

THE RICHARD BRIGHT RENAL UNIT

INTRODUCTION TO THE CARE OF PATIENTS ON HAEMODIALYSIS

INTRODUCTION

Haemodialysis is the most well established form of treatment for endstage renal failure. Enormous technological advances having been made since the introduction of this form of treatment over 30 years ago.

HOW?

The technique involves pumping the patient's blood through an array of semipermeable membranes (an "artificial kidney") which separates the blood from the dialysate, a solution of crystalloids including sodium, calcium, and a bicarbonate buffer. Osmotic exchange across the membrane allows for the removal of urea, creatinine, phosphate and other uraemic metabolites and for correction of acidosis and electrolyte abnormalities. Adjustment of the pressure difference across the membrane allows for convective loss of water and its dissolved solutes from the blood compartment, allowing correction of volume overload.

The treatment requires adequate access to the patient's circulation, usually by construction of an arteriovenous fistula or by an artificial graft. Temporary access may be required using subclavian or Hickman catheter. These access devices are regarded as the patient's "lifeline".

WHEN?

Haemodialysis usually takes place three times a week, each session lasting between 3 and 6 hours depending on the size of the patient and their compliance with dietary restrictions. A few patients with residual renal failure function can be managed successfully with twice weekly dialysis, but this is not a satisfactory regimen for the majority of patients.

WHERE?

Haemodialysis can either take place in hospital with full nursing supervision, in hospital at night, in a "Satellite Dialysis Unit" or at home. The Richard Bright Renal Unit is presently served by Satellite Units in Southmead, Bath, Weston-Super-Mare, South Bristol, Yeovil and Taunton.

COMPLICATIONS OF HAEMODIALYSIS

Fluid imbalance

In renal failure the patient's capacity to excrete a fluid load is reduced or absent. Fluid balance is maintained by removal of fluid on dialysis coupled with sodium and water restriction. Non-compliance with either can lead to volume overload, which presents in the same way as heart failure, with peripheral and pulmonary oedema. Fluid overload may also cause hypertension in renal patients. There is usually no response to diuretics, and the correct treatment is fluid removal by dialysis.

Fluid depletion is less common but may be caused by over-vigorous removal of fluid during dialysis or by intercurrent diarrhoea or vomiting. It usually presents with

symptomatic postural hypotension (which is the most reliable physical sign) and with nausea and weakness. Treatment is by administration of salt and water, either orally or intravenously depending on severity, coupled with attention to the underlying cause.

Hypertension

In some patients, blood pressure remains high despite adequate fluid removal. These patients require antihypertensive medication.

Hyperkalaemia may develop due to suppression of aldosterone-dependent colonic excretion of potassium by ACE inhibitors or to inhibition of post-prandial transport of potassium into cells by beta blockers.

Anaemia

Although Erythropoietin deficiency is the major cause, in haemodialysis patient's iron deficiency may contribute due to repeated loss of small volumes of blood in the dialyser. Iron supplements either orally or given intravenously on dialysis are therefore often necessary. Folic acid is also removed by dialysis, but deficiency is only a problem if there is concomitant dietary deficiency. Once haematinic deficiency has been corrected and other causes of anaemia excluded, treatment of anaemia is with subcutaneous epoietin or with the longer-acting analogue darbepoietin.

Other vitamin deficiencies

These are difficult to assess, but all water-soluble vitamins are removed by dialysis and we therefore administer a supplement to all patients.

Bone Disease

Dialysis patients are at risk of osteomalacia (due to defective renal hydroxylation of vitamin D), hyperparathyroidism (due to phosphate retention, calcium malabsorption, and defective hydroxylation of vitamin D), and may also develop osteoporosis. These conditions may be asymptomatic in the early stages but may result in bone pain or pathological fractures.

Joint Disease

Patients on long-term dialysis are prone to the development of stiffness and aching in the joints, particularly the shoulders. This is related to accumulation of amyloid deposits. Treatment is difficult, but the symptoms respond to successful renal transplantation. Low dose steroid treatment may be effective.

Vascular and extra-articular calcification

This is caused by hyperparathyroidism, phosphate retention, and positive calcium balance. Phosphate retention is treated by dietary restriction and by administration of "phosphate binders".

Cardiac Disease

Cardiovascular disease is responsible for much of the premature mortality of dialysis patients. This is nearly certainly due to the effects of longstanding anaemia, hypertension, and fluid overload on the myocardium, and to a high incidence of pre-

existing atherosclerotic cardiovascular disease in patients presenting with renal failure. In addition, patients may develop calcification of the aortic and mitral valves associated with phosphate retention.

