

# Chapter Five

## Trauma

1- Which x ray takes priority for a multiple trauma?

- A- Cervical spines and pelvis
- B- Chest and abdomen
- C- Cervical spines and skull
- D- Chest and cervical spines

2- A trauma victim suffers hypovolemic shock. Which solution is appropriate as the first solution?

- A- Crystalloid solution
- B- Albumin contained solutions
- C- Matched Whole Blood
- D- Group O Rh negative blood

3- A blunt trauma victim (car accident) is admitted to ED. His Chest X-ray shows unilateral pneumothorax. A chest tube is inserted. His condition is not stable. He suffers hypovolemic shock and extensive abdominal bruises. His condition remains unstable despite 2 liters of fluid. What do you do?

- A- DPL
- B- Abdominal CT
- C- More fluid replacement
- D- Laparotomy

4- A child suffers respiratory distress following a blunt trauma. The chest tube drainage shows milky fluid. What should **not** be done for this case?

- A- TPN
- B- Surgery if he is not responsive to medical therapy
- C- Giving sclerosing drugs
- D- High fat, high carbohydrate diet

5- A patient is referred to ED because of respiratory distress with cyanosis and fracture of mid face, jaws, and teeth. The fractured bone can not be taken out of the mouth completely. What is the first thing to do?

- A- Orotracheal intubation
- B- Tracheostomy
- C- Needle tracheostomy with large bore (14G) needle
- D- Nasotracheal intubation

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6- A 25 year old man has a blunt abdominal trauma. Despite no external bleeding, he has a BP of 80/40 mmHg. He responds to 2 liters IV Ringer Lactate. He still has abdominal pain and tenderness. What should be done next?

- A- DPL
- B- Observation and more fluid replacement
- C- Laparotomy
- D- CT scan

7- A worker has fallen off a burning building due to gas leakage. He has neck injuries with the possibility of cervical spine fracture. What do you suggest?

- A- He should be immobilized and transferred from the scene.
- B- IV access and immobilization of the neck should be done in the scene
- C- Call trauma team and emergency
- D- He should be transferred carefully and immediately to a safer place.

8- A young man has a bullet injury to the thighs from an accident one year ago. What do you suggest?

- A- The superficial bullets should be taken out
- B- Observation
- C- The deep bullets should be taken out
- D- All bullets should be taken out

9- A 9 year old child has fallen off a two meter height. He has a fracture line in the skull with no neurological sign. He is conscious. No history of vomiting. What do you suggest?

- A- If the CT scan is normal no further investigation is needed
- B- CT scan and hospitalization
- C- Pain killer and discharge
- D- Discharge to take a CT scan

10- A man has a car accident. He is drowsy with a GCS of 13(E3 V5 M5). PR is 110 bpm. He has LUQ tenderness with no rebound. He also suffers a left femur fracture which is immobilized. What should be done after the primary care?

- A- Observation every two hours
- B- Abdominal CT
- C- Laparotomy
- D- DPL

11- A 16 year old man has a car accident. His sixth left rib is broken. No pulmonary injury can be detected. He has severe pain in inspiration. What do you suggest?

- A- Chest tube
- B- Analgesics
- C- Fixation of the broken rib
- D- Fixation of the broken rib by casting

## Trauma-mdm

12- What is the most reliable way to study arteries in a trauma?

- A- Plain radiograph
- B- Physical exam
- C- Doppler sonography
- D- Arteriography

13- A 20 year old man has apnea(respiratory arrest) after a car accident. What is the first thing to do?

- A- Tracheostomy
- B- cricothyroidectomy
- C- Cervical spine radiography
- D- Orotracheal intubation with axial traction

14- A trauma victim comes with an open chest wound. What is the first thing to do?

- A- Tracheostomy
- B- cricothyroidectomy
- C- Orotracheal intubation
- D- Closing the wound with a dressing

15- A driver had an accident and is trapped in the driver's seat. He is agitated and has a sore on his forehead. He is cyanosed and tachycardic. What step has priority?

- A- He should be taken out of the car and have an oro tracheal tube
- B- Airway opened and the neck immobilized
- C- IV line and then he should be taken out of the car
- D- Neck immobilization and IV line

16- A young man has a car accident. He is tachycardic, tachypenic, cyanosed, his neck veins are bulged, 3<sup>rd</sup> rib crepitation, attenuated lung sounds, and the lung is tympanic in auscultation. What is the mechanism of his respiratory distress?

- A- Problem in venous return to the heart
- B- Problems in ventilation
- C- Lung contusion
- D- Pain due to rib fracture

17- What is true about blunt and penetrating abdominal trauma?

- A- Hemoperitonium is always accompanied by severe tenderness.
- B- In penetrating trauma there's no positive findings in physical examinations and exploration is recommended.
- C- Peritonitis points to DPL.
- D- CT scan is recommended for gunshot to lower lung and abdomen.

