

Chest trauma

:Causes

.Blunt trauma: like car accidents, fall from height, hitting by heavy objects .1

.penetrating and perforating injuries: like stab wound, missile injury .2

.Blast injuries: explosions .3

:Classification (the components of chest trauma)

soft tissue injury: superficial chest wall injuries affecting the skin, subcutaneous tissue .1 and muscles (soft tissue of the chest wall) without affecting the ribs or the underlying pleura as proved be thorough physical examination and proper chest x-ray, the management is just to arrest any external bleeding and wound debridement with primary wound closure if .possible

ribs and sternal fractures: in a single rib fracture and multiple simple **ribs fractures** the .2 important thing is to relief pain by oral or parenteral analgesia, chest wall strapping (chest belt), or intercostal nerve block. The **flail chest** is a condition in which three or more consecutive ribs fractured at their anterior and posterior aspects leading to paradoxical movement of the affected segment of the chest wall with resultant hypoxia and severe dyspnea that necessitates endotracheal intubation and assisted ventilation, and if the patient expected to needs prolonged intubation for more than one week then tracheostomy is indicated. In a flail chest the affected segment will be out of the continuity of the remaining chest wall, so with inspiration the intrapleural pressure will drop to more negative value, so that segment will pulled and sunken down when the remaining parts of the chest is moving out, and the reverse will happen during expiration and the affected segment bulged out while the chest wall coming in, the resultant movement called (paradoxical chest wall movement). In few cases of chest wall trauma, the affected segment will be depressed and kept sink inside with no paradoxical movement, the condition called **stove in chest**, usually needs external stabilization and some times mandates endotracheal intubation and mechanical ventilation. The **sternal fracture** could be stable or unstable fracture, the unstable one needs internal fixation by stainless steel wire, the significance of the sternal fracture is that it may indicate trauma to the underlying heart, so proper investigations of .the heart like ECG, Echo-study and cardiac enzymes should be done

:pleural injury: it may lead to .3

a. pneumothorax: which is the presence of air in the pleural cavity, it could lead to partial or complete lung collapse, and it is of three types **1. Closed** when no further movement of air in and out of the pleural cavity. **2. open** when air moving freely in and out of the pleural cavity also called **sucking wound**. **3. tension** when air moves in one direction just toward the pleural cavity and the pressure inside the cavity is built up and increases to reach high positive pressure exceeding the pressure in the right atrium causing collapse of right atrium and preventing its normal filling hence dramatically reducing the cardiac output

that leading to circulatory collapse, so it is a life-threatening condition needs immediate .diagnosis and management

b. hemothorax: is the presence of blood in the pleural cavity ranging according to the .amount of collected blood from mild to severe or massive hemothorax

c. hemo-pneumothorax: is the presence of both blood in the lower part and air in the upper part of the pleural cavity when the patient examined and x-ray taken in erect position. In traumatic pneumothorax, with partial or complete lung collapse it is better to insert tube thoracostomy(**chest tube**), as air may be increased suddenly in the pleural cavity either spontaneously or induced by endotracheal-intubation and mechanical ventilation when surgery needed for any other reason causing severe or **tension pneumothorax** which is life threatening conditions the patient develop cyanosis and severe respiratory distress, the breathing sound diminished on the affected side with hyper resonance on percussion, the trachea shift to the opposite side, this condition needs not to lose time but to insert immediately a chest tube or wide bore needle in the 2nd intercostal space at mid-clavicular line. In **open pneumothorax** (sucking wound), it needs to put immediate chest tube and .secure the wound i.e. converting open pneumothorax into close pneumothorax

pulmonary injury: trauma can lead to pulmonary contusion with interstitial edema which .4 may cause consolidation of the lung tissue and usually managed with antibiotic and clearing .of secretion

tracheo-bronchial injury: partial tear or complete separation of the trachea needs .5 immediate air way management and repair of the trachea. Bronchial tear could also be partial or complete separation and in both conditions, there is pneumothorax, surgical emphysema, severe air leak through the chest tube, severe dyspnea, hemoptysis and even hemothorax. bronchoscopy will establish the diagnosis and surgery is mandatory to repair .the trachea or major bronchial tear

great vessels injury: injury of the thoracic aorta and its main branches can occur in .6 deceleration injury, most of the patient die immediately but in 10% of the patients the pre-aortic tissue and the pleura are able to contain the intravascular pressure and produce **false .aneurysm** which can be diagnosed by C-T Angiography and needs immediate surgery

diaphragmatic injury: chest trauma can lead to rupture of the diaphragm affecting more .7 commonly the left side leading to herniation of abdominal viscera to the thoracic cavity, stomach is the most frequent herniated organ followed by transverse colon and spleen causing collapse of the lung and mediastinal shift that can be seen on chest X-ray, Barium study is of great help in the diagnosis, and the surgical repair is done through abdominal, .thoracic or combined approach, or by laparoscopy

