Injuries to the Liver, Biliary Tract, Spleen and Diaphragm

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Injuries to the Liver
Evaluation

- Fully mobilize both lobes
  - Divide the triangular and coronary ligaments
  - Avoid hepatic vein and retro hepatic cava
- Exposure of junction of hepatic veins and cava
  - Median sternotomy
  - Divide diaphragm and pericardium
Figure 2  Depicted are the venous drainage and suspensorry attachments of the liver.
Classification

- AAST organ injury grading system
- Ranges from I to VI
- I = superficial laceration
- VI = hepatic avulsion
Operative Management
Temporary Control

- Essential
- Allows anesthesia time to catch up
- Allows evaluation of other injuries
- Various techniques
Techniques for Temporary Control of Hemorrhage
Options

- Manual compression
- Perihepatic packing
- Pringle maneuver
- Packing can compress the cava, decrease venous return and reduce LV filling
Pringle Maneuver

- Time limit
- Controls bleeding from branches of hepatic artery or portal vein
- Persistent hemorrhage indicates retrohepatic cava or hepatic vein injury
- Used in conjunction with packing
Difficult Problem

- Juxtahepatic venous injuries
- Hepatic vascular isolation
- Atriocaval shunt
- Moore-Pilcher balloon
Hepatic Vascular Isolation

- Pringle maneuver
- Aortic hiatal control
- Suprarenal and suprahepatic vena caval control
- Relatively ineffective
Atriocaval Shunt

- Achieves hepatic vascular isolation
- Maintains some venous return to the RA
- Technically difficult
- Associated with high mortality
Moore-Pilcher Balloon

- Inserted through femoral vein
- Advanced into retrohepatic cava
- When positioned it occludes the hepatic veins and vena cava
- Achieves vascular isolation
Techniques for Definitive Management
Simplest Options

- Manual Compression
  - Grade I or II

- Topical hemostatic measures
  - Electrocautery
  - Argon beam
  - Thrombin
  - Fibrin glue
More Advanced

• Suture hepatorrhaphy
  - Grade III or IV
  - Reserved for lacerations 3 cm or less in depth
  - Can cause hepatic necrosis
  - Capsule must be intact

• Finger fracture
  - Selective ligation of bleeding vessels
  - Reserved for deep lacerations
  - Allows ID and control of bleeding vessels
More Advanced

- Hepatic artery ligation
  - Limited role
  - Useful only for arterial hemorrhage

- Intrahepatic balloon
  - Hand-crafted in the OR
  - May not be sufficient for major arterial bleeding
More Advanced

• Resectional debridement
  - Used for peripheral injuries
  - Allows exposure of deeper injuries

• Intrahepatic balloon
  - Hand-crafted in the OR
  - May not be sufficient for major arterial bleeding
Additional Options

• Perihepatic packing
  - Most significant advance in the tx of hepatic injuries to occur in the past 25 years
  - Purposeful and directed

• Anatomic resection and transplantation
  - Limited success
Uncommon Injury

• Subcapsular hematoma
  - Arises when parenchyma is disrupted but capsule is intact
  - Range from minor to ruptured central hematomas

• Grade I or II
  - Involve <50% of liver surface, not expanding
  - Leave alone
Uncommon Injury

• Grade III
  - Expanding
  - Should be explored
  - Result from uncontrolled arterial hemorrhage
  - Packing alone may not be successful
  - IR

• Ruptured Grade III or IV
  - Exploration + selective ligation
To Drain or not to Drain?
• Overall mortality = 10%
• Exsanguination = most common
• Liver-related complications
Complications

• Post-op hemorrhage
  - Coagulopathy
  - Missed vascular injury
  - Angio + embolization

• Abscesses
  - Penetrating = more common
  - IR drainage
  - 12th rib resection
Complications

• Bilomas
  - Can be infected
  - Drainage

• Biliary fistula
  - 3% of patients with major injuries
  - Majority close spontaneously
Complications

- PSA
  - Develop secondary to initial injury mgmt
  - Can rupture into the parenchyma, bile duct or adjacent branch of portal vein
  - Hemobilia
Injuries to the Bile Ducts and Gallbladder
Extrahepatic Bile Duct Injuries

• Characterized by bile accumulation in RUQ

• CBD – sm lac, no tissue loss vs lac involving 25-50% of duct

• Hepatic ducts – individual - ligate

• Intrapancreatic
Galbladder Injuries

- Cholecystectomy
- One caveat
- Make sure that gb is not required for reconstruction
Injuries to the Spleen
Operative Options

- Splenorrhaphy
- Partial splenectomy
- Splenectomy

- All require adequate exposure and mobilization
Injuries to the Diaphragm
Diaphragm Injuries

• 75% left-sided following blunt trauma
• Often difficult to diagnose
• Acute injuries repaired through abdomen
• Laparoscopy is both diagnostic and therapeutic
For Your Own Good

- Directed, purposeful packing
- Selective ligation = YES
- Parenchymal sutures = NO
- Diaphragm laceration = prolene
- FULLY mobilize both the liver and spleen