## Trauma-mdm

18-An 18 year-old man has a car accident which injured his lower jaw, tongue, chest and extremities. He has respiratory distress. Which is the first step to establish an airway?

- A- Emergent cricothyroidectomy
- B- Orotracheal intubation
- C- Nasotracheal intubation
- C- Emergent tracheostomy

19- An 8 year old boy has a motorcycle accident and a deep wound on his shin bone. He has a complete course of tetanus vaccination. What do you suggest to prevent tetanus?

- A- Td vaccine
- B- TIG
- C- Vaccine +IG
- D- No action is needed.

20-A young woman cuts her wrist during her work in the kitchen. How do you control her bleeding?

- A- Sutures
- B- A hemostat
- C- A Tourniquet
- D- Direct pressure

21- A 13 year old child had an abdominal blunt trauma one month ago. He was discharged 5 days after that event with normal imaging studies. He is now complaining of abdominal pain, anorexia, and vomiting. In physical examinations there is some epigastric fullness. What is the most probable diagnosis?

- A- Lesser sac abscess
- B- Retroperitoneal hematoma
- C- Pancreatic pseudocyst
- D- Urinoma

22- A man had a car accident. He is agitated and tachypneic. He has upper jaw and nose septum hematoma. While you are trying to have an IV line, he becomes apneic. What is your choice of establishing airway?

- A- Orotracheal intubation
- B- Tracheostomy
- C- Nasotracheal intubation
- D- Cricothyroidectomy

23-A young worker has fallen off a height. He has lower abdominal pain. He is hemodynamically stable. He has suprapubic tenderness and there's a blood drop in the urethral meatus. What is the first thing to do?

- A- IVP
- B- Abdominal CT
- C- Catheterization and cystography
- D- Retrograde Urethrography

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24- A man is referred to ED with a head trauma and GCS of 6 (E2V2M2) and no history of convulsions. What drug do you suggest?

- A- Phenytoin to prevent convulsions
- B- Phenobarbital to prevent convulsions
- C- Phenytoin if there is convulsions
- D- Phenobarbital if there is convulsions

25- A man has fallen off a height of 3 meters. He has abdominal and chest pain. He is alert and hemodynamically stable. By a chest radiograph, you notice the NG tube is in his left hemithorax. What is the most probable explanation?

- A- Diaphragmatic laceration
- B- Stomach laceration
- C- Esophageal laceration
- D- Diaphragmatic paralysis

26- A 25 year old man has a penetrating trauma to the neck. His vital signs recording are: Bp=90/pulse mmHg, PR=120 bpm, RR=22/min. A hematoma in zone II of his neck is expanding. What should be done?

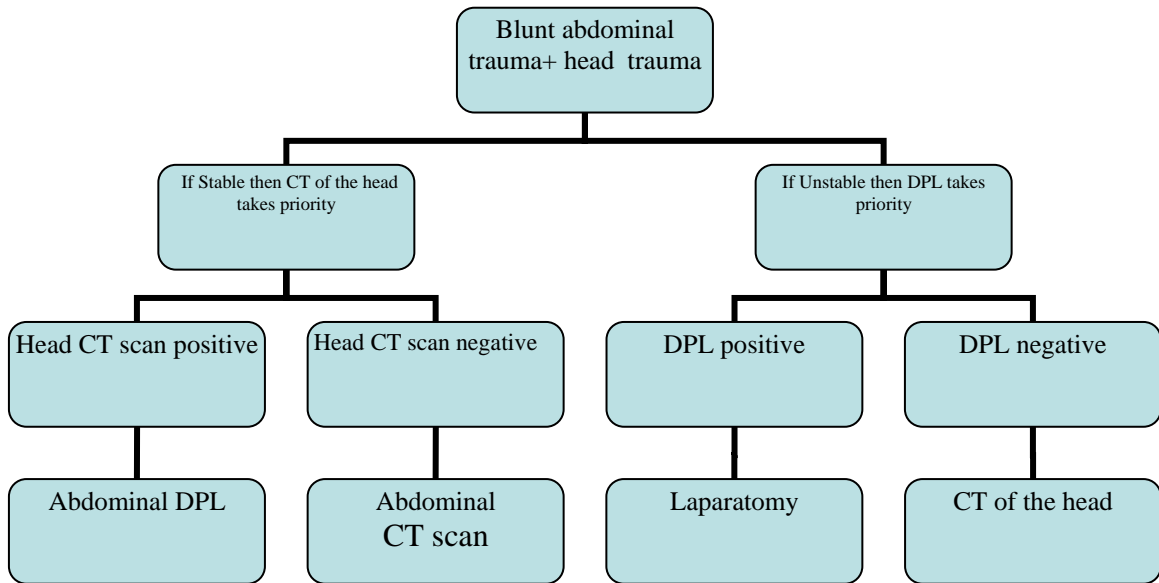
- A- Angiography
- B- Neck CT Scan
- C- Neck MRI
- D- Surgery

27- A 30 year old man has a car accident. He is alert and hemodynamically stable. His physical exam shows abdominal tenderness which persists after 12 hours. What should be done?

