Comparison between Blunt and Penetrating Abdominal Trauma
Pattern Management and Outcome

Thesis

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of Master Degree in **General Surgery**

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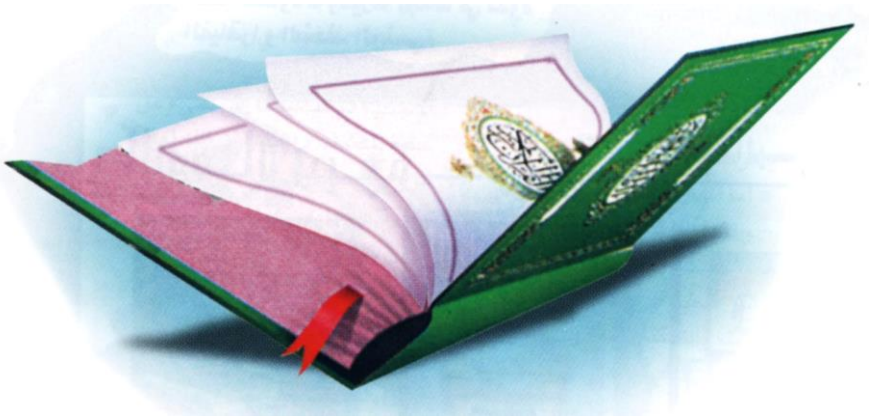
بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ



صدق الله العظيم

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Mohamed Hassan Ahmed

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List of Abbreviations

Abb.	Full term
ABG	*Arterial blood gas*
ACTH	*Adrenocorticotropic hormone*
ADH	*Aldosterone, antidiuretic hormone*
ALT	*Alanine aminotransferase*
AP	*Anterior-posterior*
aPTT	*Activated partial thromboplastin time*
AST	*Aspartate aminotransferase*
ATLS	*Advanced Trauma Life Support*
BAT	*Blunt abdominal trauma*
BUN	*Blood urea nitrogen*
CBC	*Complete blood count*
CT	*Computed tomography*
DPL	*diagnostic peritoneal lavage*
DPL	*Diagnostic peritoneal lavage*
ED	*Emergency department*
ED	*Emergency department*
EMS	*Emergency medical services*
FAST	*Focused assessment with sonography for trauma*
FAST	*Focused Assessment with Sonography in Trauma*
GI	*Gastrointestinal*
GSW	*Gun Shot Wounds*
GSW	*Gunshot wound*
IV	*Intravenous*
LDH	*Lactate dehydrogenase*
PAT	*Penetrating abdominal trauma*
PT	*Prothrombin time*
SW	*Stab Wounds*
WBC	*White blood cell*

INTRODUCTION

Abdominal trauma is seen quite often in the Emergency Department where it can take the shape of blunt, penetrating mechanisms or occasionally a combination of both. Blunt abdominal trauma (BAT) is frequently encountered in the form of motor vehicle accidents (75%), followed by falling from heights and direct abdominal impact ***(Semenovskaya et al., 2011).***

Three kinds of forces are seen with BAT: shearing forces that occur due to rapid deceleration causing tearing at fixed points of attachments. Crushing forces, that cause intra-abdominal contents to be crushed between anterior abdominal wall and posterior ribs and vertebrae; and external compression which is the sudden and rapid rise in the intra-abdominal pressure leading to rupture of viscous organs ***(Isenhour et al., 2007).***

Penetrating abdominal trauma (PAT) is on the rise with increasing gang violence. There are two main kinds of PAT: Stab Wounds (SW) and Gun Shot Wounds (GSW). SWs are more common than GSWs; however have a lesser mortality and morbidity compared to GSW. This happens because of The higher energy transfer through the bullet and multiple bullet fragments from GSW leads to increased mortality and morbidity ***(ATLS, 2013).***

Abdominal trauma patients can be presented in multiple ways ranging from frank shock to hemodynamic instability to

completely stable vital signs to a polytrauma patient. Alteration of mental status can be seen which makes the diagnosis of abdominal trauma very challenging. Patients can also present in traumatic arrest due to massive abdominal trauma ***(Holcomb et al., 2007).***

Penetrating injuries are easier to be detected. Hemodynamically stable patient often complain of abdominal tenderness, and their exams can reveal peritoneal signs ***(Kinan et al., 2012).***

Blunt abdominal trauma injuries are notoriously harder to be detected and patients often present with generalized abdominal tenderness. Nausea and vomiting can sometimes occur ***(Knepel et al., 2010).***

Focused assessment with sonography for trauma (commonly abbreviated as FAST) is a rapid bedside ultrasound examination performed by surgeons, emergency physicians and certain paramedics as a screening test for blood around the heart (pericardial effusion) or abdominal organs (hemoperitoneum) after trauma. The four classic areas that are examined for free fluid are the perihepatic space (also called Morison's pouch or the hepatorenal recess), perisplenic space, pericardium, and the pelvis. With this technique it is possible to identify the presence of intraperitoneal or pericardial free fluid. In the context of traumatic injury, this fluid will usually be due to bleeding ***(Kirkpatrick et al., 2004).***

The contrast enhanced CT scan is a non invasive procedure. It has become the gold standard radiographic modality in evaluating blunt abdominal trauma patients. CT scanners are available now in most trauma centers. With the advent of helical CT scan, scan time has become significantly shorter ***(Abu-Zidan et al., 1999).***

CT scan is indicated in blunt abdominal trauma in haemodynamically stable patients with equivocal findings on physical examination, neurological injury or impaired sensorium due to drugs or alcohol, multiple extra-abdominal injuries, and when the mechanism of injury is suggestive of duodenal or pancreatic injury. CT scan is contraindicated in a blunt abdominal trauma patient with clear indication of laparotomy and in haemodynamically unstable patient ***(Jayaraman et al., 2001).***

