



Department of anesthesia
Faculty of Medicine

Update in Perioperative Management of Traumatic Patient

Essay

Submitted for partial fulfillment of master degree
in Anesthesia

By

Bashir Abobaker Albakosh

(M.B.B.,Ch)

Supervised by

Prof. Dr.Mohammed Saeed Abdalaziz

Professor of Anesthesia and Intensive Care & Pain Management
Faculty of Medicine – Ain Shams University

Dr. Amr Mohamed Abdalfatah

Assistant professor of Anesthesia and Intensive Care & Pain Management
Faculty of Medicine – Ain Shams University

Dr.Berbara Anwar Yacoub Salib

Lecturer of Anesthesia and Intensive Care & Pain Management
Faculty of Medicine – Ain Shams University

**Faculty of Medicine
Ain Shams University
2014**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(... رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ
الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ
وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأُدْخِلْنِي
بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ)

صدق الله العظيم

النمل.. آية رقم ١٩



Acknowledgements

First, and foremost, my deepest gratitude and thanks should be offered to **"ALLAH"**, the Most Kind and Most Merciful, for giving me the strength to complete this work.

I would like to express my sincere gratitude **Prof. Dr. Mohammed Saeed Abdalaziz**, Professor of Anesthesia and Intensive Care & Pain Management, Faculty of Medicine – Ain Shams University, for his continuous support and guidance for me to present this work. It really has been an honor to work under his generous supervision.

I acknowledge with much gratitude to **Dr. Amr Mohamed Abdalfatah**, Assistant professor of Anesthesia and Intensive Care & Pain Management, Faculty of Medicine – Ain Shams University, for his great supervision and unlimited help to provide all facilities to accomplish this work.

I acknowledge with much gratitude to **Dr. Berbara Anwar Yacoub Salib**, Lecturer of Anesthesia and Intensive Care & Pain Management, Faculty of Medicine – Ain Shams University, for her valuable advice, encouragement and help in this work.

Last but not least, thanks to **my Parents** and **my Family**, for helping me to finish this work.

 **Bashir Abobaker Albakosh**

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List of Abbreviations

AAST	: American association for surgery of trauma.
ABG	: Arterial blood gas.
ACS	: Acute coronary syndrome.
ADH	: Anti diuretic hormone.
AIS	: Abbreviated injury scale.
ALS	: Advanced life support.
ARDS	: Acute respiratory distress syndrome.
ASA	: American society of anaesthesiologist.
ATLS	: Advanced trauma life support.
BIS	: Bispectral analysis.
BVM	: Bag valve mask.
CK	: Creatine kinase.
CT	: Computerized topography.
CVP	: Central venous pressure.
CXR	: Chest x-ray.
DCR	: Damage control resuscitation.
DCS	: Damage control surgery.
DIC	: Disseminated intravascular coagulation.
DRE	: Digital rectal examination.
ECG	: Electrocardiogram.
ED	: Emergency department.
EMS	: Emergency medical service.
ETCO2	: End tidal CO ₂ .
ETT	: Endotracheal tube.
FAST	: Focused abdominal sonography for trauma.
GCS	: Glasgow coma score.
Hb	: Hemoglobin.

HES	: Hydroxyethylstach.
HS	: Hypertonic saline.
HIV	: Human immunodeficiency virus.
IAH	: Intra abdominal hypertension.
ICP	: Intracerebral pressure.
ICU	: Intensive care unit.
INR	: International normalized ratio.
ISS	: Injury severity score.
LMA	: Laryngeal mask airway.
MAC	: Minimum alveolar concentration.
MAP	: Mean arterial pressure.
MDCT	: Multidetector computed tomography.
MODS	: Multiple organ dysfunction syndrome.
MTP	: Massive transfusion protocols.
MVCs	: Motor vehicle collisions.
NMB	: Neuromuscular blockade.
NS	: Normal saline.
OIS	: Organ injury scale.
OR	: Operating room.
PA	: Pulmonary artery.
PAF	: Platelet activating factor.
PCCs	: Prothrombin complex concentrates.
PEA	: Pulseless electrical activity.
PS	: Primary survey.
PT	: Prothrombin time.
PTT	: Partial thromboplastin time.
PTS	: Pediatric trauma score.
RR	: Respiratory rate.
ROC	: Resuscitation outcomes consortium.

ROTEM	: Rotational thromboelastometry.
RSI	: Rapid sequence induction.
RTS	: Revised trauma score.
SBP	: Systolic blood pressure.
SIRS	: Systemic inflammatory response syndrome.
SS	: Secondary survey.
TACO	: Transfusion associated circulatory overload.
TBI	: Traumatic brain injury.
TEG	: Thrombelastography.
THAM	: Tris-hydroxy methyl aminomethane.
TIC	: Trauma induced coagulopathy.
TIVA	: Total intravenous anaesthesia.
TRALI	: Transfusion related acute lung injury.
TRIM	: Transfusion related immunomodulation.
TRISS	: Trauma score injury severity score.
TS	: Trauma score.
TXA	: Tranexamic acid.
US	: United States.
US	: Ultrasound.
WHO	: World health organization.

