ASFA Session I: Multicomponent Apheresis Donation
10/23/2007
8:30AM – 10:00AM
Event Outline

Event Title: 5402-RC ASFA/AABB: Multicomponent Apheresis Donation
Event Director: James W. Smith
Event Date: Tuesday, October 23, 2007, 8:30 AM to 10:00 AM

Presenters: Wanda Koetz
James W. Smith

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 AM to 9:00 AM</td>
<td>James W. Smith</td>
<td>Current Status of Apheresis Donations</td>
</tr>
<tr>
<td>9:00 AM to 9:45 AM</td>
<td>Wanda Koetz</td>
<td>Management of Multicomponent Apheresis Donors</td>
</tr>
</tbody>
</table>
EVENT FACULTY LIST

Event Title: 5402-RC ASFA/AABB: Multicomponent Apheresis Donation
Event Date: Tuesday, October 23, 2007
Event Time: 8:30 AM to 10:00 AM

Director
James W. Smith
MD, PhD
1001 N Lincoln Blvd
Oklahoma City, OK, 73104, USA
405-297-5504
jsmith@obi.org

Speaker
Wanda Koetz
RN, HP(ASCP)
651-636-6190
KoetzW@usa.redcross.org
Disclosures: No

Speaker
James W. Smith
MD, PhD
1001 N Lincoln Blvd
Oklahoma City, OK, 73104, USA
405-297-5504
jsmith@obi.org
Disclosures: No
Management of Multiple Component Apheresis Donors

Wanda Koetz, RN, HP (ASCP)
American Red Cross
Biomedical Services Headquarters
Washington, DC
October 23, 2007

Outline
- Multiple procedure types
- Apheresis device capabilities
- Preventing/treating reactions
- Food and Drug Administration (FDA) regulations
- AABB Standards
- Managing donor eligibility
- The future?

Procedure Types
- Platelets
- Platelets/plasma
- Platelets/red cells
- Platelets/red cells/plasma
- Red cells/plasma
- Double red cells

Procedure Types (cont.)
- Plasma
- Granulocytes
- Mononuclear cells

“Product” Types
- Single platelethpheresis
- Double platelethpheresis
- Triple platelethpheresis
- Leukoreduced platelethpheresis
- Standard volume plasma
- “Jumbo” plasma
- Source Plasma
- Fresh Frozen Plasma
- Plasma frozen within 24 hours

“Product” Types (cont.)
- Apheresis red blood cells
- Leukoreduced apheresis red blood cells
Apheresis Device Capabilities

- Alyx
  - Double red cells
  - Red cells/plasma
- Amicus
  - Platelets
  - Platelets/plasma
  - Platelets/plasma/red cells
  - Mononuclear Cells

Apheresis Device Capabilities (cont.)

- AS-104
  - Platelets
- Auto-Pheresis C
  - Plasma
- CS-3000
  - Platelets
  - Platelets/plasma
  - Granulocytes
  - Mononuclear cells

Apheresis Device Capabilities (cont.)

- Cymbal
  - Double red cells
- MCS+ LN8150
  - Red cells/plasma
  - Double red cells

Apheresis Device Capabilities (cont.)

- MCS+ LN9000
  - Platelets
  - Platelets/plasma
- PCS
  - Plasma

Apheresis Device Capabilities (cont.)

- Spectra
  - Platelets
  - Platelets/plasma
  - Granulocytes
  - Mononuclear cells

Apheresis Device Capabilities (cont.)

- Trima
  - Platelets
  - Platelets/plasma
  - Platelets/plasma/red cells
  - Red cells/plasma
  - Double red cells
**American Red Cross, 2006**

- 36 regions
  - 36 collect platelets
  - 31 collect double red cells
- Approximately 130 fixed sites

**ARC Data (cont.)**

- 540 Amicus
- 295 Spectra (some for therapeutics)
- 260 Trima
- 350 MCS+LN 8150
- 50 Auto-C
- 170 ALYX

**ARC Data (cont.) - 2006**

- 152,000 double red cell procedures on MCS+
- 70,000 double red cell procedures on ALYX
- 450,000 platelet procedures (includes Amicus, Spectra, and Trima)
  - 300,000 Amicus
  - 140,000 + Gambro
- Granulocytes on CS-3000 and Spectra(≈ 2500/year)

**ARC Data (cont.)**

- Reactions per 10,000 procedures
  - 20.56 - hematomas (no outside medical care)
  - 5.64 – other (no outside medical care)
  - 1.87 – loss of consciousness without injury (no outside medical care)
  - 1.15 – possible nerve involvement (no outside medical care)
  - 1.07 – other (required outside medical care)
- 0.003% over all rate per 10,000 procedures
- Citrate symptoms

