Plasmapheresis

- Lack strict clinical criteria, protocols
- Most commonly used: centrifuge, kids until wash
- Be to be hard to measure
- Often have >1 tx at once
- Clinical change hard to quantify

Methods which detract clearance

Adv: Need CV access
Disadv: Separation of plasma (not WB/RBC)
Only separate off plasma (not WB/RBC)
Adv: Can do at bedside w/RRT machine (special filter)

Procedure

- Extracorporeal circuit, bleed removed, separated into components
- Centrifuge
- Technique used depends on bleed element
- Centrifugation/centrifuge based on density/viability
- Technique used on bleed element for removal
- Remove large molecules up to 30,000 Da
- C.f. 50,000 Da & haemofiltration

Phase principles

- Used to - removal of deleterious substances
- Replacement of deficient substances (TPP)

- Centrifugation/separate contents based on density/viability
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  - Greener move to outside (RBC)
  - Selective removal of cellular contents
  - Replacement of donor cells/plasma/HT
  - Removal of bleed, centrifuging, then return

- Separated, based on molar size
- Porous hollow fibres
- Permit passage of blood plasma (all except cells)

- Semiporous filter membrane
- Small molecules evenly distributed (50 Da, etc.)
- Will remove relatively most body, of mol of protein

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A single vol plasma exchange ~ 40mL/kg

- complete intravascular equilibrium in ~ 48h.
- calculate % removal plasma + whole body depends
  on (intraplasmic fraction) of

% plasma exchange used: 1 or 1.5 vol exchange.

Vascular access

- Central exchange ~ 30-50mL/min (can use PIV)
- Membrane exchange ~ 100mL/min (need CR-Fontaine line)

<table>
<thead>
<tr>
<th>G4-9F</th>
<th>&lt; 10-15 kg</th>
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<tbody>
<tr>
<td>BF 15-25 kg</td>
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<tr>
<td>10-11.5F</td>
<td>adult</td>
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Cellular removal less efficient ~ 20% effective

- affected by extracellular sites access.
- need larger exchange volumes to get cell site.
- cell compound (need > 2x blood vol exchange).

Anticoagulation

- Often use heparin. TBF -> TEEVorate flow

- Modern machines automatically adjust

  - TEEVorate is 0.3-0.4 mL in circuit.
  - Wash 1–2 Ls in 30 mins, readily metabolized.

To consider:

- Toxic substance (failed consider?
- Substance must be accessible to plasma.
- Substance long-term extracorporal clearance.
- Target cannot be removed by simple technique.

Vascular access

- Membrane exchange - 0.43 US heparin profile

  - ACT 1.5–2.0 in circuit
  - Filter removes most heparin (free + lab bond).
  - Large vol exchange deplete clot factors.

Successful apheresis requires attention to maintenance.

85/C
**Plasmapheresis P3**

### Maintenance IV Vol
- Volume of bleed vol in tube
- Haemodilution
- Apheresis vol. replacement

### Replacement
- Erythropoietin
- Albumin
- Lymphocytes

### Extravascular vol det.
- Extravascular vol det by
- Extravascular vol for each patient
- Vol shift (vol shift < 15%)

### Common
- Lower primary vol
- Better to risk smaller blood

### Maintenance of Red Cell Vol
- Separation chamber variable in vol observed cell to cell
- Maintain separation gradient
  - RBC deficit occurs at the start.
  - Tolerance of haemodilution det by
    - RBC
    - Erythrocytes
  - Det safe mix
    - Det safe mix
  - If extravascular vol > 15%, consider bleed prime.

### Indications
- 4 main categories:
  - Poorly defined
  - Evidence for support
- Category 1:
  - Category 2:
  - Category 3:
  - Category 4:

### Procedure Related
- Procedure related
  - WBC shift

### Patient Related
- Patient related
  - Apheresis
  - Cytopheresis
  - Removal of bound drugs
Schistocytic syndromes

Sickle cell disease

Double void each +

Screen

Haemolysed / Thrombotic conditions

Hyperviscosity syndromes

Char. by sluggish + I perf of microvessels 2° v. viscosity.

Classified by blood cell component

Neutrolysis + loss of normal

Macroglobulinemia

Microcytes

- easy to plasma ch.

Miscellaneous

TTP acquired antoab and sov def. ADAMTS13.

ADAMTS13 - metalloprotease, cleaves large vWF multimers.

Platelet exchange replacement factor is FVIII.

- Most 90% < 10%.

- criteria of whom to treat lacking

- no randomized benefit shown from platelet ch.

- NEC in 8% kick w/renal ch.
Plasmapheresis in Sepsis

Clinically employed thought due to fibrin/fibrinogen mediators.

- Removes mediators (inflamed fluid, cell debris, cytokines, etc.)
- Results of removing mediators mixed.
- Potential benefits: removal of mediators.

Randomized study - no benefit:
- Mortality - no difference.
- Study shows:
  - Red - MOP + TCI + IVF.
  - Diff: improvement in plasma exchange + MOP.

Pros:
- Low mortality rate in red line (10-15%).
- Need large no.'s. vs historical controls.
- Using other outcome measures (98/100)

Plasmapheresis in Drug Toxicity

- Useful for drugs with high protein binding + low Vd.
- Used effectively for:
  - Vincristine toxicity
  - Mercaptopurine toxicity
  - Lead toxicity (+ chelation)
  - Digitalis toxicity induced MI's