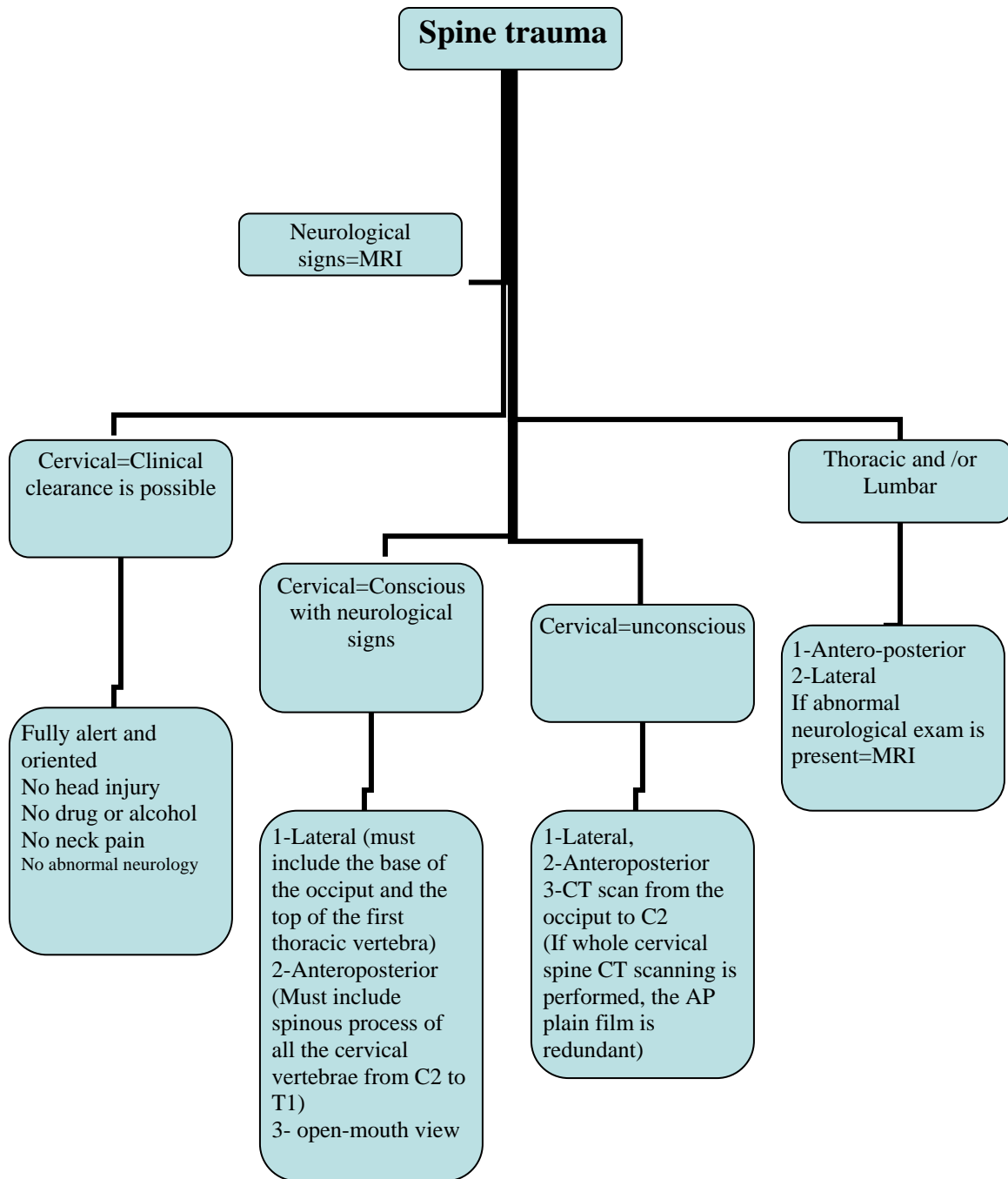
- A- Discharge the patient
- B- Surgery
- C- Abdominal CT Scan
- D- DPL

28- A man has a car accident. He has a slight respiratory distress after 12 hours. RR=28/min. He has severe tenderness in right anterior of the chest. Chest x-ray reveals right lung lower and middle lobe opacity. What is necessary at the present moment?

