LIVER TRANSPLANTATION
Update on Allocation
Living Donor Liver Tx.

Steven L. Flamm MD
Associate Professor of Medicine
Medical Director, Liver Transplantation
Northwestern University Medical School
Liver Transplantation

History

- 1958  Research programs on liver replacement at Northwestern and Harvard
- 1963  First liver transplant (Univ. of CO)
- 1967  First long survival
- 1979  Cyclosporine
- 1987  Univ. of WI solution for improved organ preservation
- 1989  FK 506
- 1999  Living donor liver transplantation
Liver Transplantation

Outcomes

- Median Length of Stay (NMH) 5-6 d
- 1-year survival ~90-94%
- 5-year survival ~75-80%
Liver Transplantation Problem

- Waiting List: >17,000 people
- Liver transplants/year: ~5,000
- Average waiting time: >1 year
Liver Transplantation

Question for Transplant Team

• When to list for liver transplantation?
• When to perform the liver transplant?
### Child-Turcotte-Pugh (CTP) Classification

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Encephalopathy Grade</strong></td>
<td>None</td>
<td>1-2</td>
<td>3-4</td>
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<tr>
<td>(mental status changes)</td>
<td></td>
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<tr>
<td><strong>Ascites (water in abdomen)</strong></td>
<td>Absent</td>
<td>Slight</td>
<td>Moderate</td>
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<tr>
<td><strong>Albumin (gm/dl)</strong></td>
<td>&gt;3.5</td>
<td>2.8-3.5</td>
<td>&lt;2.8</td>
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<tr>
<td><strong>Prothrombin time</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(clotting factors)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(seconds prolonged)</td>
<td>&lt;4</td>
<td>4-6</td>
<td>&gt;6</td>
</tr>
<tr>
<td><strong>Bilirubin (mg/dl)</strong></td>
<td>&lt;2</td>
<td>2-3</td>
<td>&gt;3</td>
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Liver Transplantation Evaluation

- Determine cause of liver disease
- Document severity of liver disease
- Determine survival and functional ability
- Concomitant medical problems
- Psychiatric evaluation
- Social Evaluation
Liver Transplantation Evaluation

• Medical history
  – Symptoms such as fatigue, itching, swelling, changes in mental status and GI bleeding
  – Other medical problems
  – Medications
  – Includes alcohol use and drug use history

• Physical examination

• Blood tests
  – Determine underlying cause of liver disease
  – Determine current functional status of the liver
Liver Transplantation Evaluation

- Liver Ultrasound/CT scan/MRI
- Liver biopsy
- ERCP – Cholangiogram – test that examines bile ducts if cirrhosis is otherwise unexplained
Liver Transplantation Evaluation

- Psychosocial evaluation
  - Support systems
  - Compliance with immunosuppression medication protocol after transplantation
Liver Transplantation
Evaluation

• Concomitant medical problems
  – Heart
  – Lung
  – Kidney
  – Bone thinning
Liver Transplantation
When?

- Quality of life
- Complications of cirrhosis
- Poor liver synthetic function
Liver Transplantation
When?

- Quality of life issues
  - Severe lethargy
  - Intractable itching
  - Recurrent bile duct infections
  - Intractable ascites
  - Severe bone thinning
  - Pain
Liver Transplantation
When?

• Complications of cirrhosis
  – Ascites
  – Bleeding from esophageal varices
  – Infected ascites (spontaneous bacterial peritonitis)
  – Kidney failure (hepatorenal syndrome)
  – Decreased mental status (encephalopathy)
Liver Transplantation
When?

• Synthetic dysfunction
  – Poor albumin
  – Increased prothrombin time (diminished clotting factors)
Liver Transplantation
When?

- Liver cancer (hepatocellular carcinoma)
Liver Transplantation
Hepatitis C

• Hepatitis C does not disappear after liver transplantation
• Within one year, the majority (although not all) of patients have recurrent hepatitis C in the new liver
• Patients generally do well over the first 5-7 years after transplantation although a small percentage develop cirrhosis once again over a relatively short period of time
• Treatment with pegylated interferon alpha + ribavirin can be implemented successfully after transplantation
DHHS Final Rule

- Issued in 1998
- Defines the principles of organ allocation
- Governs the operation of the Organ Procurement and Transplant Network (OPTN)
Guidelines for Organ Allocation

• Organs should be allocated to transplant candidates in the order of medical urgency
• The role of waiting times in determining allocation order should be minimized
• Every attempt should be made to promote efficient use of donor organs
MELD

- MELD -- Model for End-Stage Liver Disease Scoring System
  - MELD Score = 0.957 \times \log_e(\text{creatinine mg/dl})
    + 0.378 \times \log_e(\text{bilirubin mg/dl})
    + 1.120 \times \log_e(\text{INR})
    + 0.643
  - MELD score depends upon kidney function, bilirubin level and clotting factor levels
For example, a patient with cirrhosis secondary to hepatitis C has a serum creatinine of 1.9 mg/dl, bilirubin 4.2 mg/dl, and INR 1.2

\[
\text{MELD Score} = 0.957 \times \log_e(1.9) \\
+ 0.378 \times \log_e(4.2) \\
+ 1.120 \times \log_e(1.2) \\
+ 0.643 \\
= 2.039
\]

The MELD score is then rounded to the tenth decimal place (2.0) and multiplied by 10

Therefore, MELD score = 20 (maximum = 40)
Limitations of MELD

- Patients with liver cancer
- Bile duct infections
- Itching
- Disabling mental status changes
- ? Criteria for living donors
Expanding the Donor Pool

- Expand Sources
  - Human - living donors
  - Other - xenotransplantation
Historical Perspective

Successful “firsts”

- LD Kidney - 1954
- LD Intestine - 1988
- LD Liver (pediatric) - 1990
- LD Pancreas - 1992
- LD Lung - 1994
- LD Liver (adult) - 1997
Essential Concepts for Using Living Donors

- No conflict of interest
- No coercion
- Minimize donor risks
- Donors must be given every opportunity to change their minds
- Emphasize alternatives
How Much Liver Do You Need?

• Liver = 2% body weight
• Optimal: > 1% liver weight/body weight ratio
• 70 kg recipient needs at least 700 cc (gm)
• Cannot go below 0.7 - 0.8%
NMH Results - Recipients
Living Liver Donation (adults)

- 90% 1-Year Patient Survival
- 87% 1-Year Graft Survival
Conclusions
Living Donor

- Living liver donation should be reserved for situations where the benefit to recipient outweighs the risk to the donor
- Donor safety must take highest priority
- Long-term effects are unknown
- Full informed consent