

Liver trauma

General

Liver injuries are uncommon because of the liver's position under the diaphragm protected by the chest wall. However, when they do occur they are serious injuries associated with a significant morbidity and mortality.

Liver trauma can be divided into:

- ❖ Blunt traumatic injuries which produce contusions, lacerations and avulsion injuries to the liver, and
- ❖ Penetrating injuries, such as stab and gunshot wounds.

Diagnosis of liver injury

The liver is an extremely well-vascularised organ and blood loss is therefore the major early complication of liver injuries.

- ❖ All lower chest and upper abdominal stab wounds should be suspect, especially if considerable blood volume replacement has been required.
- ❖ Severe crushing injuries to the lower chest or upper abdomen often combine rib fractures, haemothorax and damage to the spleen and/or liver.

NOTE: Owing to the opportunity for massive ongoing blood loss and the rapid development of a coagulopathy, the patient should be directly transferred to the operating suite whilst blood products are obtained and volume replacement is ongoing.

- ❖ Patients with blunt trauma who are haemodynamically stable but have objective clinical signs, such as upper abdominal tenderness and guarding, should have an oral and intravenous contrast enhanced CT scan of the chest and abdomen. This will demonstrate evidence of parenchymal damage to the liver or spleen as well as associated traumatic injuries to their feeding vessels.
- ❖ The chest scan will help to exclude injuries to the great vessels and demonstrate damage to the lung parenchyma.
- ❖ Additional investigations which may be of value include ***peritoneal lavage***, which can confirm the presence of haemoperitoneum, and ***laparoscopy***, which can demonstrate an associated diaphragmatic rupture.

Initial management of liver injuries

Penetrating

The initial management of a patient with an upper abdominal penetrating injury is the basis of resuscitation. The initial survey assesses the patients airway patency, breathing pattern and circulation. Peripheral venous access is gained with two large-bore cannulae and blood sent for cross match of 10 units of blood, full blood count, urea and electrolytes, liver function tests, clotting screen, glucose and amylase. Initial volume replacement should be with colloid or 0-negative blood if necessary. Arterial blood gases should be obtained and the patient intubated and ventilated if the gas exchange is inadequate.

Intercostal chest drains should be inserted if associated pneumothorax or haemothorax is suspected.

Once initial resuscitation has been commenced the patient should be transferred to the operating theatre with further resuscitation being performed on the operating table. The necessity for fresh frozen plasma and cryoprecipitate should be discussed with the blood transfusion service immediately the patient arrives, as these patients rapidly develop irreversible coagulopathies due to a lack of fibrinogen and clotting factors.

Blunt trauma

With severe blunt injuries the plan for resuscitation and management is as outlined above for penetrating injuries. For the patient whose vital signs are normal, imaging may be performed to evaluate further the nature of the injury. The basic surgical management differs between penetrating and blunt injuries thought to involve the liver. Penetrating injuries should be explored, whereas blunt injuries can be treated conservatively. The indication for discontinuing conservative treatment for blunt trauma would be ***evidence of ongoing blood loss despite correction of any underlying coagulopathy and the development of signs of generalised peritonitis.***

The surgical approach to liver trauma

The incision is usually midline.

Options which can be used for definitive control of bleeding hepatic injury.

These may include in order:

- 1) simple manual compression for minutes
 - 2) Topical haemostatic measures which may include
 - Electro cauterization – Argon beam coagulator
 - Micro crystalline collagen in the powdered form
 - Thrombine –fibrin glue.
 - 3) Suturing hepatic paranchymal injury
 - 4) Hepatotomy with selective ligation of bleeding vessels
 - 5) finger fracture technique to identify the bleeding vessels to be ligated.
 - 6) Placing an omental patch filling large defects & to buttress hepatic sutures.
 - 7) Hepatic arterial ligation.
 - 8) Use of intra hepatic balloon.
 - 9) Resectional debridement.
 - 10) Perihepatic packing.
 - 11) Anatomic hepatic resection.
- ❖ Simple manual compression for few minutes may stop simple bleeding from simple liver wound.

- ❖ Application of topical haemostatic agent & measures. The simplest of these measures is electro cauterization, which can often control small bleeding vessels near the surface of the liver.

Bleeding from raw surface of the liver that does not respond to electrocauterization may respond to the argon beam coagulator.

Also useful in similar situation is microcrystalline collagen in the powdered form. The powder is placed on a clean 10x10 cm sponge & applied directly to the oozing surface with pressure maintained on the sponge for 10-15 minutes. Thrombin can also be applied topically to minor bleeding injuries by saturating either a gelatin foam sponge or microcrystalline collagen pad & pressing it to the bleeding site.

Fibrin glue has been used in treating both superficial & deep lacerations & appears to be the most effective topical agent.

It can also be injected deep into bleeding gunshot & stab wound tract to prevent extensive

- ❖ The finger fracture technique is used to extend the length & depth of a laceration or a missile tract until the bleeding vessels can be identified & controlled.
- ❖ An adjunct to parenchymal suturing or hepatotomy is the use of the omentum to fill large defects in the liver & to buttress hepatic sutures.

It provides an excellent source for macrophages & fill a potentially dead space with viable tissue.

Complications of liver trauma and there management

- 1) Sudden massive blood loss.
- 2) A subcapsular or intrahepatic haematoma requires no specific intervention and should be allowed to resolve spontaneously. Attempts to aspirate these lesions may result in the development of a liver abscess due to contamination.
- 3) Abscesses may also form as a result of secondary infection of an area of extensive parenchymal ischaemia, especially after penetrating trauma. Treatment under these circumstances is with appropriate systemic antibiotics and aspiration under ultrasound guidance once the necrotic tissue has liquefied.
- 4) Biliary fistulae are a rare but important complication of liver trauma and may be difficult to control. The main aspects to management are to drain any intraperitoneal bile collections externally by percutaneous drainage under ultrasound guidance. This is followed by endoscopic or percutaneous cholangiography to determine the site of the biliary fistula and decompress the biliary tree by nasobiliary drainage or

endoprosthesis insertion. If this fails to control the fistula the affected portion of the liver may require to be resected.

- 5) Late vascular complications include hepatic artery aneurysms and arteriovenous and arteriohepatic fistulae. These are best treated nonsurgically by a specialist hepatobiliary interventional radiologist. The feeding vessel can be embolised transarterially.
- 6) Evidence of liver failure may be seen with extensive liver trauma. If the blood supply and biliary drainage of the liver are intact this will usually reverse with conservative supportive treatment.
- 7) Development of biliary tract strictures many years after recovery from liver trauma.

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