ASFA Conference 2015, Review Session
May 6, 2015

PEDIATRIC APHERESIS:
Optimizing Care in a Complex Patient Population

Christina Gallagher, RN, BSN
Apheresis Coordinator
Nationwide Children’s Hospital
Columbus, Ohio
Disclosures:

- No relevant financial or nonfinancial relationships to disclose
Session Goals:

• Summarize common diseases in which apheresis is performed in the pediatric population
  ➢ Focus primarily on patient population $\leq 25$kg
• Review Total blood volume calculations and blood volumes related to both Cobe Spectra and Spectra Optia
• Examine types of access commonly used in pediatrics
• Explain blood and albumin primes
• Explore fluid and electrolyte management
• Discuss treatment of the family as a whole unit
Challenges within this patient population

- Limited data available specific to children
- Indication categories primarily based on experience in adults
- Physiological differences, including smaller total blood volume (TBV)
- Potential difficulty in obtaining vascular access
Common conditions treated in pediatric population

Plasma Exchange
- TTP
- Solid organ transplant rejection
- Renal disorders such as:
  - Atypical HUS
  - Wegner’s granulomatosis
  - Good Pasture’s syndrome
- Neurologic disorders such as:
  - Neuromyelitis Optica
  - Guillen Barre Syndrome
- Myasthenia Gravis
- TAMOF

🌟 Indications for TPE are constantly evolving
Common conditions treated in pediatric population

Red Cell exchange
• Sickle cell acute stroke
• Secondary stroke prevention
• Malaria

Peripheral Blood Progenitor cell collections
• Autologous donor
• Allogeneic (sibling) donor

WBC depletion
• New onset leukemias
Blood volume considerations

Both the Cobe Spectra and the Spectra Optia will perform calculations for Total Blood volume (TBV)

Exceptions or special considerations to this include:

- Cobe will perform calculation for all weights but it is recommended to calculate if patient is <25kg
- Optia will not perform calculations for patients <25kg and operator must perform manual calculation
- Obese patients, should ideal body weight be taken into account for calculations
Total Blood Volume Calculations

<table>
<thead>
<tr>
<th>Age of Child</th>
<th>TBV Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants 1 month-1 year</td>
<td>80 ml/kg</td>
</tr>
<tr>
<td>Children 1-18 years</td>
<td>70 ml/kg</td>
</tr>
<tr>
<td>Adults</td>
<td>TBV calculated by the machine</td>
</tr>
</tbody>
</table>
## ECV of circuit and Fluid Balance considerations

<table>
<thead>
<tr>
<th>Type of Kit</th>
<th>ECV</th>
<th>Rinseback Volume</th>
<th>Net Fluid Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectra TPE</td>
<td>170 ml</td>
<td>345 ml</td>
<td>+195</td>
</tr>
<tr>
<td>Spectra RBCX</td>
<td>170 ml</td>
<td>N/A</td>
<td>-100</td>
</tr>
<tr>
<td>Spectra AutoPBSC</td>
<td>165 ml</td>
<td>335ml</td>
<td>Not programmable. When projecting FB, add +185</td>
</tr>
<tr>
<td>Optia Exchange set</td>
<td>141 ml to 185 ml</td>
<td>110 ml</td>
<td>100%</td>
</tr>
<tr>
<td>Optia MNC</td>
<td>147 ml to 191 ml</td>
<td>110 ml + volume of blood warmer</td>
<td>Not programmable</td>
</tr>
</tbody>
</table>

Assumes No Blood Prime and 100% fluid balance
ECV=extracorporeal volume
Other Special Considerations regarding ECV and patient TBV

- Clinicians performing the procedure should always maintain awareness of safe ECV of pediatric patients
- Most patients <25 kg will require a blood or albumin prime
  - Optia prompts a red cell or albumin prime when ECV or extracorporeal red cell volume exceeds 10-15% of patient’s TBV or RCV.
Electrolyte management

• One of the common adverse reactions is Hypocalcemia
  ➢ secondary to anticoagulation with ACD-A
  ➢ Pediatrics are more susceptible for this procedure reaction

Hypomagnesemia and Hypokalemia can also be seen in the population

➢ Monitoring of these lab values intermittently can be useful in guiding symptom management as they can all be intertwined and exacerbate the hypocalcemia

➢ Treatment and replacement of these is less common though it can be beneficial
Vascular Access

- One of the most difficult tasks in this population
- Peripheral access can be successful when
  - There is adequate venous access is needed
  - The intended use is for intermittent procedures
  - The child is cooperative or easily entertained/distracted
  - Using smaller peripheral access devices

- Central venous access devices
  - 5-9 Fr cuffed (for longer term use), uncuffed catheter, ex: Cook and Medcomp
    - 15kg or less 5-7 Fr
    - 16-25 kg 9 Fr
  - Subcutaneous implanted port (SIP)
    - \( \leq 20 \)kg 6.4 Fr
    - >21kg 9.6 Fr
Preparing the Child and Family for Apheresis

- Involve both the patient and his/her parent or caregiver in the care/preparation whenever possible
- Incorporate Child Life when possible, allow for role play
- Take into account the developmental stage that the patient is in to help alleviate anxiety
- Include the child in the consent process if age appropriate
- Remember we are not only treating the patient, we are also treating their family

<table>
<thead>
<tr>
<th>Age</th>
<th>Stage</th>
<th>Outcome/growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infancy (0-18 months)</td>
<td>Trust vs Mistrust</td>
<td>Child develops a sense of trust from caregivers that show affection and are reliable</td>
</tr>
<tr>
<td>Early Childhood (2-3 years)</td>
<td>Autonomy vs Shame/doubt</td>
<td>Child will learn personal control, independence</td>
</tr>
<tr>
<td>Preschool (3-4 years)</td>
<td>Am I good or bad?</td>
<td>Child begins to explore skills, ask questions, and assert “power” over their environment</td>
</tr>
<tr>
<td>School Age (5-7 years)</td>
<td>Am I self-confident?</td>
<td>Child will cope with new demands socially as well as academically. Child gains confidence.</td>
</tr>
</tbody>
</table>
Conclusions

- Small pediatric patients can be treated both safely and effectively.
- This population because of their size and physiology can pose both complicated and unique challenges in the world of therapeutics. These challenges lead to procedural modifications related to access, electrolyte management, machine primes.
- Children and their families should be approached and taught as whole and teaching/approach should be based on their developmental stage.
Reference

COBE Spectra Apheresis System Essential’s guide for use with COBE Spectra system, versions 4.7, 5.1-5.9, 6.0-6.9, 7.0-7.9, Lakewood, CO: Terumo BCT Inc., 2012:9.1-9.5

