Post Operative Management in Heart Transplant

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Art of Good Cooking

- Good Ingredient
  - Good donor + OK recipient
- Good technique
  - Good team
- Good timing
  - Good organization
- Well practice
Heart Transplant: Peri-op Issues

- Donor
- Surgical techniques
- Peri operative graft Failure
- Imm-suppressive and rejection management
- Renal function management
Issues: medium – long term

- Renal function management
- Transplant Allograft Vasculopathy
- Malignancy
- CMV infection
Donor Management

- Matching
- Donor cardiovascular care
- Donor procurement and preservation
Donor Cardiovascular Care

- Minimize effects of brain dead physiology
  - DI
  - Hormone
  - Vascular tone
- Fluid+ Electrolyte deranged
- Over Innotropic drug
- Low Hct
- Low plasma osmolarity
Donor-recipient Matching

- **Size**: Greater than 80% of recipient body weight
- **Blood type**: Identical or compatible
- **HLA-matching**: Generally not done
- **Direct X match only in preformed antibody found in recipient**
Donor Procurement and Preservation

- Preservative agent
  - St Thomas Cardioplegia
  - Blood Cardioplegia
  - Celsior
  - HTK solution Custodiol
Donor Procurement and Preservation

- **Ischemic Time**
  - Optimum time: less than 4 hours
  - Acceptable to 6 hours
  - On arrival blood cardioplegia technique in long ischemic time case
Surgical Techniques
FIGURE 18.3  ■  Arrest and preservation of the heart.
A: Diagram of extracorporeal circulation: superior and inferior venae cavae cannulated by catheters introduced, respectively, via int. jugular vein and saphenofemoral junction, thus leaving operative field free.

B: Recipient's thorax opened by midline sternum-splitting incision; pericardium incised longitudinally and stitched to wound edges; tapes passed around venae cavae and tightened as patient is placed on extracorporeal circulation; aorta clamped. (Broken lines indicate levels for transection of aorta and pulmonary trunk.)
C: THE ATRIAL WALLS AND SEPTUM OF RECIPIENT'S HEART ARE DIVIDED JUST ABOVE THE ATRIOVENTRICULAR GROOVE

D: PORTION OF ATRIA AND GREAT VESSELS REMAINING IN RECIPIENT AFTER REMOVAL OF HEART
FIGURE 18.8  The implantation procedure is begun with the left atrial anastomosis.
HEART TRANSPLANTATION
SUTURE METHOD

H: LEFT SIDE OF EXTENDED INTERATRIAL
SEPTUM OF DONOR HEART SUTURED TO
SEPTAL STUMP OF RECIPIENT; SUTURE
WILL THEN BE CONTINUED TO UNITE THE
LEFT ATRIAL WALLS AS INDICATED BY ARROWS

I: RIGHT SIDE OF EXTENDED INTERATRIAL SEPTUM
OF DONOR HEART SUTURED TO SEPTAL STUMP
OF RECIPIENT; SUTURE WILL THEN BE CONTINUED
TO UNITE THE RIGHT ATRIAL WALLS AS
INDICATED BY ARROWS

J: AORTAS ALMOST COMPLETELY ANASTOMOSED;
LEFT HEART FLUSHED OUT WITH SALINE VIA
CATHETER IN LEFT ATRIUM TO REMOVE ALL AIR
BEFORE FINAL CLOSURE; HEART IS THEN LIFTED FROM
ITS BED AND ALL SUTURE LINES INSPECTED PRIOR
TO REMOVAL OF AORTIC CLAMP AND ANASTOMOSIS
OF PULMONARY TRUNKS; HEART IS IMMERSED IN
Completion of the transplantation procedure with atrial pacer wires in place.
Surgical Complications

- Bleeding
- Mal alignment – Flow obstruction
- Tricuspid regurgitation
Immediate Post Op Complications

- Pumping failure
- Renal failure
- Rejection
- Bleeding
Pumping Failure

- Graft preservation and Ischemic time
- Hyper acute rejection – Acute rejection
- Right heart failure
  - Pulmonary hypertension ?
Right Side Heart Failure

- Most common cause of death in perioperative
- Right ventricle is more prone to ischemic injury
  - Thin wall - less reserve muscle contraction
  - Room temperature exposed
Right Heart Failure

- High CVP
- Distended Rt ventricle
- Tricuspid regurgitation
- High Pulmonary artery pressure (PAP) +/-
  - Low PAP but distended RV – very bad sign
Treatments of RV Failure

- Decompress right side
  - Optimal preload volume
  - Over fill increases Tricuspid regurgitation

- Lower Pulmonary vascular resistance
  - Maximum ventilation support
  - Drugs: NTG, Isuprel, Primacor, Viagra
  - Nitric Oxide, Illoprost

- Increase RV contraction

- Mechanical support:
  - IABP
  - Ventricular assist device
Left Side Failure

- Mostly from donor heart issues
  - Donor pre transplant condition
  - Ischemic time
  - Myocardium Preservation
- Acute rejection is rare
- Mostly result of reperfusion injury
Treatments of LV Failure

- Rest myocardium: Empty beating heart
- Optimal innothropic drugs
- Optimal environment for myocardium recovery
  - Preload / Afterload
  - Blood gas, Electrolyte, acid base, calcium etc
- Mechanical Support
  - IABP
  - VAD
Fig. 3. Toyobo pneumatic pulsatile MCSD. Anatomical configuration of the device (left) and pump and cannula system (right).
Bi Ventricular Assist Device

