MANAGMENT OF PATIENTS WITH CHEST TRAUMA

ESSAY

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Master Degree in Anesthesiology

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List of Acronyms Used

ABG	Arterial Blood Gases
AIS	Abbreviated Injury Scale
AP	Antero-Posterior
ARDS	Adult Respiratory Distress Syndrome
ATLS	Advanced Trauma Life Support
BC	Before Christ
BCI	Blunt Cardiac Injury
BIPAP	Bi-Level Positive Airway Pressure
CBC	Complete Blood Count
CC	Cardiac Contusion
CCU	Cardiac Care Unit
CK-MB	Creatinine Kinase Myocardial-Band
CPAP	Continous Positive Airway Pressure
CT	Computed Tomography
CTA	CT Angigraphy
CXR	Chest Radiography
ECG	Electro Cardiogram
ED	Emergency Department
ERRT	Emergency Room Resuscitative Thoracotomy
FAST	Focused Abdominal Sonography For Trauma

FRC	Functional Residual Capacity
FVC	Forced Vital Capacity
GCS	Glasco Coma Scale
ICU	Intensive Care Unit
ISS	Injury Severity Score
LDH	Low Density Hypoproteins
MDCT	Multi Detection(Slice) Computed Tomography
MVC	Motor Vehicle Collosion
NISS	New Injury Severity Score
PCA	Patient Controlled Analgesia
PEEP	Positive End Expiratory Pressure
PTS	Physiological Trauma Score
RTS	Revised Trauma Score
SIRS	Systemic Inflammatory Response Syndrome
TBI	Tracheo-Bronchial-Injury
TE	Thoracic Epidural
TEE	Trans Eosophageal Echo Cardiography
TRISS	Trauma And Injury Severity Score
TTE	Trans Thoracic Echo Cardiography
VATS	Video Assisted Thoracoscopic Surgery

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Abstract

Chest trauma is a common cause of morbidity and mortality and it is the leading cause of trauma death after head trauma.

It can be classified as blunt or penetrating with different pathophysiologies.

Types of chest trauma include injury to chest wall,pulmonary injury,injury to the airways,cardiac injury and other injuries e.g esophageal injury.

Diagnosis of chest trauma can be done by laboratory studies and imaging studies.

Various types of chest trauma are treated by various measures such as:pain contol,chest tube and mechanical ventilation.

Key words: pneumotorax **,**hemothorax ,pulmonary contusion ,cardiac tamponade

Introduction

Chest trauma is a significant cause of morbidity and mortality in the world. It is the second cause of traumatic death in the United States after head injury. One of every four deaths resulting from trauma is caused by chest trauma**.**

Chest trauma can be classified as blunt or penetrating. Simple rib fractures are the most common injury sustained following blunt chest trauma, accounting for more than half of thoracic injuries from nonpenetrating trauma. Approximately 10% of all patients admitted after trauma have one or more rib fractures with 12% mortality.

These fractures are not life-threatening in themselves but can be an external marker of more severe visceral injury inside the abdomen and the chest. However, in patients who survive the initial trauma, the principal causes of death are pneumonia and sepsis, together with the
prolonged intubation and mechanical ventilation that are frequently
required in such cases. Bilateral flail chest and being over 50 years of age are aggravating factors.

The main significance of a flail chest however is that it indicates the
presence of an underlying pulmonary contusion. In most cases it is the
severity and extent of the lung injury that determines the clinical course and
requirement for mechanical ventilation. Thus the management of flail chest

consists of standard management of the rib fractures and of the pulmonay contusions underneath.

Rib fractures may compromise ventilation by a variety of mechanisms. Pain can cause respiratory splinting, resulting in atelectasis and pneumonia. Fragments of fractured ribs can act as penetrating objects leading to a hemothorax or a pneumothorax, which may be delayed for some hours to days after the injury. Hemothorax of significant degree usually is a result of laceration of an intercostal artery rather than bleeding from the lung. It could be life threatening. Management of chest wall injury is directed towards pain control to facilitate coughing and clearance of secretions. This strategy is aimed at preventing the development of pneumonia, which is the most common complication of chest wall injury.

