of my youngest child was imminent, I was still working singled handed. Billy telephoned from Dublin to say he and their team would hold themselves on call should dialysis be needed, while I had maternity leave. Maternity leave was three weeks, beginning on the day on which my son was born. That offer, for my money, beats the Internet any day!

While these friendships were forged in Nephrology, what was in effect the Irish Association of Physicians was formed. Returning on the train from a meeting of the Association of Physicians of Great Britain and Ireland, the late Ivo Drury and Desmond Montgomery conceived the idea of forming an association of physicians north and south of the Border. In 1960 the Corrigan Club was formed, with membership restricted to 60 and by election. Initially women seem to have been excluded. I was elected in 1975 . I seem to have been the first woman, elected long after my peers in renal medicine.

In 1960 after we moved into the new Dialysis Unit in Ward 9, the patients were brought to us, except for the very seriously ill on respirators. Maurice Bingham emigrated to Canada, to be replaced in the spring of 1960 by Jack Lyness. Nurses were recruited on an ad hoc basis from Ward 9, or the wards where the patient happened to be. About two hours were needed to prepare the equipment. Treatment lasted six hours, with another hour or more to clear up and ensure that the patient was stable.

In 1963 the Matron, Miss Lynn, was persuaded that we needed our own nurse. Staff Nurse Kay Maguire who had helped us many times, joined the team. Kay led the nursing team and contributed greatly to the development of the service until her untimely death in 1987.

We continued to provide a travelling service when needed, in Bob Gray's Respiratory Unit, in the Mater Hospital's single small room which served for all patients needing intensive care, in the Ulster Hospital, Craigavon Hospital's Intensive Care Unit, even as far afield as Altenagelvin.

Patients with undiagnosed impairment of renal function began to be admitted. Many had chronic renal failure and could not be expected to recover after a few dialyses. The artificial kidney was not then used for chronic renal failure because each treatment needed a cannula in an artery and in a vein, soon expending all available superficial vessels. This situation changed after 1960 when Belding Scribner invented an external shunt between artery and vein, which could be opened for treatment, then reconstituted as a shunt. This allowed treatment to be carried out repeatedly using the same pair of vessels.

Again a surgeon entered our field, Will Hanna, then a senior registrar, who inserted our first arteriovenous shunt early in 1964. The first patient died of septicaemia. We had tried to make the treatment less expensive by using a recently reported technique of rinsing the used twin coil with saline until free from blood, then storing it in the refrigerator between treatments.

The second patient fared better, commencing treatment in January 1965; she soon became well enough to live at home, returning twice a week for treatment on the twin coil kidney. We could keep her well, but we could not accept a second patient with chronic renal failure. The one artificial kidney had also to be used for its proper purpose, the treatment of acute renal failure. A chance conversation with Professor Stanley Peart of St. Mary's Hospital, London, provided the solution. The patient was transferred to St. Mary's in April 1965 where she had a cadaver kidney transplant. This functioned well for seven years, to be lost due to an episode of deep venous thrombosis following an aeroplane journey. I had sent two patients for transplants to Edinburgh and Leeds previously but neither survived. The link with St. Mary's was rewarding, leading to a series of Belfast dialysed patients being transferred to London for a cadaver graft. They returned home for long term supervision of immunosuppression therapy, soon recognised as an important and hazardous part of the transplant procedure.

Still in the three rooms in Ward 9 of Main Block, with increasing pressure to treat patients with chronic renal impairment nearly at their end, we three struggled on. By this time Kiil had invented his flat plate kidney. The blood channel was reduced to a thin film between cuprophane

membranes, eliminating the need for priming blood. The cost of disposables was very little in comparison to the expensive twin coil kidneys.