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Introduction

Trauma refers to a body wound or shock produced by sudden physical injury, as from violence or accident. Trauma can result in secondary complications such as circulatory shock, respiratory failure and death (*Soeide, 2009*).

Trauma is the leading cause of lost years of life in the world. Trauma accounts for more deaths in those younger than 24 years of age than all other modalities combined, and numbers more than 125, 000 deaths per year in the United States alone. In developing nations as deaths due to infection and malnutrition are decreasing, trauma is growing, particularly as automobiles become increasingly available (*Cain, 2008*).

50% of trauma deaths occur immediately and 20 % of them occur late while remaining 30% of trauma deaths occur within a few hours of injury which are called the "golden hours" as these deaths are preventable during those hours through effective resuscitation and good management followed by definitive surgical care. So, because many trauma victims require immediate surgery under anesthesia, anesthesiologists can directly affect their survival. In fact, the role of the anesthesiologist is often that of primary resuscitator, with provision of anesthesia for secondary surgical activity (*Morgan, 2006*).

Trauma includes a variety of insults ranging from penetrating trauma such as knife and gun shot wounds to blunt force trauma such as in motor vehicle collisions. Trauma

frequently impacts multiple-organ systems both directly and indirectly. This is particularly evident in the trauma victim suffering severe hemorrhage. To those unaccustomed to caring for such patients the answer may seem simple enough: stop the blood loss and replace the blood loss. Unfortunately, the treatment of severe hemorrhage is much more complex. One's "fight or flight" response triggering intrinsic neurohumeral responses and the liberation of local mediators in the face of acute hypotension evokes a wide range of compensatory effects, potentially protective in the short term, but damaging if unchecked or prolonged. Treating these subsequent effects, such as coagulopathies or shock lung, remains among the most challenging aspects of traumatology (**Cain, 2008**).

Unfortunately traumatic patients of motor car accident may have an increased likelihood of being drug abusers, acutely alcohol intoxicated or carriers of hepatitis or human immunodeficiency virus (HIV) thus increasing the challenge and risk during anesthesia. Also, traumatic patients may be elderly, pediatric or pregnant and may have certain types of trauma (as head trauma, airway trauma or cervical spine trauma) which need special considerations during resuscitation and management (**Barash, 2009**)

Trauma is part of most anesthesia practices but the specialty of anesthesiologists focused on trauma can give experience and contribute to better patient outcomes (**Richard Dutton, 2008**).

Trauma patient present unique challenges to anesthesiologist. Acute injuries require resource intensive care and complex cases especially when coupled with underlying medical condition (**Smith, 2008**).

Assessment of injuries takes place initially in the form of primary survey, during which time life-threatening injuries are excluded. This is followed by a secondary survey when a more detailed assessment of injuries is carried out (**Theron and Ford, 2009**).

Management of the seriously injured patient is considered as a challenge and in this critical situation, anesthesiologists are often faced with the need to simultaneously address emergent airway management, resuscitation, massive blood loss, acidemia, coagulopathy, hypothermia, and the consequences of damage to various organs. The management of each of these conditions alone can be essential for survival, and their convergence presents a unique situation in which the likelihood of death or a bad outcome is real. Success in this stressful situation requires a sophisticated understanding of basic sciences and expertise in the clinical and technical skills of anesthetic management. Together, the anesthesiologist and trauma surgeon must orchestrate the human and physical resources of the trauma center with a patient's life on the line. Recent advances in the field of trauma anesthesiology have been reached. So, resuscitation and damage control operations to address multiple critical injuries have improved survival (**Malangoni, 2008**).

Aim of the Work

The aim of the work is to highlight the recent advances in managing difficult challenges in traumatized patient thus decreasing trauma related morbidity and mortality.

Chapter (1):
**Incidence and Risk Factors
of Trauma**

(1)Incidence of trauma:

Trauma remains the leading cause of death, with bleeding as the primary cause of preventable mortality during the first 24 hours following trauma. When death occurs, it happens quickly, typically within the first 6 hours after injury. One of four patients that arrives in the emergency department after trauma is already in the state of acute traumatic coagulopathy and shock (*Maegeie et al., 2014*).

In the United States (US), trauma is the third leading cause of death in people of all ages (after heart disease and cancer) and the leading cause of death in children and adults up to 44 years of age (*Joshua and Albert, 2012*).

According to the World Health Organization (WHO), motor vehicle collisions account for 1.3 million deaths annually, were the ninth leading cause of disability in 2004, and will rise to the third leading cause of disability worldwide by 2030. Outside areas of armed conflict, penetrating injuries are responsible for fewer than 15 percent of traumatic deaths worldwide, but these rates vary by country (*Raja et al., 2014*).

While the most common preventable causes of mortality from trauma are hemorrhage, multiple organ dysfunction