Role of diagnostic laparoscopy in abdominal trauma

Essay
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In General Surgery

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Introduction

Trauma is the leading cause of death between the ages of one and 44 years. In all age groups, it is surpassed only by cancer and atherosclerosis ini mortality. The evaluation and treatment of abdominal injuries are critical components in the management of severely injured trauma patients. Because missed intra-abdominal injuries are a frequent cause of preentable trauma deaths, a high index of suspicion is warranted. Multiple factors, including the mechanism of injury, the body region injured, the patient's homodynamic and neurological status, associated injuries, and institutional resources influence the diagnostic approach and the outcome of abdominal injuries **(American College of Surgeons, 1997)**.

Assessment of abdominal trauma can be greatly aided by accurate history taking. A patient who was involved in a motor car accident in which the steering wheel was impacted. Strongly suggests the possibility of duodenal or pancreatic trauma. If the patient has lower chest pain& sustained rib fractures on the lower left chest, there is 20% chance of associated splenic injury & with rib fractures on the right side there is 10% chance of liver injury. Also, back pain with a compression fracture of the upper limb or spinal region carries an associated 20% chance of associated renal injury **(Hoyt et al., 2008)**.

Radiological studies that are of value in the evaluation of abdominal trauma are plain films, urethrography, cystography and IV Urography (IVU). CT scan, ultrasound& angiography **(Hoyt et al., 2008)**.

The use of laparoscopy in the diagnosis and treatment of patients with abdominal trauma injuries does have some limitations. Hemo dynamically unstable patients, for example, cannot tolerate the delays in laparoscopic entry into the abdomen and the pneumo peritoneum that laparoscopic procedures require. Some studies also show that certain Intra-abdominal trauma injuries may be difficult to detect with laparoscopy **(Pitcher et al., 1999)**.

Aim of the work

The aim of the work is to evaluate the role of laparoscopy in diagnosis and treatment of abdominal trauma with discussing the significant advantages of laparoscopy.

Anatomy of abdominal wall

The outline of the anterior abdominal wall is approximately hexagonal. It is bounded superiorly by the arched costal margin (with the xiphisternal junction at the summit of the arch). The lateral boundary on either side is, arbitrarily, the mid-axillary line (between the lateral part of the costal margin and the summit of the iliac crest). Inferiorly, on each side, the anterior abdominal wall is bounded in continuity, by the anterior half of the iliac crest, inguinal ligament, pubic crest and pubic symphysis.

Layers of the anterior abdominal wall:

The anterior abdominal wall is a many-layered structure. From the surface inwards, the successive layers are:

- Skin.
- Superficial fascia (comprising two layers).
- A musclo-aponeurotic layer (which is architecturally complex and composed of several layers).
- Transversalis fascia.
- A properitoneal adipose layer.
- Parietal peritoneum.

(Mahadevan, 2006)

There is no deep fascia over the trunk as it would render deep breathing or abdominal distension impossible. The muscles of the anterior abdominal wall have several functions:

- Flex the trunk.
- Are important accessory muscles of respiration in forcible expiration and coughing.
- Are used in defecation.
- Initiate micturation.
- Initiate parturition.
- Protect the abdominal viscera in trauma.

(Ellis, 2006)

