

MAJOR TRAUMA AND MULTIPLE INJURIES

* **Incidence :**

- Trauma is a **common cause of mortality** in civilian life and during war time.
- It is the **commonest** cause of death at age of **1-44 year**.
- It is the **3rd. common** cause of death in **all ages** .

* **Aetiology :** There 2 types of injuries

A) Penetrating injury :

1-Low velocity injuries:

- These are caused by stab by sharp instrument or bullets from pistols.
- The injury is suspected over a **small area**.

2- High velocity injuries:

- These are caused by firearm injury from rifles.
- Shock waves spread from the missile tract and affect areas far from this tract .

B) Blunt injuries :

- These are caused by direct blow , fall from height or

• Road traffic accidents :

- When a **pedestrian** is struck by a moving vehicle , there is **acceleration injury** in addition to the **direct trauma** at the



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site of impact .

- The person **inside the moving car** acquires the same velocity of the car :
 - ♣ If he is not wearing the seat belt , his body strike the car .
 - ♣ If he is wearing the seat belt → seat belt injuries (skin mark, fracture clavicle , thoracic or abdominal injuries) .



* Causes of mortality after major trauma :

I) Immediate death :(within few minutes)

- **Airway** obstruction or major injuries of airway .
- Rupture **heart** or major blood vessels .
- Major injury of **brain** or upper spinal cord.

II) Early death : (within few hours)

- Intracranial **haemorrhage** .
- Intra-thoracic or intra-abdominal haemorrhage .
- Major fracture (femur, pelvis & spine)

III) Late death : (within few weeks)

- **Sepsis.**
- Multiple organ **failure.**

* **Management of major trauma :**

• **Intoduction :**

- Victims of major trauma should be treated well trained **trauma team.**
- In mass casualty , **triage** or sorting of the patients according to their clinical diagnosis and the available resources .It may take 2 forms :
 - ♣ If the number of victims does not exceed the facilities , all injured are treated .
 - ♣ If the number of victims exceed the facilities , the critically injured most likely to survive are treated first .

• **Methods :** **A**dvanced **T**rauma **L**ife **S**upport (**ATLS**) protocol

I) Primary survey and resuscitation :(ABCDE)

- ❖ This should **start** at the site of **accident** by well trained ambulance team and continue as the victim reaches the **emergency department** .

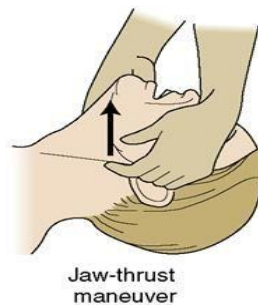
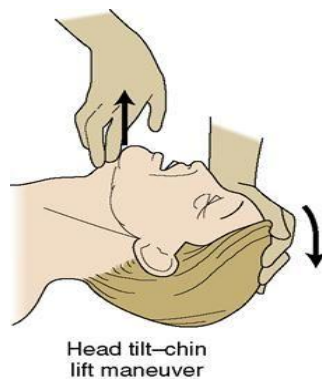
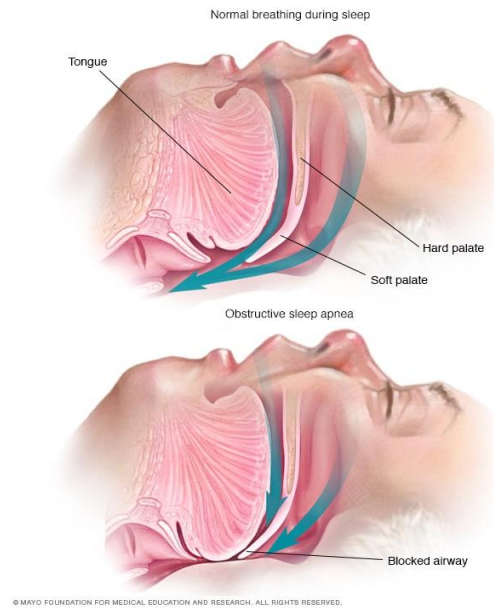
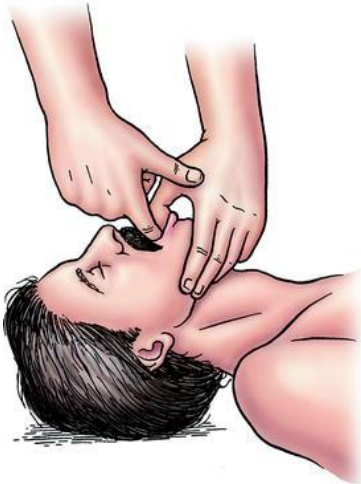
A) Airway and cervical control :

- The patient's airway is evaluated and protected with **concomitant** control of movement of the cervical spine .
- In general, if the patient is capable of **unstrained speech** , his airway is **patent** .

