PERITONEAL DIALYSIS WORKSHOP

Mignon McCulloch
Departments of Paediatric Nephrology & PICU
Red Cross Children’s Hospital & University of Cape Town
Clinical Patients

2.5kg boy
- Congenital Heart
- Post-op surgical
- No urine output x 8hrs
- What next?

9 month old boy
- Diarrhoea and vomiting
- Assessed as Shocked
- Management?

12 year old boy
- Meningococcal Sepsis
- Shocked needing inotropic support
- Poor urine output x 12hrs
- What next?
Clinical Problems Produced By AKI
Potassium Level

Potassium Level (mmol/L)

Fri 9 Mar 2007
Sat 10
Sun 11
Mon 12

PAYNE, JONTY

Potassium Level (mmol/L)
What does Peritoneal Dialysis (PD) do?

- Performed by introducing small volumes of dialysis solution (dextrose containing salt solution) into peritoneal cavity.
- By diffusion & ultrafiltration, toxic materials and water removed into dialysis solution.
- Removal from body of waste products / drugs occurs when dialysate is drained.
Appropriate timing of RRT – PD/CVVH
– inconclusive evidence

Absolute indications
- Severe Hyperkalaemia
- Clinical Uraemia
- Severe Acidaemia /Metabolic ‘chaos’
- Volume overload
  - Pulmonary oedema complicated by hypoxia or cardiogenic shock
  - Make space for nutrition

Relative indications
- Metabolic
  - Drugs eg. salicylates
  - Ammonia
- Temperature Control
- ? Liver failure
Quick and Easy
Gold Standard

- Attempt to transfer child to a paediatric renal centre if at all possible.
- Failing this, attempt to get surgeons to place a Tenckhoff catheter.
- *If neither possible attempt bed-side PD catheter*
Sterility

- Strict hand washing
- Sterile technique
Practicalities of PD

- Bed-side insertion by Paeds Nephrologist/Intensivist/Surgeons
- Airway management
- Empty Bladder
- Sedation + Local Anaesthetic
Practicalities of PD

- **Prescription**
  - Start off with 10-20ml/kg fluid per exchange
  - Adapted to ventilatory requirements

- **Dialysis fluid**
  - Lactate buffered – Dianeal or
  - Bicarbonate based - Bicavera
  - Weak 1.5%/Medium 2.5%/Strong 4.25%
  - ‘Home-made solutions’ – Ringers and 50% Dextrose

- **Cycles: Fill/Dwell/Drain**
  - 10/30-90/20mins
Making Fluid for Dialysis

- 1L Ringers lactate:
  (Na 127 mmol/L lactate 27 mmol/L Ca 1.36 mmol/L K 3.8 mmol/L glucose 1.45 % Osmo 346)

- 30 ml 50% dextrose = 1.5%
- 50ml 50% dextrose = 2.5%
- 85ml 50% dextrose = 4.25%

- This is similar to lactate based PD solutions
PD Fluid Prescription

Adjustments
- Fluid overload – increase sugar solution
- Solute removal eg. K+ - increase frequency of cycle (Ensure K+ free solution)

Additives
- Heparin 500-1000u/litre
- Antibiotics ?

- Neonates /liver failure– better to use bicarbonate based solution
- Lactate based fluids may confuse lactate reading on gas
PD Catheters

- **Art of Medicine?** *Innovative and Creative*
  - Cannulaes
  - Naso-gastric tubes/Chest Drains
  - Venous Central lines
  - Rigid ‘Stick’ catheters
  - ‘Peel away’ Tenckhoff
  - Flexible Multi-purpose drainage catheters
    - *Auron A et al Am J Kidney Dis 2007*
New Generation Cook Catheters

Use of the Multipurpose Drainage Catheter for the Provision of Acute Peritoneal Dialysis in Infants and Children

Ari Auron, MD,† Bradley A. Warady, MD,† Steve Simon, PhD,§ Douglas L. Blowey, MD,† Tarak Srivastava, MD,† Gulam Musharaf, MD,† and Uri S. Alon, MD†

Figure 1. CMMDC. (Top) Mac-Loc mechanism, (center) distal fenestrations, and (bottom) distal catheter coiling. (Reprinted with permission from Cook Inc, Bloomington, IN).
Kimal ‘Peel-away’ Tenckhoff
Step Wise

- Catheter in
- Clean
- Introduce local anaesthetic
  - To peritoneum
- Vascular cannula insertion
  - Aim below bifurcation of aorta
- Connect blood giving set and fill abdomen til “tense” – normal saline
Keep Going

