

## Short reports

### Open heart surgery in patients receiving chronic haemodialysis

EILIS MCGOVERN, ROSEMARY ROONEY, MAURICE C NELIGAN

*From the National Cardiac Surgical Unit, Mater Misericordiae Hospital, Dublin*

Chronic haemodialysis in the past was considered a contraindication to major heart surgery. In 1968, however, Lansing<sup>1</sup> recorded the first successful valve replacement in a patient on haemodialysis and in 1974<sup>2</sup> and 1975<sup>3</sup> initial experience with coronary artery bypass grafting in such patients was reported. In view of the fact that more patients are having long term dialysis and that the incidence of coronary heart disease and infective endocarditis is higher than average in this group of patients, it can be expected that greater numbers will become candidates for major heart surgery in the future. We describe our experience with two patients and discuss the management of their problems.

#### Case reports

##### CASE 1

A 20 year old girl had been on haemodialysis for two years for chronic renal failure secondary to Goodpasture's syndrome. She then developed septicaemia, and despite intravenous antibiotics signs of infective endocarditis with aortic incompetence became evident. Two episodes of acute pulmonary oedema occurred, both of which were resistant to haemodialysis, so a decision was made to proceed with valve replacement.

Haemodialysis was last performed two days before operation. At this time the blood urea concentration was 21 mmol/l (126.5 mg/dl), plasma creatinine 763  $\mu$ mol/l (8.6 mg/dl), potassium 4.1 mmol (mEq)/l, haemoglobin 10 g/dl, and packed cell volume 0.31.

A Swan-Ganz catheter was inserted and the patient anaesthetised in a routine manner. Her right forearm was positioned to protect her arteriovenous fistula from pressure during the operation. The heart lung machine was primed with three units of blood and 1 litre of Hartmann's solution to obtain a packed cell volume of 0.25. On establishment of cardiopulmonary bypass 1 litre of cold crystalloid was infused for cardioplegia via the coronary ostia; this was retrieved and discarded.

The aortic valve was found to be completely destroyed by infection and it was replaced with a size 21 Hall-Kaster prosthesis. The fluid administered intravenously in theatre was restricted to 1.5 litres of Hartmann's solution. The cell saver was used to salvage blood loss.

After operation fluid intake was monitored by assessment of the patient's clinical condition, central venous pressure, and pulmonary artery wedge pressure. After

Address for reprint requests: Dr Rosemary Rooney, Mater Misericordiae Hospital, Eccles Street, Dublin 7.

Accepted 10 January 1984

bypass the serum potassium concentration was normal; four hours later, however, it had risen to 7.6 mmol/l, so haemodialysis was resumed. This was repeated 24 hours later for fluid overload and pulmonary congestion. Six days later the patient was metabolically and haemodynamically stable and resumed alternate day haemodialysis. She was initially given anticoagulation treatment with warfarin, but this proved difficult to control so she was maintained on dipyrindamole instead.

Five months later the patient received a successful renal transplant. At follow up 18 months later she was well, with no evidence of renal or cardiac decompensation.

##### CASE 2

A 52 year old woman developed chronic renal failure secondary to IgA glomerulonephritis and had been having haemodialysis for two months. She had a three year history of progressive angina of effort. Coronary angiography showed that she had severe three vessel disease and it was therefore decided to proceed with surgery.

Haemodialysis was performed two days before surgery. The patient also received 3 units of packed cells because of a low haemoglobin concentration (7.6 g/dl). Before operation a Swan-Ganz catheter was inserted and fluid intake was restricted to 750 ml. The prime for the heart lung machine consisted of 2 units of blood and 1 litre of Hartmann's solution. One litre of cold crystalloid was used for cardioplegia and discarded as in the previous case. Four grafts were inserted into the left anterior descending, diagonal, obtuse marginal, and right coronary arteries.

After operation the patient had fluids restricted to about 1 litre a day. She received calcium resonium prophylactically. Her cardiovascular and metabolic state remained stable, with a serum potassium concentration in the normal range. She did not require haemodialysis until 48 hours after operation, when she resumed her usual regimen. Thereafter she made an uneventful recovery and was discharged from hospital 12 days after surgery.