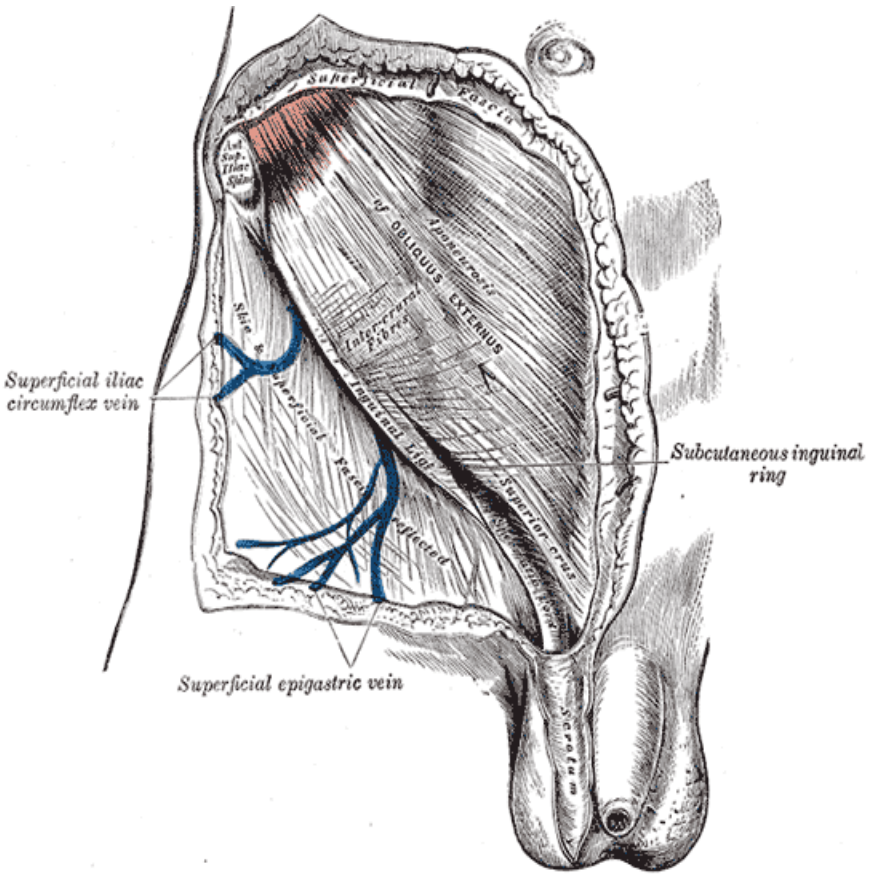

Figure (1): Scarpa's fascia **(Ellis, 2006)**

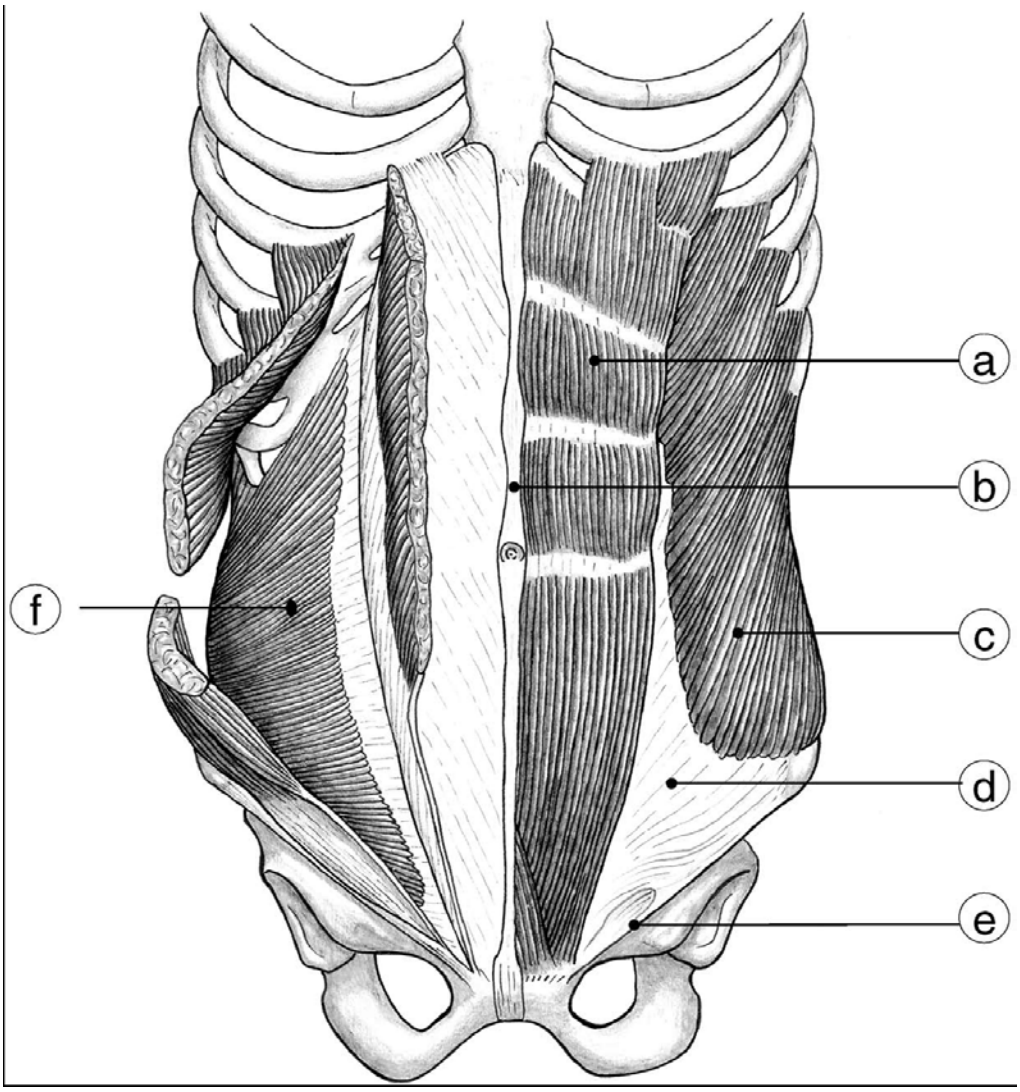

Figure (2): Musculo-aponeurotic layer of anterior abdominal wall **(Ellis, 2006)**

Abdominal anatomy:

The abdomen encompasses a large area of the body, from the diaphragm superiorly to the infra-gluteal fold inferiorly, including the entire circumference of this region. injury to the back also may result in significant intra-abdominal injury. Multiple system injuries, particularly those involving the central nervous system, chest and musculoskeletal system, are often associated and may obscure injury to the abdominal contents and symptoms from this area. The importance of