Hiroshi Date, MD

- Faculty member has nothing to disclose with regard to commercial support.
- Faculty member does not plan on discussing unlabeled/investigational uses of a commercial product.
Living-Donor Lobar Lung Transplantation (LDLLLT)
Inclusion Criteria for LDLLT Recipient

- Age < 55 y
- Candidates for cadaveric lung Tx
- Critically ill patients who are unlikely to survive the long wait for cadaveric lungs
Inclusion Criteria for Living-Donor

- Relatives within the third degree or a spouse
- $20 \, \text{y} \leq \text{Age} \leq 60 \, \text{y}$
- ABO compatibility
- $\text{PaO}_2 > 80 \, \text{mmHg}$
- $\text{FVC}, \text{FEV}_1 > 85\%$ of predicted value
Informed consent for potential donors

- Permanent VC ↓
- Various complications
- Possible mortality
- Avoid coercion
- Observer
- Individual interview
- Repeat interview at least 3 times
Ethical committee

- Each case discussion
- Independent from transplant team
Size Matching

- Donor FVC
- CT volumetry
- Chest X-ray
- Height
- Body weight
Rt. Graft FVC
Donor FVC × 5/19

+ 

Lt. Graft FVC
Donor FVC × 4/19

∥

Graft FVC
Size Matching

\[
\text{Graft FVC} \quad \frac{\text{Predicted FVC of Recipient}}{\text{ }} > 45-50\%
\]

Date et al. JTCVS 2003; 126:476-81
y = 0.736x + 472
r = 0.799
p < 0.001
Patients (n = 58)

• 1998.10 – 2010.3

• Okayama 47, Kyoto 11

• Sex  Male: 14, Female: 44

• Age  6-55 y (Ave. 31.1 y)

Children: 15, Adults: 43

Only 6 adult males
Preoperative Condition (n = 58)

- Oxygen dependent: 58 (100%)
- Bed-bound: 36 (62%)
- Ventilator dependent: 7 (13%)
Bilateral LDLLT (n = 52)

Unilateral LDLLT (n = 6)

Cardiopulmonary bypass (+)
### Diseases (n = 58)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchiolitis obliterans</td>
<td>16</td>
</tr>
<tr>
<td>Idiopathic pulmonary arterial hypertension</td>
<td>15</td>
</tr>
<tr>
<td>Interstitial pneumonia</td>
<td>14</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>5</td>
</tr>
<tr>
<td>Lymphangioleiomyomatosis</td>
<td>4</td>
</tr>
<tr>
<td>Cystic fibrosis</td>
<td>1</td>
</tr>
<tr>
<td>Eisenmenger’s syndrome</td>
<td>1</td>
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<tr>
<td>Emphysema</td>
<td>1</td>
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<tr>
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<td>1</td>
</tr>
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<td>Count</td>
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</tbody>
</table>
Bronchiolitis obliterans (n = 16)

• Hematopoietic Stem Cell TX (GVHD)  13

• Stevens-Jhonson Syndrome  2

• Sauropus Androgenous  1
Bronchiolitis obliterans (n = 16)

- Hematopoietic Stem Cell TX (GVHD) 13
  - Leukemia 9
  - Neuroblastoma 2
  - Primary macroglobulinemia 1
  - Aplastic anemia 1

HSCT-LDLLT interval

8-87 months (ave. 41.8)

Leukemia recurred 5 years after LDLLT in one patient.
### Diseases (n = 58)

- **Bronchiolitis obliterans** 16
- **Idiopathic pulmonary arterial hypertension** 15
- **Interstitial pneumonia** 14
- **Bronchiectasis** 5
- **Lymphangioleiomyomatosis** 4
- **Cystic fibrosis** 1
- **Eisenmenger’s syndrome** 1
- **Emphysema** 1
- **Eosinophilic granuloma** 1
43 y, Female, IPAH
43 y, Female, IPAH

Before LDLLLT

After LDLLLT
Postoperative Course

- Tracheostomy: 34/58 (58%)
- Ventilation: 18.7 ± 3.3 days
- ICU stay: 24.3 ± 4.2 days
• Hospital stay 70.5 ± 5.1 days
• Hospital survival 55/58 (95%)

