بسم الله الرحمن الرحيم

قَالُوا سُبْحَانكَ لاَ علِمَ لَنَا إِلاّ مَا
عَلّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

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USE OF ULTRASOUND AND LAPAROSCOPY FOR EVALUATION OF BLUNT ABDOMINAL TRAUMA

Thesis

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In General Surgery

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Mohamed El-Agamy

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List of Abbreviations

AAST	American Association for the Surgery of Trauma
ACS	Abdominal Compartmental Syndrome
ALT	Alanine Transaminase
AST	Aspartate Transaminase
BAT	Blunt Abdominal Trauma
CT	Computed Tomography
DL	Diagnostic Laparoscopy
DPL	Diagnostic Peritoneal Lavage
ER	Emergency Room
FAST	Focused Assessment Sonography for Trauma
FIO_2	Fraction of Inspired Oxygen
IV	Intravenous
IVP	Intravenous Pyelography
NOM	Non-Operative Management
NTL	Non-Therapeutic Laparoscopy
PICU	Pediatric Intensive Care Unit
SAE	Splenic Artery Embolotherapy
SaO_2	Oxygen Saturation
US	Ultrasonography

Introduction

Abdominal trauma is a significant source of morbidity and mortality with the penetrating and blunt mechanisms of injury. Its rapid diagnosis is essential in order to minimize morbidity ***(Fabian and Croce, 2000)***.

It is important to understand that 50% of all deaths occur either at the scene or en route to the hospital usually due to massive hemorrhage or severe neurological injury, 30% die within several hours to two days post-injury while 20% die of infection or multiple organ failure many days or weeks post-injury ***(Sauaia et al., 1995)***.

Blunt abdominal trauma usually occurs in association with multi-system injury making its diagnosis more complex and challenging. Physical examination of the abdomen in the presence of central nervous system injury or dysfunction is quite unreliable. The major diagnostic modalities beyond physical examination include ultrasonography, diagnostic peritoneal lavage, computed tomography and laparoscopy ***(Fabian and Croce, 2000)***.

Emergent abdominal sonography is the screening test of choice for blunt abdominal injury at many trauma centers. It is rapid and accurate screening test for blunt abdominal injury. It can be learned and reliably performed by non-radiologists ***(Boulanger et al., 1996)***.

Laparoscopy has taken center in general surgery in recent years initially because of its clear superiority to open surgery for routine cholecystectomy. It has spread rapidly into related surgical therapeutic and diagnostic applications ***(Gazzaniga et al., 1996)***.

Laparoscopy was most valuable in penetrating trauma, avoiding laparotomy in more than two-thirds of patients with suspected intra-abdominal injuries and can serves as a useful adjunct for the evaluation of blunt trauma as the procedure is associated with low rate of complications and missed injuries ***(Chelly et al., 2003)***.

In the setting of blunt abdominal trauma laparoscopy is used mainly for diagnosis and its role in definitive operative repair is still debated and used mainly in treatment of multiple injuries to small bowel with a favourable outcome ***(Iannelli et al., 2003)***.

Aim of the Work

Studying diagnosis and evaluation of blunt abdominal trauma by the use of both ultrasonography and abdominal laparoscopy and comparing accuracy of diagnosis of both methods with the final diagnosis.

Blunt Abdominal Trauma

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 ***(Jansen et al., 2008).***

The most commonly injured organs are the spleen, liver, retro-peritoneum, small bowel, kidneys, bladder, colorectum, diaphragm and pancreas. Men tend to be affected slightly more often than women ***(Nebelkopf, 1999).***

Blunt abdominal trauma is regularly encountered in the emergency department. The lack of historical data and the presence of distracting injuries or altered mental status, from head injury or intoxication, can make these injuries difficult to diagnose and manage. Victims of blunt trauma often have both abdominal and extra abdominal injuries, further complicating care ***(Jansen et al., 2008).***

Blunt trauma has become an everyday clinical situation because of the rapid increase in the number of motor accidents. Immediate assessment of the abdomen for patients with possible blunt abdominal trauma is a critical and challenging task for the emergency physician. This evaluation must be made

as quickly and safely as possible because of the increasing demands of an emergency department. Moreover the question of a safe evaluation is more demanding in stable patients. Physical findings are frequently unreliable for a variety of reasons such as affected mental status, effects of medications and concomitant injuries ***(Kinnunen et al., 1994)***.

Vehicular trauma is by far the leading cause of blunt abdominal trauma in the civilian population. Auto-to-auto and auto-to-pedestrian collisions have been cited as causes in 50-75% of cases. Other common etiologies include falls and industrial or recreational accidents. Rare causes of blunt abdominal injuries include iatrogenic trauma during cardiopulmonary resuscitation, manual thrusts to clear an airway and the Heimlich Maneuver ***(Walker and Criddle, 2003)***.

Intra-abdominal injuries secondary to blunt force are attributed to collisions between the injured person and the external environment and to acceleration or deceleration forces acting on the person's internal organs. Blunt force injuries to the abdomen can generally be explained by 3 mechanisms ***(Nebelkopf, 1999)***.

The first mechanism is deceleration. Rapid deceleration causes differential movement among adjacent structures. As a result, shear forces are created and cause hollow, solid, visceral organs and vascular pedicles to tear especially at relatively

fixed points of attachment. For example, the distal aorta is attached to the thoracic spine and decelerates much more quickly than the relatively mobile aortic arch. As a result, shear forces in the aorta may cause it to rupture. Similar situations can occur at the renal pedicles and at the cervicothoracic junction of the spinal cord ***(McKenney et al., 1994)***.

Classic deceleration injuries include hepatic tear along the ligamentum teres and intimal injuries to the renal arteries. As bowel loops travel from their mesenteric attachments, thrombosis and mesenteric tears with resultant splanchnic vessel injuries can result ***(Walker and Criddle, 2003)***.

The second mechanism involves crushing. Intra-abdominal contents are crushed between the anterior abdominal wall and the vertebral column or posterior thoracic cage. This produces a crushing effect to which solid viscera (e.g. spleen, liver, kidneys) are especially vulnerable ***(Walker and Criddle, 2003)***.

The third mechanism is external compression, whether from direct blows or from external compression against a fixed object (e.g. lap belt, spinal column). External compressive forces result in a sudden and dramatic rise in intra-abdominal pressure and culminate in rupture of a hollow viscous organ ***(Nebelkopf, 1999)***.

Assessment of Blunt Abdominal Trauma

Assessment of patient with blunt abdominal trauma is achieved by:

I- Clinical Assessment:

It is often difficult to evaluate patients with blunt abdominal trauma due to many reasons as accompanying injuries of other parts of the body as head trauma, thorax, trunk and extremities. Also many have confounding problems such as acute alcoholic intoxication or symptoms from drug abuse ***(Rizoli et al., 1994)***.

1- History:

In all cases of trauma, it is important to obtain a history as accurate as possible. However, because of urgent requirement for therapy, it may be necessary to gather these informations piecemeal. The History may be inaccurate or impossible to obtain. The emotional stress associated with trauma affects both patient and bystanders all tend to prevent a clear recitation of the events leading to hospitalization. Furthermore a history may be inaccurate because of legal or moral problems raised by the nature of the accident. Therefore the examiner must always be alert to the possibility of distortion of the history in his evaluation of abdominal injuries, especially pertinent in trauma