Rejection
Initiation of Allograft Rejection

- Allograft
- Donor Antigen (HLA Class II & Other)
- ANTIGEN PROCESSING
- APC
- HLA II
- Donor Antigen (Processed)
- OKT3
- CD5
- ToR
- CD4
- CD68
- CD2
- IL-1, IL-6
- TNF
- Steroids
- Inactive TH (CD4+) Cell
Immunosuppressive Therapy

CNI
- Cyclosporine A
- FK 506

Antimetabolite
- Azathioprine
- Mycophenolate

Steroid
- Adrenocortical steroids

Lymphocytolytic Therapy
- Anti-thymocyte globulin (ATG)
Induction Therapy

RATG: Reduce

- Acute rejection
- Periop acute renal failure
- Long term rejection

Increase

- Infection
Standard Triple therapy

- Preoperative
  - Azathioprine: 4 mg/kg IV

- Intraoperative
  - Methylprednisolone: 500 mg

- Postoperative
  - Cyclosporine: 2-6 mg/kg po bid based on trough levels and renal function
  - Azathioprine: 2 mg/kg/day
  - Methylprednisolone: 125 mg IV every 8 hours for 3-4 doses, followed by prednisone
  - Prednisone: (beginning after Methylprednisolone) 1 mg/kg/day tapering over 1 week to 0.5 mg/kg/day,
Maintenance Immunosuppression

Goal

- Lowest overall level of immunosuppression to prevent rejection
- Cyclosporine levels
  - Low therapeutic after 1-2 years
- Azathioprine
  - 1-2 mg/kg/day after 1-2 years
- Prednisone
  - 0 - 0.1 mg/kg/day after 1 year
Problem with CNI

- Renal toxicity esp during critical period
  - Injured and recovering myocardium
  - Injured renal after CPB
  - Compromised cardiac output and renal perfusion
CNI free Regimens

- m TOR inhibitor
  - Sirolimus (Rapamune)
  - Everolimus (Certican)
- No renal toxicity
- Higher rate of rejection in de novo used.
Strategies: Renal Shutdown

Immediate Post Op

- Prolonged Induction
  - Higher rate of infection
- CNI free regimen de novo
  - Higher rate of rejection
- Lower CNI combined with mTOR
- Forget kidneys and protect heart
  - Renal transplant after kidney transplant?
Rejection

- Endomyocardial biopsy
- Acute rejection
  - Hospital
  - Out-patient
Rejection
Rejection
Rejection
## TREATMENT OF REJECTION

<table>
<thead>
<tr>
<th>GRADE</th>
<th>Mild</th>
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</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>None or oral corticosteroid augmentation</td>
</tr>
<tr>
<td>Moderate</td>
<td>Oral corticosteroid augmentation or IV corticosteroids</td>
</tr>
<tr>
<td>Severe</td>
<td>IV corticosteroids +/- ATG or OKT3</td>
</tr>
</tbody>
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Infection

Most of fatal infection in post op heart transplant came from

- Colonized pre transplant (poor condition recipient)

- Consequences of prolong postop heart failure; prolong intubation

CMV is the most common infection problem in medium and long term
Infection

- Pre transplant prolong intubation is the most important risk factor in post transplant infection
- Prolong post transplant intubation must be avoid
- Post op renal failure contribute to fatal infection
Infection

- Bacterial - Most Common
- Viral
- Fungal
<table>
<thead>
<tr>
<th>Pathogenic Organism</th>
<th>Prophylactic Agent</th>
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<tbody>
<tr>
<td>Cytomegalovirus</td>
<td>Gancyclovir, Acyclovir, IVIg</td>
</tr>
<tr>
<td>Herpes simplex</td>
<td>Acyclovir</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>Pyrimethamine and Leucovorin</td>
</tr>
<tr>
<td>Pneumocystis</td>
<td>TMP/SMX, Dapsone, Pentamidine</td>
</tr>
<tr>
<td>Oral candidiasis</td>
<td>Nystatin, Mycelex troches</td>
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Perioperative Renal Failure

- Poor renal perfusion
  - Poor cardiac function
  - Post cardio pul bypass injury
- CNI toxicity in not fully recovered renal
- Induction Therapy: give renal toxic free window period
Renal Failure

- Most important side effect of cyclosporin—
  from afferent arteriolar vasoconstriction and
direct tubular cell injury;

- Dose related to some extent and will improve
  with reduction in the Cyclosporin dose
Peri operative renal failure

- Extended induction technique
  - Intermittent RATG after completed normal induction duration
  - Follow CD 3
  - CNI free until renal recover
  - Significantly increase infection
Common Dilemmas

- Poor cardiac function
  - Cannot extubate
  - Cannot start oral CNI
  - Prolong use of RATG : over suppress
  - Infection flare up
Common Dilemmas

- Poor cardiac function
  - Poor urine flow
  - Cannot start oral CNI
  - Higher risk of rejection
Conclusions

- Donor recipient condition – Most important
- Right side heart failure is the most common cause of operative dead
- Prolong poor cardiac function leaded to prolong intubation and fatal infection
- Post operative care is the most difficult aspect in heart transplant
Thank you