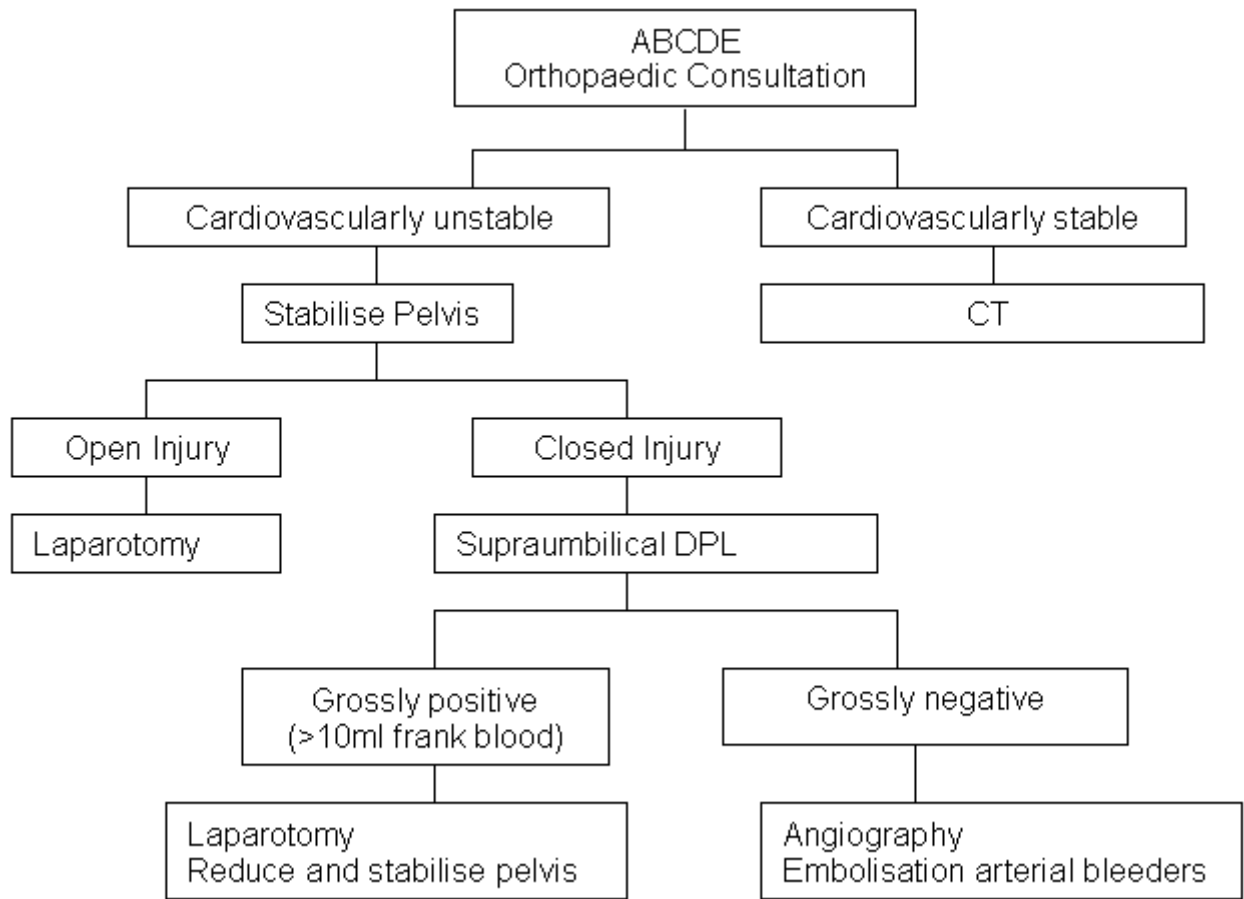
- A- Avoiding excessive hydration
- B- Wide spectrum antibiotic
- C- Thorax CT Scan
- D- Chest tube insertion



**Diagram5-1: Blunt abdominal trauma plus head trauma**



**Diagram5-2: Cervical Spine trauma; indication for specific imaging tests**



**Diagram5-3: Fractured Pelvis Management**

<b>Eye Opening 4</b> Spontaneous	<b>3</b> To Voice	<b>2</b> To Pain	<b>1</b> Nil		
<b>Verbal Response 5</b> Orientated	<b>4</b> Confused	<b>3</b> Words	<b>2</b> Groans	<b>1</b> Nil	
<b>Motor Response 6</b> Obeyes Commands	<b>5</b> Localizes Pain	<b>4</b> Withdraws from Pain	<b>3</b> Abnormal Flexion	<b>2</b> Extension	<b>1</b> Nil

