MECHANISM OF ACTIONS OF AUTOMATED RED BLOOD CELL EXCHANGE

SEPTEMBER 2012
Agenda

- Indications for RBC exchange
- RBCX procedure goal
- Indications for RBC depletion
- RBC depletion procedure goal
- RBCX procedure techniques
- Benefits of depletion/exchange procedure
- COBE Spectra – Spectra Optia
Indications for RBC Exchange

- Sickle Cell Disease
- B – Thalassemia major
- Protozoal infections (Malaria, Babesiosis)
- Incompatible RBC Transfusion
- Carbon Monoxide poisoning
Role of RBCX in Hemoglobinopathies

- Replace abnormal patient RBCs with normal donor RBCs to improve oxygen delivery and clinical condition more efficiently than simple transfusions.
- Maintain the patient’s hematocrit (Hct) at an appropriate level.
- Prevent or decrease iron overload associated with either the disease process or the use of simple transfusion.
RBCX - Procedure Goals

- Reduce the number of defective/infected red blood cells
- Maintain or alter the patient’s hematocrit (Hct) (Avoid Hyperviscosity)
- Control of the fluid balance
Indications for RBC Depletion

- Polycythemia vera
- Iron overload
  - Primary hemochromatosis
  - Secondary hemochromatosis
    - Iron-loading anemia
    - Chronic transfusion
Rapid removal of greatly elevated numbers of RBCs to reduce blood viscosity and red cell volume, or removal of RBCs to reduce iron load and maintain normal iron levels.

Control of the fluid balance by replacement of removed volume with appropriate fluids.
Indications for RBC Depletion/Exchange

- Thalassemia Beta Major
- Sickle Cell Disease
Benefits of Depletion / Exchange procedure

- Better reduction of HbS
- Improved extraction efficiency
- Less use of RBC units as a replacement fluid
RBCX procedure techniques
Calculate FCR

Starting Defective RBC Cells (Pre)  60%

Target Defective RBC Cells (Post)  18%

\[
\frac{\text{Post} \%}{\text{Pre} \%} = \text{Target FCR}
\]

\[
\frac{18\%}{60\%} = 30\%
\]

Target FCR
Flexibility to Perform Multiple Types of RBCX Procedures

COBE Spectra
- Exchange
- Depletion
- Depletion/Exchange
  - (off label)

Spectra Optia
- Exchange
- Depletion
- Depletion/Exchange
Confidence you expect

COBE Spectra System

Spectra Optia System
COBE Spectra Red Cell Exchange Set

COBE Spectra System

[Diagram of the COBE Spectra System with labels for Patient RBCs and Donor RBCs, showing the connections and flow of blood between the patient and donor.]
Spectra Optia Exchange Set

Spectra Optia System
RBC Single-Stage Channel Separation

RBC, WBC, & Platelet out

Plasma returned

Whole Blood In
Sex, height, weight
Patient’s Hct
Average replacement fluid Hct
Desired end Hct for the patient
Fluid balance
The Spectra system uses the Hct values entered to calculate the corresponding red cell volume of the patient (before and after the procedure) and the replacement fluid required in order to achieve the desired end results.

**Data Entry**

Patient Hct= 22 %, End Hct= 30 %
Average replace Hct= 55 % OK(YES/NO)?
1. Once the initial data has been entered, the following screen appears:

   **Calculate replacement fluid volume needed.** (YES/NO)?

2. To determine the replacement volume required, press **YES**.
3. Enter the desired fraction of red cells remaining (FCR). The default FCR is 40%.

Enter desired Fraction of red cells remaining: FCR = \{40\}\%  (YES/NO)?
1. Once the initial data has been entered, the following screen appears:

   Calculate replacement fluid volume needed (YES/NO)?

2. Press NO. The following screen appears:

   Enter total replacement fluid volume: { 0} ml.
Replacement Volume Entry

3. Enter the available replacement volume:

   Enter total replacement fluid volume: {2000}ml.

4. The Spectra system calculates and displays the run results:

   Replace=2000 ml,  FB=100%,  FCR= 44%,  
   End Hct= 30%,  time= 48 min  OK(YES/N0)?
Patient Data
Fluid Data

Exchange type
Fluid Data (continued)

- Replacement fluids
- Fluid balance
Enter target FCR for patient (%).
Main Run Screen
Exchange status screen

**Exchange Status**

- **Fluid Balance**
  - Current: -9 mL (99%)
  - -385 mL (75%)
  - 385 mL (125%)

- **Replacement Fluid**: RBC
- **Bolus Volume (mL)**: 0
- **Patient Hct (%)**: 25

**Fluid Status**

- **Remove (mL)**: 7
- **Exchange (mL)**: 6

**Date and Time**: 5-06-2009 15:14
Indications for RBCX
Indications for RBCX

Sickle cell Disease
Indications for RBCX

Hemochromatosis
Indications for RBCX

Thalassemia
Indications for RBCX

Malaria/Babesiosis
Indications for RBCX

Incompatible RBC Transfusion
Indications for RBCX

Polycythemia Vera & Erythrocytosis
Indications for RBCX

Carbon Monoxide Poisoning
Indications for RBCX

- Sickle Cell Disease
- Thalassemia
- Incompatible RBC Transfusion
- Carbon Monoxide Poisoning
- Hemochromatosis
- Malaria/Babesiosis
- Polycythemia Vera & Erythrocytosis