CLASSIFICATION AND PATHOPHYSIOLOGY OF CHEST TRAUMA

Chest trauma is a serious injury of the chest. Thoracic trauma is a common cause of significant disability and mortality and the leading cause of death from physical trauma after head and spinal cord injury. [1] Blunt thoracic injuries are the primary or a contributing cause of about a quarter of all trauma-related deaths. The mortality rate is about 10%. [2] Chest injuries were first described in detail in around 1600 BC in the ancient Egyptian. [3]

Classification:

Chest trauma can be classified as blunt or penetrating. Blunt and penetrating injuries have different pathophysiologies and clinical courses.

Specific types of chest trauma include:

- Injuries to the chest wall
    - Chest wall contusions or hematomas.
    - Rib fractures
    - Flail chest
    - Sternal fractures
    - Fractures of the clavicle and shoulder girdle

- Pulmonary injury (injury to the lung) and injuries involving the pleural space
    - Pulmonary contusion
    - Pulmonary laceration
    - Pneumothorax
    - Hemothorax
    - Hemopneumothorax
- Injury to the airways
    - Tracheobronchial tear
- Cardiac injury
    - Pericardial tamponade
    - Myocardial contusion
- Blood vessel injuries
    - Traumatic aortic rupture, thoracic aorta injury
- And injuries to other structures
    - Esophageal injury
    - Diaphragm injury

Pathophysiology:

- ***Injuries to the chest wall***

1-Rib fracture:

A **rib fracture** is a break or fracture in one or more of the bones making up the rib cage.

The first rib is rarely fractured because of its protected position behind the clavicle. However, if it is broken serious damage can occur to the brachial plexus of nerves and the subclavian vessels. Fractures of the first and second ribs may be more likely to be associated with head and facial injuries than other rib fractures. [4]

The middle ribs are the ones most commonly fractured. Fractures usually occur from direct blows or from indirect crushing injuries. The weakest part of a rib is just anterior to its angle, but a fracture can occur anywhere. The most commonly fractured ribs are the 7th and 10th. [4]

A lower rib fracture has the complication of potentially injuring the diaphragm, which could result in a diaphragmatic hernia.

Rib fractures are usually quite painful because the ribs have to move to allow for breathing.

When several ribs are broken in several places a flail chest results, and the detached bone sections will move separately from the rest of the chest.