repeated assessment of a patient suspected of having intra-abdominal injury cannot be overemphasized **(Agur and Dalley, 2009)**.

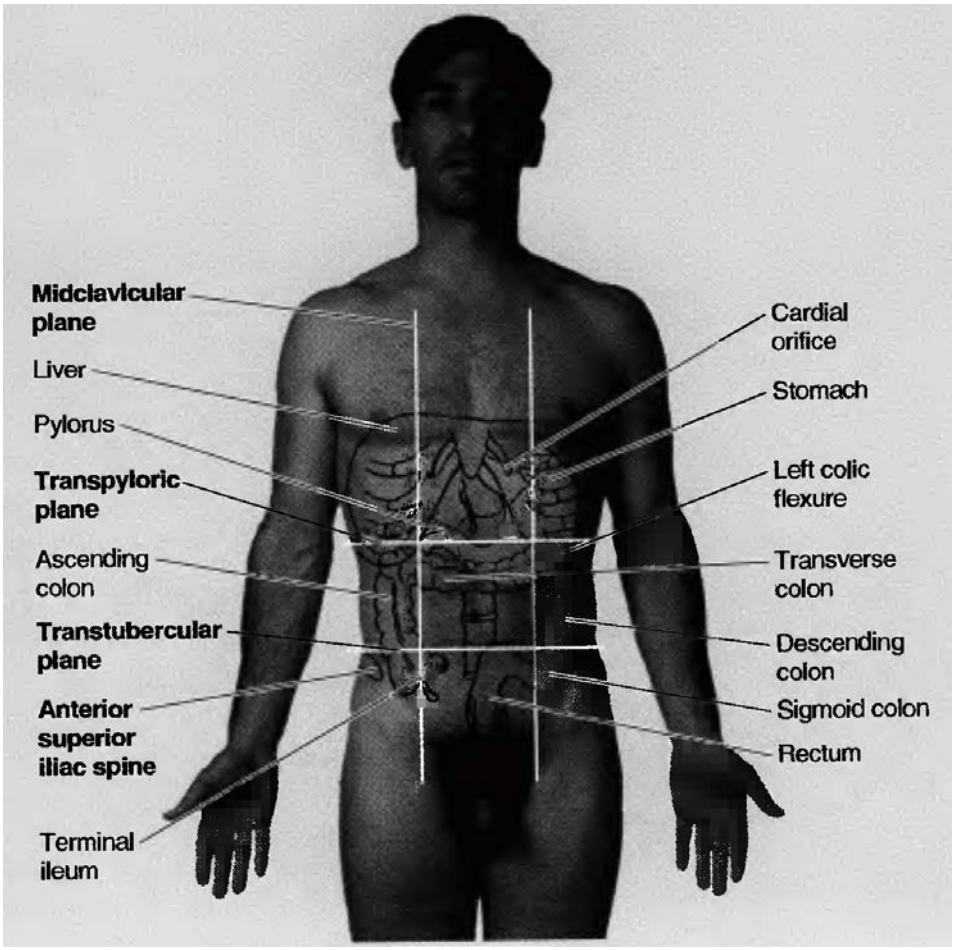

Figure (3): Surface anatomy of major abdominal organs anterior view **(Agur and Dalley, 2009)**

A practical knowledge of the contents of the abdomen is important. Assessment of the abdomen is influenced by its differing anatomical features. For evaluation purposes, the abdomen is divided into four areas:

1. Intrathoracic abdomen.

2. True abdomen.

3. Pelvic abdomen.

4. Retroperitoneal abdomen.

All the other areas are difficult to assess on physical examination, with the exception of the true abdomen **(Agur and Dalley, 2009)**.

