PRACTICE GUIDELINE

Effective Date: 6-18-04 Manual Reference: **Deaconess Trauma Services**

TITLE: MANAGEMENT OF LIVER INJURIES

PURPOSE: To define situations in which non-operative management of liver injuries is safe and desirable, outline a protocol for non-operative management of liver injuries, and outline a protocol for the operative management of liver injuries.

DEFINITIONS:

1. Grade I: Parenchymal fracture <1 cm deep; Capsular avulsion

2. Grade II: Parenchymal fracture 1-3 cm deep; Subcapsular hematoma <10 cm in diameter; Peripheral penetrating wound

3. Grade III: Parenchymal fracture >3 cm deep; Subcapsular hematoma >10 cm; Central penetrating wound

4. Grade IV: Lobar tissue destruction ; Massive central hematoma

5. Grade V: Retrohepatic vena cava injury ; Extensive bilobar disruption

GUIDELINES:

1. Indications for operative and non-operative management of liver injuries:
    a. Operative management of liver injuries should be considered when there is ongoing bleeding from the liver injury resulting in unstable vital signs or there is the possibility of other injuries.
        i. Markedly unstable patient with rapidly expanding abdomen or increasing rigidity.
        ii. Grossly positive peritoneal lavage.
        iii. Grade V liver injury on CT scan.
        iv. A “swirl” pattern on CT scan suggestive of ongoing bleeding.
        v. Gunshot wound to the abdomen in the RUQ.

    b. Non-operative management of liver injuries can be considered in the otherwise stable patient.
        i. Liver injury diagnosed on CT scan with normalizing vital signs Grade I to IV:
            a) Injury not into hilum.
            b) Rim of blood fairly localized around liver.
        ii. DPL positive by cell count (grossly negative) in otherwise stable patient with a mechanism suggestive for liver injury, might consider CT scan after DPL.

2. Operative management:
    a. Transfer patient immediately to the operating room, have self-retaining retractors available.
    b. Prep from chin to mid-thigh; table to table.
    c. Generous midline incision from xiphoid to below the umbilicus.

d. Pack the RUQ with multiple lap pads.
e. Pack the other quadrants and check the mesentery for bleeding.
f. Assess the bleeding from the liver.
    i. If the bleeding is brisk, clamp the porta hepatis with your finger or a non-crushing clamp (Pringle maneuver).
        a) If bleeding persists, consider hepatic vein injury or retrohepatic caval injury.
            i) Consider atrial-caval shunting.
            ii) Consider veno-veno bypass.
            iii) Consider resectional debridement to get to the vena cava and the branches of the hepatic veins.
            iv) Consider packing.
        b) If bleeding subsides:
            i) Control bleeding with suture ligaments.
            ii) Release Pringle maneuver and control major bleeding with suture ligatures.
            iii) Consider omental pack.
        c) If bleeding subsides but worsens because of coagulopathy, consider packing.
    ii. If bleeding is moderate but controllable with packs:
        a) Mobilize the liver:
            i) Divide falciform ligaments.
            ii) Divide lateral triangular ligaments.
            iii) Rotate liver medially into wound.
        b) Explore injury (but do not worsen it).
        c) Control bleeding with suture ligatures.
        d) Consider liver edge approximation with large absorbable sutures.
        e) Consider omental pack.
    iii. If bleeding is controllable but then worsens because of coagulopathy, then consider packing.
g. When hepatic hemorrhage is controlled, explore the rest of the abdomen with particular attention to porta hepatis, duodenum, pancreas and right colon.
h. Drain liver if lacerations are deep and there is possibility of bile leak and fluid collection.
i. If packs are placed, they should be removed in 24-48 hours. Prepare for this procedure with the availability of autotransfusion, the argon beam coagulator and blood products.
j. If packs are placed, consider empiric antibiotic therapy while packs are in place.

3. Non-operative management:
    a. Admit all Grade III-IV liver lacerations or those with significant blood around the liver (with normalizing vital signs) to a monitored bed. Consider admitting patients with large amounts of blood around the liver with hematocrit <32% to the Trauma ICU. All others can be admitted to the trauma floor.
        i. Monitor hourly vital signs until normal (e.g., pulse < 100/min).
        ii. Bed rest.

iii. NPO.
iv. Draw serial hematocrit and hemoglobin every 6 hours until stable X 2.

b. When hematocrit is stable and there have been no adverse hemodynamic events:
i. Transfer to regular floor.
ii. Advance diet.
iii. Hematocrit and hemoglobin daily.
iv. Liver enzymes and bilirubin on day 2.
v. Bed rest 2 days. Grade I and II liver fractures may ambulate immediately.
vi. If stable and tolerating diet:
a) Grade I and II injuries: discharge on day 1-2.
b) Grade III and IV injuries: discharge on day 5.

c. After discharge:
i. No school for a week.
ii. No physical education for six weeks.
iii. No major contact sports:
a) Grade I and II: for six weeks.
b) Grade III, IV and V: for three months.
iv. Return to trauma surgeons office in two weeks.
v. Instruct to return to the ED if:
a) Worsening RUQ pain.
b) Fever.
c) Jaundice.

4. Pitfalls:

a. Fever and/or jaundice – consider biloma.
i. CT scan to confirm.
ii. Percutaneous drainage.
iii. Consider ERCP with stent placement and/or sphincterotomy.

b. UGI bleed two to four weeks after injury – consider hemobilia.
i. CT scan to confirm large intrahepatic injury or clot.
ii. Angiography to confirm etiology.
iii. Angiographic embolization of vessel.
iv. Do not explore for hemobilia.

c. Hypotension, drop in hematocrit seven to ten days after non-operative management of severe liver injury:
i. Repeat bleed, usually arterial.
ii. Admit to ICU, stabilize.
iii. Angiography to confirm etiology.
iv. Angiographic embolization of the vessel.
v. Attempt to avoid exploration at this time.

REFERENCES:

- Deaconess Trauma Guideline Manual, PENETRATING INJURIES TO THE ABDOMEN.
- Deaconess Trauma Guideline Manual, BLUNT ABDOMINAL TRAUMA.

- Deaconess Trauma Guideline Manual, DIAGNOSTIC PERITONEAL LAVAGE.

REVIEWED DATE	REVISED DATE
JAN 05	JAN 08
JAN 06	
JAN 07	