PEDIATRIC HEMODIALYSIS:
CONCEPT & MANAGEMENT

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ACUTE HEMODIALYSIS
HEMODILAYSIS TECHNIQUE

- Access
- Machine
- Blood line
- Dialyzer
- Priming volume
- Blood-dialysate flow
- Dialysate solution
- Anticoagulant
- UF-Dry weight
- Sodium profile
HEMODILAYSIS TECHNIQUE: Vascular access

- Acute dialysis: double lumen catheter
HEMODILAYSYIS TECHNIQUE: Vascular access

- **Acute dialysis:** double lumen catheter
  - Femoral vein
  - Internal jugular vein
  - Subclavian vein
HEMODIALYSIS TECHNIQUE: *Vascular access*

- **Acute dialysis:** double lumen catheter

<table>
<thead>
<tr>
<th>CATHETER SIZE</th>
<th>LENGTH (cm)</th>
<th>PATIENT WEIGHT (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Fr</td>
<td>8-12</td>
<td>10-15</td>
</tr>
<tr>
<td>8 Fr</td>
<td>9-12</td>
<td>15-20</td>
</tr>
<tr>
<td>9 Fr</td>
<td>12-15</td>
<td>20-30</td>
</tr>
<tr>
<td>10,11.5,12 Fr</td>
<td>12-18</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

Trays included: Maximal Barrier Precautions kit that comes with gown, cap, body drape and safety components.
HEMODILAYYSIS TECHNIQUE: Machine
HEMODILAYYSIS TECHNIQUE: Machine
HEMODILAYSIS TECHNIQUE: Blood line

- **Blood line**: prefer 6 mm for weight <20-30 kg
HEMODILAYSIS TECHNIQUE: Blood line

- Blood line: prefer 6 mm for weight <20-30 kg

<table>
<thead>
<tr>
<th>Type of blood lines</th>
<th>Priming volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric (Nipro)</td>
<td>64 ml</td>
</tr>
<tr>
<td>Pediatric (Kawasumi)</td>
<td>80 ml</td>
</tr>
</tbody>
</table>
HEMODILAYSIS TECHNIQUE: Dialyzer

- Dialyzer: low flux ($C_{UF} < 10 \text{ cc/min/hr}$)
Dialyzer Surface Priming Kuf Urea Cl BFR
area (m²) vol (mL) (mL/hr/mmHg) at 200 mL/min

Polysulfone

<table>
<thead>
<tr>
<th>Dialyzer</th>
<th>Surface area (m²)</th>
<th>Priming vol (mL)</th>
<th>Kuf (mL/hr/mmHg) at 200 mL/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3</td>
<td>0.4</td>
<td>28</td>
<td>1.7</td>
</tr>
<tr>
<td>F4</td>
<td>0.7</td>
<td>42</td>
<td>2.8</td>
</tr>
<tr>
<td>F5</td>
<td>1.0</td>
<td>63</td>
<td>4.0</td>
</tr>
<tr>
<td>F6</td>
<td>1.3</td>
<td>82</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Surface area of dialyzer approximate to BSA
HEMODILAYYSIS TECHNIQUE: Priming volume

- Priming volume (blood line + dialyzer): not more than 10% of blood volume
  - (80 cc/kg → blood volume, not more than 8 cc/kg)
HEMODILAYSIS TECHNIQUE: Blood-dialysate flow

- Blood flow:
  - 3-5 cc/min
  - (BW + 10) x 2.5 cc/min
  - 90 cc/min/m²

- Dialysate flow: at least 1.5 x blood flow
HEMODILAYYSIS TECHNIQUE: Dialysate

- Na: 138-140 mmol/L
- K: 2-3 mmol/L
- Ca: 1.25-1.5 mmol/L
- Bicarbonate = 30-35 mmol/L
- Glucose: standard 200 mg/dL
- Temp: standard (keep 38-39 °C in small children)
HEMODILAYESIS TECHNIQUE: *Anticoagulant*

- **No anticoagulant**

- **Heparin**
  - *Loading dose*: 10-30 U/kg/hr
  - *Continuous drip*: 10-20 U/kg/hr
    (keep aPTT 1.5-3 x baseline)

- **Low molecular weight heparin**
  - 0.5-1.0 mg/kg
HEMODILAYYSIS TECHNIQUE: *Ultrafiltration*

- Not more than 1.5-2.0% of BW/hour
- Not more than 5% of BW

If UF > 5% BW: Mannitol and sodium 138-148 mEq/L

COMPLICATION
COMPLICATION: Dialysis disequilibrium syndrome

- Neurologic symptoms of varying severity due primarily to cerebral edema

- Predisposing factors
  - New patient with high BUN
  - Pediatrics
  - Metabolic acidosis
  - Underlying of seizure
COMPLICATION: Dialysis disequilibrium syndrome

Prevention

- Gradual reduction in BUN
- Initiated with two hours of dialysis
- Low blood flow rate
- Small surface area dialyzer
COMPLICATION: Dialysis disequilibrium syndrome

Prevention

- Mannitol 0.5-1 g/kg
- 50% glucose
COMPLICATION: Intradialytic hypotension

- **Predisposing factors**
  - Rapid reduction in plasma osmolality
  - Rapid fluid removal
  - Autonomic neuropathy
  - Diminished cardiac reserve
COMPLICATION: Intradialytic hypotension

- **Predisposing factors**
  - Intake of antihypertensive medications
  - Use of a lower sodium concentration
  - Sudden release of adenosine during organ ischemia
  - Ingestion of a meal immediately before or during dialysis
  - Reactions to the dialyzer membrane
COMPLICATION: Intradialytic hypotension

• Prevention
  • Accurate setting of the "dry weight"
  • Steady, constant ultrafiltration
  • Increased dialysate sodium concentration and sodium modeling
  • Bicarbonate dialysate buffer
COMPLICATION: Intradialytic hypotension

- **Prevention**
  - **Improvement in cardiovascular performance**
    - Increasing the dialysate calcium concentration
    - Using cool temperature
    - Correction of anemia with erythropoietin