

## Dialysis

### *Chronic renal failure*

- Dialysis threshold controversial. Usually when  $GFR \leq 10-15 \text{ mL/min}$  (stage 5 CKD).
- Treatment of ESRF with dialysis has a high mortality rate and low quality of life. Increasing the dialysis dose above three times weekly haemodialysis does not decrease the mortality rate.

### *Indications for dialysis in acute renal failure*

- Refractory hyperK<sup>+</sup>
- Oliguria  $< 5 \text{ mL/kg/day}$
- Overt uraemia (encephalopathy, pericarditis)
- Intractable fluid overload
- $U_r > 30 \text{ mmol/l}$  and  $Cr > 700-1000 \mu\text{mol/L}$
- Uncontrollable acidosis or HT
- $120 \text{ mmol/L} > Na^+ > 155 \text{ mmol/L}$
- Dialysable drug toxicity
- Hyperthermia

## Peritoneal dialysis

- Dialysate is infused into the peritoneal cavity and blood flowing through peritoneal capillaries acts as the blood source. After time for exchange, the dialysate is drained.
- Ultrafiltration is controlled by altering the osmolality of the dialysate solution and thus drawing water out of the patient's blood. This can be achieved with glucose (1.3–2.5%) or other large molecular weight solutes in the dialysate. The glucose load may cause poor diabetes control and weight gain.
- A permanent catheter is inserted into the patient's peritoneum under LA or GA, which remains in place permanently and through which dialysate is infused.
- Options are intermittent (IPD), Continuous ambulatory (CAPD) - 4 x 20min during day, Continuous cycling (CCPD) - ~4x @ night and 1 whole-day exchange.
- Peritoneal dialysis can be performed at home, at work or while on holiday. It therefore allows a high degree of independence and control but a great deal of support is still reqd.
- **CI:** cellulitis, recent abdominal wound or intrabdominal vascular graft, thoracoabdominal communication, herniae, respiratory disease, obesity.
- Complications of peritoneal dialysis:
  - Peritonitis, sclerosing peritonitis
  - Catheter problems: infection, blockage, kinking, leaks or slow drainage
  - Fluid retention (APO/pleural effusion), weight gain
  - Constipation, hyperglycemia, malnutrition
  - Hernias (incisional, inguinal, umbilical) and
  - Back pain

## Haemodialysis

- Blood from an AV fistula is pumped through an artificial kidney separated by a membrane from dialysate (a solution of electrolytes), whose concentration can be varied precisely. Solute present in the blood at high concentration (e.g. urea, potassium, creatinine) diffuse into the dialysate and are removed. Heparin is constantly infused.
- Ultrafiltration regulates water distribution by altering membrane pressure gradient.
- Patients need very good vascular access, which is obtained by creating a fistula between a peripheral artery and vein (usually radial or brachial) 3-6mo before starting haemodialysis, or a permanent plastic catheter inserted into an IJ or SC vein.

- Haemodialysis for CRF often 3x/wk for 4hr. Daily haemodialysis is possible but intensive.
- **CI:** hypotension, active bleeding.
- Complications of haemodialysis:
  - Access related: local infection, endocarditis, osteomyelitis, creation of stenosis, thrombosis or aneurysm
  - Hypotension (common), cardiac arrhythmias, air embolism
  - Nausea and vomiting, headache, cramps
  - Fever: infected central lines
  - Dialyser reactions: anaphylactic reaction to sterilising agents
  - Heparin-induced thrombocytopenia, haemolysis
  - Disequilibrium syndrome: restlessness, headache, tremors, fits and coma
  - Dialysis dementia

## Transplantation

- Best long-term outcome for patients with ESRF. Co-morbid disease affects survival.
- Kidney may come from a cadaveric donor (85-90%) or from a living donor.
- Ischaemia times for the donor kidney:
  - Warm ischaemia: before cooled or when warmed for transplantation (max 1hr).
  - Cold ischaemia: time in ice (max 30hr).
- Generally native kidneys not removed, new one placed extraperitoneally in the iliac fossa.
- Life-long immunosuppression required.
- Regular screening for cancers, drug toxicity and cardiovascular disease.
- **CI:** Cancer, active infection (incl hepatitis), severe IHD or PVD, AIDS, mental incapacity
- Benefits: stop dialysis, normal fluid intake, diet and activity. Reversal of anaemia and renal bone disease
- Risks of transplantation:
  - Immediate operative complications (local infection, pain, pneumonia, DVT)
  - Immediate graft failure
  - Arterial or venous thrombosis in the transplant
  - Infections (viral, bacterial, fungal)
  - Cancer (skin, lymphoma)
  - Side effects of immunosuppressive drugs
- Complications of transplantation and subsequent immunosuppression treatment:
  - Postoperative problems, e.g. DVT, PE and pneumonia.
  - Opportunistic infections: viral (HSV, CMV), fungal and bacterial
  - Malignancies (especially lymphomas and skin cancers)
  - Drug toxicity, bone marrow suppression
  - Recurrence of the original disease in the transplant
  - Urinary tract obstruction
  - Cardiovascular disease, hypertension, dyslipidaemia
  - Graft rejection: Hyperacute, accelerated, acute cellular or chronic.
- Prognosis:
  - Transplant mean survival: Cadaveric: 15yr, Living: ~18-20yr.
  - Acute rejection and early graft loss are becoming increasingly less common.
  - Most patients with a renal transplant will die from cardiovascular disease.