Donor Selection

David M. Levi, MD, FACS

- Donor selection topics
  - Extended criteria donors
  - PHS increased social risk
  - Hep B core Ab+ donors
  - Hep C Ab+ donors
  - Hepatic steatosis
  - Domino liver transplantation
  - Split liver transplantation
  - Auxiliary transplantation
  - Donation after cardiac death
  - Living donor selection
Extended criteria donor (ECD) livers

- Sometimes referred to as “marginal” grafts
- Conceptually, ECD livers are at increased risk of early failure (PNF, DGF) or predisposes to inferior outcomes
- No precise definition

Generally accepted ECD variables

- Advanced donor age (>70)
- Prolonged WIT (>12 hours)
- Prolonged CIT (>40 min)
- Graft steatosis (≥ 30%)
- DCD grafts
- “Orphaned” grafts
ECD outcomes

- At high volume centers, patient and graft survival is similar to recipients of SCD livers
- Experience and appropriate recipient selection are key to achieving good outcomes

PHS increased social risk (PHS IR)

- In 2013, PHS published criteria defining deceased donors at increased risk for HIV, HBV, and HCV transmission to potential organ transplant recipients
- Donors with a history of specific social behaviors are deemed PHS IR
- These were integrated into OPTN policy; use of livers from these donors requires the patient’s informed consent
PHS IR livers

- Utilization is associated w decreased waitlist mortality and improved survival
- In general, these livers are physiologically equal or better than non-IR liver grafts
- Transplant centers need protocols for monitoring/suveillance for disease transmission post transplant
Hep B core Ab + donors

- Anti-HBc+, HBsAg-
- Relatively common (5-10% of deceased donors)
- May harbor occult infection; HBV DNA in serum or liver
- Most centers use these grafts selectively for HBV naïve recipients
- No consensus re post transplant prophylaxis regimen, trend towards less HBIG and entecavir > lamivudine

**Liver Transplantation Using Hepatitis B core Positive Grafts with Antiviral Monotherapy Prophylaxis**

A Single Centre, Retrospective Study of Adult Liver Transplant

- 964 liver transplants from 2000 to 2015
- 56.8% 56%/ anti-HBc Negative
- 43.2% 43%/ anti-HBc Positive
- 108 HBsAg+ve recipients received anti-HBc +ve grafts
- Antiviral monotherapy prophylaxis only
  - No HBIG was used
  - 64 on Lamivudine
  - 64 on Entecavir
- 3 de novo HBV infection
  - Risk of de novo HBV was 2.8%
- No significant difference
  - 10-year Patient & Graft Survival ~80%
  - anti-HBc +ve grafts vs. anti-HBc -ve grafts

Hepatitis C antibody + donors

- Utilization of HCV+ livers is increasing
  - Opioid crisis – more HCV+ donors w/o established liver disease
  - DAA therapy – high efficacy post LT
- 2 types
  - Viremic – HCV RNA positive by nucleic acid testing (NAT+)
  - Nonviremic – HCV RNA negative by nucleic acid testing (NAT-)
TABLE 1. Advantages and Disadvantages of Utilizing HCV-Positive Donors for HCV-Negative Recipients

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increase pool of currently available donors</td>
<td>- 100% risk of transmission of HCV for recipients</td>
</tr>
<tr>
<td>- Decrease wait-time mortality for very sick recipients (FHF, high MELD &gt;30)</td>
<td>- High cost of DAA</td>
</tr>
<tr>
<td>- Potentially younger donors without other comorbidities</td>
<td>- Limited access to DAA regimens</td>
</tr>
<tr>
<td>- DAA regimens have a very high rate of cure</td>
<td>- Requirement for preapproval by drug companies or insurance companies*</td>
</tr>
<tr>
<td>- Similar long-term graft and patient outcome than HCV-negative donors</td>
<td>- Possible interaction between DAA regimens and immunosuppression</td>
</tr>
<tr>
<td></td>
<td>- Ethical/societal barrier</td>
</tr>
<tr>
<td></td>
<td>*only for countries where insurance companies cover the costs</td>
</tr>
</tbody>
</table>

o HCV+ donor livers
  - HCV transmission
    - Ab+/NAT- → 15%-20%
    - Ab+/NAT+ → 100%
  - Grafts w/o significant inflammation/fibrosis are considered
  - Genotype of NAT+ donors is unknown at time of procurement
Transplant center protocol
• Use selectively for appropriate candidates
• Informed consent
• Post LT serologic monitoring
• Timely access to and initiation of DAA's is critical

Hepatic steatosis
• Hepatocytes contain triglyceride vacuoles
• Macrovesicular – large vacuoles w peripheral displacement of the nucleus
• Considered ECD grafts – associated with poor outcomes
• Macro >> microsteatosis
• Assessment of the steatotic graft
  • Preprocurement imaging may be helpful (if available)
    • US - ↑ in liver echogenicity (brightness) relative to kidney
    • CT w/o contrast – absolute liver attenuation <40 HU (or 10+ < spleen)
  • Liver biopsy - semiquantitative
    • Mild – 5%-33%
    • Moderate – >33%-66%
    • Severe – >66%

Moderate >33%-66%
• Use selectively
  • ↓ MELD
  • Short CIT

Severe >66%
• Use is relatively contraindicated
o Domino liver transplant
  • Involves utilizing the native liver from a recipient for another patient
  • The domino donor liver is usually anatomically and functionally normal except for a single metabolic defect
  • The domino liver recipient is typically older and is unlikely to encounter symptoms related the defect during their lifetime
  • Classic example, familial amyloidotic polyneuropathy
- **Split LT**
  - 1988, pioneered Pichlmayr and Bismuth
  - Applies knowledge of liver segmental anatomy to divide a single graft for 2 recipients
  - Technically and logistically demanding
  - Classic split – LLS (seg 2,3) for a child or small adult; eRL (seg 1,4-8) for an adult

Auxiliary LT

- Definition – providing additional or supplementary support
- APOLT – auxiliary partial orthotopic liver transplant
- **APOLT**
  - LT where a portion of the native liver is left in place after partial hepatectomy to create space implantation of a segmental liver graft
  - Indications –
    - FHF
    - MLD (non-cirrhotic)
  - When used for FHF, the goal is withdrawal of immunosuppression after native liver regeneration

Left sided APOLT for MLD. Graft implantation in progress. The child underwent native extended left hepatectomy to provide sufficient space for an adult LLS graft donated by her mother.

- Donation after cardiac death
  - Organ procurement after circulatory death criteria
  - ECDs –
    - Use selectively (donor age and BMI)
    - Minimize CIT
    - Select “appropriate” recipient
  - Warm ischemia + agonal time < 30 min
  - ↑ risk for PNF, DGF, and ischemic cholangiopathy
Living donor selection

- Donor safety is paramount
- Morbidity 15-25%
- Mortality 0.5%
Living donor selection

- Adult, age 18-60, ABO compatible
- Mentally and physically healthy, no comorbidities
- BMI <30, minimal hepatic steatosis (<10%)
- Vascular and biliary anatomy favorable
- Graft size –
  - Big enough for recipient (GRWR 0.80 or >)
  - Not too big for the donor (RLV ≥30%)