INTRODUCTION TO TCCC

OVERVIEW

- History of TCCC
- Principles of TCCC
- Phases of TCCC

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

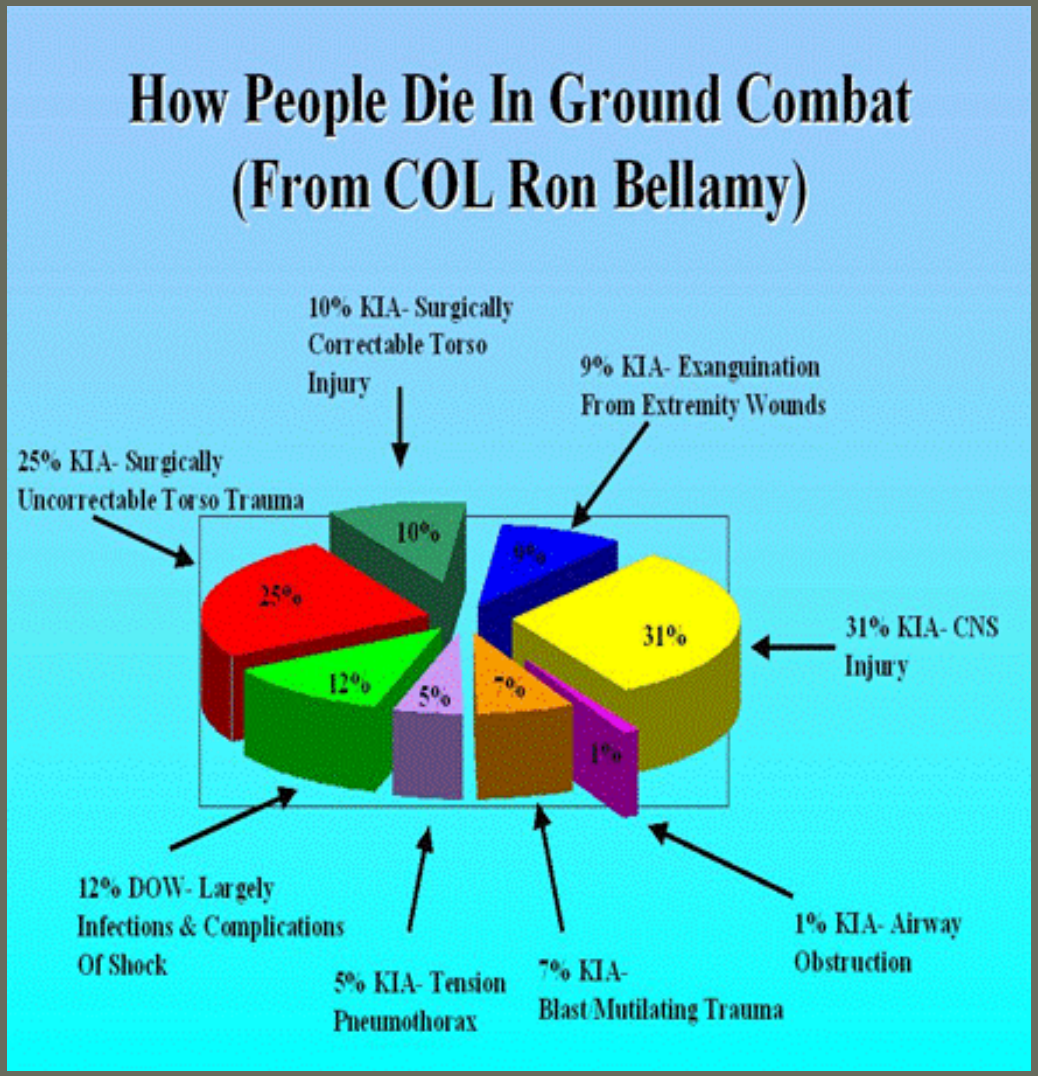
Enabling Learning Objectives

HISTORY OF TCCC

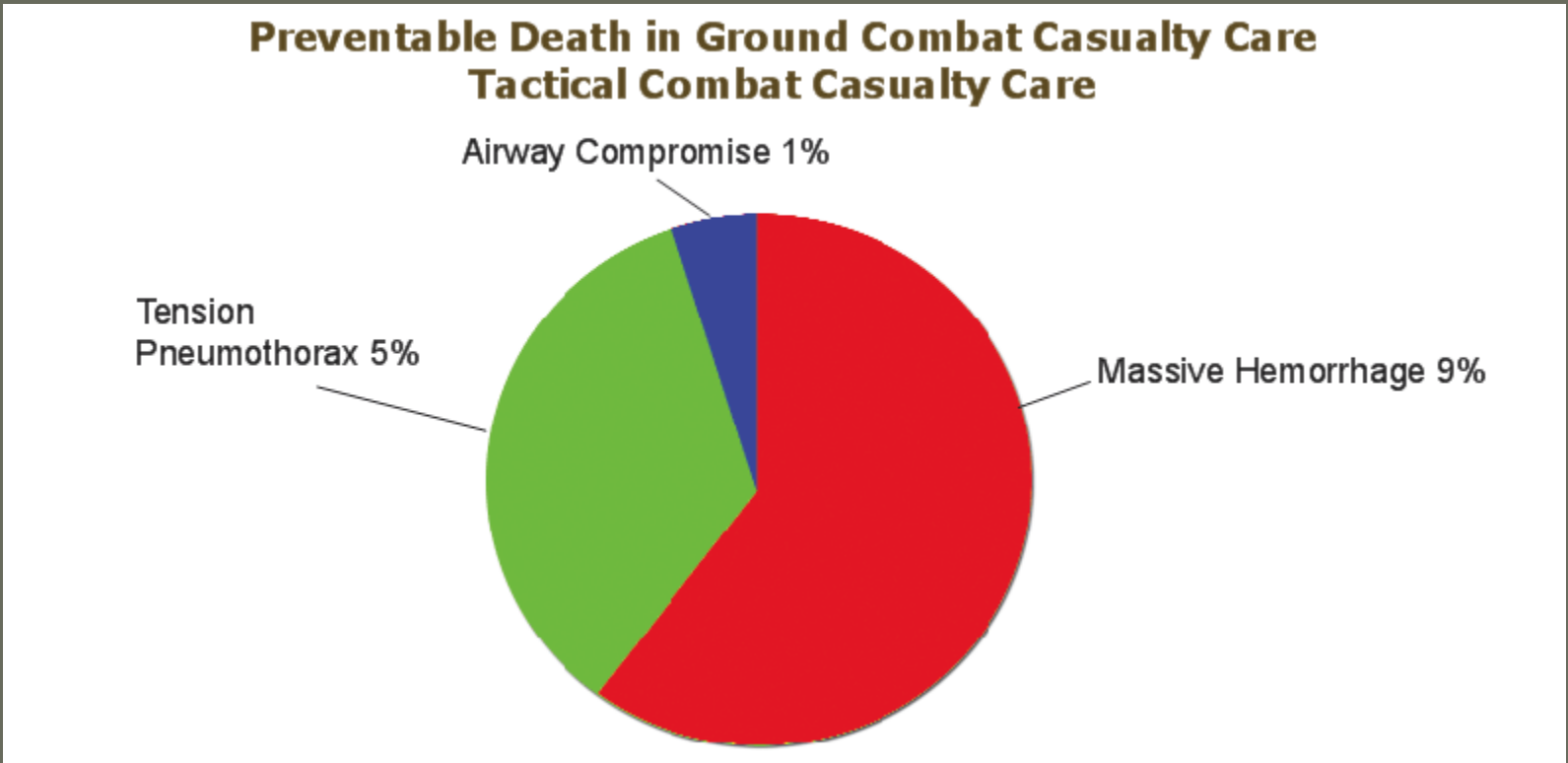
HISTORY OF TCCC

- Committee on Tactical Combat Casualty Care (CoTCCC)
  - Established 2001
  - Originally a Special Operations research project
- TCCC Guidelines
  - Published every 4 years in Prehospital Trauma Life Support manual
  - National Association of Emergency Medical Tehcnicians posts updates on their website as they are approved

HISTORY OF TCCC



HISTORY OF TCCC



PRINCIPLES OF TCCC

PRINCIPLES OF TCCC

- Fundamentally different than civilian medicine
  - Unique wounds
  - Tactical conditions

- “Good medicine may be bad tactics”

PRINCIPLES OF TCCC

- Three primary goals:

1) Treat the casualty
2) Prevent additional casualties
3) Complete the mission

PHASES OF TCCC

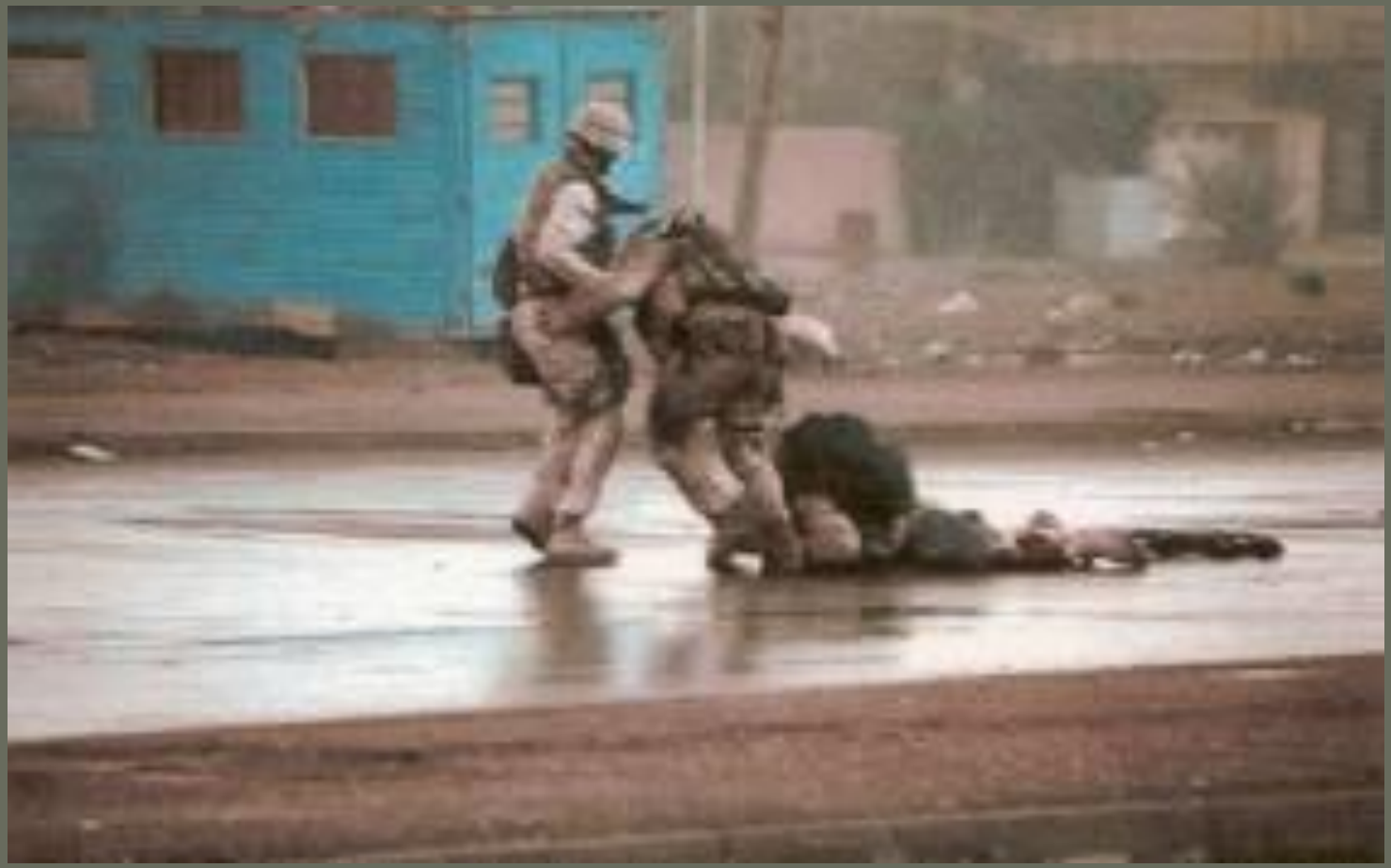
PHASES OF TCCC

- TCCC is divided into three distinct care phases:

1) Care Under Fire
2) Tactical Field Care
3) Tactical Evacuation Care

CARE UNDER FIRE

- Care rendered at the scene while Corpsman and casualty are still under effective fire
  - Point of injury
  - On the “X”
- Risk of additional casualties is extremely high
- The best medicine is fire superiority. The need for medical care must be weighed against the need to move to cover and to suppress hostile fire rapidly



CARE UNDER FIRE

- Self Aid/Buddy Aid
  - Is the casualty conscious?
  - Can the casualty return fire?
  - Can the casualty treat themselves?
  - Can the casualty move to you?

- Tourniquets for life-threatening extremity hemorrhage are the ONLY intervention used during this phase

TACTICAL FIELD CARE

- Corpsman and casualties are no longer under effective enemy fire

- Time to reassess interventions and fully assess the casualty

TACTICAL FIELD CARE

PRIORITIES OF TACTICAL FIELD CARE

- Disarm all casualties with altered mental status
- Obtain airway
- Asses and treat external hemorrhaging
- Manage shock/fluid resuscitation
- Hypothermia prevention
- Pain relief/antibiotics

TACTICAL FIELD CARE

- M – Manage and treat external hemorrhage
- A – Airway assessment
- R – Respiratory trauma assessment
- C – Circulation assessment
- H – Head trauma assessment & Hypothermia prevention/management

TACTICAL EVACUATION CARE

- Casualties are being transported to a higher echelon of care

- Encompasses both medical evacuation (MEDEVAC) and casualty evacuation (CASEVAC)

TACTICAL EVACUATION CARE

- MEDEVAC
  - Dedicated medical platforms
  - Crewed by medical personnel

- CASEVAC
  - Armed assets with no Red Cross markings
  - Point of injury to first MTF

INTRODUCTION TO TCCC

MANAGE SHOCK CASUALTIES

OVERVIEW

- Cardiovascular System Terminology
- Anatomy Cardiovascular System
- Types of Shock
  - Signs & Symptoms
  - Treatment

LEARNING OBJECTIVES

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TERMINOLOGY

TERMINOLOGY

- Overview
- Shock is regarded as a state of generalized cellular hypoperfusion in which delivery of oxygen to the cells is inadequate to meet metabolic needs.
- There is no laboratory test to diagnose shock.
- The initial step is to recognize its presence.
- By far, the most common cause of shock in the trauma casualty is hemorrhage.