**Table5-1: Glasgow Coma Score-GCS (sum of the best response in each category)**

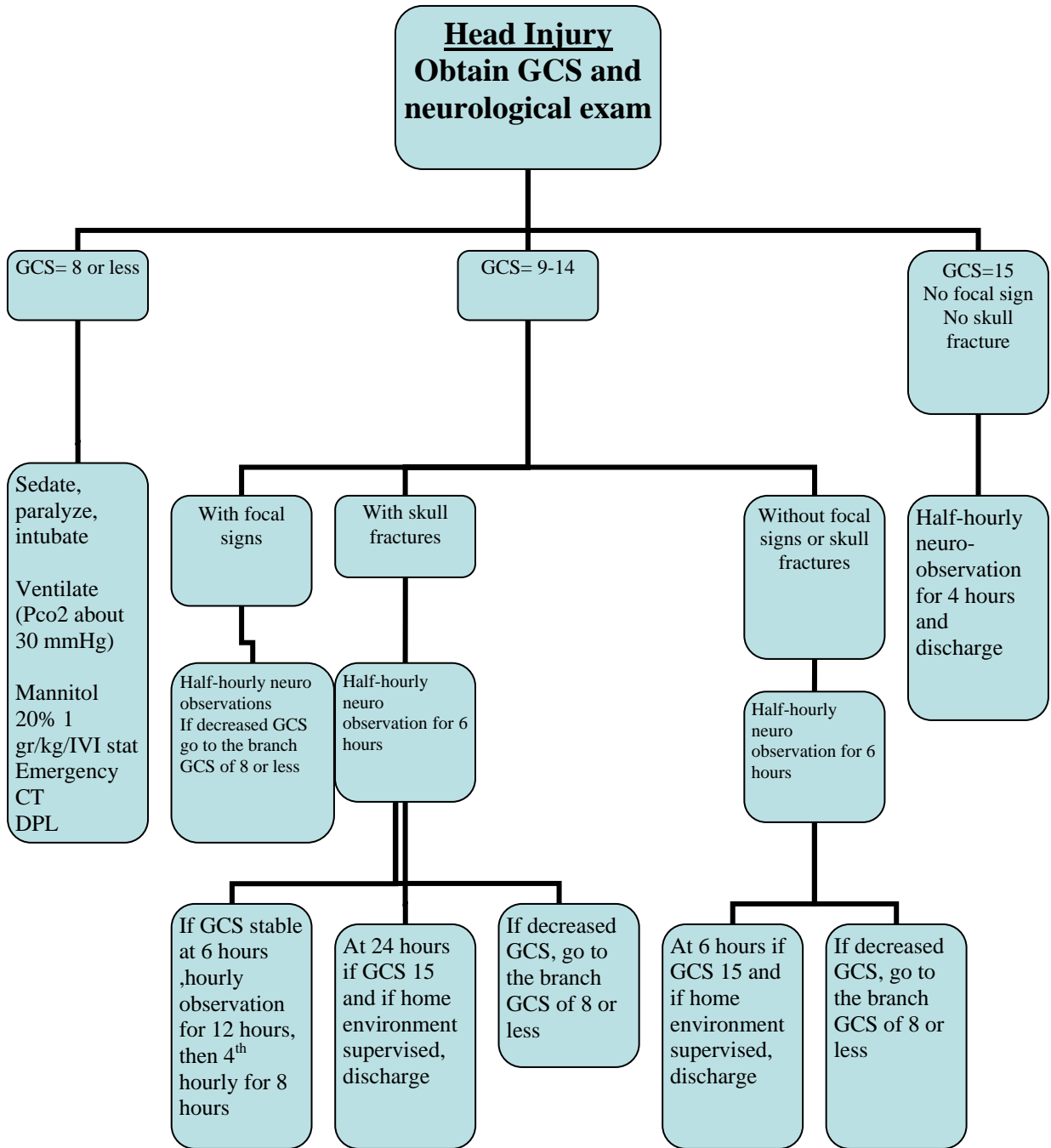
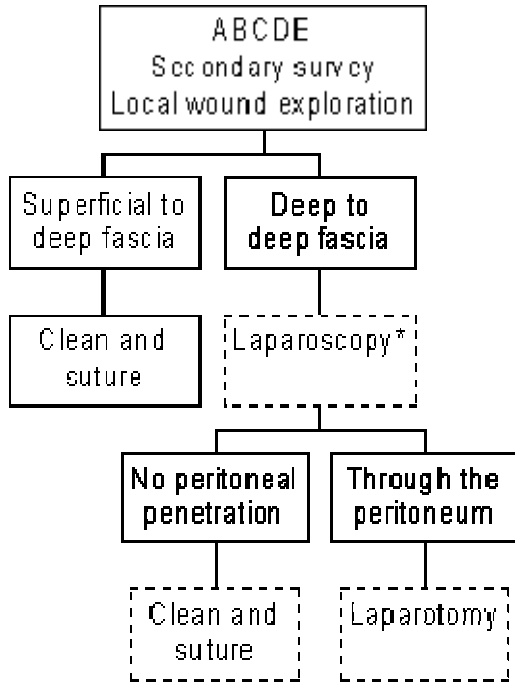