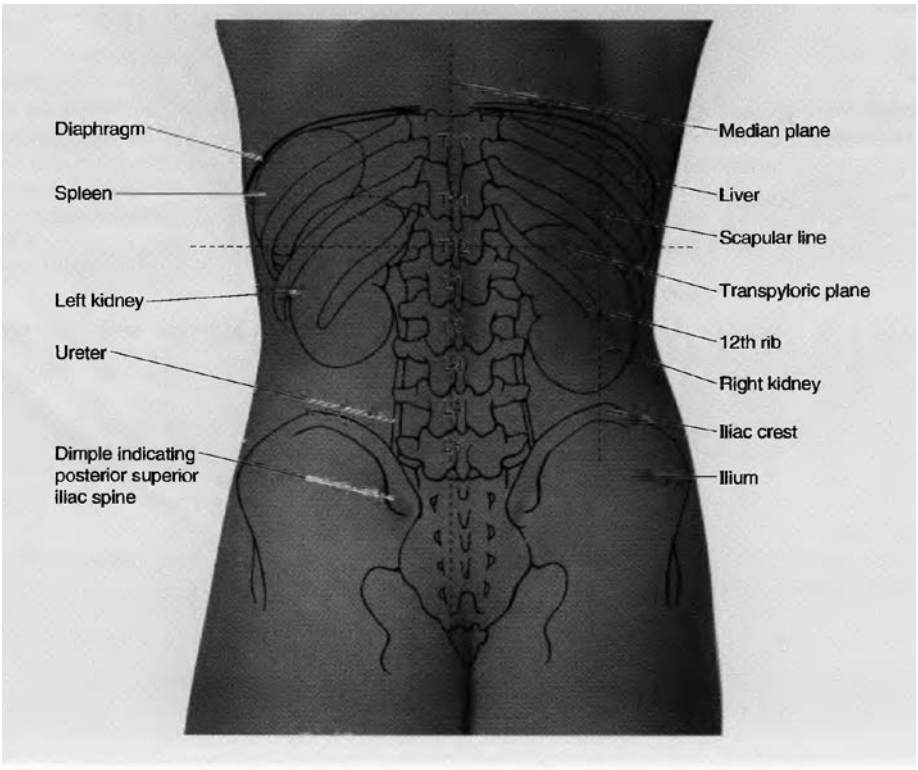

Figure (4): Surface anatomy of major abdominal organs viewed from the back **(Moore et al., 2005)**

The intrathoracic abdomen is that portion of the upper abdomen that lies beneath the rib cage. The contents include the diaphragm, liver, spleen and stomach, but bony and cartilaginous structures make this portion essentially inaccessible to palpation. Each structure may be injured when blunt injury is (delivered to the rib cage and peritoneal lavage becomes useful in evaluatting this area of anatomy **(Agur and Dalley , 2009)**.

The pelvic abdomen lies in the hollow of the pelvis. It is surrounded by the bony pelvis and its contents include the rectum, bladder, urethra, small bowel, and in females, the uterus, fallopian tubes and ovaries. Trauma to the pelvis, particularly pelvic fractures, may damage the organs. Injury to these structures may lack physical findings and is difficult to diagnose. As such, suspected injuries to this area of the abdomen must be investigated using adjunctive procedures such as bladder catheterization, urethrocystography and sigmoidscopy.

The retroperitoneal abdomen contains the kidneys, ureter, pancreas, second and third portion of the duodenum, the ascending and descending colon, and the great vessels, the aorta and vena cava. The kidney can be damaged by injury to the lower ribs posteriorly, and crushing injuries to the front or sides of the trunk may damage any of these structures. As with the thoracic and pelvic abdomen, injury to these structures may result in few physical findings, and physical examination and even peritoneal lavage may be of little or no help. Evaluation of the retroperitoneal abdomen requires utilization of radiographic procedures including intravenous pyelography, angiography and CT. In addition, serum amlase determinations may be helpful **(Mahadevan, 2006)**.