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▪ Clear airway :

- 1- **Remove** any blood , vomit , secretions or foreign body by finger sweep or with a rigid sucker .
- 2- Chin lift or jaw thrust to avoid falling back of tongue .

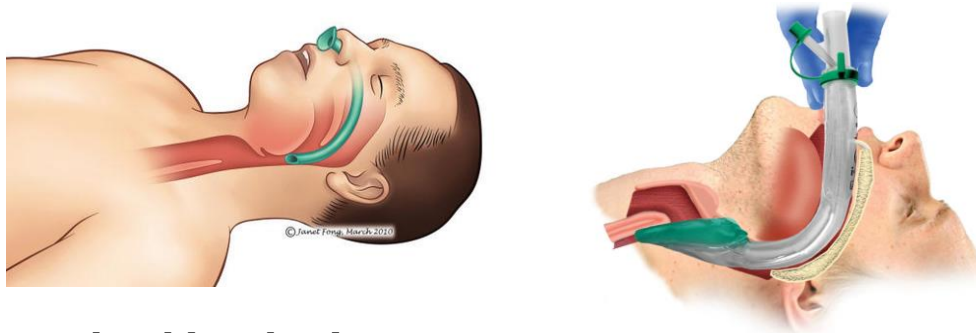


Main causes of upper airway obstruction are : falling of the tongue , blood , vomitus , secretions , teeth or dentature and soft tissue oedema .

▪ Protect the airway :

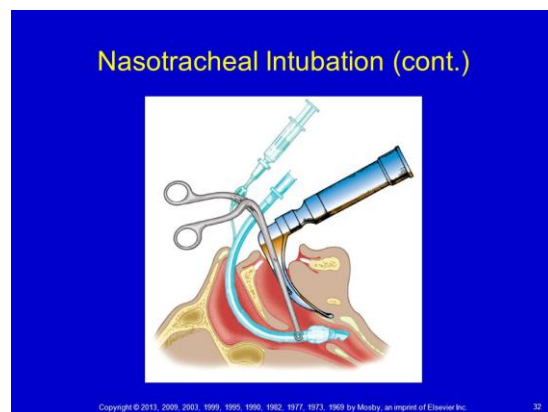
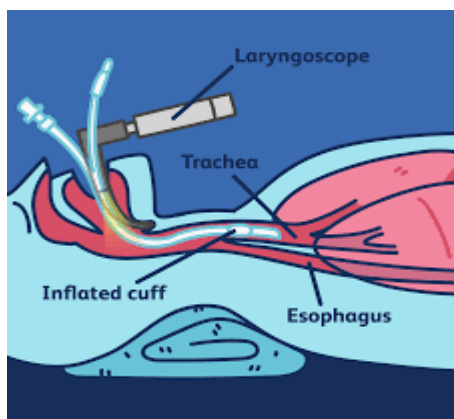
- 1- **Oropharyngeal or nasopharyngeal tube** prevent falling back of **tongue** and occlude the airway (prevent **inhalation**),

in **unconscious** patient .



2- Tracheal intubation :

- **Indications** : Apnea , maxillofacial trauma , inhalation , injury of airway , close head injury (allow hyperventilation to decrease intracranial pressure) , mechanical ventilation is essential or unconscious patient .
- **Methods** :
 - ♣ **Orotracheal intubation** allows the use of a large tube.
 - ♣ **Nasotracheal intubation** is safer if cervical spine fracture is suspected .