**Preventing Reactions**

- Donor criteria
- Lower donor/staff ratio
- Fluid replacement
  - Anticoagulant
  - Instrument prime solution
  - Saline replacement for red cell apheresis
- Use of oral calcium supplements
- Keep the donor warm
- Lower ECV devices
Treating Reactions

- Personal attention from staff
- Positioning the donor
- Use of oral calcium supplements
- Pausing procedure
- Saline infusion
- Lower the flow rate
- Change the anticoagulant ratio

FDA Regulations

- 1988 Guidance Document for Plateletpheresis
  - No more than 24 times per year
  - No more than 2 in 7 days with 48 hours between
  - ECV of red cells must be < 100 mL if a whole blood or equivalent loss in the previous 56 days

FDA Regulations (cont.)

- 1995 Memorandum for Infrequent Plasmapheresis Donors
  - Every 4 weeks
  - Volumes retained of 500/600 mL or per manufacturer’s approval with each procedure

FDA Regulations (cont.)

- “The Standard Operating Procedures should include procedures to ensure that the donor is not participating simultaneously in other blood or plasma collection programs, or has not been a frequent (more often than every 4 weeks) apheresis donor.”

FDA Regulations (cont.)

- 2001 Guidance Document for Apheresis Red Cells
  - Every 8 weeks if donating RBC and platelets and/or plasma
  - Every 16 weeks for double red cells
  - Additional deferral periods based on actual red cell loss

AABB Standards

- 5.5.2.1 – every 4 weeks for “infrequent” plasmapheresis donors
- 5.5.2.2.1 – maximum of 2 in a 7-day period with 2 days between
- 5.5.3.1 – “total plasma removed shall not exceed the amount cleared by the FDA by the instrument.”
5.5.3.2 – Deferred for 8 weeks if given whole blood unless red cell ECV of the instrument is < 100 mL
5.5.3.3 – If red cell loss during apheresis is ≥ 200 mL, deferred for 8 weeks
5.5.3.6.1 – Deferred for 16 weeks after apheresis

5.5.4.1 – “In the case of multiple concurrent component collection by apheresis, the combined volume limits of red cells and plasma removed from the donor shall follow criteria for the FDA-cleared device used.”

Donor Management

- Donation frequency
  - Types
  - Intervals

Donor Management (cont.)

- Donation volumes
  - RBCs
    - Per donation (including sample tubes, residual in disposable, and any RBCs in the collected component)
    - Cumulative RBC losses over 12 months
  - Plasma
    - Per donation (including sample tubes, residual in disposable, and actual plasma volume in the collected components)
    - Cumulative plasma losses over 12 months

Donor Management (cont.)

- Establishing maximums
  - RBC
    - Per donation (according to manufacturer’s directions)
    - In 12 months – “should not exceed the loss of RBC permitted by FDA regulations for whole blood collection.”

Donor Management (cont.)

- Plasma
  - Per donation – according to manufacturer’s directions
  - In 12 month period
    - 12 liters for donors ≤ 175 lb
    - 14.4 liters for donors > 175 lb
Donor Management (cont.)

- Tracking
  - Manual records
  - "home grown" software programs
  - Blood computer systems (Progesa/eProgesa)
  - Data management systems (for example, Vista)

- TRALI
  - Plasma by November 2007
  - Plasma containing products by 2008

- Strategies
  - Male-only
  - Question the donor
  - Test

Summary

- Management of the donor to prevent/treat reactions
- FDA and AABB regulations
- Management of donor eligibility information

The Future???

- 2005 FDA Draft Guidance Document for Apheresis
  - Maximum of 24 products per year, not donations
- New devices?
- New approved procedures for current devices?
- Increased demand for granulocytes?

Questions?
CURRENT STATUS OF DONOR APHERESIS IN THE U.S.

James W. Smith, MD, PhD
Oklahoma Blood Institute

Apheresis Donations

- Improved Technologies
- Increased Efficiencies
- Ability to collect multiple products- whether multiples of one or several different components
- cGMP through standardization, reproducibility, and automated manufacture of products

Equipment for Donor Apheresis

- Baxter Fenwal- Amicus, ALYX, Autopheresis-C
- Gambro BCT (Cobe)- Trima, Trima Accel
- Haemonetics- MCS 8150, 9000, Cymbal, PCS-2

Apheresis Platelets

- From 2001 to 2004 there was a 4.9% increase in apheresis platelets vs 0.9% increase in WB-derived platelets.
- From 2001 to 2004 there was a 10% increase in transfusion of apheresis platelets vs 41.2% decrease in transfusion of WB-derived platelets.