- Acute rejection and side effect of OKT3 on day 16
- Aspergillus infection on day 60
- Heart failure on day 2
% FVC

% predicted FVC (%)

Months

1 6 12 24 36

Yamane M, Date H, et al. JHLT 2007
Survival after LDLLT

LDLLT (n = 58)

CLT (n = 12)

p = 0.031
Outcome of living-donors (n = 108)

- Three reoperations
- No operation related death
- All have returned to their previous life styles
Survival after LDLLT

LDLLT (n = 58)
BOS after LDLLT

• 42 LDLLT in 1998-2006
• Evaluated in 2007
• Follow up period: Ave. 50 ± 4 months (range 8-106)
• 40/42 (95%) recipients survived more than 6 months.
• 10/40 (25%) developed BOS.
BOS after LDLLT (n = 10)

<table>
<thead>
<tr>
<th>Unilateral BOS</th>
<th>Bilateral BOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 7)</td>
<td>(n = 3)</td>
</tr>
</tbody>
</table>
Challenging cases in Kyoto University
Oversize Graft
Oversize Graft (200%)

Recipient
• 8 y f, BO/IP after HSCT for neuroblastoma
• Ventilator dependent for 2 months
• 111 cm, 12.4 Kg

Donor
• 33 y f, mother
• 162 cm, 68 Kg
8 y f, BO/IP after HSCT for neuroblastoma

Pre transplant

2 months after right single LDLLT
Undersize Graft
Undersize Graft

Recipient
• 44 y m, BO after HSCT for AML
• 171 cm, 52.8 Kg

Right Donor
• 45 y f, sister
• 154 cm, 49 Kg
Graft size 22%

Left Donor
• 43 y f, wife
• 154 cm, 48 Kg
Graft size 36%
Right middle and lower lobectomy

Left lingulectomy and lower lobectomy
Before LDLLLT

FEV1
0.59 L

After LDLLLT

FEV1
2.55 L
Eleven cases of LDLLT in a new Kyoto Lung Transplant Program

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Side</th>
<th>Survival Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 y f</td>
<td>OB after SJS</td>
<td>unilateral</td>
<td></td>
<td>22 months alive</td>
</tr>
<tr>
<td>54 y f</td>
<td>IP with DM</td>
<td>bilateral</td>
<td></td>
<td>19 months alive</td>
</tr>
<tr>
<td>8 y f</td>
<td>IP/OB after HSCT</td>
<td>unilateral</td>
<td></td>
<td>17 months alive</td>
</tr>
<tr>
<td>41 y f</td>
<td>OB after HSCT</td>
<td>unilateral</td>
<td></td>
<td>16 months alive</td>
</tr>
<tr>
<td>44 y f</td>
<td>OB after HSCT</td>
<td>bilateral</td>
<td></td>
<td>9 months alive</td>
</tr>
<tr>
<td>34 y f</td>
<td>IIP</td>
<td>bilateral</td>
<td></td>
<td>8 month alive</td>
</tr>
<tr>
<td>15 y m</td>
<td>OB after HSCT</td>
<td>bilateral</td>
<td></td>
<td>7 month alive</td>
</tr>
<tr>
<td>44 y m</td>
<td>OB after HSCT</td>
<td>bilateral</td>
<td></td>
<td>5 month alive</td>
</tr>
<tr>
<td>10 y m</td>
<td>OB after HSCT</td>
<td>bilateral</td>
<td></td>
<td>2 month alive</td>
</tr>
<tr>
<td>49 y f</td>
<td>Bronchiectasis</td>
<td>bilateral</td>
<td></td>
<td>1 month alive</td>
</tr>
<tr>
<td>44 y m</td>
<td>OB after HSCT</td>
<td>bilateral</td>
<td></td>
<td>1 month alive</td>
</tr>
</tbody>
</table>
Living-Donor Lobar Lung Transplantation (LDLLT)

Summary

• LDLLT can be applied to various lung diseases
• By transplanting two different lobes, BOS is seen often unilaterally after LDLLT
• Size mismatch can be overcome in a certain degree
• LDLLT may provide better survival than conventional cadaveric lung transplantation