Posthepatectomy Liver Failure

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Introduction

• Major source of morbidity and mortality after liver resection
• Devastating complication
• Little treatment
• Incidence: 4-19%
• Recently < 10%
• Mortality following hepatectomy – 0-6%
• PHLF contributing in the majority
Definition

• Wide variety of definitions
• 50-50 criterion
• Snap peak total bilirubin $> 7$ mg/dL
• MELD score
• Child-Pugh score
• Composite integer-based risk score
Definition cont.

• International Study Group of Liver Surgery (ISGLS) defined PHLF as the “impaired ability of the liver to maintain its synthetic, excretory and detoxifying functions, which are characterized by an increased international normalized ratio and concomitant hyperbilirubinemia on or after postoperative day 5.”

• Also advocated a grading system.
<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Description</th>
<th>Treatment</th>
<th>Diagnosis</th>
<th>Clinical Symptoms</th>
<th>Location for Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Deterioration in liver function</td>
<td>None</td>
<td>• UOP &gt;0.5 mL/kg/h</td>
<td>None</td>
<td>Surgical ward</td>
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<tr>
<td>B</td>
<td>Deviation from expected post-operative course without requirement for invasive procedures</td>
<td>Non-invasive: fresh frozen plasma; albumin; diuretics; non-invasive ventilatory support; abdominal ultrasound; CT scan</td>
<td>• UOP ≤0.5 mL/kg/h</td>
<td>• Ascites</td>
<td>Intermediate unit or ICU</td>
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<td></td>
<td></td>
<td>• BUN &lt;150 mg/dL</td>
<td>• Weight gain</td>
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<td></td>
<td></td>
<td></td>
<td>• &lt;90% O2 saturation despite oxygen supplementation</td>
<td>• Mild respiratory</td>
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<td></td>
<td>• INR ≥1.5, &lt;2.0</td>
<td>• Confusion</td>
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<tr>
<td>C</td>
<td>Multi-system failure requiring invasive treatment</td>
<td>Invasive: hemodialysis; intubation; extracorporeal liver support; salvage hepatectomy; vasopressors; intravenous glucose for hypoglycemia; ICP monitor</td>
<td>• UOP ≤0.5 mL/kg/h</td>
<td>• Renal failure</td>
<td>ICU</td>
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<tr>
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<td></td>
<td></td>
<td>• BUN ≥150 mg/dL</td>
<td>• Hemodynamic instability</td>
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<td></td>
<td>• ≤85% O2 saturation despite high fraction of inspired oxygen support</td>
<td>• Respiratory failure</td>
<td></td>
</tr>
</tbody>
</table>

• Problems with ISGLS definition:
  – Found to be least predictive of major complications and risk of post-op death when compared with 50-50 criteria and snap peak bili > 7.

Risk factors

• Patient-related factors
• Liver-related
• Surgery-related
Patient-related factors

• Age
• Male gender
• Malnutrition
• Diabetes
• ASA score
Liver-related factors

• Underlying hepatic parenchymal disease
  – Cirrhosis
  – Steatosis and steatohepatitis
  – Chemotherapy induced liver injury
Surgery-related factors

- Blood loss and transfusion requirements
- Extent of resection
- Complex operations
- Duration of Pringle Maneuvre
Preop risk assessment

• Quality assessment of the liver
• Quantity assessment
Quality assessment

• Traditional liver function markers:
  – Child-Pugh score and MELD score
• Indocyanine Green retention at 15 min
• Other liver function tests
  – Based on clearance of substrate
    • Lidocaine, galactose, aminopyrine, amino acid, and methacetin
  – Based on synthetic functions
    • Serum hyaluronate, type IV collagen, energy production, number of receptors for asiaglycoprotein
Quantity assessment

• CT and MRI volumetry

• Pre-op CT imaging focus on:
  – Liver attenuation - steatohepatitis
  – Splenomegaly, varices or ascites – suspect underlying cirrhosis
Prevention

• Preventive strategies aimed at increasing future liver remnant (FLR):
  – Portal vein embolization (PVE)
  – Portal vein ligation (PVL)
  – Associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) procedure
PVE

- Embolization of portal vein ipsilateral to the side of the disease.
- Leads to hypertrophy of the contralateral side, i.e FLR.
- Hypertrophy of 30-40% in 80% of pts.¹
- Guidelines recommend PVE in:²
  - Cirrhotics with FLR of <40%
  - Normal liver FLR <20%

² Thakrar PD, et al. Semin Roentgenol. 2011;46
ALPPS

- Developed to decrease time between PVL and resection
- May facilitate superior hypertrophy compared to PVE – 74% volume increase in mean of 9 days
- Higher operative morbidity (16-64%) and perioperative mortality (12-23%).

Treatment

• When present:
  – Multi-organ failure
  – Renal insufficiency
  – Encephalopathy
  – Need for ventilator support
  – Need for pressor support
  – Develop persistent hyperbilirubinemia
  – Coagulopathy
Rx cont.

• Monitor postop to identify and treat PHLF early
• Monitor for early clinical and laboratory signs of liver failure
• Monitor for early signs of infection, hemodynamic failure, renal failure, malnutrition, or metabolic disorders
Rx cont.

- Management principles: American Association for the Study of Liver Diseases Guidelines for the management of acute liver failure.
- Severity followed using lab values
- Resuscitative measures and organ support – optimize environment for liver regeneration
Rx cont.

- Establish antimicrobial therapy
- Look for vascular complication
- Radiological drainage if biliary fistula
- Optimize vital functions
- Prevent malnutrition
- Review all medication – stop hepatotoxic and nephrotoxic medication
- Symptomatic treatment
- Coagulopathy
Rx cont.

- Artificial liver
- Liver transplantation
Conclusion

• Major contributor to posthepatectomy morbidity and mortality
• Current definition ISGLS – not without problems
• Important to risk stratify patients before embarking on surgery
• Vitally important to determine FLR before surgery
• Implement preventative techniques in high risk patients
• Meticulous surgical technique
• Identify PHLF early and initiate treatment
• Rx mainly based on supportive treatment

• List of references in the handbook.
Thank you