Pediatric Cardiac Transplantation of a Highly Sensitized Patient After Mechanical Support and Exchange Transfusions: A Case Report

Dafne Andrea Chianella, CCP
Alicia Sievert, CCP, FPP; Mary McCall, CCP,FPP; Jeffery Acsell, CCP; Anthony Shackelford, DHA, CCP
Disclosures

- I have no disclosures
Overview

Sensitization

- Define
- Causes
- Effects
- Therapeutic Options
- Case Report
What is Sensitization?

* The development of circulation antibodies directed against human leukocyte antigen (HLA) system.

* HLA System: genes responsible for regulating the human immune system
  - Diversity in humans
  - Defense against disease

HLA exposure = AB production = sensitivity
Measures of Sensitivity?

- Panel reactive antibody test. (PRA)=% of incompatible donors in a population.
- scouring:
  - 0% - 99%.
  - PRA ≥10% = elevated
    Aka “Sensitized”

Mean fluorescence intensity (MFI)= represents the strength of antibody binding.

- MFI >8000 = strong binding
- MFI 2000-8000 = moderate binding
- MFI <2000 = weak binding.
What Causes Sensitization?

- Previous blood transfusions
- Previous transplantations
- Exposure to VADs and ECMO
- Exposure to allograft material
- Pregnancy

AB = Sensitization
Effects Of Sensitivity

• Pre-op
  – Restrictions on possible donors
  – Exclusion from transplant lists
  – Prolonged waiting times

• Post-op
  – Cardiac transplant rejection manifestations
    • Acute cell-mediated rejection
    • Antibody-mediated rejection (AMR)
    • Cardiac allograft vasculopathy
Pre-, Intra-, and Post-operative desensitization
- Plasmapheresis
- Intravenous immunoglobulin (IVIG)
- anti-T-cell and anti-B-cell agents and other meds.
- Exchange transfusions
Exchange Transfusion: Perfusion Strategy

- Toronto, Hospital for Sick Children:
  - West LJ, Pollock-Barziv SM, Dipchand Al et al.
  - ABO-incompatible heart transplantation in infants.

- Summery:
  - Neonatal “Grace Period” of immunological immaturity.
  - ABO-incompatible heart transplantation
  - Exchange transfusion:
    - prime components
    - plasma discarded, RBC’s washed and returned
    - Anti-A and anti-B AB titer levels tested.
Case Report

- 16 y.o. male with history of dilated cardiomyopathy/heart failure.
- 5/20/2013: listed for cardiac transplant
  - Heartware?
- 6/3/13: acutely decompensated
  - Multi organ failure
Emergent Centrimag Insertion

- Pending Heartware approval
- Ascending aorta - 21 Fr cannula
- RSPV/left atrial junction - 28 Fr angled metal-tipped
- MANY blood products
  - liver and kidney function slowly improved
PROCEDURE:
1. Centrimag LVAD explantation.
2. Tricuspid valve annuloplasty
3. Primary repair of ASD (PFO)
4. Heartware LVAD implantation.
   - Aorta and LV apex cannulation.
   - 4 L per minute at 2700 RPM
   - TEE = severe RV dysfunction, mild TR
   - Several transfusions.
Pathway to Sensitization

- VADs and high number of transfusions
- PRA= 86%
- Positive autocross-match
  - Possibly viral ??=> Caused cardiomyopathy
  - MFI of 20,000 to himself.

- Donor Qualifications:
  - virtual cross-match= MFI< 2000.
  - Prospective cross-match showed less reaction than autocross-match
MUSC Clinical Protocol for a Highly Sensitized Patient

- Pre-Transplant and Peri-Operative Guidelines:
  - Tacrolimus, Mycophenolate mofetil, and Solumedrol

- Intra-operative 3X volume exchange
  - Remove the whole blood
  - Transfuse PRBC and FFP cocktail
  - Initiate CPB
  - Separate/discard plasma (source of circulating AB)
  - Return washed pt PRC
Exchange Transfusion

- Patient Parameters:
  - Ht: 180cm Wt: 60 kg
  - BSA: 1.8 m2

- 3x Exchange Cocktail:
  - 19.5 units PRBC
  - 19.5 units FFP

- 1.5x Exchange Cocktail
  - 9.8 units PRBC
  - 9.8 units FFP
**Diagram of Cardiovascular Circuit**

- **Aortic canula**
- **SVC**
- **Aorta**
- **IVC**

**Components and Processes:****

- **Filter**
- **Roller Pump**
- **Oxygenator and reservoir with blood and fluid prime**
- **Clamped during exchange transfusion**
- **Clamped during CPB**
- **Venous drainage collected**

**Annotations:**

- This blood can be discarded or can be used for plasma and platelet sequestration.
OHT

• Heartware and AICD explant.
• CPB
  – Exchange Transfusion
  – OHT total ischemic time= 224 min.

• MUSC anti-rejection Post-Transplant guidelines:
  1. Immunosuppression
     Cellcept, Solumedrol, tacolimus
  2. Rejection Monitoring
     Endomyocardial biopsy
1 Year Post-Op RESULTS

- Current ECHO
  - EF= 57.8%

- Pathology 9/4/2014
  - elevated donor-specific antibodies
  - complement deposition on his graft.
    Immunofluorescence Microscopy:
    -(+) capillary deposition of C4d
  - AMR (antibody-mediated rejection)

- Treatment:
  - medically and with plasmapheresis.
Conclusion

• VAD therapy and multiple transfusions can bridge a cardiac patient to transplant, but is associated with many risks.

• The development of HLA antibodies can lead to sensitization, severely limiting the possible donor pool.

• An exchange transfusion, in combination with pre-, intra, and post-op desensitization therapies may help delay/decrease rejection.

• With the number of sensitized patients awaiting OHT increasing, we must continue to research and develop strategies to decrease morbidity and mortality.
Social Media Update:

Well today is a very special day to me! It is my one year anniversary of having my new heart! 💗 <3 . With God all things are possible 🌟 , I'm am still here today because of 2 people who are both my hero's! God and my donor who I am both so thankful for 💓 .

#realscars#realbattle
#realwarrior
#transplantlife

319 people like this.