TERMINOLOGY

- Systolic Blood Pressure
  - force of the blood against vessels produced by ventricular contraction
  - Normal Systolic BP = 120 –140 mmHg

- Diastolic Blood Pressure
  - pressure in vessels while the heart is at rest
  - Normal Diastolic BP = 60 – 80 mmHg

MEDICAL TERMINOLOGY

- Preload
  - amount of blood returning into the heart from the systemic circulatory system (venous return)
- Afterload
  - resistance to blood flow the heart must overcome to pump blood
- Stroke Volume
  - amount of blood pumped by the heart with each contraction
- Capillary Refill Test
  - Indicative of tissue perfusion

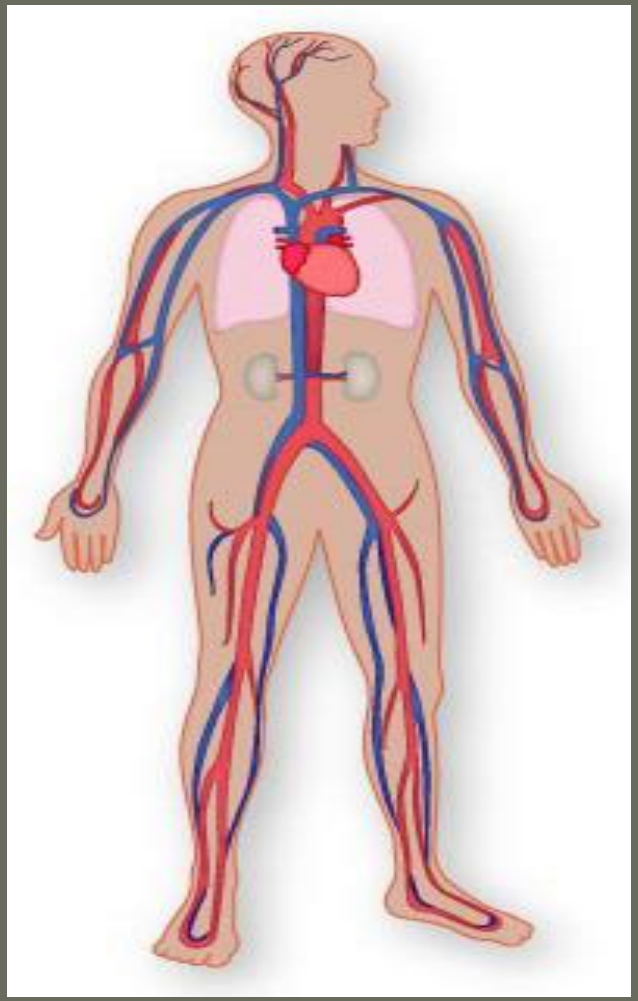
TERMINOLOGY

- Nervous System (2 components)
  - Sympathetic
    - Fight or flight response
    - Goal is to maintain sufficient amount of oxygenated blood to critical areas
  - Parasympathetic
    - Rest and digest
    - Maintains normal body functions

TERMINOLOGY

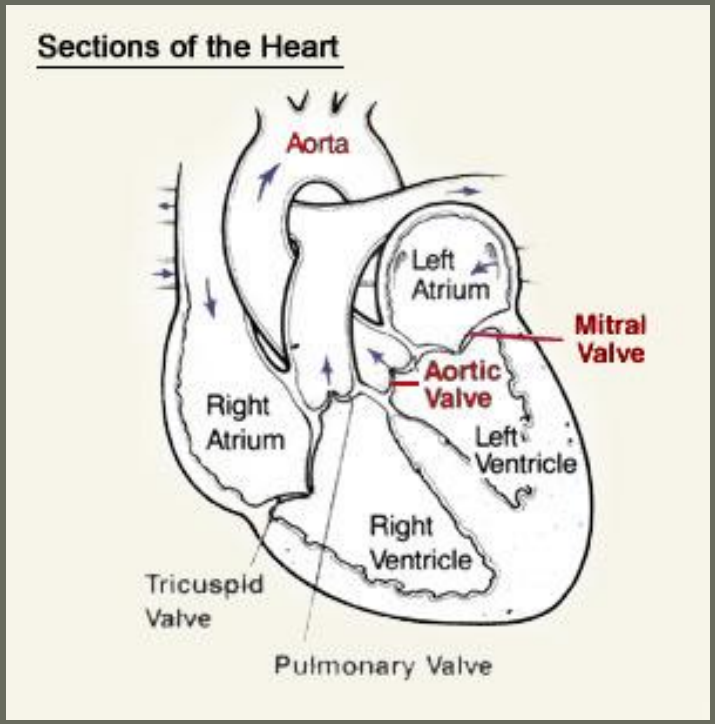
- Metabolism
  - Aerobic Metabolism
    - Body's principle energy process
    - Uses oxygen as power source
  - Anaerobic Metabolism
    - Back-up power system
    - Uses stored body fat