The true abdomen contains the small and large intestines, the bladder when distended, and uterus when gravid. Injuries to any of these organs are usually manifested by pain from peritonitis and are associated with abdominal findings. Peritoneal lavage is a useful adjunct when an injury is suspected and a plain abdominal film may be helpful when free air is present **(Mahadevan, 2006)**.

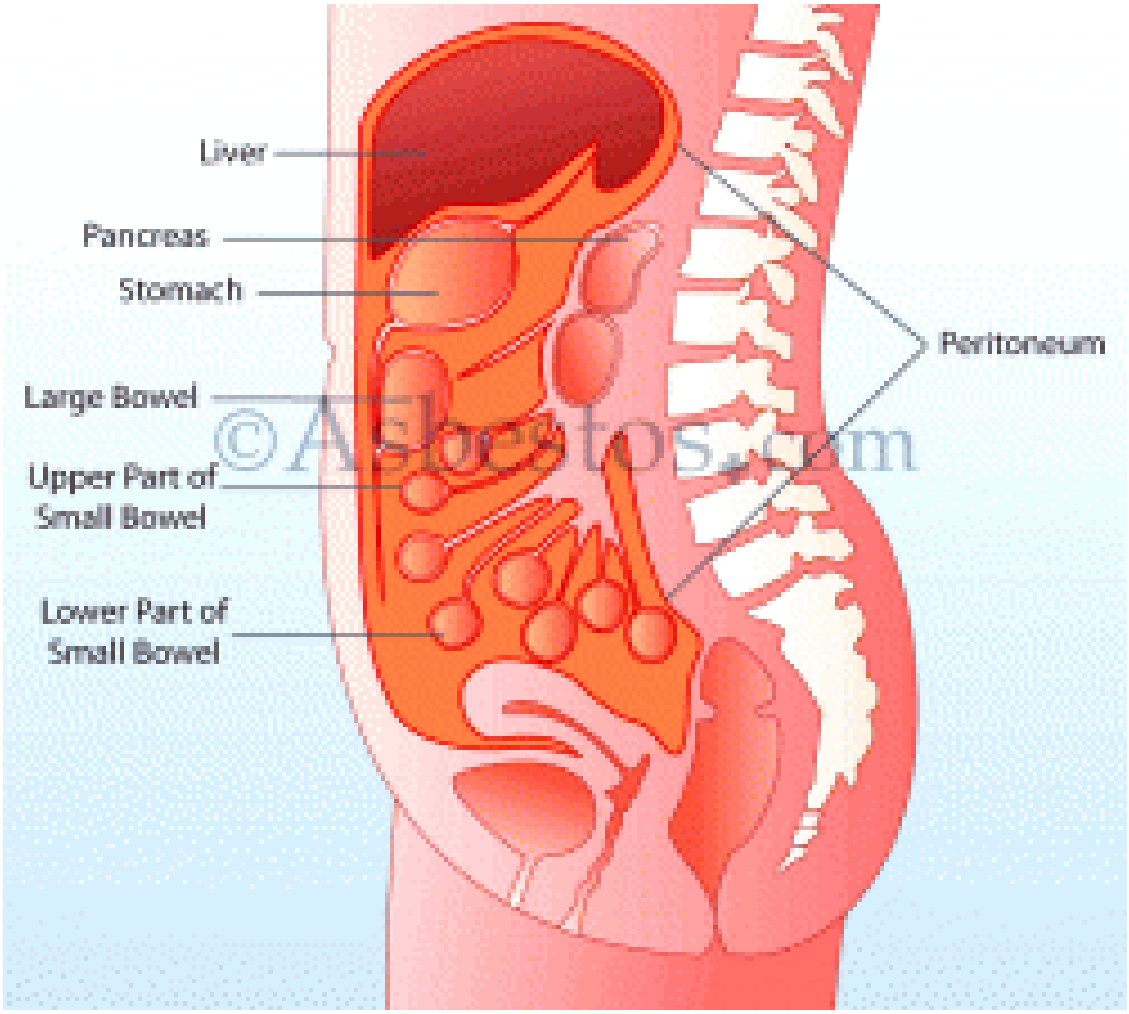

Figure (5): Abdominal contents and peritoneum **(Agur and Dalley, 2009)**

Abdominal trauma

Trauma is the leading cause of death between the ages of one and 44 years. In all age groups, it is surpassed only by cancer and atherosclerosis ini mortality. The evaluation and treatment of abdominal injuries are critical components in the management of severely injured trauma patients. Because missed intra-abdominal injuries are a frequent cause of trauma deaths, a high index of suspicion is warranted. Multiple factors influence the outcome of trauma patients, including: the mechanism of injury, the body region injured, the patient's homodynamic and neurological status, associated injuries, and institutional resources influence the diagnostic and therapeutic approaches **(American College of Surgeons, 1997)**.

Abdominal trauma is classified into two classes:

1) Blunt Abdominal Trauma (BAT).

2) Penetrating abdominal trauma which can be classified into:

a) Low-energy penetrating wounds.

b) High-energy penetrating wounds.

(American College of Surgeons, 1997)

Causes of blunt abdominal trauma:

Nearly three quarters of patients had been involved in a road traffic collision or a fall from height **(Jansen et al., 2009)**. While Motor Vehicle Crashes (MVCs) account for the majority of BAT, other causes such as motor cycle falls, industrial injuries, assaults and vehicles striking pedstrains are seen in emergency departments **(Acosta et al., 2003)**.

In a study of intra-abdominal injuries on 596 patients, over a 6-year period more than 67% of BAT injuries, the highest incidences were associated with motor vehicles (table 1) **(Richards et al., 2004)**.

Table (1): Mechanism of BAT for patient with intra-abdominal injury **(Richards et al., 2004)**

Mechanism	N %
Motor vehicle crash	403(67.6%)
Vehicle versus pedestrian	87(14.6%)
Fall	47(7.9%)
Assault	41(6.9%)
Motor cycle crash	16(2.7%)
Blast	2(0.3%)
Total	596(100%)

Incidence of blunt abdominal trauma is increasing because of the increased automobile and motorcycle accident rates. The car remains the cause of non-penetrating trauma in at least 70% of patients with this injury **(Hoyt et al., 2008)**.

