Complex Liver Transplant Surgery: Techniques for Difficult Hurdles

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Complex or Extreme?

► Arterial reconstruction
  ▪ Intraoperative challenges
  ▪ Post transplant frustrations
► Splanchnic venous thrombosis
  ▪ Pre transplant consideration
  ▪ Intraoperative approaches
► Venous bypass
  ▪ What
► Budd Chiari Syndrome
  ▪ Always something wacky
Arterial Problems

- Complex reconstruction on backtable
- Unsuitable recipient artery
- Post-transplant challenges
  - HAT
  - Pseudo aneurisms
62 yo male Laennec's/Hep C with small HCC. Donor
63 yo CVA, 10% macro, outside team removing, arrives with 4 hours CIT

► Hepatectomy goes well
► Sew it in and unclamp
  ▪ Uneventful ..sorta..
► Feel artery and clearly thrombosed with dissection
► Liver now 10 h since donor clamp
► Next choice?
62 yo male Laennec's/Hep C with small HCC. Donor 63 yo CVA, 10% macro, outside team removing, arrives with 4 hours CIT

A. Go directly to conduit infra renal
B. Go directly to conduit supra-celiac?
C. Dissect artery down to splenic and try to use
D. Use vein conduit from donor
E. Stop and relist?
Aortic Conduits
Post Transplant Hepatic Artery thrombosis
Diagnosis

- Lab tests
- Duplex
- CT angio
- MR angio
- Old fashioned angio
- Take to OR
- Relist
35 yo male with PSC undergoes OLT with SCD. POD 1 ultrasound normal. POD 7 slight increase in LFT’s..? rejection....US reveals no arterial waveform. Next steps?

► Wait and see?
► Definitive diagnostic test? Angio of some type
► Immediate return to operating room with hopes that its ok and possible to vascularize
► relist
35 yo male with PSC undergoes OLT with SCD. POD 1 ultrasound normal. POD 7 slight increase in LFT’s...? rejection....US reveals no arterial waveform.

A. Wait and see?

B. Definitive diagnostic test?
   Angio of some type

C. Immediate return to operating room with hopes that it's ok and possible to vascularize

D. relist

5% 7% 31% 57%
Arterial stenosis
Prevalence and Risk factors of Portal and/or splanchnic venous thrombosis

► In cirrhotic patients 2 to 26%

- Hospital Beaujon (Gut 2005)
  - 15 of 251 had porto/mesenteric or splenic
  - Multivariate analysis suggested low platelet count and history of variceal bleeding increased risk

- Birmingham (Transplantation 2000)
  - 16 of 779 had extensive porto/mesenteric disease

- Cardarelli Hospital (J Hepatology 2004)
  - 32 of 701 had porto/mesenteric/splenic
  - mutation 20210 of the prothrombin gene increases more than fivefold the risk of PVT.
Risk factors

► Hepatocellular carcinoma
  ▪ Typically not tx candidates

► Portosystemic shunt
  ▪ Failed central shunts
  ▪ Distal splenorenal- 10% risk of PVT

► Budd-Chiari syndrome

► Hypercoagulable conditions

<table>
<thead>
<tr>
<th>Thrombophilic risk factors</th>
<th>PVT</th>
<th>CCG</th>
<th>P value</th>
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<tr>
<td>Previous sclerotherapy</td>
<td>25 (31.6)</td>
<td>18 (23.1)</td>
<td>0.23</td>
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<td>Abdominal surgery</td>
<td>23 (29.1)</td>
<td>27 (34.6)</td>
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<tr>
<td>FVL</td>
<td>8 (11.4)</td>
<td>4 (5.1)</td>
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<tr>
<td>PTHR 20210</td>
<td>15 (21.4)</td>
<td>4 (5.1)</td>
<td>0.003</td>
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<tr>
<td>MTHFR TT677</td>
<td>15 (21.4)</td>
<td>11 (14.1)</td>
<td>0.24</td>
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<tr>
<td>ACA IgG (&gt; 10 U/ml)</td>
<td>25 (43.9)</td>
<td>37 (48.7)</td>
<td>0.58</td>
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<tr>
<td>ACA IgM (&gt; 10 U/ml)</td>
<td>9 (14.0)</td>
<td>13 (17.1)</td>
<td>0.63</td>
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<tr>
<td>Homecysteine ( &gt;13 µmol/l)</td>
<td>17 (28.3)</td>
<td>31 (41.9)</td>
<td>0.10</td>
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</table>
Case Report - Mr. B

