The Safe and Adequate Division Point of Left Bile Duct During Donor Left Lateral Sectionectomy

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The Importance of the Division Point

• Multiple openings of BD on the graft
  ① small diameter
  ② thin wall
  ③ separated BD
  → Difficult BD anastomosis
  → Postoperative biliary complications

• Therefore, understanding the exact biliary anatomy and obtaining one opening of BD are important during living donor hepatectomy.

  However, there are few reports about left BD in spite of the high risk for multiple BD openings and BD complication because of its small diameter and variations.

Left BD type and the Division Point

Where is the optimal division point?

• 3 types of left BD according to the confluence patterns

The Division Point in BD (type I)

The division point
A: between BD bifurcation and umbilical fissure
B: just right lateral side of the umbilical portion of left PV(U)
C: left lateral side of U

A - no risk for multiple openings
B - some risk for multiple openings
C - definite risk for multiple openings

Type I (78%)

Type II (16%)

Type III (4%)

The Division Point in BD (type II)

The division point
A: between BD bifurcation and umbilical fissure
B: just right lateral side of the umbilical portion of left PV (U)
C: left lateral side of U

A - no risk for multiple openings
B - definite risk for multiple openings
C - definite risk for multiple openings

Type I (78%)
Type II (16%)
Type III (4%)

The Division Point in BD (type III)

The division point
A: between BD bifurcation and umbilical fissure
B: just right lateral side of the umbilical portion of left PV(U)
C: left lateral side of U

A - no risk for multiple openings
B - definite risk for multiple openings
C - definite risk for multiple openings

Type I (78%)
Type II (16%)
Type III (4%)

The Chance of BD Bifurcation Injury

when the division point A is closer to BD bifurcation or the draining point of right post. bile duct (RPBD)

→ the chance of injury for CBD or Right BD will be increased
Hypothesis & Aim

• Hypothesis
  – The factors affecting the number of BD opening during donor left lateral sectionectomy; the BD type & the division point of BD

• In this study
  – (1) evaluated the risk for multiple openings of BD according to the BD type of 43 donors.
  – (2) tried to find out the safe and adequate division point of BD according to the bile duct structures of another 99 donors
(1) Multiple Openings According to the Left BD Type

• Patients & Methods
  – 43 donors of LDLT using left later graft or extended left lateral graft
  – Retrospective review
  – Left BD type based on the preoperative MR cholangiography

• Result

<table>
<thead>
<tr>
<th>BD type</th>
<th>the number of BD opening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>one</td>
</tr>
<tr>
<td>Type I</td>
<td>25(92.6%)</td>
</tr>
<tr>
<td>Type II</td>
<td>8(66.7%)</td>
</tr>
<tr>
<td>Type III</td>
<td>3</td>
</tr>
</tbody>
</table>

P=0.078
(2) Optimal Division Point of BD During Donor Left Lateral Sectionectomy

• Patients & Methods
  – Another 99 living donors who had preoperative MRI
  – On the assumption
    • Land mark in the operation
      ; right lateral side of the umbilical portion of left PV
      point U – the acute angle point where left PV enter umbilical portion

  – Risk analysis by the distance from U to the division point

  – Measurement
    ✓ Distance B : CBD bifurcation or RPBD ~ U
      → The chance of injury for BD bifurcation or Rt. Post. BD
    ✓ Distance M ; U ~ the union point of B2 & 3
      → The possibility of multiple openings of BD

U : right border of PV umbilical portion
The Distance B and M According to BD Type

<table>
<thead>
<tr>
<th>Distance</th>
<th>Type I (mm, mean±SD)</th>
<th>Type II</th>
<th>Type III</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>16.14 ± 4.62</td>
<td>15.69 ± 5.45</td>
<td>17.29 ± 5.31</td>
<td>.661</td>
</tr>
<tr>
<td>M</td>
<td>-5.98 ± 4.22</td>
<td>5.80 ± 4.79</td>
<td>6.10 ± 3.72</td>
<td>.000</td>
</tr>
</tbody>
</table>

9 donors were unclassified d/t poor quality of images
(2) Optimal Division Point of BD During Donor Left Lateral Sectionectomy in Type I

Distribution according to the distance M

Distribution according to the distance B

A division point of BD at the distance from U (mm)
The Probability of Multiple Opening and BD Bifurcation Injury According to the Division Point

Red dot line: the chance of BD bifurcation injury
Blue solid line: the risk for multiple openings of BD on a graft
The Probability of Multiple Opening and BD Bifurcation Injury According to the Division Point

The crossing point would have both the lower chance of BD bifurcation and the lower risk of multiple openings.

Red dot line: the chance of BD bifurcation injury
Blue solid line: the risk for multiple openings of BD on a graft
The Probability of Multiple Opening and BD Bifurcation Injury According to the Division Point

But, the point, *where the possibility of injury for the BD bifurcation or RPBD is less than 5%, is located within 5mm from U.*
Summary & Conclusion

• The ideal division point
  ; obtaining one opening of BD without injuring main BD

However,

we have to decide the optimal division point of BD
which has the low chance of injury for CBD bifurcation or RPBD
and the low risk of multiple openings in the left lateral sectionectomy

The optimal division point was right 5 mm away from right border of the umbilical portion of left PV in type I, 6mm in type II and 7mm in type III

But, considering donor’s safety, it is better to divide the left BD within 5mm from the right border of the umbilical portion of Lt. PV