The Transfusion Service’s Role in Solid Organ Transplantation

Nicole Draper, MD
3/9/2011
Pre-Transplant
UNOS

- 2 ABO typings, different specimens
  - A subtyping
  - Donors: trauma blood
- 2 person database verification

Anti-A → Endothelium → Complement

Vascular Damage → Thrombosis
UNOS

• Patient waiting list
  – Regionally
  – ABO blood group
  – HLA type and/or antibodies
  – Red cell antibodies

• Transplant center final check: ABO of recipient and donor
Case 1

- 45 year old man with hypertropic cardiomyopathy
- 5 months ago had LVAD placed
- >10 RBC’s transfused
- 4 months ago negative ABSC
- Heart available for transplant
## Antibody Panel

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<th></th>
<th>Rh</th>
<th>Kell</th>
<th>Duffy</th>
<th>Kidd</th>
<th>Lewis</th>
<th>MNS</th>
<th>Luth</th>
<th>PEG</th>
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</tbody>
</table>

A C 0
Reduce Exposure

- Erythropoietin
- Variceal bleeding
  - β-blockers, octreotide
  - Banding
  - TIPS (transjugular intrahepatic portosystemic shunting)
Leukocyte Reduced

- HLA antibodies
  - Increased rejection
  - Decreased number of compatible organs
- CMV
  - Post-transplant immunosuppression
    - Anti-CMV-negative recipient
    - Anti-CMV-negative donor
Plasmapheresis

- ABO incompatible transplants
  - Kidney (II)
  - Neonatal heart (II)
  - Liver (III)
- Subsequent transfusion: not recipient type plasma
Plasmapheresis

- Suppress HLA antibodies
  - High dose IVIG
  - Low dose IVIG with plasmapheresis
  - ASFA Category II for renal transplant living
  - ASFA Category III for high PRA, cadaveric donor

- Acute liver failure
  - Supportive therapy
  - ASFA Category III
Infection

- **Required testing**
  - HbsAg
  - Anti-HIV-1/2
  - Anti-HBc
  - Anti-HCV
  - Anti-HTLV-I/II
  - VDRL or RPR
  - Anti-CMV
  - Anti-EBV
- **WNV encouraged for living donors**

- **Other transmissions**
  - Trypanosoma cruzi
  - Tuberculosis
  - MRSA
  - Rabies
  - Toxoplasmosis
Transplantation
Liver

- ABO compatible, not HLA
- 12 hours viability
- High risk of bleeding
  - Coagulopathy
    - Loss of production
    - Hypothermia
    - Heparin
  - Thrombocytopenia
    - Splenomegaly
    - Low levels of thrombopoietin

http://biologyonline.us/Online%20A&P/AP%201/Northland/AP1lab/Lab%20Online/Lab%202012/24.htm
Liver

• High risk of bleeding
  – Raw surface at diaphragm and retroperitoneum
  – Portal hypertension
    • Dilation: 20% to 50% TBV
    • Pressure
  – Systemic fibrinolysis
    • Anhepatic
    • Imbalance
Liver

- MELD score ≥ 15
  - INR
  - Bilirubin
  - Creatinine
    - Dialysis
- Highest scores have higher priority

- 0.957 \times \log_e(cr \ mg/dL) + 0.378 \times \log_e(bili \ mg/dL) + 1.120 \times \log_e(INR) + 0.6431
- Multiply the score by 10 and round to the nearest whole number.

<table>
<thead>
<tr>
<th>RISK</th>
<th>RBC</th>
<th>FFP</th>
<th>Plts</th>
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<tr>
<td>High</td>
<td>20</td>
<td>10</td>
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<tr>
<td>Med</td>
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<td>Low</td>
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</table>

- Risk determined by transplant anesthesiologist.
- Products dispensed in a cooler to the OR.

UCH policy, Xia VW et al. Liver Transplantation 2006
Liver

• Red cell antibodies
  – Antigen negative RBC’s at beginning and end
  – ABO compatible during massive blood loss
  – Post-transplant immunosuppression

• Reduced blood use
  – Portal caval shunts
  – Vasopressin
  – Intraoperative blood recovery
  – Antifibrinolytic drugs/TEG
  – FVIIa
<table>
<thead>
<tr>
<th>Organ</th>
<th>Red Blood Cells</th>
<th>Plasma</th>
<th>Platelets</th>
<th>Reference</th>
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<td>Wegner^26</td>
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<tr>
<td>Repeated sternotomy</td>
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<td>1-8</td>
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<tr>
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<td>Wegner^26</td>
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<tr>
<td>After support device</td>
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<td>13</td>
<td>12</td>
<td>Wegner^26</td>
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<tr>
<td>(with aprotinin)</td>
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<tr>
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<td>Kidney</td>
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<td>Danielson^29</td>
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</table>

Units are rounded to the nearest integer. Platelets are expressed as platelet concentrates, with apheresis units counted as 6 units. The cardiac transplantation range is from two centers. In one center, aprotinin reduced overall component transfusions in repeated sternotomy cases in a randomized study.25
Heart

• ABO compatible
• Incompatible possible in infants
  – Anti-A and or Anti-B $\leq 1:4$
  – Typing discrepancy
• Avoid HLA antibodies, crossmatch
• 4-6 hours viability
• Assist device: anticoagulation
• Bypass
  – Platelets
  – Antithrombin

Case 2

- 40 year old woman: aortic valve replacement
- Post-cardiotomy shock (stone heart)
- BiVAD
- Anti-D
- PRA: Incompatible with >90% of the general population

??????
Case 2

- Short plt storage
- Aspirin
- IVIG
Lung

- ABO compatible
- Avoid HLA antibodies
- 4-6 hours viability
Kidney

- ABO compatible
  - A₂ subtype to O or B recipients
  - A₂B subtype to B recipients
  - Anti-A titer
- HLA-A, -B, -DR compatible, crossmatch
- Up to 30 hours viability
- Type and screen
Pancreas

- ABO compatible
- HLA-A, -B, -DR compatible
- 18 hours viability
Post-Transplant
Passenger Lymphocytes

- Liver, combined heart-lung, lung
- Recirculate through lymph nodes & spleen
- Microchimerism
  - Tolerance of graft
  - GVHD
  - GVHHA
Graft-vs-Host Hemolytic Anemia

- Antibodies from donor lymphocytes
- IgG anamnestic response, 1-2 weeks
- ABO
  - Minor incompatibility
  - Most commonly O donor, non-O recipient
  - A or B donor, AB recipient
- Also D, K, Jk(a), Fy(a)
- Typically persist a few weeks
GVHHA

• Treatment
  – Transfuse donor type RBC’s
  – Red cell exchange
  – Soluble A or B antigens in plasma
  – Local irradiation

• Prevention
  – Donor type RBC’s at transplant
Graft-vs-Host Thrombocytopenia

• Donor ITP
Graft-vs-Host Disease

- Occasionally
- HLA antibodies
- Donor derived T-cells
- Diarrhea, jaundice, rash
- Pancytopenia
Transfusion Associated GVHD

• Rare: 4 cases with >20,000 organs/year
  – Cases of GVHD and transfusion associated chimerism in blood
  – Blood donor derived lymphocytes in diseased tissue
• Solid organ transplant not an irradiation indication
  – Post-transplant lymphoproliferative disease
  – GVHD
Immune Dysregulation

• Delayed warm-auto hemolytic anemia
  – Alemtuzumab
  – 5.6% of 300 pancreas transplant patients
  – In most hemolysis severe
• Pure red cell aplasia
• ITP
Plasmapheresis

- Antibody mediated rejection
  - Kidney (I)
  - Heart (III)