CARDIOVASCULAR ANATOMY



CARDIOVASCULAR ANATOMY

- Shock occurs from failure of any one or more of the cardiovascular components:
  - Pump: Heart
  - Fluid: RBC, WBC, Platelets
  - Container: Arteries, Veins, and Capillaries



TYPES OF SHOCK

3 Types of Shock

1- Hypovelemic

2- Distributive

3- Cardiogenic

HYPOVOLEMIC SHOCK

- Definition: Loss of body fluids from dehydration, burns, or hemorrhage. The container has retained its normal size but the fluid volume is decreased.
- Hemorrhagic shock is the most common form of hypovolemic shock in a tactical situation.
- On the battlefield, assume all shock, until proven otherwise, is hemorrhagic shock.

HYPOVOLEMIC SHOCK

- Signs and Symptoms
  - Signs and symptoms of hemorrhagic shock are linked to the amount of blood lost and the body's reaction to it.
  - ***DO NOT rely on B/P as the primary indicator***
  - To accurately assess for shock, pay close attention to:
    - Mental status of casualty
    - Quality of distal pulses
    - Heart rate

HYPOVOLEMIC SHOCK

Hemorrhagic shock can be divided into four classes:

Class I Shock

Minimal affects, no significant clinical findings

HYPOVOLEMIC SHOCK

- Class II Shock
  - Casualty getting worse
  - Breathing faster, heart beating faster
  - Compensatory mechanisms are able to maintain B/P and perfusion

HYPOVOLEMIC SHOCK

- Class III Shock
  - Unfavorable signs begin to appear
  - The body can not maintain adequate perfusion
  - Casualty is in significant trouble

HYPOVOLEMIC SHOCK

- Class IV Shock
  - Severe stage of shock
  - Even though blood volume may be restored and vital signs stabilized, death is imminent, if you don't act quickly.
  - Survival depends on immediate hemorrhage control and aggressive resuscitation. May not be able to do in tactical situation.

HYPOVOLEMIC SHOCK

- Treatment
  - STOP THE BLEEDING !!!!
    - LIFE THREATENING extremity hemorrhage, use tourniquet and/or hemostatic agents
    - LIFE THREATENING non-extremity hemorrhage, use direct pressure
  - Consider IV and fluid resuscitation
    - Remember- only ¼-⅓ of an isotonic crystalloid remains in the intravascular space 30-60 minutes after infusion.

DISTRIBUTIVE SHOCK

- Definition: Shock that occurs when blood vessels enlarge without an increase in fluid volume.

- Causes: Spinal cord trauma, fainting, severe infections, and allergic reactions.

DISTRIBUTIVE SHOCK

3 different types:

- Septic
  - Neurogenic
    - Psychogenic

SEPTIC SHOCK

- Cause
  - Severe, life threatening bacterial infection
  - Toxins cause blood vessels to dilate and plasma is lost through vessel walls, causing a loss in volume
  - Usually seen 5 – 7 days after initial trauma, so your focus is on prevention rather than treatment

SEPTIC SHOCK

- Signs and Symptoms
  - Hypotension
  - Fever
  - Cold, clammy skin
  - Pale, mottled skin color
  - Altered LOC
  - Slowed CAP refill

SEPTIC SHOCK

- Treatment
  - Usually performed at higher level of care
  - Priority should be on TACEVAC
  - IV fluid therapy
  - IV antibiotic therapy (directed by MO)

DISTRIBUTIVE SHOCK

3 different types:

- Septic
- Neurogenic
- Psychogenic

NEUROGENIC SHOCK

- Definition: Failure of the nervous system to control blood vessel diameter. Results in significant dilation of peripheral arteries.

NEUROGENIC SHOCK

- Causes
  - Brain or spinal cord injuries

- Signs & Symptoms
  - Slow Heart Rate
  - Dry and warm skin
  - Hypotension
  - Injuries consistent with spinal injury

Bradycardia and hypotension not usually seen together so use this as a red flag!

NEUROGENIC SHOCK

- Treatment
  - Maintain ABC's
  - Spinal Immobilization
  - O2 therapy (if available)
  - Fluid resuscitation
  - Trendelenburg position
  - Keep patient warm
  - TACEVAC

DISTRIBUTIVE SHOCK

3 different types:

- Septic
- Neurogenic
- Psychogenic

PSYCHOGENIC SHOCK

- Stimulation of the 10th Cranial nerve (Vagus Nerve)
- AKA – vasovagal syncope or fainting
- Condition is considered temporary and self-correcting

PSYCHOGENIC SHOCK

- Causes
  - Fear
  - Bad or upsetting news
  - Sight of blood or trauma

PSYCHOGENIC SHOCK

- Signs and Symptoms
  - Fainting
  - Cool, clammy skin
  - Weakness
  - Altered LOC
  - Hypotension (briefly)

PSYCHOGENIC SHOCK

- Treatment
  - Usually self limiting condition
  - Place patient in a horizontal position

CARDIOGENIC SHOCK

- Shock caused by failure of heart to pump blood throughout the body. There is enough fluid (blood) filling the pump but there is something wrong with the pump.