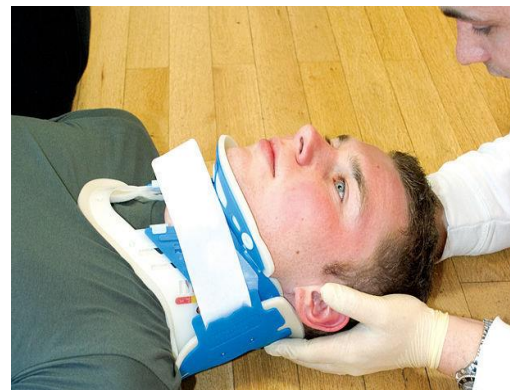
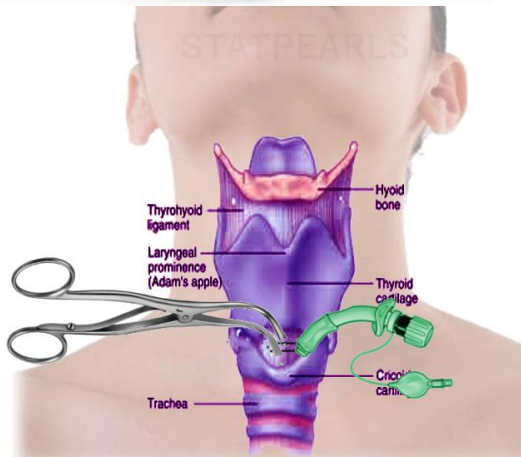
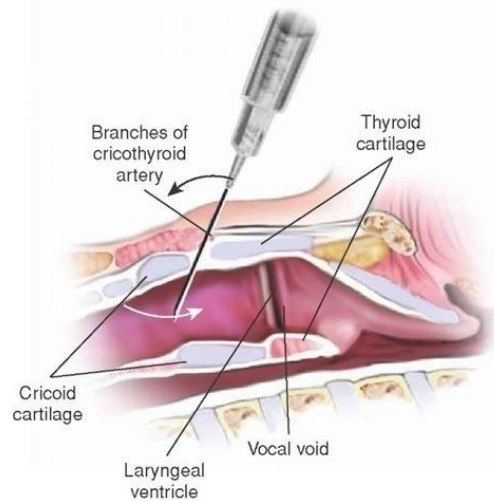
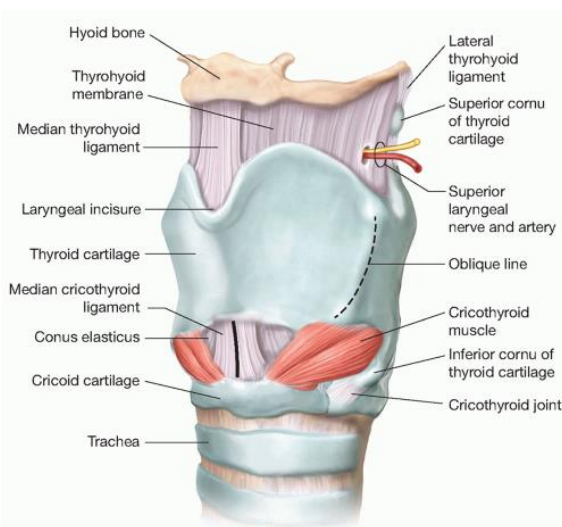
3- Cricothyrotomy :

- **Indications** : This a temporary measure done for urgent upper airway obstruction with inability to ventilate and inability of tracheal intubation .
- **Contraindications** : Children below 12 years or tracheal transection .

- **Methods:** This done either by **surgical cricothyroidotomy** (make incision in the middle line in the skin and cricothyroid membrane and insertion of a tube) or **percutaneous needle cricothyroidotomy** (insertion of wide bore needle) .

* N.B:

- **Tracheostomy** is rare needed nowadays as emergency.
- Please see the following excellent videos:
 - <https://www.youtube.com/watch?v=n5DUC1Lit08>
 - <https://www.youtube.com/watch?v=PzyTXXQp2j8>
 - <https://www.youtube.com/watch?v=XpcrsVNGoM4>
 - <https://www.youtube.com/watch?v=fNRDWN2OdpY>



Rigid Collar

- **Cervical spine control :**

- Immediate manual immobilization of the head and cervical spine until a rigid collar , bags and adhesive tape across the forehead are applied .

