INTRODUCTION

Blunt abdominal trauma is a leading cause of morbidity and mortality among all age groups. Identification of serious intra-abdominal pathology is often challenging. Many injuries may not manifest during the initial assessment and treatment period. Missed intra-abdominal injuries and concealed hemorrhage are frequent causes of increased morbidity and mortality, especially in patients who survive the initial phase after an injury ***(Rivara, 2005)***.

According to national and international data, blunt abdominal trauma is more common in men. The male-to-female ratio is 60:40. Most studies indicate that the peak incidence is in persons aged 14-30 year ***(Demetriades et al., 2004).***

Blunt abdominal trauma usually results from motor vehicle collisions (MVCs), assaults, recreational accidents, or falls. Blunt abdominal trauma most often results in injury to the spleen, which in over 60 percent of cases is the only damaged intra peritoneal structure. The liver and kidney can also be injured. Less commonly, hollow viscus injury may occur. Several patho-physiologic mechanisms can occur in patients with blunt abdominal trauma. A sudden and pronounced rise in intra abdominal pressure created by outward forces can rupture a hollow viscus. Elderly and alcoholic patients generally have lax abdominal walls and are more likely to sustain such injuries, Delayed splenic rupture can occur ***(Rondsari et al., 2005).***

A carefully performed physical examination remains the most important method to determine the need for exploratory laparotomy. In recent years, laboratory evaluation of trauma patients has been a matter of significant discussion. Commonly recommended studies include: complete blood- count (CBC), serum chemistries, serum amylase, coagulation studies, blood typing, cross-matching, arterial blood gases (ABGs) and a urine pregnancy test (for females of childbearing age) ***(Brasel and Nirula, 2005)***.

The most important initial concern in the evaluation of a patient with blunt abdominal trauma is an assessment of haemodynamic stability.In the haemo-dynamically unstable patient,a rapid evaluation must be made regarding the presence of haemo-peritoneum. This can be accomplished by means of plain radiography; diagnostic peritoneal lavage (DPL) or the focused assessment with ultrasonography for trauma (FAST) but Computed Tomography (CT) provides most detailed images ***(Brasel and Nirula, 2005).***

Pre-hospital care focuses on rapidly evaluating life-threatening problems, initiating resuscitative measures, and initiating prompt transport to a definitive care site. The injured patient is at risk for progressive deterioration from continued bleeding and requires rapid transport to a trauma center ***(Nirula et al., 2010).***

The use of laparoscopy for the treatment of various surgical diseases has been well described, and its use is widely

accepted. Diagnostic laparoscopy (DL) has been used by gynecologists for many years, and only recently has its use by the general surgeon gained interest. The ease of use and its ability to directly visualize the abdominal viscera have lead many surgeons to suggest the use of laparoscopy in the evaluation of the acute and traumatized abdomen ***(Johnson and Luchette, 2010).***

The proposed benefits include reduced incidence of non therapeutic laparotomies and shortened hospital stay as compared with current diagnostic regimens. Laparoscopy has been reported as a therapeutic tool in selected trauma patients for example repair of diaphragmatic lacerations with sutures, suturing of gastrointestinal perforations, hemostasis of liver and splenic lacerations, resection of small bowel and colon ,splenectomy,and distal pancreatectomy, Despite these proposed benefits, the use of DL in the management of the trauma patient is restricted to the hemodynamically stable patient**.** In the setting of blunt trauma, DL has been demonstrated to accurately diagnose solid organ injuries and is capable of predicting individuals requiring celiotomy. The role of DL in this setting mirrors that of diagnostic peritoneal lavage ***(Johnson and Luchette, 2010).***

Although laparoscopy has been used to evaluate patients with possible abdominal trauma, its use for this purpose is limited by the availability of other diagnostic procedures that

may be more suitable for particular circumstances and are more accurate for certain injuries ***(Johnson and Luchette, 2010).***

Laparoscopy is contraindicated in patients who are hypovolemic or hemodynamically unstable and should not be performed in patients with clear indications for celiotomy. It may not be appropriate for patients with cardiac dysfunction, nor for those with significant head injuries who are at risk for intracranial hypertension ***(Poole et al., 1996).***

