Management of liver injury
And
Prognostic Criteria

Essay

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List of abbreviations

- **AAST** American Association of Surgery for Trauma
- **AIS** Abbreviated Injury Scale
- **CBD** Common Bile Duct
- **DIC** Disseminated Intravascular Coagulopathy
- **DPL** Diagnostic Peritoneal Lavage
- **ECG** Electrocardiography
- **ERCP** Endoscopic Retrograde Cholangio-Pancretography
- **GCS** Glasgow Coma Scale
- **HELLPS** Hypovolemic shock, Elevated Liver Enzymes, Low Platelets Syndrome
- **HIDA scan** Hepatic Iminodiacetic Acid scan
- **ISS** Injury Severity Score
- **IVC** Inferior Vena Cava
- **OIS** Organ Injury Scaling
- **RTS** Revised Trauma Score
- **SBP** Systolic Blood Pressure

Introduction

The incidence of abdominal trauma increases each year. Blunt abdominal trauma generally leads to higher mortality rates than penetrating wounds & presents greater problems in diagnosis ***(Shires et al., 1995).***

The spleen, liver, kidneys & bowel are the most frequently injured abdominal viscera. As the largest of the intra-abdominal organs, the liver is the most frequently injured in both blunt & penetrating wounds *(**Walt & Bender, 1997**)*.

Liver injury occurs in about 15-20% of all patients suffering from blunt abdominal trauma, in 40% of those with abdominal stab wounds & in 30% of those with abdominal gunshot wounds *(**Forti et al., 1992**)*.

Despite advances in resuscitative & surgical techniques, the overall mortality from liver trauma approximates 12% & can be as high as 50-89% when multiple organs are injured *(**Greenfield, 1999**)*.

Morbidity & mortality from hepatic trauma are influenced by many factors. For instance, the type of trauma whether blunt or penetrating, the severity of injury to the liver, the presence of shock, the volume of hemorrhage & concomitant damage to other intra-abdominal structures. So that, trauma score at the time of admission & classification of hepatic damage were predictive of survival *(**Greenfield, 1999**)*.

Approximately 80% of liver trauma cases have a good prognosis and don't create decision-making problems for the surgeon, while the remaining 20% still represent a problem for the correct choice. So that, liver injuries are frequently classified into categories depending on the type & the extent of the injury ***(Terrinoni et al.,1995)***.

Recently, there has been a trend towards more conservative management but the mortality rate from liver trauma have a linear relationship to the magnitude of liver injury & the severity of associated lesions. While the common complications for major hepatic trauma include biliary fistula, peri-hepatic abscess, intra-hepatic haematoma, arterioportal fistula, hemobilia & hepatic or renal failure ***(Greenfield, 1999)***.

Aim of the work

The aim of the work is to evaluate the risk factors controlling the outcome of liver injury & discussing the new concept in management of liver injury to improve the prognosis.

Surgical Anatomy of The Liver

Precise knowledge of the liver, biliary tract and the related blood vessels and lymphatic drainage are essential for the performance of liver and biliary surgery (***Blumgart et al., 2001***).

Development of the liver:

The liver arises in the fourth week as a diverticulum from the ventral surface of the duodenal forgut, close to its junction with the midgut, lined with endoderm, grows ventrally and cranially into the septum transversum, its tip diverges into two solid hepatic buds of cells, the future right and left lobes of the liver (***Gray, 2000***).

The liver parenchyma appears first as solid cords of cells from the end of the hepatic diverticulum that grows into the septum transversum. These hepatic cords invest first the vitelline veins in the fifth week and later part of the left umbilical vein. These vessels break up into a plexus of thin walled blood vessels that will form the sinusoids of the liver (***Eugene et al., 2003***).

The buds develop into epithelial trabeculae or sheets, which branch and anastomose to form a close meshwork. The intervals of the meshwork become filled with blood sinusoids and on section the organ has the appearance of a vascular sponge (***Gray, 2000).***

The original diverticulum forms the bile duct, and from its distal part the cystic duct and the gall bladder arise as an outgrowth, solid at first but later canalized. The bile duct first opens into the wall surface of the duodenum, later, after rotation of the gut; it migrates to the left across the dorsal surface of the duodenum to the position, which it occupies in the adult on the medial border **(*Eugene et al., 2003*).**

As the liver enlarges, it projects into the abdominal cavity from the caudal surface of the septum trasversum, In the process, mesenchyme of the septum becomes drown out and cavitated ventral to the liver to form falciform ligament, and craniodorsally to form the coronary, right and left triangular ligaments and the lesser omentum ***(Gray, 2000).***

Gross Anatomy

The liver, the largest gland of the body, lies in the upper right part of the abdominal cavity, occupying most of the right hypochondrium and epigastrium and extending into the left hypochondrium as far as the left lateral line ***(Snell, 1995).***