St John
Ambulance

**What to do if
someone has a
spinal injury**



- Cervical spines are suspected to be unstable in the following situations :
 - ♣ Clinical examination reveals **deformity** or cervical **tenderness**
 - ♣ Maxillofacial or head **trauma** or trauma above the clavicle .
 - ♣ **Multisystem** trauma or **unconsciousness** .
- **Radiological** evaluation is done later after stabilization of vital signs , by at least 3 views of cervical spine (AP, lateral and odontoid).

B) Breathing :

- **Assessment :**

1-Inspection: air movement , respiratory rate , cyanosis , tracheal shift , jugular venous distension , open chest wound , asymmetric chest expansion and use of accessory muscles of respiration .

2- Palpation : for subcutaneous emphysema and flail segment

3- Percussion : for hyper-resonance or dullness over lung fields

4- Auscultation : for upper & lower airway sounds .

* **N.B : 5 main features of respiratory distress** :Tachypnea or dyspnea , use accessory respiratory muscles , difficult speaking , agitation or confusion and low O2 saturation at bed side oximetry .

• **Methods :**

- All patients receive **oxygen by mask** .



- Urgent treatment of **4 threatening thoracic conditions** :

1- Open pneumothorax :

- ♣ **Intial treatment** is occlusive dressing fixed at 3 sides only.
- ♣ Once available, **definitive treatment** is insertion of chest tube connected to under water seal.

2-Tension pneumothorax:

- ♣ Immediate **decompression** by insert a needle in **2nd intercostal** space in the mid-clavicular line. It is temporary measure until the definitive treatment is available .
- ♣ Once available, **definitive treatment** is insertion of chest tube connected to under water seal .


3-Haemothorax:

- ♣ A **chest tube** connected to under water seal .
- ♣ Later **thoracotomy** may be needed if bleeding continues .

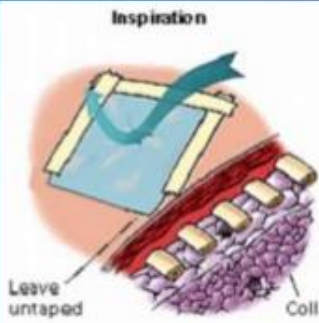
4-Flail chest : Immediate stabilization of flail segment by cotton

gauze and adhesive bandage.

Open Pneumothorax



Inspiration

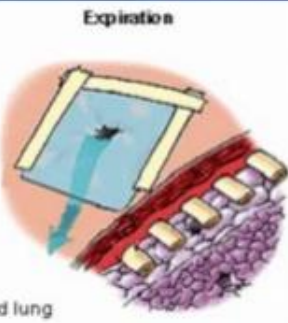


Leave untaped

Collapsed lung

Dressing seals, blocking air entry

Expiration



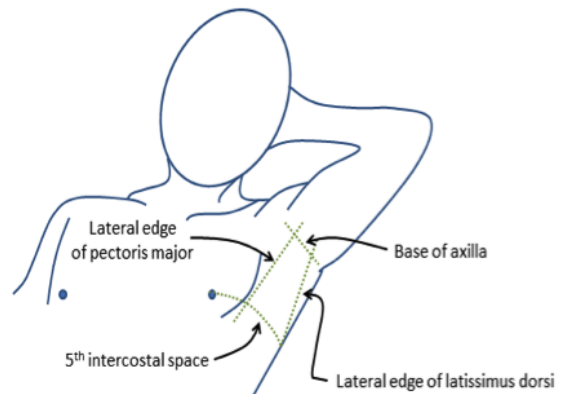
Trapped air able to exit through untaped section of dressing

FIGURE 4-4 Dressing for Treatment of Open Pneumothorax. Promptly close the defect with a sterile occlusive dressing that is large enough to overlap the wound's edges. Tape it securely on three sides to provide a flutter-type valve effect.