- 50 yo man with alpha-1 antitrypsin
  - Fatigue, encephalopathy, ascites and peripheral edema.
  - 3 variceal bleeds with the last requiring 13 units blood.
  - Ultrasound demonstrated portal vein thrombosis and MR angiogram revealed extensive thrombosis of splenic and SMV.
  - History of DVT, pulmonary embolus, vena caval filter and is taking Coumadin.
  - Was referred for consideration of multivisceral transplant.
Total Splanchnic Venous Thrombosis

- Prevalence and risk factors
- Imaging studies
- Pre-transplant management
- Operative choices
  - Thrombectomy
  - Mesoportal jump graft
  - Caval-portal hemi transposition
  - Multviseral transplantation
Selecting the best operation

- Thrombectomy or use recanalized portal vein
- Mesoportal graft or other extra-anatomic inflow
- Cavo-portal hemi transposition
- Multiviseral transplant
Thrombectomy, use of recanalized portal vein, or resection of phlebosclerotic portal vein with graft placement

Good first step

- Thrombectomy
  - infrequently used
- Characterize portal flow

- Grafts needed when donor pancreas used
- Avoid extensive peri-pancreatic dissection
Mesoportal or other extra-anatomic bypass

- Safe and effective
- Preferred approach for most patients
- Adequate portal inflow and splanchnic decompression
- SMV approached similar to mesocaval shunt (Rex)
- Avoids peri-pancreatic dissection
- Coronary, middle colic biliary collateral
Cavo-portal Hemi transposition
Cavo-portal Hemitransposition

- when hepatopetal flow to the liver graft cannot be established by other techniques
- Satisfactory graft function (early)
- Does not deal with portal hypertension
- Ascites/GI bleeding

- Miami-23 patients
- 63% 1 year survival with 11/23 currently alive
  - 7/23 post operative GI bleed
  - Postoperative ascites
  - Cases of deaths sepsis/pulmonary embolus
Multiviseral transplant
Multiviseral Transplantation

-- No Splanchnic venous opportunities
-- Very effective
  ► Pretransplant decision
  ► Limited donor pool
  ► Postoperative care specialized
  ► Decreased survival
Case report—Mr. B

- At transplant SMV not suitable
- Good flow through recanalized portal vein or collateral
- Good PV flow on post-op ultrasound
- Postoperative variceal bleed
  - Stopped anticoagulation
- Done well
Approach to PVT

- Don’t transplant too high risk
- Attempt Declot or some type of thrombo/endo-venectomy
- Split pancreas and do anastomosis there
- Go directly to SMV with jump graft
- Multivisceral transplant
Approach to PVT

A. Don’t transplant too high risk
B. Attempt Declot or some type of thrombo/endo-venectomy
C. Split pancreas and do anastomosis there
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E. Multivisceral transplant
Conclusion

- Pre-transplant imaging critical
- Anti-coagulation
- Select operation to fit anatomy
  - Plan
  - Splanchnic inflow
  - Limited roles of cavo-portal hemi-transposition and multiviseral
- Splanchnic venous thrombosis should not be an obstacle to successful transplantation
Whats up with Venous Bypass?

- Use on every case with or with portal
- Percutaneous technique
- Only on selected cases
  - Retransplant?
  - Fulminants
- Whats venous bypass?

Shaw et al 1985
What's up with Venous Bypass?

A. Use on every case with or with portal
B. Percutaneous technique
C. Only on selected cases
D. What's venous bypass?

- A. Retransplant?
- B. Fulminants
- D. What's venous bypass?

- Use on every case with portal: 68%
- Percutaneous technique: 23%
- Only on selected cases: 5%
- Retransplant: 4%
- Fulminants: 0%
- What's venous bypass: 0%
Budd-Chiari Syndrome
Technical Challenges of Budd Chiari

- Liver Huge
- Caudate lobe hypertrophy with displacement of cava or distorted anatomy
- Previous operations
  - Prior porto-caval shunt
- Venous Thombosis
  - PVT
  - Caval thrombosis
- Nasty Collaterals
Slow is smooth...smooth is fast
A Selective Approach to Managing Total Splanchnic Venous Thrombosis in Liver Transplantation

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Avoidance the **Best** approach
Living Donor Liver transplant
Adult Living Donor Liver Transplant

- Donor events
- Complex reconstruction
- How many bile ducts?
- How many hepatic veins?
- Hepatic artery...size matters?
Imaging Studies

- Ultrasound
- CT angiogram
- MR angiography-
  - gadolinium enhanced
- Angiography
- Operating room
Pre-transplant management

► Repeat imaging
  - 3 to 6 months

► Anticoagulation
  - Pro
    ► recanalization of venous thrombosis
    ► No evidence of increased bleeding
    ► Vit K antagonists
  - Con
    ► Are you kidding????
    ► Worsen variceal bleed
    ► Increase bleeding during liver transplant