- Introduce guidewire again aiming into pelvis
- Remove vascular canula
- Increase skin opening with needle/scalpel
- Introduce Catheter over guide aiming for pelvis
- Remove Guidewire
- Secure and connect
Securing Catheter

- Collect fluid for MC&S.
- Connect plastic tubing (or transfer set) with Y connection to the catheter and allow drainage of fluid.
- Strap PD catheter securely to abdominal wall.
- Tunnelling in bigger kids
Automated Dialysis Home choice machine
Manual Dialysis with Fluid Warmer
<table>
<thead>
<tr>
<th>Time In</th>
<th>Fill Volume</th>
<th>Drain Volume</th>
<th>Time Out</th>
<th>Fill – Drain Ultrafiltrate</th>
<th>Cumulative</th>
<th>Fluid Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00</td>
<td>200ml</td>
<td>220ml</td>
<td>11.00</td>
<td>20ml</td>
<td>20ml</td>
<td>2.5% Balsol</td>
</tr>
<tr>
<td>11.20</td>
<td>200ml</td>
<td>245ml</td>
<td>12.20</td>
<td>45ml</td>
<td>65ml</td>
<td>4.5% balsol</td>
</tr>
</tbody>
</table>
Long term

- Replace with a formal Tenckhoff after 5-7 days if possible.
- Assess social situation
  - Cost in other countries
  - What does it do to the rest of the family
- SA – we do not offer long term dialysis to a patient who is not a transplant candidate
Tips for Success

- Size matters...keep skin nick at minimum or nil at all
  - Else will leak!!!
- Avoid metal needle that comes with pack
  - Rather Jelco/Venous access catheter
  - Withdraw needle 0.5mm as go thru peritoneum and advance plastic sheath
- Run fluid in freely to fill abdomen before wire and catheter
  - If not free-flowing → pull needle back slightly
  - May be in bowel?....role of ultrasound
  - Don’t forget to empty bladder
General Rules

- Maintain absolute strict sterile technique when mixing.
- The Less you add the less chance of infection.
- Don’t mix Bicarb and Calcium.
- Can add K up to 4-5 mmol /L to correct K.
- Can add concentrated NaCl to increase Na to within about 15mmol of patients sodium.
- Generally add heparin 500-1000IU/L to bags (use new heparin each time to avoid infection).
- IV solution [ ] may vary from country to country so check concentrations before mixing.
ISPD GUIDELINES/RECOMMENDATIONS

PERITONEAL DIALYSIS FOR ACUTE KIDNEY INJURY

Brett Cullis,1,2 Mohamed Abdelraheem,3 Georgi Abrahams,4 Andre Balbi,5 Dinna N. Cruz,6 Yaacov Frishberg,7 Vera Koch,8 Mignon McCulloch,9 Alp Numanoglu,10 Peter Nourse,9 Roberto Pecoits-Filho,11 Daniela Ponce,5 Bradley Warady,12 Karen Yeates,13 and Fredric O. Finkelstein14
Boston Children’s Hospital

Register and Login at openpediatrics.org

Join the global conversation.

Monthly World Shared Practice Forums for physicians and nurses.

LEARN ABOUT OPENPediatrics

JOIN OUR COMMUNITY

SUPPORT OPENPediatrics

GLOBAL KNOWLEDGE SHARING

OPENPediatrics is an online community of clinicians sharing best practices from all resource settings around the world through innovative collaboration and digital learning technologies.

Our open access, online educational platform is sponsored by Boston Children’s Hospital in collaboration with the...

PARTICIPATION AND USE

- Hospitals: 883
- Countries: 122
- Video Views: 87k

...And growing

Why is it needed?
Program Director Dr. Burns shares the inspiration for OPENPediatrics.
Welcome to the **Peritoneal Dialysis Simulator**

The purpose of this application is to educate you on **proper peritoneal dialysis protocol** through a series of **interactive stages**. Along the way, we will **track your progress** and assess your abilities in a series of **final patient simulations**.

**STAGE 1**
**Knowledge Guide**
Learn the basic information necessary to successfully perform peritoneal dialysis.

**STAGE 2**
**PD Tactics**
Apply your knowledge to a series of peritoneal dialysis tasks and scenarios.

**STAGE 3**
**Case Studies**
Test your abilities in three challenging case studies.

12 hours have passed
Says that the patient is having trouble breathing.
Acute PD in Children

- Acute PD is possible
  - Without a surgeon....altho first prize to have a surgeon
  - By Doctors or Nurses...building teams
  - Using improvised equipment...altho better to have PD catheters
  - Using home made fluid...altho better to have manufactured fluid
  - With good outcomes in many
Thank you to all my colleagues @ Red Cross Children’s Hospital
Thank you for coming to this course!