Trauma victims who undergo laparoscopy are at risk for complications peculiar to this technique. These include extraperitoneal insufflation of CO, (which might mandate celiotomy) tension pneumothorax from unrecognized injuries to the diaphragm, and iatrogenic injuries to hollow viscera or intra-abdominal blood vessels. Port-site infections might occur in the postoperative period, as well as port-site hernias ***(Poole et al., 1996).***

AIM OF THE WORK

The aim of the study is to review the role of laparoscopy in diagnosis and management of blunt abdominal trauma regarding feasibility, indications, restrictions and complications.

ANATOMICAL BOUNDARIES

Anterior abdomen: trans-nipple line superiorly, inguinal ligaments and symphasis pubis inferiorly, anterior axillary lines laterally.

Flanks: between anterior and posterior axillary lines from 6th intercostal space to iliac crest.

Back: posterior to posterior axillary lines, from tip of scapulae to iliac crests ***(Moore et al., 2011).***

Pelvi-Abdominal cavity:

Upper peritoneal cavity: covered by lower aspect of bony thorax. Includes diaphragm, liver, spleen, stomach, transverse colon.

Lower peritoneal cavity: small bowel, ascending and descending colon, sigmoid colon, and (in women) internal reproductive organs.

Pelvic cavity: contains rectum, urinary bladder, iliac vessels, and (in women) internal reproductive organs.

Retroperitoneal space: posterior to peritoneal lining of abdomen, Abdominal aorta, IVC, most of duodenum, pancreas, kidneys, ureters, and posterior aspects of ascending and descending colon ***(Adams, 2009).***

Surface landmarks of abdominal wall:

Xiphoid process:

This is the thin cartilaginous lower part of the sternum. The xihoid junction is identified by feeling the lower edge of the body of the sternum and it lies opposite the body of 9^{th} thoracic vertebrae.

Costal margin:

This is the curved lower margin of the thoracic wall and is formed in front by cartilages of the 7^{th}, 8^{th}, 9^{th}, 10^{th} ribs and behind by the cartilages of 11^{th} and 12^{th} ribs. It lies opposite the body of 3^{rd} lumbar vertebra.

Iliac crest:

This can be felt along entire length and ends in front at the ASIS and behind at PSIS. It is highest point lies opposite the body of 4^{th} lumbar vertebrae.

Pubic tubercle:

It's important surface landmark, it may be identified as small protuberance along the superior surface of the pubis.

Symphysis pubis:

It's the cartilaginous joint that lies in the midline between the bodies of the pubic bones. It's felt as solid structure beneath the skin in the midline at the lower extremity of anterior abdominal wall ***(Williams, 2009).***

Inguinal ligament:

This ligament lies beneath skin crease in the groin. It's the rolled under anterior margin of the aponeurosis of external oblique muscle. It's attached laterally to the anterior superior iliac spine (ASIS) and curved downward and medially to be attached to the pubic tubercle ***(Williams, 2009).***

Planes and regions of the abdomen:

There are two vertical and two horizontal planes divide abdomen into 9 regions:

The vertical planes:

They are right and left lateral planes each is drawn vertically from the midclavicular point to midinguinal point.

The horizontal planes:

I. Subcostal plane:

Is drawn transversely at the lowest points of the costal margin, at the lower border of the 10^{th} costal cartilage (level with the body of L_3 vertebra).

II. Intertubercular plane:

Is drawn across the tubercle of the two iliac crests (level with the body of L_5 vertebra) ***(Keith and Anne, 2007).***