Diagram5-4: Head Injury Management



**Diagram5-5: Penetrating Abdominal Injury Management**

## Three Common Surgical procedures in Trauma patients

### 1-DPL

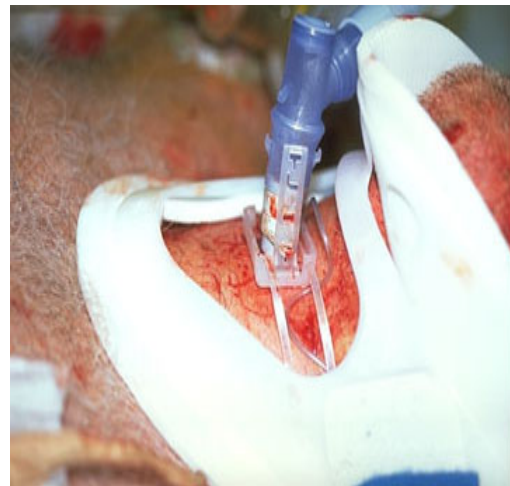
This can be performed as a sterile procedure in the emergency department by injecting local anaesthetic down to the peritoneum just below the umbilicus in the midline. A catheter is then inserted under direct vision into the peritoneal cavity. If suction with a syringe reveals frank blood, the test is positive and the catheter can be withdrawn. Otherwise, 1 litre of warmed 0.9% Saline solution is infused and the infusion set is then placed below the level of the patient. The patient's bed should be placed in Trendelenberg and reverse Trendelenberg to aid mixing. A 'Lavage Pack' is available in resusc room and Operating theatres for testing the effluent. Present testing includes RBC, WCC, Alk Phos, Amylase and Gram stain.

### 2-CHEST DRAINAGE

In case of tension pneumothorax, when the patient is compromised, a 12 G cannula is inserted into the second intercostal space- mid clavicular line. Then in a better occasion the intercostal catheter should be placed.

An intercostal catheter, 32G or larger, with the trocar removed, should be inserted in the fifth or sixth intercostal space just anterior to the mid-axillary line. Liberal use of local anaesthetic (to the pleura, muscle and skin) is followed by a skin incision of 1.5cm. Blunt dissection is then performed down to, then through the pleura, and the tube is inserted by directing it posteriorly and superiorly towards the apex. Avoid purse string sutures - use simple mattress sutures. Secure the tube to the side of the body with elastoplast. Place the underwater seal below the bed. The tube should only be clamped for a good reason and with extreme caution to prevent tension pneumothorax. If there is free bleeding, milk the tubes to avoid clotting. Suction (20cm water) is often necessary to drain blood and air.

### 3-CRICOTHYROIDOTOMY



The essential indication for a surgical airway is the need for an airway. However, the usual first preference is for orotracheal intubation. (Nasotracheal intubation is slower and should be attempted only if the patient is haemodynamically stable and can be hand ventilated for long enough to obtain optimum pre-oxygenation). The hard collar

may be temporarily removed if the neck is protected by in-line immobilization. A Surgical Airway should be performed if orotracheal intubation is unsuccessful.

Situations in which a Surgical Airway should be considered as the primary method include Major Maxillo-Facial Injury (eg compound mandibular fractures, Le Forte III Midface Fracture), Oral Burns, Fractured Larynx.

The simplest technique is needle cricothyroidotomy. This involves placing a 12 Gauge Cannula into the trachea via the cricothyroid membrane. This will allow adequate ventilation for up to 45 minutes, hypercapnea being the main limiting factor. This may buy enough time to obtain expert airway assistance and attend to other emergency procedures. (This is the preferred technique for children under the age of 12.)

Formal Cricothyroidotomy is the classic surgical airway. It is safer and quicker than attempting Formal Tracheostomy in the Emergency Room. The patient's cervical spine is immobilized in the neutral position. A Right Handed Surgeon stands on the patient's right. The area is prepped and draped. Local anaesthetic with adrenaline is used only in the conscious patient who has a patent airway. In an asphyxiated / dying patient there is insufficient time.

The thyroid cartilage is stabilized with the left hand as the right hand makes the incision. The first incision is 3cm long transverse incision through the skin overlying the cricothyroid membrane (closer to the cricoid cartilage than the thyroid cartilage). The second pass of the scalpel is again transverse, through the cricothyroid membrane into the airway. With the scalpel blade protruding into the airway, it is rotated 90 degrees so that it is now longitudinal, holding the two edges of the incised membrane apart.

The left hand now releases the thyroid cartilage and picks up an artery forceps. The artery forceps is placed into the airway, through the exposed gap, and opened so as to take over from the scalpel as the means of holding the incised edges apart. The scalpel can now be removed and placed in the sharps tray. The right hand then picks up the endotracheal tube or tracheostomy tube and inserts it into the airway, directed towards the chest. The best size ET tube for an adult cricothyroidotomy is a size 6.0.

After confirming adequate position, the tube should be secured and suctioned. A definitive airway will be required as soon as the patient is stable, fully assessed and appropriate interventions have been performed.

Fortunately, with skilled airway doctors in most trauma centers, surgical airways are rarely required.