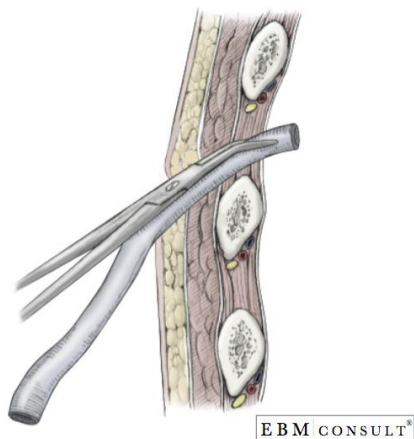
Initial treatment for Open pneumothorax

Tension Pneumothorax

Needle decompression 2nd ICS in MCL



20



Treatment for Flail Chest

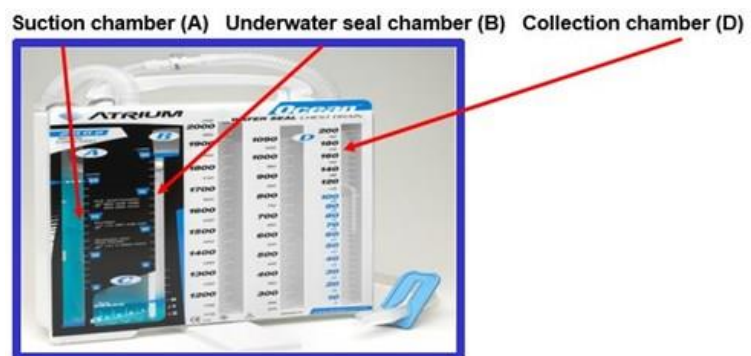
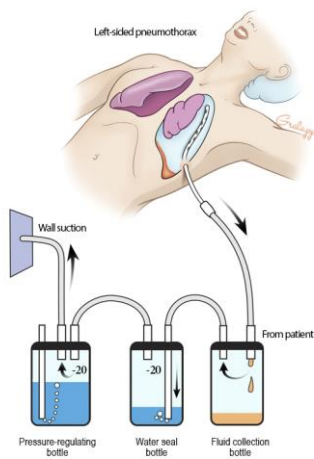


Combat Trauma Treatment Chest Injury 43

Site of insertion of intercostals tube

* **N.B:**

- **Nowadays** , intercostal tube is inserted in the 5th. intercostals space in the midaxillary line .
- **The nipple** is a landmark for the 5th. intercostals space .
- Intercostal tube is inserted in the 5th. intercostals space, **at the upper border of 6th. rib** to avoid injury of **intercostals vessels and nerves** at the lower border of 5th. rib.



Old & Recent Under Water Seal

C) **C**irculation :

a) **Cardiac arrest** : Immediate **CPR**

b) **Shock** is one of main causes of death in major trauma patient and it may be one of the followings :

1) **Haemorrhagic shock: Commonest.**

2) **Cardiogenic shock** : due to cardiac tamponade or myocardial trauma .

3) **Neurogenic shock** : due to spinal cord injury .

▪ **Assessment** : pulse , B.P, color of skin and level of consciousness

▪ **Methods** :

1)Control of external bleeding: (Compression)

- ♣ Packing of wound and local pressure bandage. (The most efficient method).
- ♣ Direct Pressure.
- ♣ Proximal pressure over the feeding vessels.
- ♣ Elevate the part.
- ♣ Tourniquet is used only if other measures fail to stop life threatening bleeding .

➤ **Complications** : acute ischaemia and injury of soft tissues .

* N.B:

- **ABC** for bleeding (**A**lert ambulance center , find the **B**leeding & **C**ompression)
- Sites of **occult severe internal bleeding** are intra-thoracic ,intra-abdominal , fracture pelvis or femur .

2- 2 large caliber (16 gauge) peripheral **IV lines** are inserted .A central IV line (in the IJV) may be needed .

3-Blood **samples** are sent for typing , cross matching ,HB% , haematocrite and blood chemistry .

4- **Ringer's lactate** solution is infused.

- ♣ Crystalloid needed = **3 times** the estimated blood loss .

5- Once available , infusion of cross matched **blood**.

- ♣ IV fluid and blood transfusion at a rate that ensures normal **urine output** of 0.5 -1 ml/kg/hour for adults.Therefore , urinary **catheter** is applied for any patient for major trauma .