esophageal injury: thoracic esophagus is rarely injured because it is protected by the .8 thoracic spine and other intrathoracic organs, pain and dysphagia and some times fever can be the presenting features, the diagnosis can be established by contrast study of the esophagus, and the management will be either conservative by intravenous fluid, heavy antibiotics and NBM for 5-7 days which may be enough to seal the perforation, otherwise .surgery is indicated to close the perforation

cardiac injury: may vary from superficial laceration to trans-mural damage which lead to .9 atrial and ventricular septal defect or coronary arteries injury, the patient may develop chest

pain, dyspnea, hypotension and tachycardia. The diagnosis can be accomplished by Echocardiogram, cardiac enzymes, cardiac catheterization and C-T cardiac and coronary angiography, the management includes resuscitation and immediate thoracotomy or sternotomy to repair the injury

:Thoracotomy in chest trauma

the majority of the chest injuries (80%-90%) can be managed by tube thoracostomy (chest :tube), thoracotomy may be

:A. resuscitative (emergency department) thoracotomy

:Penetrating thoracic injury .1

- a. traumatic arrest with previously witnessed cardiac activities (pre-hospital or in-hospital)
- b. unresponsive hypotension (BP less than 70mmHg)

:Blunt thoracic injury .2

- a. unresponsive hypotension (BP less than 70mmHg)
- b. rapid exsanguination from chest tube (more than 1500ml)

:B. immediate (urgent) thoracotomy

.Massive hemoptysis .1

Massive hemothorax (initial drain 1500 or ongoing drain more than 200ml/hr. for few .2 hrs

.Ruptured main bronchus with massive air leak .3

.Suspected great vessel injury .4

.Diaphragmatic injury .5

.Some cases of esophageal injuries .6

.Cardiac injury .7

.Some cases of flail chest .8

:C. elective thoracotomy

.Clotted hemothorax .1

.Trapped lung syndrome .2

.Big foreign body .3

:Complications of chest trauma

:Pulmonary .1

ARDS: called also wet lung, it is a syndrome of acute respiratory failure with non- .1 cardiogenic pulmonary edema leading to reduced lung compliance and hypoxia which is

refractory to oxygen therapy, it characterized by diffuse bilateral pulmonary infiltrates on
.chest X-ray (white lung)

.Atelectasis .2

.Pneumonic changes .3

.Pulmonary infarction .4

.Lung abscess .5

Pulmonary AV fistula .6

Bronchial stenosis .7

Tracheo-esophageal fistula .8

.Cardiac arrhythmia .9

:Pleural space .2

.Empyema .1

.Broncho-pleural fistula .2

.Organized hematoma .3

.Chylothorax .4

.Fibrothorax .5

.Diaphragmatic hernia .6

:Vascular .3

.Thrombo-embolism .1

.Air embolism .2

.Great vessel fistula .3

:Chest wall .4

.Hernia .1

.Persistent pain .2

:mediastinum.5

.Mediastinitis .1

.Pericarditis .2

:The main Steps of management

.rapid and full history from the patient or the accompanies .1

.thorough physical examination .2

:start with ABC according to **ATLS** (Advanced Trauma Life Support) .3

A(Airway): keep patent airway by clean the mouth and nose, with removal of blood clots, debris and suction of ongoing bleeding, pulling of retracted tongue and fix it by suture in comatose patient, and put airway piece, if features of upper airway obstruction still found so .either manage with endotracheal intubation or emergency tracheostomy

B(Breathing): any thing interfere with the mechanics of ventilation should be removed .like tight clothes, or any other external pressure

C(Circulation): the circulation should be maintained be arrest of any external bleeding, gain rapid venous access, take blood sample for cross-match, prepare blood and replace the .loss with proper fluid until the blood is prepared to be given

the patient should be kept in bed and managed in semi recumbent position, with O2 .4
:supplementation is conducted for the following candidates

.a. O2 saturation less than 95% in young patients and less than 90% in elderly

.b. development of cyanosis

c. disturbs level of consciousness attributed to hypoxia and provided no associated head .injury

if the patient capable for transfer, so send for radiology department and at least take .5 chest x-ray and sometime chest C-T scan if the trauma causing suspicious serious .intrathoracic injury

the subsequent management will depend upon the results of clinical examination and the .6 finding on chest x-ray or C-T scan, multiple fracture rib or sternum or in case of flail chest the patient needs chest strapping or belt, presence of air or blood in the pleural cavity mandate .insertion of chest tube, and each problem will be managed accordingly

analgesia, it is very important step in the management, it ranges from oral simple .7 analgesia to systemic narcotic analgesia, in simple chest trauma it may be the only step in the management and in more severe one it is an essential part of management, especially with narcotic analgesia other trauma like abdominal and head injuries should be excluded .because it will interfere with the diagnosis and subsequent management

some of the patients not responding to such steps of management, or have some serious .8 .injuries and become candidates for emergency or urgent thoracotomy