A London engineer named Heppel made a copy of the original Swedish Kiil for his wife who was treated at the Royal Free Hospital. He was good enough to make two Kiils for us on the understanding that I would pay for them some time. They were poorly finished, and brutes to build as the rough edges punctured the cuprophane membranes. Flat plate dialysers are flushed with fresh dialysis fluid at the rate of half-litre per minute. A large volume of dialysis fluid was needed for the 14 hour treatment. A 400 litre plastic fish tank was ordered in which to prepare the dialysis mix from the solid chemicals. This was not delivered for about six months. In the meantime we treated 2 patients by using the 100 litre tank of the original twin coil kidney. Mr. Megaw kindly lent us one of his two cystoscopy theatres for this purpose. The patients were treated at night allowing the twin coil kidney to be available during the day for treatment of patients with acute renal failure. The 100 litre tank had to be replenished with fresh dialysis fluid four times during the night. The service was possible only because Jack Lyness volunteered to sleep on a couch in the surgeon's room four nights each week, to be awakened by the night nurse when the fluid was down to a critical level. Jack also carried out his daytime duties for about six months until the big tank arrived. It is horrifying now to think that, oblivious to the perils of hepatitis B, never mind A and C, blood stained Kiils were carried in the morning through Ward 9 to the patients' bathroom where they were scrubbed in the patients' bath. The dialysis tank had to be scrubbed and sterilised with hypochlorite, on occasions with spillage into Casualty Outpatients situated below us. Patients sometimes developed rigors. Usually the cause eluded us but once we discovered pigeon droppings in the supply water tank. A new patient could be accepted only when an existing one was transferred to London for a transplant.

By 1964 there were plans for the Tower Block, which was to include a haemodialysis unit. A sketch plan was drawn with the enthusiastic help of the late Mr. Paddy Semple. In 1965 it became clear that some provision for the growing need of the Renal Unit would be essential long before the most optimistic estimate for the opening of the Tower Block. Space was not available in the Main Block. The solution was a new building behind Ava. Following the successful treatment of our second haemodialysis patient by transplantation in St. Mary's Hospital, we were determined to develop a service for the treatment of chronic renal failure which would include transplantation.

The design of Renal 1, with differential pressure ventilation, allowed good quality reverse barrier nursing, to protect patients from hospital borne infection. This was then thought essential for transplantation, as there was a very high death rate from sepsis of immunosuppressed patients.

Death from sepsis was indeed very rare in our transplant programme. The Unit had an integral operating theatre. Haemodialysis could be provided in each patient's room, including the transplant

After Calne and Murray's successful use of azathioprine in human kidney transplantation, it would seem to me that transplantation would prove to be the definitive treatment for kidney failure. Good-quality dialysis therapy would be needed to make the patients fit and maintaining them until a kidney could be provided, hopefully one from a cadaver. If the graft fails the patient should be able to return to dialysis therapy to await the second or even a third graft. The Belfast transplant programme began in 1968, after the opening of Renall, which provided a suitable environment. Joseph McElroy was appointed as nephrologist: Stuart Clark and Joseph Kennedy, were to each give two sessions from their consultant appointments to allow continuous cover for the harvesting and transplantation of cadaver kidneys. John Alexander and Cecil Hewitt were to provide anaesthesia. Joseph Kennedy and John Alexander continued to contribute to the transplant programme until retirement in 1996: the others left for other appointments. Our consultant surgeons and trainees have come and contributed, while the service has continued to develop. This includes Gordon Loughridge, and Richard Donaldson over earlier years. Sam Nelson set up the tissue typing service in 1968, later developed by Derek Middleton to hold an international reputation. The program was carefully planned with the main source of grafts being cadaver kidneys. The role of each member of staff was thought out and agreed, each step of the procedure for retrieval of cadaver kidneys and their insertion into the recipient, the immunosuppression and post operative care written down to form the Belfast Recipe for Transplantation. During the first year, all the grafts were from cadavers: later, occasionally living related donors were used. A significant difference from other centres was the sparing use of corticosteroids. We used much lower doses of steroids, for induction, antirejection treatment if needed, and long term maintenance therapy.

The first transplant was carried out on 22 November 1968. Initially successful, it was lost three months later from irreversible rejection. Thereafter we achieved a one year first cadaver graft survival of 80%, which was much above the 50% or even less than recorded in many units. Our results continued to top the figures collected by UK Transplant Service until usage of cyclosporine became general .

By 31 December 1996, 924 transplants have been carried out for 800 patients. 64 came from living donors, and 860 from cadavers. The one year first cadaver graft survival continued to hover about 80%, despite many much older and otherwise disadvantaged recipients. I am particularly proud of the long term transplant results, which are in press. 54% of grafts transplanted 10 years ago continue to function.