- Causes may be:
  - Intrinsic (internal causes)
  - Extrinsic (external causes)

CARDIOGENIC SHOCK

- Intrinsic Causes
  - Myocardial Infarction
  - Blunt injury to the heart

CARDIOGENIC SHOCK

- Signs and Symptoms
  - Abnormal pulse rate/rhythm
  - Chest pain
  - Shortness of Breath
  - Nausea and Vomiting

CARDIOGENIC SHOCK

- Treatment
  - Maintain ABC's
  - Obtain IV access
  - Oxygen therapy (if available)
  - CASEVAC

CARDIOGENIC SHOCK

- Extrinsic Causes
  - Tension Pneumothorax
  - Cardiac Tamponade

CARDIOGENIC SHOCK

- Tension Pneumothorax signs and symptoms
  - Obvious chest trauma
  - SOB
  - Tachycardia
  - Cyanosis
  - Absent lung sounds on affected side
  - JVD/Tracheal deviation (late sign)

CARDIOGENIC SHOCK

- Cardiac Tamponade signs and symptoms
  - Chest trauma
  - SOB/Dyspnea
  - Tachycardia
  - Cyanosis
  - Distant heart tones
  - Narrowing pulse pressure

CARDIOGENIC SHOCK

- Treatment
  - Maintain ABC's
  - O2, if available
  - CASEVAC
  - Needle Thoracentesis (for tension pneumothorax)

VOLUME RESUSCITATION

Beneficial when three conditions exist:

1. The casualty is bleeding at a rate of 25-100ml/ min.
2. The fluid administration rate is equal to the bleeding rate.
3. The scene time and transport time exceed 30 minutes

– NEVER delay transport to start an IV

VOLUME RESUSCITATION

You will receive training on the type of vascular access to start and the type of fluids to give in the lesson on Tactical Fluid Resuscitation

MANAGE SHOCK CASUALTIES

MANAGE HEMORRHAGE

OVERVIEW

- Types of Hemorrhage
  -Signs and Symptoms of External and Internal Hemorrhage
- Estimating Blood Loss
- Methods of Hemorrhage Control
- Tourniquet Application

LEARNING OBJECTIVES

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And

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BACKGROUND

- Historically, 20% of injured combatants die on the battlefield

- In Vietnam, over 60% died from bleeding out within 3 to 5 minutes.

Notice how strong flow is.
This is a small, surgically induced bleed.
Imagine how fast a big hole would bleed!

BACKGROUND

- Many of these deaths could have been prevented with timely intervention.

- To decrease these statistics, you must be able to rapidly identify and manage hemorrhage.

TYPES OF HEMORRHAGE

- Loss of blood from damaged vessels is a large source of external hemorrhage in combat
  - Arterial - **Bright red blood**, spurting
  - Venous - **Dark red**, steady even flow
  - Capillary - **Brick red**, oozing

EXTERNAL HEMORRHAGE

- Easy to recognize: blood everywhere
- Causes
  - Penetrating wounds
    - Gunshot, stab and shrapnel wounds
  - De-gloving wounds
    - Vehicle accidents
  - Amputating wounds
    - Blasts from artillery, mortars or landmines

EXTERNAL HEMORRHAGE

- You must determine which bleeding is LIFE-THREATENING and which is non-life threatening.
  - This depends on the amount of blood loss and the class of shock of the patient.

SIGNS & SYMPTOMS

- External Hemorrhage
  - Massive blood loss
  - Obvious signs and symptoms of shock

INTERNAL HEMORRHAGE

- Harder to recognize, can't visually see it
- Frequent cause of death
- Indications: bleeding from mouth, rectum, or blood in the urine
- Requires surgical intervention
- Treat and TACEVAC

INTERNAL HEMORRHAGE

- Causes
  - Blunt trauma
  - Concussion injuries from blasts
  - Vehicle accidents
  - Falling from heights
  - Closed fractures

SIGNS & SYMPTOMS

- Internal Hemorrhage
  - Hematemsis
  - Hemoptysis
  - Hematochezia
  - Melena
  - Hematuria
  - Ecchymosis
  - Rigid abdomen
  - Rapidly forming hematoma and edema
  - Signs of shock

ESTIMATING BLOOD LOSS (EBL)

ESTIMATE BLOOD LOSS (EBL)

- Why is determining EBL important?
  - Average adult blood volume = approx. 5 liters
  - Loss of 25% to 40% = Life Threatening Condition
  - Helps to predict who will go into or be in shock
  - Identifies who to treat first

ESTIMATE BLOOD LOSS (EBL)

- How to determine EBL:
  - Look for blood surrounding patient
  - Inspect clothing for blood saturation
  - Inspect bandage saturation
  - Determine level of shock

ESTIMATE BLOOD LOSS (EBL)

	Small Battle Dressing	Medium Battle Dressing	Large Battle Dressing	Abdominal Battle Dressing
Amount of estimated blood	300 ml	750 ml	1000 ml	2500 ml
EBL	About 6%	About 15%	About 20%	About 50%

*Amounts are based on the average adult blood volume of about 5 liters.