#### Discussion

These two cases illustrate many of the problems encountered in the management of patients having chronic haemodialysis who require major surgery.

The timing of haemodialysis before operation is controversial; it has been suggested that it should be performed as close to surgery as possible, to allow a longer interval after operation before dialysis is resumed.<sup>4</sup> This obviates the need for postoperative anticoagulation, which might precipitate mediastinal bleeding. On the other hand, some recommend a 24 hour interval between haemodia-

lysis and surgery to allow the return of haemodynamic stability.<sup>3</sup>

Patients with chronic renal failure tend to have severe anaemia. This can be corrected before operation in a stable patient such as our second patient, to allow for the haemodilution which occurs during cardiopulmonary bypass. Pulmonary oedema would, however, contraindicate transfusion; in such a case blood can be incorporated into the prime. If possible fresh blood should be used, as the potassium content is lower and the clotting factor content higher than with old blood. In view of the fact that many of these patients will be candidates for renal transplantation in the future, it may be possible to avoid sensitisation (which could cause problems with tissue typing) by the use of washed red blood cells.<sup>6</sup>

From an anaesthetic standpoint, insertion of a Swan-Ganz catheter is essential in the management of these patients. It allows for accurate fluid monitoring during the most critical phase of treatment—that is, during and immediately after operation. It is important to protect the patient's shunt or fistula from trauma, as these are particularly prone to thrombotic occlusion during major surgery.<sup>5</sup>

Regular estimation of the acid base balance and electrolyte concentrations is essential during operation for detecting and treating abnormalities, and obviously must be continued afterwards until the patient is stable.

Haemodialysis is usually resumed two to three days after surgery, but may be necessary earlier for hyperkalaemia or fluid overload. Peritoneal dialysis has been suggested as an alternative method at this stage as it avoids anticoagulation.<sup>1</sup> A further alternative is intraoperative haemodialysis, which as well as eliminating the need for heparinisation avoids a positive fluid balance at the end of cardiopulmonary bypass.<sup>7</sup>

The question of long term anticoagulation in patients who have valve replacement remains controversial.<sup>4</sup> Control of anticoagulation is difficult in patients having haemodialysis, but these patients are also known to be prone to thrombotic episodes. In older age groups it may be advisable to use tissue valves and thus avoid this problem.

Clearly more patients having haemodialysis will be presented for major heart surgery, but the problems encountered in their management should diminish with greater experience.

## References

- <sup>1</sup> Lansing AM, Leb DE, Berman LB. Cardiovascular surgery in end-stage renal failure. *JAMA* 1968;**204**:682–6.
- <sup>2</sup> Sakurai H, Ackad A, Friedman HS, Lejam F, Haft II, Stein RM. Aorto-coronary bypass graft surgery in a patient on home haemodialysis. *Clin Nephrol* 1974;**2**:208–10.
- <sup>3</sup> Lansing AM, Masri, Karalakulasingam R, Martin DG. Angina during haemodialysis. *JAMA* 1975;**232**:736–7.
- <sup>4</sup> Manhas DR, Merendino KA. The management of cardiac surgery in patients with chronic renal failure. *J Thorac Cardiovasc Surg* 1972;**63**:235–9.
- <sup>5</sup> Talano J, Scancon P, Meadows W, Kahn M, Pifarre R, Gunnar R. Influence of surgery on survival in 145 patients with left main stem coronary artery disease. *Circulation* 1975;**51**,suppl:1–105.
- <sup>6</sup> Patel R, Merril JP, Briggs WA. Analysis of results of kidney transplantation: comparison in recipients with and without preformed anti-leukocyte antibodies. *N Engl J Med* 1971;**232**:274–7.
- <sup>7</sup> Soffer O, Macdonnell RC, Finlayson DC, *et al.* Intraoperative haemodialysis during cardiopulmonary bypass in chronic renal failure. *J Thorac Cardiovasc Surg* 1979;**77**:789–91.