Neurophathy

Patients may develop neuropathy due to vitamin B deficiency or to under dialysis: both of these are now very rare. Patients on long-term dialysis may also develop carpal tunnel syndrome due to amyloid deposition.

DRUG THERAPY

1. Blood Pressure

Hypertension is a major contributor to the excess cardiovascular mortality in renal patients. Many patients require antihypertensive therapy despite careful avoidance of fluid overload. Diuretics are usually ineffective. The choice of antihypertensive regimen is individualised, but may include beta-blockers, long-acting calcium channel blockers, ACE inhibitors, ATII receptor blockers, alphablockers, centrally acting agents (e.g. Moxonidine), hydralazine, and, occasionally, Minoxidil. Some of these drugs require dosage adjustment.

The aim is to maintain systolic < 130 mm Hg and diastolic < 80 mm Hg, although this target may be difficult to achieve

2. Vitamin Supplements

We currently dispense a “black-listed” combination tablet (“Nephrovite”) which contains those water-soluble vitamins, which are removed by dialysis but not those fat-soluble ones, which may accumulate.

Vitamin D analogues are often needed to aid calcium absorption and to suppress hyperparathyroidism. Dose adjustment requires measurement of PTH, calcium, phosphate, and alkaline phosphatase. Two drugs are used: Alfacalcidol and Calcitriol, both with a usual dose range of 0.25 – 5.0 micrograms od. Occasionally large once weekly doses of vitamin D analogues are used, with the aim of suppressing hyperparathyroidism with proportionately less effect on calcium absorption.

3. Calcium supplements and phosphate binders

Prevention of phosphate retention (which may contribute to vascular calcification, extra-articular calcification, and hyperparathyroidism) is by dietary restriction of phosphate combined with oral “phosphate binders” which limit absorption of dietary phosphate. Aluminium hydroxide was used extensively in the past for this purpose but has now been largely abandoned owing to the long-term risks of aluminium absorption. Calcium carbonate (Calcium 500, Calcichew, or Titalac, 3-9 tabs a day with meals) is now our preferred phosphate binder, although use may be limited by the development of hypercalcaemia. Use of dialysate with a lower calcium concentration helps to avert this problem, but may result in negative calcium balance if compliance with calcium supplements is poor. Calcium acetate has better phosphate binding capacity and should be used in preference to calcium carbonate if the patient is being treated with an H₂ antagonist or proton pump inhibitor.

Sevelamer hydrochloride ("Renagel") is a newly introduced and expensive phosphate binder which contains neither calcium nor aluminium. The use of this drug may reduce the risk of progressive vascular calcification, but cost prevents its widespread adoption at present.

4. Iron supplements

These are not routinely used but may be necessary in patients with occult bleeding, menorrhagia, or low iron stores, particularly if also receiving Erythropoietin. Because renal failure per se results in anaemia, measurements of ferritin and transferrin saturation are needed to guide therapy. Iron supplements are routinely given to patients on Erythropoietin. Occasionally, intravenous iron supplements are necessary.

5. Hormone Replacement

Renal failure is not a contraindication to HRT in postmenopausal women and prevention of osteoporosis may be particularly valuable because of the limited exercise capacity and propensity to renal osteodystrophy of renal patients. HRT also has beneficial effects on cardiovascular risk factors. For these reasons we encourage the use of HRT.

6. Vaccinations

Renal failure is listed as a positive indication for influenza vaccination by the Dept of Health, because of the increased risk of severe infection in debilitated patients. Pneumorax may also be of benefit.

7. Antipruritics

Many renal patients develop intractable itching, the pathogenesis of which is multifactorial. Benefit may be derived from emollients (e.g. E45 cream), antihistamines, and sometimes weak steroid preparations. Attention to biochemical control, particularly of calcium and phosphate, is also important.

8. Erythropoietin

UP to 70% of Haemodialysis patients require treatment with epoietin, or the newly introduced long-acting analogue darbepoietin. These are given by subcutaneous injection, twice or thrice weekly (for epoietin) or once weekly (for darbepoietin). These expensive drugs will be prescribed by the Renal Unit. Monitoring requires a fortnightly full blood count in the initiation phase and a monthly full blood count in the maintenance phase.

FOLLOW-UP

All patients are reviewed regularly in our hospital dialysis clinic, for assessment of "dry weight", biochemical adequacy of dialysis, presence of bone disease, and of other parameters such as anaemia and neuropathy. Letters will be sent to you after visit summarising the findings.