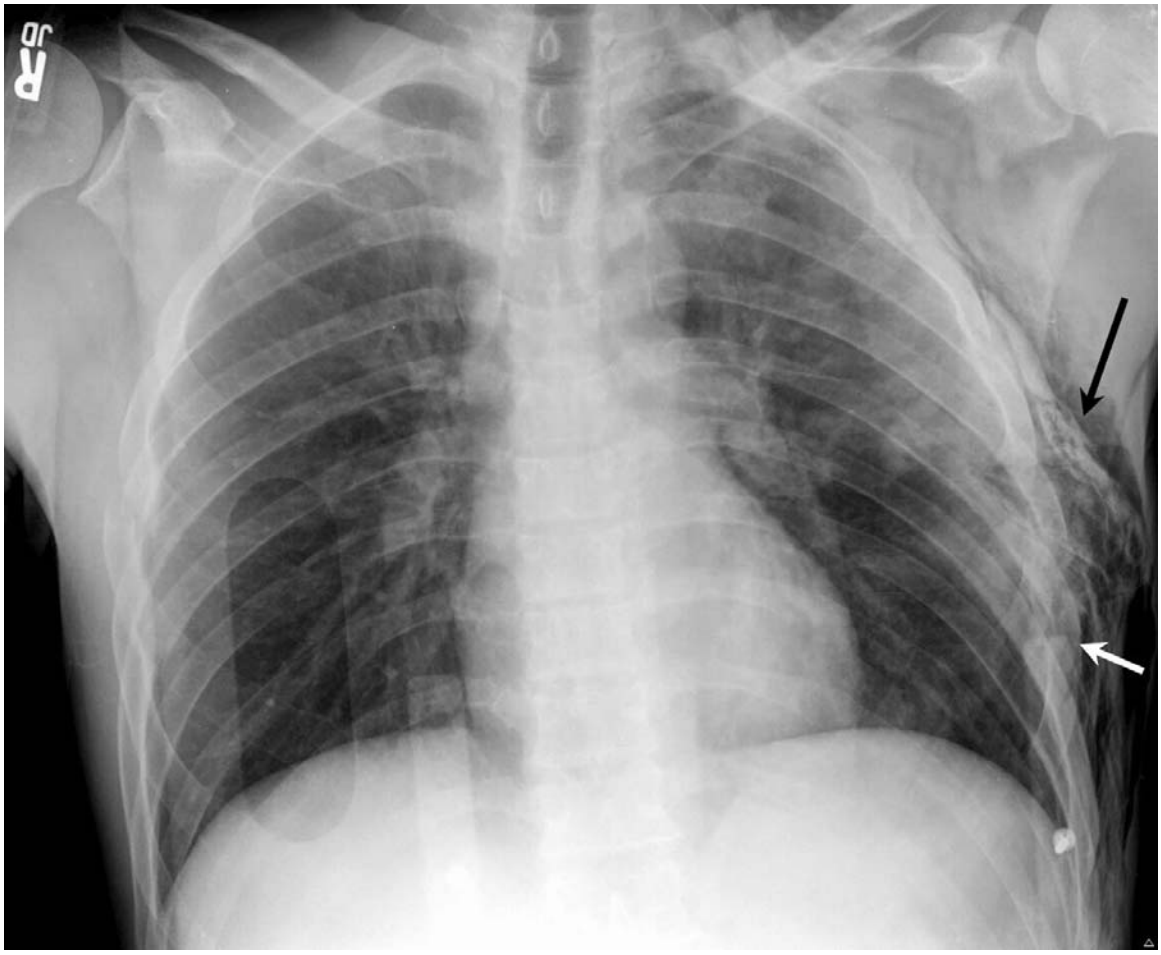

Figure 1:Rib Fracture in a x-ray

This anteroposterior (AP) chest radiograph demonstrates a left lateral lower rib fracture (white arrow). In addition, there is an associated left subcutaneous gas pattern that dissects along the left chest wall (black arrow)**.** [5]

2-flail chest:

A **flail chest** is a life-threatening medical condition that occurs when a segment of the chest wall bones breaks under extreme stress and becomes detached from the rest of the chest wall. It occurs when multiple adjacent ribs are broken in multiple places, separating a segment, so a part of the chest wall moves independently.

The number of ribs that must be broken varies by differing definitions: some sources say at least two adjacent ribs are broken in at least two places, [6] some require three or more ribs in two or more places. [7] The flail segment moves in the opposite direction to the rest of the chest wall: because of the ambient pressure in comparison to the pressure inside the lungs, it goes in while the rest of the chest is moving out, and vice versa. This so-called "paradoxical motion" can increase the work and pain involved in breathing. Flail chest is invariably accompanied by pulmonary contusion, a bruise of the lung tissue that can interfere with blood oxygenation. [8] Often, it is the contusion, not the flail segment, that is the main cause of respiratory failure in patients with both injuries.-[9]

Flail chest is a serious, life-threatening chest injury often associated with underlying pulmonary injury and is most commonly seen in cases of significant blunt trauma. In emergency department presentations, approximately 30% of patients with extensive thoracic trauma have a flail chest.-[6]

This typically occurs when three or more adjacent ribs are fractured in two or more places, allowing that segment of the thoracic wall to displace and move independently of the rest of the chest wall. Flail chest can also occur when ribs are fractured proximally in conjunction with disarticulation of costochondral cartilages distally. For the condition to occur, generally there must be a significant force applied over a large surface of the thorax to create the multiple anterior and posterior rib fractures. Rollover and crushing injuries most commonly break ribs at only one point,for flail chest to occur a significant impact is required, breaking the ribs in two or more places.