



Clinical and Laboratory Evaluation of Blunt Trauma Patients for the Early Diagnosis of Intra-Abdominal Injuries (A Prospective Study in Ain Shams University Hospitals)

Thesis

*Submitted for Partial Fulfillment of Master Degree
in Forensic Medicine and Clinical Toxicology*

By

Yasmine Karam Zaki Sayed

Demonstrator of Forensic Medicine and Clinical Toxicology
Department Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr. Sanaa Ibrahim Ahmed Bilal

Professor of Forensic Medicine and Clinical Toxicology
Faculty of Medicine, Ain Shams University

Dr. Dalia Mohammed Nabil Zaki

Lecturer of Forensic Medicine and Clinical Toxicology
Faculty of Medicine, Ain Shams University

Prof. Dr. Mohammed Mohammed Matar

Assistant Professor of General Surgery
Faculty of Medicine, Ain Shams University

Faculty of Medicine, Ain Shams University

2020

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgments

*First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.*

*I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr. Sanaa Ibrahim Ahmed Bilal**, Professor of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Ain Shams University, for her meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to **Dr. Dalia Mohammed Nabil Zaki**, Lecturer of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Ain Shams University, for her sincere efforts, fruitful encouragement.*

*I am deeply thankful to **Prof. Dr. Mohammed Mohammed Matar**, Assistant Professor of General Surgery, Faculty of Medicine, Ain Shams University, for his great help, outstanding support, active participation and guidance.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Yasmine Karam Zaki Sayed

List of Contents

Title	Page No.
List of Tables.....	5
List of Figures	7
List of Abbreviations.....	9
Introduction	- 1 -
Aim of the Study	15
Review of Literature	16
Blunt Abdominal Trauma (BAT)	16
Aetiology	16
Pathophysiology.....	17
Types of injuries of abdominal organs	18
Diagnosis.....	27
Management	36
Patients and Methods.....	44
Results.....	53
Discussion	73
Conclusion	87
Recommendations	89
Summary	91
References	95
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table 1:	Spleen injury grading system according to The American Association for the Surgery of Trauma organ injury scale (AAST).....	20
Table 2:	Liver injury grading system according to The American Association for the Surgery of Trauma organ injury scale (AAST).	22
Table 3:	Renal injury grading system according to The American Association for the Surgery of Trauma organ injury scale (AAST).	23
Table 4:	Classification of 30 patients with blunt abdominal trauma according to CT findings.....	53
Table 5:	Difference in mean age (years) and sex between both groups of blunt abdominal trauma patients.	55
Table 6:	Difference between both groups of blunt abdominal trauma as regards aetiology and delay time of trauma.	57
Table 7:	Comparison between both studied groups of blunt abdominal trauma regarding symptoms and signs.	59
Table 8:	Comparison of means of pulse rate, arterial blood pressure and respiratory rate between both studied groups of blunt abdominal trauma.	62
Table 9:	Comparison of conscious level between both studied groups of blunt abdominal trauma.....	64

List of Tables cont...

Table No.	Title	Page No.
Table 10:	Comparison of means of the laboratory parameters between both studied groups of blunt abdominal trauma.....	65
Table 11:	The relation between blood hemoglobin (gm/dl), pulse rate (bpm), respiratory rate (brpm), conscious level and intra-abdominal injuries in blunt abdominal trauma patients.	69
Table 12:	A scoring system for detection of intra-abdominal injuries in blunt abdominal trauma patients.	71

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Pie chart showing classification of 30 patients with blunt abdominal trauma according to CT findings.	54
Figure (2):	Column chart showing the difference in mean age (years) between both groups of blunt abdominal trauma.	56
Figure (3):	Column chart showing comparison between both groups of blunt abdominal trauma as regards sex.	56
Figure (4):	Column chart showing comparison between both groups of blunt abdominal trauma as regards aetiology of trauma.	58
Figure (5):	Column chart showing comparison between both studied groups of blunt abdominal trauma regarding symptoms.	60
Figure (6):	Column chart showing comparison between both studied groups of blunt abdominal trauma regarding signs.	61
Figure (7):	Column chart showing comparison of the mean of pulse between both studied groups of blunt abdominal trauma.	63
Figure (8):	Column chart showing comparison of the mean of respiratory rate between both studied groups of blunt abdominal trauma.	63
Figure (9):	Column chart showing comparison of conscious level between both studied groups of blunt abdominal trauma.	64
Figure (10):	Column chart showing comparison of means of hemoglobin level between both studied groups of blunt abdominal trauma.	66

List of Figures cont...