Platelet Collection and Usage (in thousands of units)

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2001</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apheresis Platelets</td>
<td>9,161</td>
<td>8,734</td>
<td>4.9</td>
</tr>
<tr>
<td>WB Platelets</td>
<td>4,202</td>
<td>4,164</td>
<td>0.9</td>
</tr>
<tr>
<td>Transfusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apheresis Platelets</td>
<td>8,338</td>
<td>7,582</td>
<td>10.0</td>
</tr>
<tr>
<td>WB Platelets</td>
<td>1,537</td>
<td>2,614</td>
<td>-41.2</td>
</tr>
</tbody>
</table>
Apheresis Plasma/FFP

- From 2001 to 2004 there was a 4.8% increase in production of these components.
- From 2001 to 2004 there was a 4.1% increase in transfusion of these components.

Transfusable Plasma (in thousands of units)

<table>
<thead>
<tr>
<th>Collection</th>
<th>2004</th>
<th>2001</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFP/Aph. Plasma</td>
<td>4,651</td>
<td>4,437</td>
<td>4.8</td>
</tr>
<tr>
<td>Transfusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FFP/Aph. Plasma</td>
<td>4,089</td>
<td>3,926</td>
<td>4.1</td>
</tr>
</tbody>
</table>

WB vs Apheresis RBCs

- From 2001 to 2004 there was a 2.6% decrease in WB RBCs produced vs a 200.4% increase in apheresis RBCs.
- For this same period there was a 2% overall increase in the transfusion of RBCs.

RBC Collection and Usage (in thousands of units)

<table>
<thead>
<tr>
<th>Collection</th>
<th>2004</th>
<th>2001</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB Allo + Directed</td>
<td>13,906</td>
<td>14,428</td>
<td>-3.6</td>
</tr>
<tr>
<td>Auto</td>
<td>458</td>
<td>619</td>
<td>-26.0</td>
</tr>
<tr>
<td>Apheresis</td>
<td>824</td>
<td>273</td>
<td>200.4</td>
</tr>
<tr>
<td>Total</td>
<td>15,019</td>
<td>15,076</td>
<td>-0.4</td>
</tr>
<tr>
<td>Transfusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WB Allo + Directed</td>
<td>13,852</td>
<td>13,456</td>
<td>-2.9</td>
</tr>
<tr>
<td>Auto</td>
<td>270</td>
<td>359</td>
<td>-24.6</td>
</tr>
<tr>
<td>Total</td>
<td>14,182</td>
<td>13,898</td>
<td>2.0</td>
</tr>
</tbody>
</table>

MCC- RBC Collection (BCA-2005) (in thousands of units)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB + Directed</td>
<td>4,476</td>
<td>97.1</td>
</tr>
<tr>
<td>Auto</td>
<td>99</td>
<td>2.4</td>
</tr>
<tr>
<td>Total (WB)</td>
<td>4,593</td>
<td></td>
</tr>
<tr>
<td>Automated</td>
<td></td>
<td></td>
</tr>
<tr>
<td># RBC Procedures</td>
<td>344</td>
<td></td>
</tr>
<tr>
<td># RBC Products</td>
<td>629</td>
<td>12% (WB + Apheresis)</td>
</tr>
<tr>
<td># Concurrent Plasma</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td># Jumbo Plasma</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Total Products</td>
<td>679</td>
<td></td>
</tr>
</tbody>
</table>

Current Estimates for RBCs

- Automated RBCs- 824,000 (in 2004)
- Growth Rate of 25% annually for 2 years yields approximately 1.3 million RBC/yr
**MCC- Apheresis Platelets (BCA-2005) (in thousands of units)**

- # Platelet Apheresis Procedures 322
- # Single Products 508
- # Concurrent Plasma 66
- # Concurrent Jumbo Plasma 6
- # Concurrent RBCs 33
- Total Products 641

**Cellular Therapy Product Donations (2004)**

<table>
<thead>
<tr>
<th></th>
<th>Autologous</th>
<th>Allogeneic</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC-A</td>
<td>14,083</td>
<td>3,298</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>565</td>
<td>1,023</td>
</tr>
</tbody>
</table>

**Future Developments**

- Continue to enhance “manufacturing” at the donor site.
- Devices under development can provide faster, more efficient processing, or finished WB components at the bedside.
- Continue to enhance safety- saline administration can decrease hypovolemic and vaso-vagal reactions.

**Opportunities**

- Educate donors and staff.
- Reengineer aspects of the donation process as well as downstream activities.
- The goal is to collect the right product at the right time, from the right donor.

**Information Sources**

- The 2005 Nationwide Blood Collection and Utilization Survey Report, DHHS
- The 2006 BCA/hemerica Annual Survey