HEPATECTOMY

Surgical Potpourri Session
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Hepatic Resection Is Safe
Improved Safety of Liver Resection

- Mortality < 5%
  - Zero mortality in some series

- Hemorrhage control and reduction in need for transfusion
  - Low CVP anesthesia
  - Novel methods of parenchymal transection
  - Hemodilution

- Liver dysfunction and failure
Hepatectomy

Improved Operative Technique

• Hilar dissection first
• Intraoperative Ultrasound
• Preserve adequate inflow and outflow
• Adequate technical support in OR
• Adequate training of staff
• Adequate surgeon training (HPB, SSO, Transplant)

“OR Team”
Hepatectomy

Selection Criteria for Resectability

- Preservation of functional hepatic parenchyma
  - Preservation of two contiguous liver segments
  - Normal liver: 25% liver remnant
  - Cirrhotic liver 50-75% depending on Child class

- Operative risk (POM Clinic)

- Ability to obtain a negative margin
  - R0 resection

- Good performance status
  - ECOG 0-1
Hepatectomy

Improved Patient Selection

- Ability to calculate Future Liver Remnant
- Multidisciplinary Tumor Board
- Specialized Radiology support
- Specialized IR support
- Specialized GI support

“Treatment Team”
Hepatotomy

Hemorrhage Control

- Minimize retrograde hepatic venous bleeding during parenchymal dissection
- Eliminate vicious cycle of bleeding, poor visibility & additional venous injury

Low CVP = Less Blood Loss

Hepatectomy

Low CVP Anesthesia

- **Pre-hepatic & hepatic resection phase**
  - Limit IVF
  - CVP < 5 mm Hg
  - UO > 25 mL/hr
  - SBP > 90
  - Limit blood transfusion for > 25% blood vol. loss

- **Post-hepatic resection phase**
  - Make pt euvoletic
  - Give blood products PRN

- 496 Hepatic Resections
  - Over 70% major

- Decrease blood loss
  - Mean 645 mL

- Reduced blood transfusion
  - 67% no transfusion

- Preservation of renal function
  - 3% persistent elevation in Cr

*Melendez et al, J Am Coll Surg 1998*
Acute Hypovolemic Hemodilution

- Retrospective study, 208 pts
- Decrease in both EBL and transfusion
  - 430 vs 830 mL EBL
  - 65% reduction in transfusion

DiFronzo, Kaiser Med Cent LA
Low CVP with Milrinone

- Randomized Study  38 pts
- Living Donor Hepatectomy
- Decrease in both EBL and Superior Surgical Field
  - 142 vs 378 mL EBL
- Rapid Postop Recovery
- Requires Central Line

Ryu et al. Am J Transplant 2010
Hepatectomy

Improved In-Patient Care

- Complication Prevention Bundles (pulmonary)
- 24 hour ICU support
- Specialized IR support
- Specialized GI support
- Specialized Pathology support

“Postop Team”
Hepatectomy

Pneumonia Incidence WCR 2010

Fuchshuber, The Permanente Journal 2012
NSQIP
Preoperative Risk Calculator for Liver resection?
## Mortality After Liver Resection for Colorectal Metastasis

<table>
<thead>
<tr>
<th>Series</th>
<th>Number</th>
<th>30-day Mortality (%)</th>
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<tbody>
<tr>
<td>Cady 1998</td>
<td>253</td>
<td>3.6</td>
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<tr>
<td>Nordlinger 1992</td>
<td>1818</td>
<td>2.4</td>
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<tr>
<td>Iwatsuki 1999</td>
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<tr>
<td>Jenkins 1997</td>
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<tr>
<td>Fong 1999</td>
<td>1001</td>
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<tr>
<td>Scheele 1996</td>
<td>498</td>
<td>5.0</td>
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<tr>
<td>Jamison 1997</td>
<td>280</td>
<td>1.8**</td>
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<td>Choti 2002</td>
<td>226</td>
<td>0.9</td>
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<tr>
<td>Wei 2006</td>
<td>423</td>
<td>1.6</td>
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</table>

* 90 day mortality 1%
**60-day mortality 3.6%
# Morbidity After Liver Resection for Colorectal Metastasis

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number of Studies</th>
<th>Number of Patients</th>
<th>% Patients w/ Complications</th>
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<tbody>
<tr>
<td>Wound Infection</td>
<td>10</td>
<td>1618</td>
<td>5.4</td>
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<tr>
<td>Sepsis</td>
<td>12</td>
<td>3312</td>
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<tr>
<td>Pleural Effusion</td>
<td>7</td>
<td>1268</td>
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<tr>
<td>Bile Leak</td>
<td>15</td>
<td>3764</td>
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<tr>
<td>Perihepatic Abscess</td>
<td>11</td>
<td>1755</td>
<td>3.0</td>
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<tr>
<td>Liver Failure</td>
<td>16</td>
<td>3646</td>
<td>2.8</td>
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<tr>
<td>Postop Hemorrhage</td>
<td>15</td>
<td>3913</td>
<td>2.7</td>
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<tr>
<td>Pneumonia</td>
<td>6</td>
<td>933</td>
<td>1.9</td>
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<td>Other Complications</td>
<td>23</td>
<td>6529</td>
<td>20.1</td>
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</tbody>
</table>

*from Simmons et al, Br J Cancer 2006*
Hepatectomy

Key Elements of Safe Liver Resection?
Hepatectomy

• Appropriate Patient Selection
• Good operative technique and OR support
• Minimize blood loss and transfusion
• Prevent complications postop (bundles)
• Specialized ancillary service
Hepatectomy

Patient Safety

- Appropriate Patient Selection (Multidisciplinary Team)
- Good Operative Technique (Surgeon and OR Team)
- Minimize Blood Loss and Transfusion (periop Team)
- Optimized postop care (Inpatient Team)

**Team** approach in patient selection

**Team** approach in OR and Periop

**Team** approach in postop care
Human Factors
Hepatectomy

THANK YOU!
Acute Normovolemic Hemodilution

- RCT, 130 pts, all ASA Class I/II
- ANH protocol:
  - Target Hgb 8
  - Mean 2250 mL blood removed
- ANH reduced allogeneic blood transfusion by 50% (from 25 to 12.7%)
  - No difference in EBL between cohorts
- No increase in complications