Nevertheless, CT scanning has certain limitations. It needs a specialized technician to perform it and a radiologist to read it. CT scan, although very sensitive in detecting solid organ injuries, may miss mesenteric tears, bowel injury especially small tears, diaphragmatic rupture if coronal and sagittal reconstruction was not made, and pancreatic injury if done early after trauma- A large multi-institutional study has shown that 13% of patients with perforated small bowel injury had a normal CT scan preoperatively. Intravenous and oral contrast has the hazards of aspiration, delay in diagnosis when oral contrast is used, and allergic reaction with the use of intravenous contrast ***(Fakhry et al., 2003).***

The presence of free intraperitoneal fluid in blunt abdominal trauma in absence of a detectable solid organ injury creates a clinical dilemma. There is a probability of 25% of missing bowel lesions. DPL is advised in that situation if a conservative approach is advocated ***(Rodriguez et al., 2002).***

Treatment of abdominal trauma begins at the scene of the injury and is continued upon the patient's arrival at the emergency department (ED) or trauma center. Management may involve nonoperative measures or surgical treatment, as appropriate.

Indications for laparotomy in a patient with blunt abdominal injury include the following: Signs of peritonitis, Uncontrolled shock or hemorrhage, clinical deterioration during observation, Hemoperitoneum findings after focused assessment with sonography for trauma (FAST) or diagnostic peritoneal lavage (DPL) examinations ***(Olthof, 2013).***

Finally, surgical intervention is indicated in patients with evidence of peritonitis based on physical examination findings. Operative treatment is not indicated in every patient with positive FAST scan results. Hemodynamically stable patients with positive FAST findings may require a computed tomography (CT) scan to better define the nature and extent of their injuries. Operating on every patient with positive FAST scan findings may result in an unacceptably high laparotomy rate ***(Boggs, 2013).***

Aim of the Work

The aim of this study is to compare between the different types of traumatic abdominal injuries, their outcome and how to manage each of them.

Chapter 1

EMBRYOLOGY

Germ layers, formed during gastrulation, are present by two weeks and include endoderm, mesoderm and ectoderm. In humans, the germ tissues are the basis of all tissues and organs ***(Faure et al., 2011).***

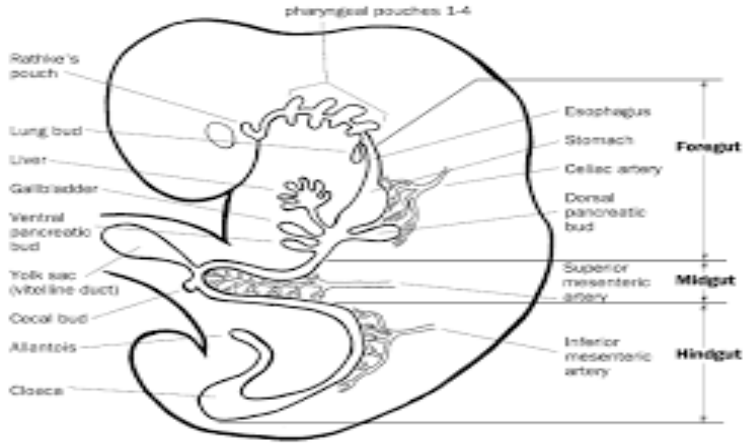

Figure (1): Showing digestive system development.

The Primitive gut tube develops during week 3-4 by incorporating the yolk sac during craniocaudal and lateral folding of the embryo. The tube is divided into 3 distinct sections; foregut, midgut and hindgut ***(Faure et al., 2011).***

The stomach develops from a fusiform dilation in the foregut during week 4. A 90 degree clockwise rotation creates the lesser peritoneal sac ***(Lees et al., 2005).***

The human spleen arises in the 5th week within the dorsal mesentery as proliferating mesenchyme overlying the dorsal pancreatic endoderm ***(Endo et al., 2014).***

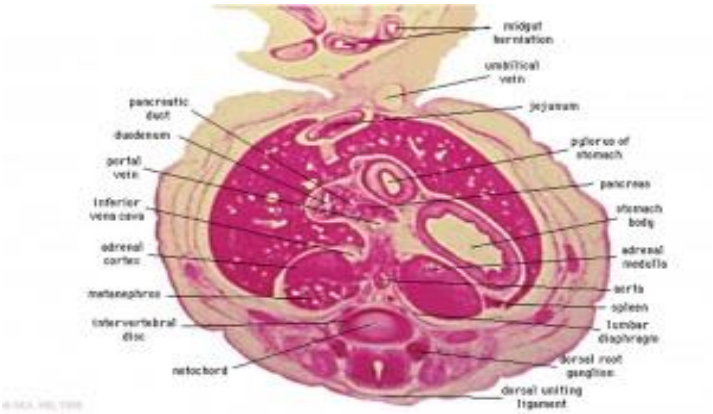

Figure (2): Showing development of spleen

The liver develops from an endodermal outgrowth, hepatic diverticulum, at the cranioventral portion of the foregut. Mesoderm surrounds the diverticulum septum tansversum ***(Osefo et al., 2009).***

Gallbladder and bile ducts begin as a cystic diverticulum. The gallbladder is initially solid and become cystic. Intrahepatic bile duct development starts at the hilum and progresses to the periphery of the liver ***(Sri Paran et al., 2006).***

Pancreas development begins during the 4th-5th weeks of gestation as distinct dorsal and ventral buds arising from the endoderm of the caudal foregut. Rotation of the duodenum causes the ventral pancreatic bud to rotate clockwise to the left of the duodenum and brings it posterior and inferior to the