AREAS FOR SHARED CARE

Biochemical monitoring and adjustment of dialysis prescription are clearly the responsibility of the hospital, but these form only a part of the care of these patients.

1. General clinical care

Many dialysis patients will consult you with respiratory, gastrointestinal, dermatological, and other illnesses. In the past such patients often used to phone us with such problems, but this is clearly inappropriate. We welcome greater involvement by GPs in these areas, where their expertise is likely to be considerably greater than ours. It is important to watch carefully for signs of fluid overload (due to inadequate fluid removal on dialysis) which may present as heart failure or breathlessness. We are always pleased to discuss problems over the telephone. If hospital admission is necessary, whether for problems related to renal failure or seemingly unrelated, we very much prefer patients to be admitted to Southmead rather than other hospitals. The reasons for this are to allow us to perform dialysis for patients unable to do so for themselves, and also because many investigations (e.g. angiography, barium enema) require different preparations in patients on dialysis.

2. Blood pressure and fluid balance

Many patients may present to GPs with symptoms of fluid imbalance (described above): clinical assessment may be difficult but if an individual GP feels confident in the assessment of fluid imbalance we would welcome involvement by GPs in this area. It should be emphasised that peripheral oedema without distended neck veins should not be taken as a reliable sign of fluid overload, due to the many other causes of peripheral oedema that are present in these patients. Hospital assessment may be necessary to differentiate fluid overload from acute cardiac dysfunction, particularly if the patient is at their target weight.

If patients on haemodialysis do well, they often gain flesh weight. Attempts to reach the previously set "target weight" may then result in symptomatic hypovolaemia. Target weight may be re set as the weight (on the patients own scales) at which the patient appears euvolaemic:

- No muscle cramps
- No fall in blood pressure from lying to standing
- No peripheral oedema
(excluding local causes or hypoalbuminaemia)
- No basal crepitations
- JVP not elevated
- Blood pressure no higher than usual

If a GP sees a patient in whom the target weight appears inappropriate he/she should telephone the Unit to discuss this.

3. Psychosocial care

Dialysis, whether at home or in hospital, puts a considerable strain on even the most well adjusted families. We have ready access to Social Work support, two part time psychologists, and several patient support groups. We also welcome active involvement of GPs in supporting these patients and their families.

4. Diabetes

Up to 70% of our haemodialysis patients are diabetic. We welcome continued involvement by GPs in diabetes care, in particular in monitoring for non-renal complications such as peripheral vascular disease and retinopathy.

5. Prescribing

We hope that GPs will continue to issue repeat prescriptions for routine medication. For our part we undertake to communicate clearly and promptly the indications for such therapy and reasons for any changes.

HAEMODIALYSIS IN THE COMMUNITY : THE HOME TEAM

Haemodialysis patients are invariably trained for home dialysis on an outpatient basis by specialist staff within Southmead Kidney Unit. Occasionally patients are trained for Home Haemodialysis in their own homes by members of the Home Team. During their training period they are thoroughly prepared in the techniques necessary to support themselves at home with haemodialysis. Although the vast majority of patients are trained to be independent with their treatment, their carers and families are encouraged to come along with them and see what is involved with haemodialysis.

All patients are supported in the community by their own named Renal Community Nurse. There are 5 members of the Home Dialysis team and 2 home dialysis supplies co-ordinators. The nurses are based at Southmead Hospital in Bristol and are each responsible for a defined geographical area within a 60 mile radius of Bristol.

While attending the hospital for haemodialysis training the patients are introduced to their home team nurse. Patients will have the nurse who trained them in attendance for the first one or two weeks of home dialysis. The home care will then be handed over to the home nurse who will visit a week or so later. They will then receive regular visits from their nurse, normally every three to four months, or more frequently if necessary.

A member of the home team is available to be contacted by telephone from 8.30 a.m. to 10.30 a.m., Monday to Friday. There is also a telephone answer machine for the periods of time when the Home Team are not available. All the calls are returned as soon as possible. Nursing Staff in the clinical area are always available for advice with any urgent nursing/dialysis related problems.

The haemodialysis equipment is serviced and maintained by a team of renal technicians who also provide 24 hour assistance to home patients. The provision of dialysis medical supplies are dealt with by the home dialysis co-ordinators. Everything that is required for home dialysis is delivered directly to the patient's home.

Everyone at the renal unit is working towards providing a high level of service to support the patient at home. We appreciate that the care given by the GP and Community Team is of equal importance.