Reducing Liver Transplant Rejection Rates with Bone Marrow
Justin LaMarca, Natalie Licata, Rauwolfia Mannan, and Lumiere Valentine

Background

• An immune system, with antibodies known as antigens, will reject an organ if it is recognized as a foreign object.
• Organ rejection rates can be lowered using immunosuppressant drugs. This also increase the risk of infection.
• The recipient has a higher chance of developing cancer from the immunosuppressant drugs.

Negative Bone Marrow Transplant Aspects

• Short term risks are pneumonia, other infectious diseases, excessive bleeding, liver disorder caused by blocked blood vessels, and transplant rejection.
• The donor’s bone marrow launches an immune-mediated attack against the recipient’s tissues, in 40% to 50% of the recipients. It is known as acute graft versus host disease. It is more frequently found in mismatched patients.
• Approximately 25-50% of bone marrow transplant recipients develop long-term complications.

Conclusions

• LDLT recipients have a higher survival rate overtime.
• Bone marrow transplants with a liver transplant would reduced the risk of organ rejection. The risks of a bone marrow-liver transplant are smaller than the risks that come from having a liver transplant alone.

Acknowledgments

We acknowledge Dr. James Jensen, Jennifer Trapani, Dr. M. A. Mannan, and the Research Exploration Academy.

Liver Transplantation in the United States, 1999-2008

Figure 3. Location bone marrow is taken from donor and given to recipient. Source: 2010 CHLA Bone Marrow Transplantation.

Bone Marrow Transplant

• The organ recipient’s bone marrow is weakened and the donor’s bone marrow is used to repopulate the recipient’s bone marrow. (Fig. 3.)
• People receiving organ transplants are much less likely to reject them if they also receive some bone marrow from the organ donor.
• The donor’s immune system becomes temporarily mixed with the recipient’s immune system, chimerism, after having a bone marrow transplant.
• The presence of immune system cells from the donor help convince the recipient’s system not to attack the new organ. (Table 1.)
• By reducing the body’s tendency to reject a new organ, bone marrow cells allow lower doses of immunosuppressant drugs to be used.

Living Donor Liver Transplants (LDLT)

• A living person donates 50% to 75% of his or her liver, which grows to full size in both the donor and recipient. (Fig 1.)
• The quality of the liver may be better because living donors are generally young, healthy adults who have gone through a complete medical evaluation. (Fig 4.)
• The ischemic time (cold time outside the body) on the organ is minimal, which causes less damage to liver tissue.
• Living donors increase the available donor pool. (Fig 2.)

Figure 1. Division of the liver between the patient and the donor. Source: USC Live Donor Liver Transplant.

Table 1. Three case studies that show successful patients after having both a solid organ transplant and a bone marrow transplant. Source: Bone Marrow Transplantation (2003) 31,633-642.

<table>
<thead>
<tr>
<th>Patient Age/Sex</th>
<th>Primary disease</th>
<th>BMT donor Bone Marrow</th>
<th>Conditioning regimens</th>
<th>Immuno- Suppression</th>
<th>Time between BMT and SOF</th>
<th>Death</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>43 Years Female</td>
<td>Breast cancer liver metastasis</td>
<td>Orthotopic liver AUTO</td>
<td>CY/TBI</td>
<td>Pred No</td>
<td>85 days</td>
<td>Alive and well</td>
<td>13 months</td>
</tr>
<tr>
<td>55 Years Female</td>
<td>Multiple myeloma renal failure</td>
<td>Orthotopic liver AUTO</td>
<td>R/I</td>
<td>CSA/ATG</td>
<td>Same day</td>
<td>Alive and well off CSA by day 73</td>
<td>6 months</td>
</tr>
<tr>
<td>18 Years Male</td>
<td>Cholangiopathy</td>
<td>Orthotopic liver AUTO</td>
<td>Cy/TBI</td>
<td>Pred No</td>
<td>85 days</td>
<td>Alive and well</td>
<td>13 months</td>
</tr>
</tbody>
</table>

References