Massive hemorrhage may be fatal within 60 -120 seconds.

METHODS OF HEMORRHAGE CONTROL

DIRECT PRESSURE

- Initial control measure (unless in Care Under Fire Phase)
- Will control most types of hemorrhage
- Requires two hands and lots of pressure to be done right
- You can convert it to a pressure dressing

BANDAGES AND DRESSINGS

- Any material applied to hold a dressing in place, wrap or bind a body part
- Provides additional pressure to dressing
- Protects the dressing

BANDAGES AND DRESSINGS

- Ensure dressing is tight enough
- Provide pressure over the entire wound
- Dressing must cover the entire wound, bandage must cover the entire dressing
- Leave fingers and toes exposed
  - Assess circulation using PMS

PRESSURE DRESSING

- If hemorrhage continues
  - DO NOT remove the first dressing
  - Apply a second dressing over the first
- If hemorrhage still cannot be controlled:
  - Use a tourniquet!
- Once hemorrhage is controlled, cover the entire dressing with a bandage

KERLIX

- Advantages
  - Absorbency
  - Stretchable
  - Sterile
  - Packs well
- Disadvantages
  - Loses bulk
  - Catches debris
  - Snags easily

ACE WRAP

- Advantages
  - Quickly applied
  - Pressure to entire area
  - Excellent support
- Disadvantages
  - Decrease peripheral circulation

CRAVATS

- Advantages
  - Versatile
  - Small packaging
  - Can be used as a tourniquet
- Disadvantages
  - Very little absorbency

COMBINATION: DRESSING/BANDAGE

- Cinch Tight
  - Found in the IFAK
  - Medium to large battle dressing combined with a 4 inch ace wrap

“H” BANDAGE

- Found in the IFAK
- It is a medium to large battle dressing combined with a 4 inch wide Ace Wrap.
- Has a distinctive “H” on dressing to help apply pressure

FIELD EXPEDIENT DRESSINGS

- Patient clothing
- Patient equipment
- Anything else available to you
- The only limitation is YOUR imagination!

HEMOSTATIC AGENTS

- A hemostatic agent causes the wound to develop a clot that stops the flow of blood and will remain within the wound until removed by medical personnel.
- The only hemostatic agent approved by the CoTCCC is QuikClot Combat Gauze.
- QuikClot Combat Gauze is the first-line treatment of life threatening hemorrhage in a tactical setting that is not amenable to tourniquet placement.

HEMOSTATIC AGENTS

COMBAT GAUZE

- Combines surgical gauze with an inorganic material that stops arterial and venous bleeding in seconds.
- Does not create heat
- Is non-allergenic
- Fits any size or shape wound
- Rolls are 4 yards long by 3” wide

COMBAT GAUZE

- Application Procedures
  - Expose injury
  - Remove excess blood; preserve any clots
  - Locate source of most active bleeding
  - Remove Combat Gauze from package
  - Pack tightly into wound
  - May be re-packed or adjusted to ensure proper placement

COMBAT GAUZE

- Application Procedures (cont.)
  - Apply enough direct pressure to stop bleeding
  - Hold pressure for a minimum of 3 minutes
  - Once applied Combat Gauze will be removed by authorized medical personnel only
  - Can be reinforced with an additional roll if bleeding continues
  - Leave in place and secure with pressure dressing
  - Document, place empty package near wound, and transport the patient

TOURNIQUETS

TOURNIQUET APPLICATION

- In Care Under Fire, ***A TOURNIQUET IS THE FIRST OPTION*** for controlling life-threatening extremity hemorrhage. Place the tourniquet tightly over the uniform, proximal to the wound.
  - It can be properly placed during Tactical Field Care.

CAT TOURNIQUET

- Tourniquet of choice is the Combat Application Tourniquet (CAT)
- Issued upon deployment
- Lightweight and easy to use, even on yourself
- Beware of counterfeit!

SOF-T TOURNIQUET

- 1-1/2 inch constriction band
- Aluminum windlass rod
- Applied the same way, regardless of location

FIELD EXPENDIENT TOURNIQUET

TOURNIQUET POINTERS

- Do NOT place over a joint
- Do NOT place over two bones (tib/fib, radius/ulna)
- Do NOT cover with dressing, blanket, clothing, etc., leave exposed

APPLICATION TIGHTNESS

- The bigger the extremity, the tighter it needs to be.
- May need multiple tourniquets
- Don’t stop tightening when the casualty complains it hurts but when hemorrhage is controlled.
- Consider use of pain medications
- Mark the casualty
- Do NOT cover the tourniquet after application. Leave it exposed to ease monitoring.

