Living Donor Liver Transplant
Current status and Future Prospects
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Mount Elizabeth Novena Cambodia Phnom Penh 2014
Medical Causes of The Failing Liver

- Drug Induced
- Alcohol
- Hepatitis (including Fulminant variety)
- Metabolic causes
- Autoimmune causes
- Congenital
Oncological for Liver Transplantation

- Klatskin Tumours
- Neuroendocrine Tumours
- Hepatocellular Cancers
<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
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<tr>
<td>1967-1989</td>
<td>Liver Tx in pts with advanced disease resulted in early recurrence within 2 years in majority of patients, most often in the graft</td>
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<td>Long term survival in occasional patients</td>
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<td>OLT not indicated for HCC</td>
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<td>1989-1995</td>
<td>Early attempts at combined modality therapy-adjuvant systemic chemotherapy, radiation therapy, locoregional maneuvers (chemoembolisation, alcohol injection)</td>
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<td>Promising results in some uncontrolled studies</td>
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<td>1996-2001</td>
<td>Donor waiting times for tumour patients greatly prolonged (&gt;1year)</td>
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<td>Improved definition of selection and staging criteria</td>
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<td>OLT for HCC approved in 2001</td>
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<td>Use of marginal and living donors to expand donor pool</td>
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<td>Additional locoregional techniques (cryosurgery, radiofrequency ablation)</td>
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<td>2002-present</td>
<td>UNOS implements MELD system for organ allocation with adjustments for patients with HCC: shorter waiting times for tumor patients</td>
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<td>Better definition and refinement off prognostic factors/selection criteria</td>
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<td>Delineation of timing and sequence of adjuvant combined modality therapy ongoing; optimal regime unknown</td>
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<td>Identification of molecular markers/gene expression profiling: development of xenotransplantation and artificial liver cells</td>
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Controversial Indications

• Positivity for HIV
  ➡ provided CD4 Levels are above 400/mm$^3$
• Portal Venous Thrombosis
• Pulmonary Hypertension
Living Donor Liver Transplantation

- Right Lobe / Left Lobe
- Double Left Lobe Transplantation
- ABO incompatible Grafts
- Paired Liver Donors
Anatomical Anomaly Commonly Accompanying BA (~10%)

BASM (splenic malformation) Syndrome; Syndromic Biliary Atresia

[Modified from Pediatr Rev 1999;20:363]
Results of LDLT for Biliary Atresia in Japan

Survival by Age at LT: n=1,616 (1989-2010)

Cumulative Survival

Years after Transplant

Cumulative Survival (%)
Living Donor Liver Transplantation

Right Liver Graft

- Rt hepatic V
- IVC
- Hep A
- Portal vein
- Bile duct

Left Liver Graft

- Lt & Mid hepatic V
- Portal V
- Hepatic A
- Jejunum (Roux-Y)

Left Lateral Segment Graft

- Lt hepatic V
- IVC
- Bile duct
- Portal V
- Hepatic A
Reduced Lateral Segment Graft (Monosegment-like graft)

Parenchymal volume can be reduced, but not vascular (PV/HV) size
Portal Vein Diameter in Post-Kasai Biliary Atresia

PV stenosis = Venosclerosis: preTx evaluation of size/flow indispensable

[July 1997, 15th JLTS]
PV Stenosis/Sclerosis (Mural Thrombus) in Infants w/ BA

Variations in PV Reconstruction at Tx: minimal anastomosis number is a key!!
Side-Patch Venous Graft for Portal Vein Stenosis/Sclerosis in Biliary Atresia
Pediatric LDLT: Blood-type Incompatible LDLT

Protocol for ABO-Incompatible LDLT

- Reduction of anti-ABH Ab before LT
  → <16x IgG/IgM (by multiple plasma/blood exchange)
- Anti-CD20 antibody (rituximab) 10-14 days before LT
- Use of CellCept (MMF)
- ± Portal venous infusion of steroid
- Plasma/blood exchange if anti-ABH increases after LT
- Goal: Control of humoral (antibody-mediated) rejection
Pediatric LDLT: Blood-type Incompatible LDLT