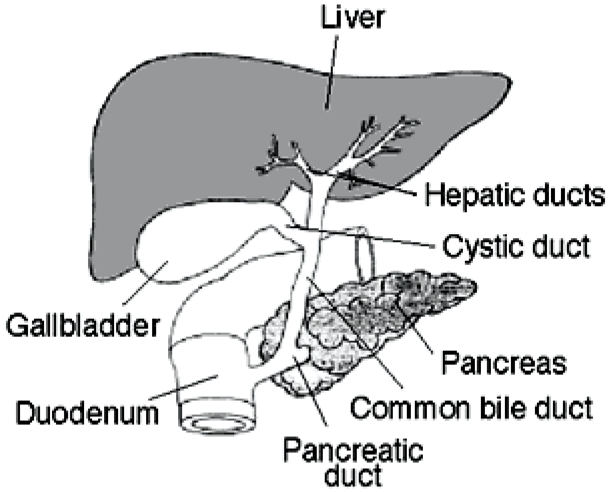

Fig.(1): The Hepato-Biliary System

In males, it weighs 1.4-1.8 Kgm, and in females 1.2-1.4 kgm with a range of 1.0-2.5 kgm. It is somewhat cuneiform, reddish brown in color in fresh state, and though firm and plaint,it is easily lacerated ***(Gray, 2000).***

For centuries, the division of the liver into lobes has been misunderstood. It was untill 1543 when Vesalius first recognized the asymmetric two lobbed appearance. Once the apparent lobation was established, it was another 350 years before the true lobar structure was suggested. It was reported that the division between true right and left lobes of the liver was not at the falciform ligament as has previously been believed, but rather at a line passing through the bed of the gall bladder and projecting posteriorly towards the vena Cava (known as Cantlie's line) ***(Starzl, 1989).***

In the early 1950s, it was demonstrated by casting studies of the liver that each true lobe was further divided into two segments, an anterior and posterior segments of the right lobe, a medial and lateral segments of the left lobe, and that the hepatic arterial, portal venous and biliary ducts branches conformed to the four segments. **Couinaud** divided each of the four segments into two, resulting in a total of eight segments ***(Starzl, 1989)***.

Borders:

The superior, anterior and right surfaces are continuous at rounded borders, but a sharp inferior border separates the right and anterior surfaces from the inferior surface. This border is rounded between the right and inferior surfaces, but becomes thin and angular at the lower limit of the anterior surface and is notched along this edge by the ligamentum teres, to the right of the midline. Lateral to the fundus of the gall bladder, which often corresponds to a second notch 4-5 cm to the right of midline, the inferior border largely follow the costal margin. Left to the fundus, it ascends less obliquely than the costal margin, crossing the infrasternal angle to pass behind the left costal margin near the tip of the eighth costal cartilage. It then ascends sharply to merge with the thin margin of the left lobe. At the infrasternal angle, the inferior border adjoins the anterior abdominal wall and is accessible to examination by percussion, but is not usually palpable. In the midline, the inferior border is near the transpyloric plane, about a hand’s breadth below the xiphisternal joint. In women and children, the inferior border often projects a little below the right costal margin ***(Gray, 2000).***

Surfaces:

The liver is a wedge shaped, with the base of the wedge to the right and the apex to the left ***(Ger, 1989).***

The superior surface includes parts of the right and left lobes. It fits closely under the diaphragm, separated from it by peritoneum except for a small triangular area where the two layers of the falciform ligament diverge. Right and left it is convex, but centrally it presents a shallow cardiac impression corresponding to the right diaphragmatic pleura and right pulmonary base, the pericardium and ventricular part of the heart and part of the left diaphragmatic pleura and left pulmonary base ***(Gray, 2000).***

The anterior surface, which is triangular and convex, is covered by peritoneum except at the attachment of the falciform ligament. Much of it is in contact with the diaphragm, which separate it on the right from the pleura and 6^{th} to 10^{th} ribs and cartilages and on the left from the 7^{th} and 8^{th} costal cartilages. The thin margins of the base of the lungs are thus quite close to the upper part of this surface; more extensively so on the right. The median area of the anterior hepatic surface lies behind the xiphoid process and the anterior abdominal wall in the infracostal angle ***(Gray, 2000).***

The right surface, covered by peritoneum, adjoins the right dome of the diaphragm, which separates it from the right lung and pleura and the 7^{th} to 11^{th} rib. Above its upper third, both lung and pleura are inserted between the diaphragm and ribs; over its middle third only the costodiaphragmatic pleura is interposed; over its lower third the diaphragm and thoracic wall are in contact ***(Gray, 2000).***

No definable border separates superior, anterior and right aspects of the liver and it would be more appropriate to group these as the diaphragmatic surface, mostly separated from the visceral surface by a narrow edge or border ***(Gray, 2000).***

The posterior and inferior surfaces merge into each other and are seen by elevating the inferior margin. The inferior concave surface presents a prominent porta hepatis from the passage of the major vessels and bile ducts and is related to structures that leave surface impression on the liver. From the right, these are the upper half of the right kidney and suprarenal gland posteriorly, with the hepatic flexure of the colon and the junction of the first and second parts of the duodenum anteriorly. Passing leftward, the liver is in contact with the inferior vena cava and the esophagus and proximal stomach ***(Ger, 1989).***

The posterior surface is largely retroperitoneal and lies in contact with the retro hepatic vena cava and the