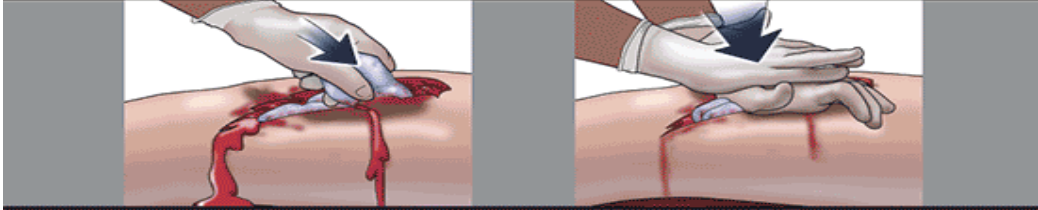
SAVE A LIFE



1 APPLY PRESSURE WITH HANDS



2 APPLY DRESSING AND PRESS



3 APPLY TOURNIQUET



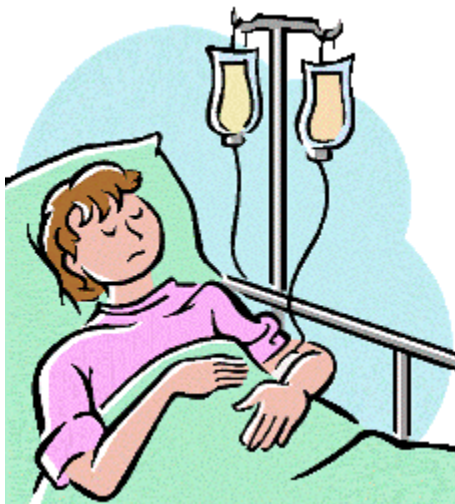
Packing & local pressure bandage



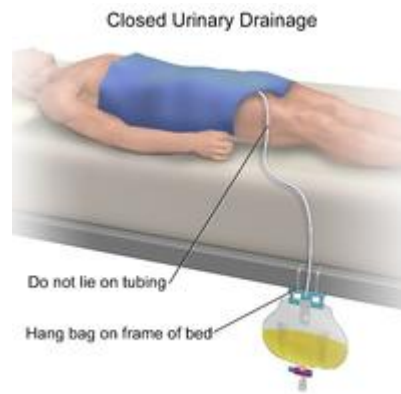
Direct Pressure



Proximal pressure



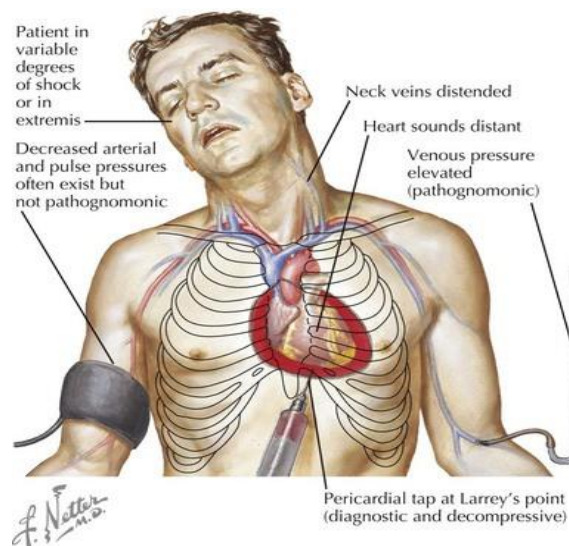
IV lines and fluids



Urinary catheter

c) Cardiac tamponade :

- **Urgent** decompression by needle **pericardiocentesis** followed later by operative **pericardiotomy** and control source of bleeding .



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D) Disability :

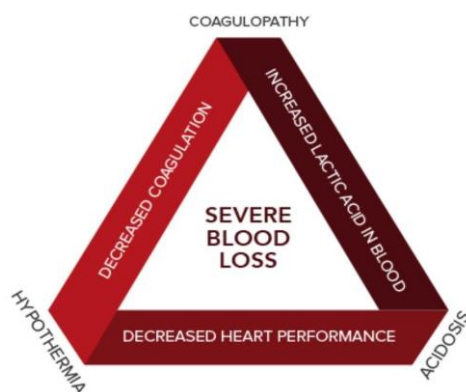
- **Common causes** of neurological deficit related to trauma are :
 1. Head injury .
 2. Shock .
 3. Hypoxia .
 4. Alcohol & drugs abuse .
- **Neurological assessment :**
 - ♣ **AVPU evaluation** : Base on patient's best response .
 - A. **A**lert and responsive .
 - V. Response to **V**ocal stimuli .
 - P. Response to **p**ainful stimuli .
 - U. **U**nresponsive .