Fig. No.	Title	Page No.
Figure (11):	Column chart showing the CT findings in blunt abdominal trauma patients in group II.	67
Figure (12):	Roc curve of hemoglobin level, pulse rate, and respiratory rate.	68
Figure (13):	Column chart showing the relation between hemoglobin level (gm/dl), pulse rate (bpm), respiratory rate (brpm), conscious level and intra-abdominal injuries in blunt abdominal trauma patients.	70
Figure (14):	A scoring system of blunt abdominal trauma patients.	71
Figure (15):	Roc curve of the Prediction score in blunt abdominal trauma patients.	72

List of Abbreviations

Abb.	Full term
<i>AAST</i>	<i>American Association for the Surgery of Trauma organ injury scale</i>
<i>ABG</i>	<i>Arterial blood gas</i>
<i>ALT</i>	<i>Alanine aminotransferase</i>
<i>AST</i>	<i>Aspartate aminotransferase</i>
<i>ASUHs</i>	<i>Ain Shams University Hospitals</i>
<i>BAT</i>	<i>Blunt Abdominal Trauma</i>
<i>Bpm</i>	<i>Beat per minute</i>
<i>Brpm</i>	<i>Breath per minute</i>
<i>CBC</i>	<i>Complete blood count</i>
<i>CK</i>	<i>Creatine Kinase</i>
<i>CT</i>	<i>Computed Tomography</i>
<i>DBP</i>	<i>Diastolic blood pressure</i>
<i>DPL</i>	<i>Diagnostic peritoneal lavage</i>
<i>ED</i>	<i>Emergency department</i>
<i>ERCP</i>	<i>Endoscopic retrograde cholangiopancreatography</i>
<i>FAST</i>	<i>Focused assessment of sonography for trauma</i>
<i>GCS</i>	<i>Glasgow Coma Scale</i>
<i>Hb.</i>	<i>Hemoglobin</i>
<i>Hge</i>	<i>Haemorrhage</i>
<i>HS</i>	<i>Highly significant</i>
<i>HVI</i>	<i>Hollow viscus injury</i>
<i>IA</i>	<i>Intra_abdominal</i>

List of Abbreviations cont...

Abb.	Full term
<i>IAIs</i>	<i>Intra-abdominal injuries</i>
<i>IQR</i>	<i>InterQuartile range</i>
<i>LDH</i>	<i>Lactate dehydrogenase</i>
<i>MLC</i>	<i>Medico-legal case</i>
<i>NPV</i>	<i>Negative predictive value</i>
<i>NS</i>	<i>Non significant</i>
<i>PCO2</i>	<i>Partial pressure of carbon dioxide</i>
<i>PO2</i>	<i>Partial pressure of oxygen</i>
<i>PPV</i>	<i>Positive predictive value</i>
<i>PT</i>	<i>Prothrombin Time</i>
<i>PTT</i>	<i>Partial Thromboplastin Time</i>
<i>R.R</i>	<i>Respiratory rate</i>
<i>ROC</i>	<i>Receiver operating characteristic curve</i>
<i>S</i>	<i>Significant</i>
<i>SaO2</i>	<i>Oxygen saturation</i>
<i>SBP</i>	<i>Systolic Blood Pressure</i>
<i>SD</i>	<i>Standard deviation</i>
<i>U/S</i>	<i>Ultrasonography</i>

INTRODUCTION

Trauma is an injury or damage caused by physical harm from an external source (accidents, falls, hits, weapons, etc) (*Meisler et al., 2011*).

In developing countries including Egypt, trauma is considered as a silent killer epidemic which is increasing day after day due to lack of statistical data and research in trauma field. Also, lack of available medical resources needed for management and treatment of trauma patients is another cause to be considered in developing countries (*Mahran et al., 2016*).