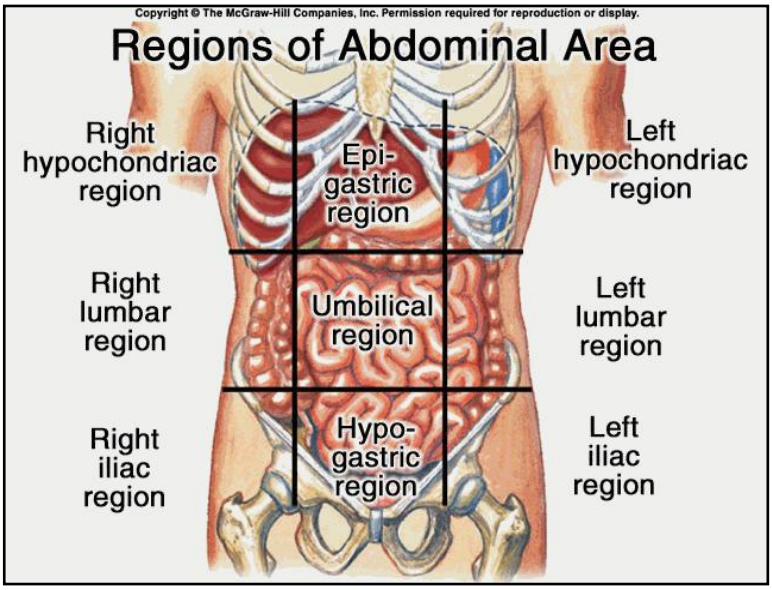

Figure (1): Regions of the abdomen ***(Frank Netter, 2009)***

Contents of abdominal regions:

Upper abdomen:

I. Right Hypochondriom:

- Greater part of right lobe of the liver.
- Right hepatic flexure of the colon.
- Part of right kidney.

II. Epigastric region:

- Left lobe of the liver.
- Part of right lobe of the liver.
- Gall bladder.
- The 2 orifices of the stomach.
- Part of the stomach.
- 1st, 2nd parts of the duodenum.
- Pancreas.
- Inner end of the spleen.

(Keith and Anne, 2007)

III. Left hypochondrium:

- Part of the stomach.
- Splenic flexure of the colon.
- The greater part of spleen.
- Tail of pancreas.
- Part of left kidney.

(Keith and Anne, 2007)

<u>Middle abdomen:</u>

I. Right lumbar:

- Ascending colon.
- Right kidney.

II. Umbilical:

- Transverse colon.
- 3rd part of the duodenum.
- Coils of jejuneum and ileum.
- Greater omentum and mesentery.

III. Left lumbar:

- Descending colon.
- Part of left kidney.

<u>Lower abdomen:</u>

I. Right iliac fossa:

- Caceum.
- Appendix.
- End of ileum.

(Keith and Anne, 2007)

II. Hypogastrium:

- Urinary bladder.
- Small intestine.
- Gravid uterus.

(Keith and Anne, 2007)

III. Left iliac fossa:

- Sigmoid colon.
- Coils of jejunum and ileum.

(Keith and Anne, 2007)

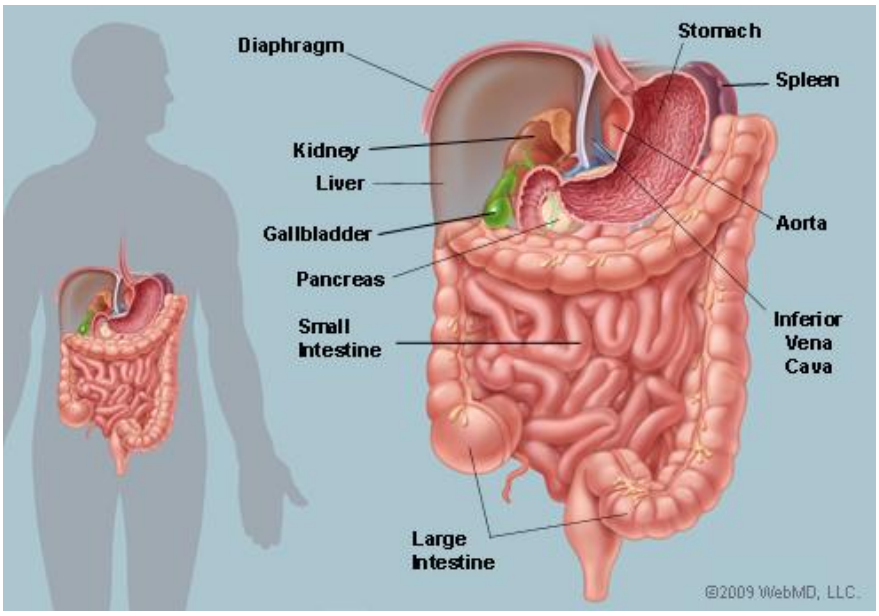

Figure (2): Anatomy of abdominal cavity ***(Wiley, 2009)***

Surface landmarks of the abdominal viscera:

Liver:

Location and Extent:

In the adult, the liver fills the right hypochondrium and the epigastric regions. It extends inferiorly into the right lumbar

region and occupies part of the left hypochondrium, reaching to the left lateral line. The liver is covered by ribs and costal cartilages, except in the epigastric region where it reaches the anterior abdominal wall just below the infrasternal notch ***(Kennedy and Madding, 1994).***

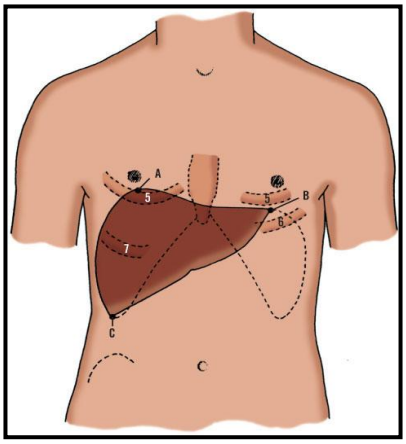

Figure (3): Outlines of the Liver on the Anterior Body Wall ***(Skandalakis et al., 2009)***

Point A is 1 cm (about one-half fingerwidth) below the right nipple at the level of the fifth rib.

Point B is located approximately 2cm (about one fingerwidth) inferior to and medial to the left nipple, at the level of the left fifth intercostal space.

Point C is in the right costal margin at the anterior axillary line ***(Skandalakis et al., 2009).***

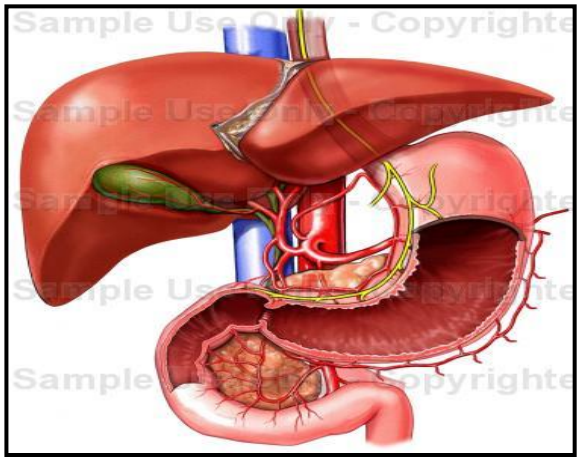

Figure (4): Anatomy of the liver, gall bladder and stomach. ***(Wiley, 2009)***

Gall bladder:

GB comes in contact with the anterior abdominal wall close to tip of 9th costal cartilage. This corresponds to upper end of right linea semilunaris or to point where the transpyloric plane cuts right costal margin ***(Skandalakis et al., 2009).***

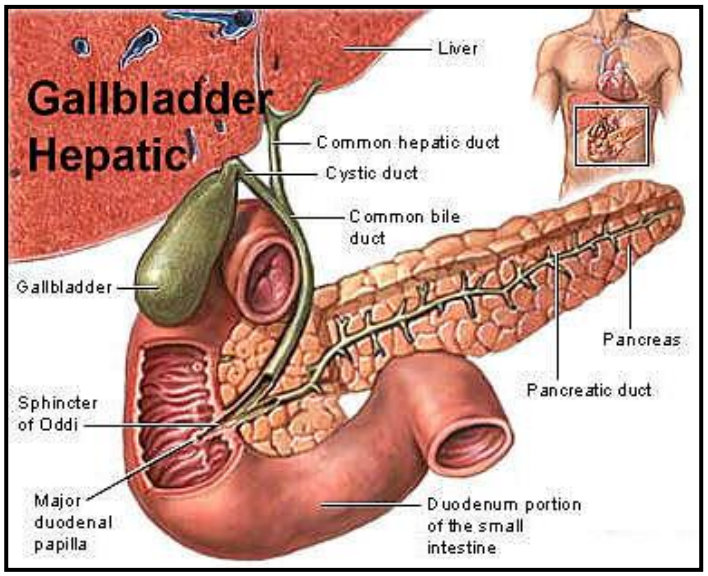

Figure (5): Anatomy of gall bladder & biliary system ***(Wiley, 2009)***

Spleen:

The spleen is located in the left upper quadrant of the abdomen in a niche formed by the diaphragm above it (posterolateral). The stomach is located medially (antero-medial), the left kidney and left adrenal gland posteriorly (posteromedial), the phrenicocolic ligament below, and the chest wall (the ninth to eleventh left ribs) laterally. The tail of the pancreas in most cases is related to the splenic hilum. The spleen is concealed at the left hypochondrium. It is not palpable under normal conditions ***(Allen et al., 1992).***

The spleen is associated with the posterior portions of the left ninth, tenth, and eleventh ribs. It is separated from them by the diaphragm and the costodiaphragmatic recess. The spleen is oriented obliquely. Its upper end is situated some 5cm from the dorsal midline, approximating the level of the spinous processes of the tenth and eleventh thoracic vertebrae. The lower end lies just behind the midaxillary line. The long axis of the organ roughly parallels the course of the tenth rib ***(Allen et al., 1992).***

Pancreas:

It has head, neck, body and tail. The neck lies in transpyloric plane from neck, head passes downward and right while the body passes upward and to the left ***(Trede and Carter, 1993).***

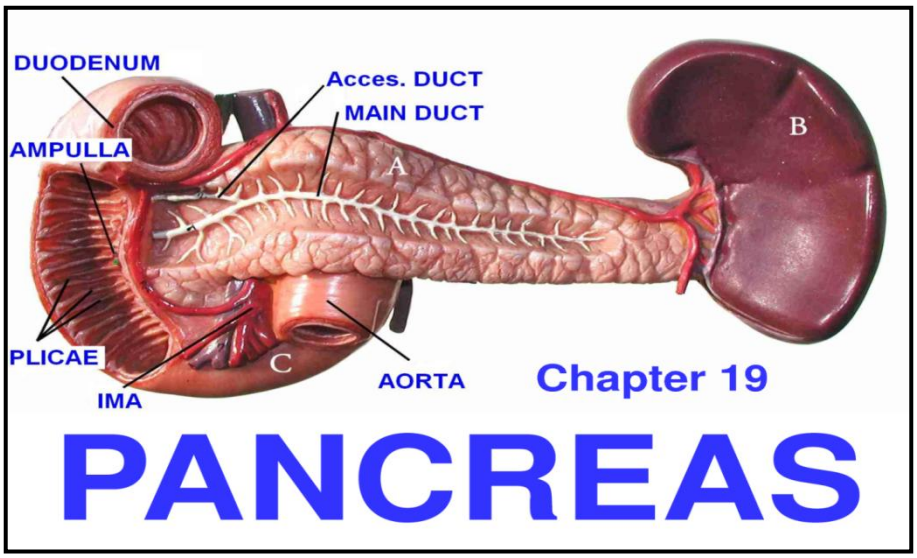

Figure (6): Anatomy of the Spleen & Pancreas (A): Pancreas, (B): Spleen, (C): Duodenum ***(Frank Netter, 2009)***

Kidneys:

Anterior surface marking:

Right kidney is about (1.5cm) lower than left kidney. So, the upper end of right kidney reaches the 11th intercostal space while the upper end of left kidney ascends higher to reach 11th rib itself.

- Hilum of each kidney lies 6 cm from the median plane.
- Hilum of right kidney lies little below the trans--pyloric plane but hilum of left kidney lies a little above the transpyloric plane.
- The lower end of right kidney lies 5cm above the iliac crest.
- The lower end of left kidney lies 6-6.5cm above the iliac crest.