Vehicular trauma is by far the leading cause of BAT in the civilian population. Auto-to-auto and auto-to-pedestrian collisions have been cited as cases in 50-75% of cases. Medical causes of blunt abdominal injuries include iatrogenic trauma during cardiopulmonary resuscitation, and manual thrusts to clear an airway, which are rarely seen **(Udeani et al., 2006)**.

For any given emergency system, the mix of blunt versus penetrating trauma may vary greatly depending on population demographics, rural versus urban environment and other socioeconomic factors such as drug, traffic, crime, prevalence of driving under the influence and law enforcement **(Peterson ct al., 2003)**.

Causes of penetrating abdominal trauma:

Penetrating abdominal trauma (PAT) remains a persistent source of morbidity and mortality' for trauma patients. It can produce hemorrhage and hypovolemic shock and is often associated with injuries to other body regions.

Patients who have PAT may not always present with obvious signs and symptoms. Frequent assessments and ongoing evaluation are essential components for detecting any changes, no matter how subtle, in the patient's condition **(American College of Surgons, 2004)**.

Gunshot Wounds (GSWs), considered high-velocity projectiles, are the most common cause (64%) of penetrating abdominal trauma, followed by stab wounds (31%) and gunshot wounds (5%). Penetrating abdominal trauma may result from urban violence. Domestic violence crosses all socioeconomic barriers and is an important consideration in the evaluation of injuries sustained at home and those reportedly involving the patient's family or significant others **(Cigdem et al., 2009)**.

From a global perspective, penetrating abdominal trauma in most settings results principally from military actions and wars. Penetrating abdominal trauma may be iatrogenically introduced. A documented complication of diagnostic peritoneal lavage is injury to the underlying bowel, bladder, or major vessels such as the aorta or vena cava. However, the incidence of such complications is relatively small **(Cigdem, et al., 2009)**.

Biomechanics of blunt abdominal trauma:

Blunt abdominal trauma may results in injury to intra abdominal organs by two discrete mechanism-direct compression and deceleration resulting in shearing forces **(Jansen et al., 2009)**. Mechanism of injury has proven to be useful in field triage. When used in combination with other indices, mechanism of injury has limited under-triage and over triage of trauma patients at the injury scene **(Hider et al., 2009)**.