### **Points to remember:**

A high index of suspicion must exist for hidden injuries even if the patient is initially hemodynamically stable in following cases:

1. Penetrating injury to the head, neck, chest, abdomen or groin;
2. Two or more proximal long bone fractures;
3. Trauma combined with burns equal to or greater than 15% Body Surface Area;
4. Flail chest;
5. Falls equal to or greater than 20 feet;
6. Vehicle crash causing any of the following:
  - (a) 20" deformity of vehicle;
  - (b) Displacement of axle toward passenger compartment;

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- (c) Intrusion of passenger compartment by 15" on patient side or 20" on opposite side;
- (d) Rollover;
- (e) Death of another passenger in vehicle;
- (f) Ejection of patient;

7. Pedestrian struck by vehicle traveling at speed equal to or greater than 20 MPH. Initiating IV therapy should not delay transport; if transportation is unavoidably delayed, IV therapy may be started prior to transport.

Estimated blood loss	Suitable fluid regimes		
1000 mls	3000 mls crystalloid	or	1000 mls colloid
1500 mls	1500 mls crystalloid & 1000mls colloid	or	4500 mls crystalloid
2000 mls	1000 mls crystalloid, 1000mls colloid & 2 units blood	or	3000 mls crystalloid & 2 units blood

**Table 5-2: Suitable Blood Replacement Regimes for Previously Healthy Adults**

	<b>Class 1</b>	<b>Class 2</b>	<b>Class 3</b>	<b>Class 4</b>
<b>Blood Loss</b> Volume (mls) in adult	750mls	800 - 1500mls	1500 - 2000mls	>2000mls
<b>Blood Loss</b> % Circ. blood volume	<15%	15 - 30%	30 - 40%	>40%
<b>Systolic Blood Pressure</b>	No change	Normal	Reduced	Very low
<b>Diastolic Blood Pressure</b>	No change	Raised	Reduced	Very low / Unrecordable
<b>Pulse</b> (beats /min)	Slight tachycardia	100 - 120	120 (thready)	>120 (very thready)
<b>Capillary Refill</b>	Normal	Slow (>2s)	Slow (>2s)	Undetectable
<b>Respiratory Rate</b>	Normal	Normal	Raised (>20/min)	Raised (>20/min)
<b>Urine Flow</b> (mls/hr)	>30	20 - 30	10 - 20	0 - 10
<b>Extremities</b>	Normal	Pale	Pale	Pale & cold
<b>Complexion</b>	Normal	Pale	Pale	Ashen
<b>Mental state</b>	Alert, thirsty	Anxious or aggressive, thirsty	Anxious or aggressive or drowsy	Drowsy, confused or unconscious

**Table 5-3: Clinical Signs of Shock**

## Summary:

### Neck: penetrating trauma:

- unstable=explore
- Stable but symptomatic
  - Zone I=Angiography====> if positive then explore
  - Zone II=Explore
  - Zone III=Angiography====> if positive then explore
- Stable and symptom free
  - Zone I= three survey(esophagus, trachea, angiography)====>If positive then explore
  - Zone II, III=observation for 12 hours

### Neck: blunt trauma:

Cervical Spine Care+ airway care

### Thoracic Trauma (penetrating and/or Blunt):

- Stable
  - Heart temponade= pericardiocentesis in ED/sternotomy in OR
  - Large pneumothorax= Thoracotomy
  - Gunshot/ penetrating below the nipples
    - Right side= DPL====> If positive then laparotomy
    - Left side=Explore====> If positive then laparotomy
  - Mediastinal emphysema= Esophagoscopy====>If positive then Thoracotomy
  - Neck emphysema= Broncoscopy====> If positive neck exploration
  - Laryngeal edema= Intubation + tracheostomy
- Unstable= Thoracotomy

### Abdominal penetrating trauma:

- Gunshot=laparotomy
- Cut:
  - Anterior and lateral====>explore
  - Back and flank====>CT scan
  - Right side= DPL====> If positive then laparotomy
  - Left side=Explore====> If positive then laparotomy

### Abdominal Blunt trauma:

- Unstable(peritonitis, unstable vital signs, definite positive abdominal signs )====> laparotomy
- Unstable( equivocal or unreliable abdominal signs, unconsciousness, hct below 36%,hematuria, hypotension, abdominal tenderness)====>DPL/FAST
  - If positive then laparotomy.
  - If negative then search another source for instability
- Stable:
  - Equivocal or unreliable signs or not available for repeated examination=>CT scan
  - Normal examination and patient available for repeated abdominal examination ====>observe

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**Pelvis penetrating trauma:**

- Stable:
  - Lower chest/flank/back ==>Abdominal CT scan
  - Suprapubic ==>CT scan and cystogram
  - Penis ==>Retrograde Urethro Graphy
  - Scrotum ==> Urologist consultation
- Unstable:Laparatomy

**Pelvis Blunt trauma:**

- RUG if there is blood on the meatus
- CT scan or IVP or cystogram if :
  - Hematuria(for adults only gross hematuria but in Children both gross and microscopic hematuria)
  - signs of shock
  - Pelvic fracture
  - Deceleration injuries

**A multiple trauma case:**

29-A 75 year old female pedestrian is rolled over by a truck. Her vital signs:  
BP150/100mmHg/PR=80 bpm/RR=32/min/ GCS=15(E4 V5 M6).