E) Exposure and Environments :

- **Clothes** : All clothes of the trauma victim are removed using sharp large scissors .
- **Warmth**: Keep the ER warm and use blanket to prevent **hypothermia**

N.B : Triad of death in trauma :

The Triad of Death in Trauma



TRAUMA 1

* Additional important points :

a) Pain control .

b) Prolapsed viscera or bones are never reduced but covered only by sterile dressing.

c) Insert:

1- Urethral catheter: to monitor urine output. It is contraindicated if there is urethral bleeding suggesting urethral injury as catheterization compound the condition.

2- Nasogastric (Ryle's) tube : to prevent vomiting & aspiration .

d)Monitoring of trauma patient :

1- ECG,B.P, temperature , Pulse & oxygen oximetry

2- Capnography(CO₂) and ventilatory rate

3- Urine output



Oximetry



Capnography

d) Radiological assessment :

1- AP chest and pelvis X-rays

2- EFAST exam. : (**E**xtended **F**ocused **A**ssessment with **S**onography in **T**rauma). Nowadays , this included in the primary survey to identify pneumothorax , haemothorax , pericardial tamponade, and free fluid in the abdomen.

e) History : SAMPLE

- ♣ **S**ymptoms , if the patient is conscious .
- ♣ **A**llergy .

TRAUMA 1

- ♣ **Medications**
- ♣ **Past medical history and pregnancy in females.**
- ♣ **time of Last meal.**
- ♣ **Events of injury .**

* N.B :At the end of survey for trauma patient **early detection or exclusion** of the following 5 serious fatal conditions :

- 1-Airway obstruction .
- 2-Pneumothorax (open or tension).
- 3-Massive haemothorax .
- 4-Flail chest .
5. Cardiac tamponade .

II) Secondary survey :

* Secondary survey is started once resuscitation , stabilization of vital signs and preliminary radiological evaluation are completed .

* **Objectives & methods :**

A) Complete history :in addition to SAMPLE

- **Trauma** : site , type & effects .

B) Examination of the patient from head to toe and front to back .

NB: *Meticulous exam. of all systems of the body putting in mind that associated multiple injuries are very common.*

1- Head : (see exam. of the head in management of head injury)

2- Face :

3- Neck :exam. of front of neck & cervical spine (tenderness or deformity) .

4- Chest : (see exam. of the chest in management of chest injury)

5-Abdomen : (see exam. of the abdomen in management of abdominal injury)

6- Perineum with PR & PV exam.: to exclude evidence of rupture urethra .

7- Limbs : for deformity , swelling , fracture or evidence of vascular , nerve or tendon injuries .

8- Spine : To exam. the back turn the patient in one piece by 4 persons to avoid spinal cord injury if there is unstable spine fracture



9- Nervous system :

- ♣ Glasgow coma scale (see head injury)
- ♣ Pupils for size , equality and reaction to light .
- ♣ Exam. cranial nerves .
- ♣ Sensory & motor exam. in the limbs .

C) Urgent investigations: (See investigations for head. chest & abdominal injuries).

- ***If the patient on clinical grounds, is in urgent need for surgery, no time should be lost in doing investigation.***

D) Final diagnosis after integration of all clinical , laboratory and radiological information.

- ♣ Some cases require **transfer** to another department in the same hospital or transfer to another hospital .

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- ♣ The level of **medical care** should not drop during transfer.
- ♣ Repeated evaluation of the patient because some injuries may present after a **lucid interval** e.g. rupture spleen , retroperitoneal duodenal injury or extra-dural haemorrhage .

III) Antibiotics & tetanus Prophylaxis

IV) Definitive treatment of individual injuries :

- This will be discussed in the related chapters .

•N.B:

- The severity of the injuries determine the priority in the treatment .
- **Treatment of respiratory obstruction , cardiac arrest & blood volume** replacement have the first priority followed by severe internal **abdominal** bleeding , **head** injuries then chest injury and finally injuries in the limbs (unless there is vascular injury with threatened ischaemia of the limb).
- In the operating theatre many teams of surgeons are working simultaneously for urgent control of these injuries.