Results of Incompatible LDLT in Japan by Age Group [1989 - 2008, n=516]
Blood-type (ABO) Incompatible LDLT

Two Distinct Types of Liver Damage Caused by Antibody-Mediated Rejection

- Hepatic Focal Necrosis
- Intrahepatic Biliary Strictures
<table>
<thead>
<tr>
<th>Name</th>
<th>Indication</th>
<th>Donor Relationship</th>
<th>Rt/Lt lobe</th>
<th>Vascular biliary anatomy</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK</td>
<td>Hep C Encephalopathy SBP</td>
<td>Nephew</td>
<td>Rt</td>
<td></td>
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<tr>
<td>CHS</td>
<td>AFLF Drugs</td>
<td>Brother</td>
<td>Lt</td>
<td></td>
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<tr>
<td>AH</td>
<td>Cryptogenic</td>
<td>Relative</td>
<td>Rt</td>
<td>Double Bile duct</td>
<td></td>
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<tr>
<td>TGL</td>
<td>HCC Muticentric</td>
<td>Daughter</td>
<td>Rt</td>
<td></td>
<td></td>
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<tr>
<td>MCR</td>
<td>Prev Cad Tx HAT</td>
<td>Aunty</td>
<td>Rt</td>
<td>Double Hepatic Vein</td>
<td>Died 3 weeks</td>
</tr>
<tr>
<td>PH</td>
<td>Hep B Muticentric HCC</td>
<td>Brother</td>
<td>Rt</td>
<td></td>
<td>Died 8 months</td>
</tr>
<tr>
<td>AR</td>
<td>AFLF Hep E</td>
<td>Cousin</td>
<td>Rt</td>
<td></td>
<td>Died 3 weeks</td>
</tr>
<tr>
<td>CS</td>
<td>Cryptogenic Hep Encephalopathy</td>
<td>Close Friend</td>
<td>Rt</td>
<td>Double Bile Duct</td>
<td></td>
</tr>
<tr>
<td>GI</td>
<td>Hep B PH and Bleeding GIT</td>
<td>Nephew</td>
<td>Ext Rt</td>
<td>Double right Hepatic vein Vascular Conduit for MHV</td>
<td></td>
</tr>
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</table>
Graft Weight \[ \geq \frac{0.8\%}{\text{Body weight of Recipient}} \]
Factors Influencing Outcome

Graft Weight

Portal Pressure

Hepatic Venous Outflow
QuickTime™ and a Video decompressor are needed to see this picture.
Length Of Donor Operation

- Usually 4 to 6 hours
- Small dose of heparin given just before removal of Right Lobe
- Graft Flushed with HTK solution on back table
Donor Morbidity

• 1 patient had a bile leak
• He had a Double Duct in the Right Lobe
• Stented with ERCP
• Radiological Stenting
• Finally resolved
• 6 weeks completely resolved
Length Of Stay

- 9 stayed for 7 nights in the ward
- Returned to work at 6 weeks
Algorithm for Right Lobe Graft Selection

Right Lobe Graft

MHV dominant
- GRWR<1%
  - Remnant
    - LV<35%
      - Discussion
    - LV>35%
      - With MHV
  - Remnant
    - LV<35%
    - Discussion
  - Remnant
    - LV>35%
- GRWR>1%
  - Remnant
    - LV<35%
  - Remnant
    - LV>35%
  - Discussion

RHV dominant
- GRWR<1%
  - Remnant
    - LV<35%
    - Discussion
  - Remnant
    - LV>35%
  - Discussion
  - Remnant
    - LV<35%
    - With MHV
- GRWR>1%
  - Discussion
  - With MHV
  - w/o MHV
Younger Age Group For Transplant

Double Left Lobe

ABO Incompatible Grafts

Patients with extensive porto-venous mesenteric thrombosis

0% Donor Morbidity and Mortality