The primary care of oxygen-head collar- IV access and NS is started.

The primary survey shows deterioration of her BP. How do you detect the source of her lowering blood pressure?

A-Focused US Assessment (FAST)

B- Abdominal CT

C- DPL

30- The chosen diagnostic test in question 29 shows retroperitoneal hemorrhage. What should be done next?

A- Angiography

B- Complete spinal x-ray

C- Operation

31- The diagnostic test of question 30, shows bleeding from femoral vessel. What next?

A- Femoral artery embolization

B- Fluid replacement

C- RBC scan

**Table 5-4: protocol of certain trauma injuries management:**

Type of injury	management
<b>Hypovolemic Shock</b>	<ol style="list-style-type: none"> <li>1. Airway control; O<sub>2</sub>; protect c-spine.</li> <li>2. Transport.</li> <li>3. Two large bore IV's of Normal Saline wide open.</li> <li>4. EKG Monitor.</li> </ol> <p>(Pediatric shock is same as above plus: Fluid bolus of 20cc/kg normal saline; repeat bolus in 10 minutes if shock persists. IO infusion if peripheral access not available. )</p>
<b>Traumatic/Hypovolemic Cardiopulmonary Arrest</b>	<ol style="list-style-type: none"> <li>1. Basic Life Support is initiated.</li> <li>2. Endotracheal intubation is performed.</li> <li>3. TRANSPORTATION IS INITIATED.</li> <li>4. Begin rapid infusion of Normal Saline via large bore catheter. Begin second infusion if possible.</li> <li>5. Begin EKG monitoring.</li> <li>6. Initiate the appropriate cardiac arrest protocol.</li> </ol>
<b>Tension Pneumothorax</b>	<ol style="list-style-type: none"> <li>1. Airway control and O<sub>2</sub>.</li> <li>2. EKG Monitor.</li> <li>3. Pleural decompression using large bore over-the-needle catheter if: there is evidence of Respiratory/Cardiovascular compromise AND two (2) of the following: <ul style="list-style-type: none"> <li>• absence/decreased breath sounds on affected side,</li> <li>• tracheal deviation,</li> <li>• subcutaneous emphysema.</li> </ul> </li> <li>4. IV of Normal Saline at KVO.</li> </ol>
<b>Head Trauma</b>	<ol style="list-style-type: none"> <li>1. Routine Medical Care</li> <li>2. If unconscious, airway control with intubation and hyperventilate at 24 respirations/minute.</li> <li>3. If there is clinical indication of hypoglycemia associated with unconsciousness, DEXTROSE 50% 50cc IV.</li> <li>4. If there is clinical indication of narcotic use associated with unconsciousness, NALOXONE 2mg IV, ET, or IM.</li> <li>5. If signs of shock, refer to Shock Protocol. (Traumatic or Non-Traumatic, as appropriate).</li> </ol> <p><b>Medical Control Options</b>  * NALOXONE 2mg IV, ET, or IM; may be repeated to total of 8mg. (pediatrics: * NALOXONE 0.1mg/kg IV, up to 2mg; may repeat 3 times.)  * DEXTROSE 50%, 50cc IV.  (Pediatrics: DEXTROSE 25% 2cc/kg IV).  THIAMINE 100mg IM or IV.</p>
<b>Thermal Burns</b>	<ol style="list-style-type: none"> <li>1. Stop burning process.</li> </ol>

	<p>2. Routine Medical Care                  3. For respiratory burns, refer to protocol: IMMEDIATE RESPIRATORY ARREST (chapter 8).                  4. Transport. If transport is delayed, IV access may be obtained prior to transport.                  5. IV of Normal Saline, large bore (avoid burn tissue if possible) at KVO; If &gt;15% BSA burn estimate, initial flow at 100cc/hr.  <b>Medical Control Options</b>                  * MORPHINE SULFATE 2-5mg slow IVP; can be repeated to maximum 15mg.</p>
<b>Analgesic Treatment for Isolated Extremity Trauma</b>	<p>* IV OF NORMAL SALINE, rate according to VS.                  * MORPHINE SULFATE 2-5mg slow IVP ; can be repeated to maximum 15mg.</p>

Answers:

- |       |       |       |
|-------|-------|-------|
| 1- D  | 12- D | 23-D  |
| 2- A  | 13- D | 24- A |
| 3- D  | 14- D | 25-A  |
| 4- D  | 15- B | 26- D |
| 5- C  | 16-A  | 27-C  |
| 6- A  | 17- B | 28- A |
| 7- D  | 18-A  | 29-B  |
| 8-B   | 19- D | 30-A  |
| 9- B  | 20- D | 31-A  |
| 10- D | 21- C |       |
| 11-B  | 22- A |       |

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