Trauma is the commonest cause of death among people aged 1-34 years, a leading cause of disability and a major contributor to health costs. WHO data suggest that 1 in 10 deaths worldwide is the result of trauma. The majority of deaths from trauma occur in economically productive persons with male to female ratio 2:1. Deaths from trauma are predicted to rise to 65% by the year 2020 (*Davis et al., 2006*).

Injuries are classified by either severity or location of the damage or a combination of both (*Sharma et al., 2017*).

They may also be classified medically according to causative agent into blunt force injuries, sharp force injuries, thermal injuries, chemical injuries and blast injuries (*Barek and Haque , 2013*).

For legal purposes injuries are classified as simple (those wounds that heal in less than 20 days without causing any disability), dangerous (those that heal in more than 20 days or create permanent infirmity), and fatal (those that cause death immediately or after short period) (*Payne-James , 2003*).

Blunt abdominal trauma (BAT) is seen with increasing frequency in emergency rooms and is continuous to be associated with significant morbidity and mortality (*Davis et al., 2006*).

Intra-abdominal injuries following blunt trauma present a great medico-legal importance to forensic experts. Sometimes there is no external abdominal injury but the patient dies of intra-abdominal haemorrhage. Exact injury may be not diagnosed except during operation by the surgeon or during autopsy by the autopsy surgeon (*Singh et al., 2012*).

Abdominal organs are vulnerable to a variety of injuries due to lax compressible abdominal wall that transmits the force to abdominal viscera (*Dimaio et al., 2001*).

Undetected intra-abdominal injuries (IAIs) can lead to late-stage mortality and morbidity and the treating surgeon may be a subject of medical negligence. So, diagnosing IAIs accurately and in a timely manner is crucial especially in blunt trauma patients (*Meisler et al., 2011*).

Clinical examination may be unreliable in the evaluation of these patients especially in the presence of associated injuries. However, some studies reported that it plays an important role in early diagnosis of IAI's if used with other tools (*Srivastava et al., 2017*).

The most important initial concern in the evaluation of a patient with blunt abdominal trauma is an assessment of hemodynamic stability. In recent years, some studies reported that the use of laboratory data is useful for the detection of IAI's in blunt abdominal trauma (*Musalar et al., 2017*).

Hepatic Transaminases are useful hematological markers for the early diagnosis of the initial liver injury and may guide in decision making especially in medical centers with limited facilities (*Zachariah et al., 2017*).

Serum amylase and lipase when coupled with other laboratory tests and imaging modalities may have significant role in predicting the site of injury as well as the surgical outcome in patients with IAI's (*Singh et al., 2016*).

However another study demonstrates that serum amylase and lipase are not significant for detecting or excluding any pancreatic injury (*Musalar et al., 2017*).

Jansen, et al (2008), reported that the use of haemoglobin, creatine kinase and myoglobin is also important in early diagnosis of IAI's associated with BAT.

Radiographic and surgical interventions are indicated in patients with persistent high levels of biochemical parameters, conditions that suggest significant IAI **(Ritchie and Williscroft, 2006)**.

Radiographic studies of the abdomen are indicated in stable patients when the physical examination findings are inconclusive **(Jost et al., 2017)**.

Although CT scan provides a rapid and reliable tool compared to biochemical tests for the diagnosis of IAIs in BAT patients, yet it has been reported to have some limitations. These limitations include an increase in treatment costs, the absence of a radiologist on call for 24 hours and limited use in selected patients due to the radiation load, and being unsuitable for hemodynamically unstable patients **(Tintinalli et al., 2012)**.

Therefore, under conditions in which abdominal CT screening is not currently possible, clinical picture and biochemical tests may be predictors for IAIs in blunt trauma patients and may be correlated with the injury level. Hence decreasing the risk of death as well as helping physicians to avoid any mal-judgment about their patients' condition **(Majercik et al., 2014)**.

AIM OF THE STUDY

The aim of the study is to:

Investigate the contribution of non-invasively and rapidly obtained clinical presentation and biochemical parameters in the early diagnosis of IAI in blunt trauma patients. Then

Develop a scoring system and investigate its clinical applicability as pre-test to determine whether abdominal CT should be performed during the diagnosis or not. This may help to decrease number of malpractice claims due to medical negligence.