TOURNIQUET TO A DRESSING

Tourniquet use is the first line of hemorrhage control while in the Care Under Fire Phase.

Only when in the Tactical Field Care Phase should you even consider converting a tourniquet to a pressure dressing.

TOURNIQUET TO A DRESSING

Do **NOT** convert a tourniquet to a pressure dressing under the following conditions:

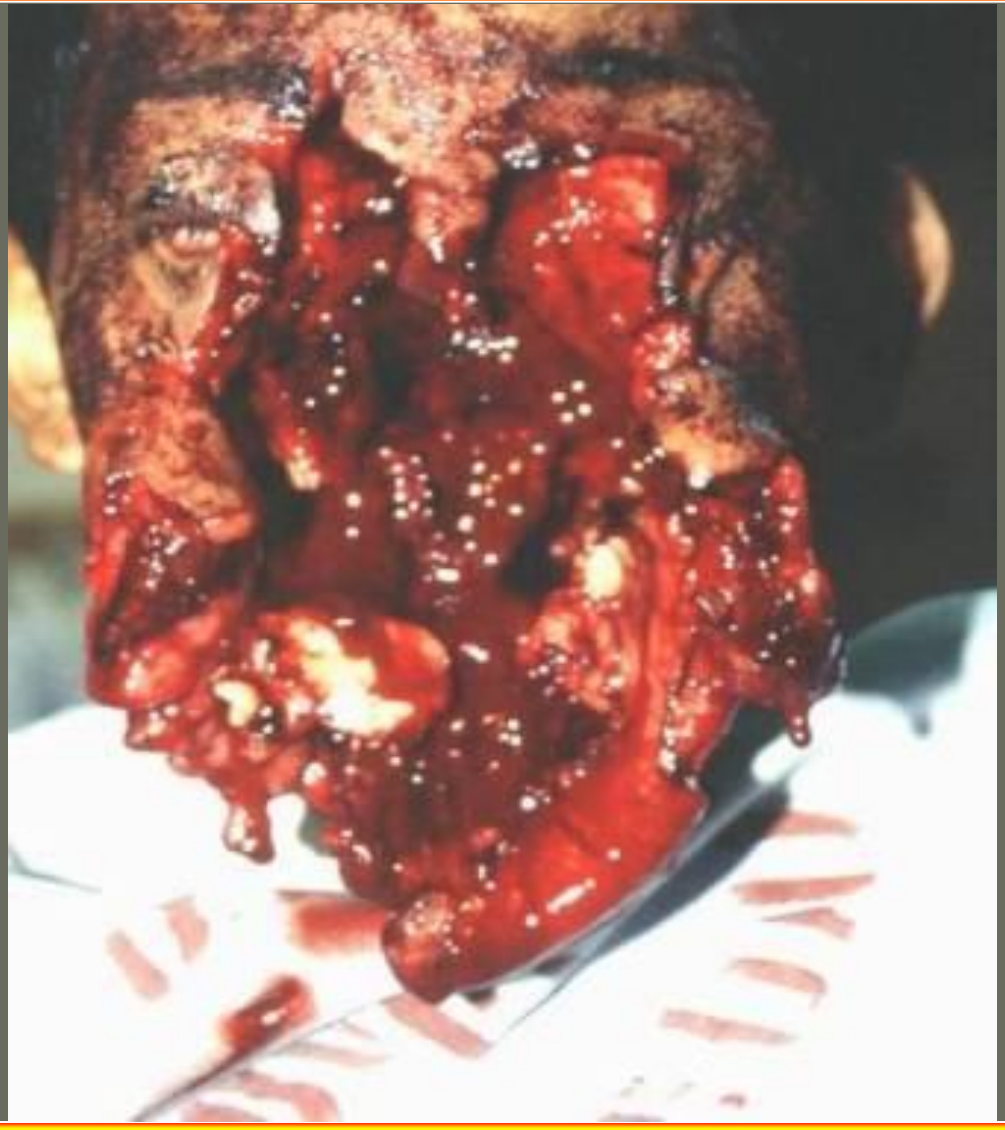
- The casualty is in Class III or IV shock
- There has been a complete amputation below the tourniquet.
- There is no one to monitor the casualty for re-bleeding.
- Tourniquet has been in place for more than 6 hours.
- Short transport time to surgical intervention.

DEMONSTRATION

PRACTICAL APPLICATION

CTPS LAB

MAINTAIN AIRWAY



OVERVIEW

- Terminology
- Anatomy
- Signs & Symptoms
- Treatments

LEARNING OBJECTIVES

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TERMINOLOGY

TERMINOLOGY

- PHARYNX – Muscle lined with mucous running from the back of the soft palate to the upper end of the esophagus; Divided into three sections:
  - Nasopharynx
  - Oropharynx
  - Hypopharynx

- NASAL SEPTUM – Separates left and right airways of nose

- NARES – External openings of nasal cavity

TERMINOLOGY

- LARYNX (voicebox) – Cartilaginous box located above the trachea, containing vocal cords and muscles that make them work

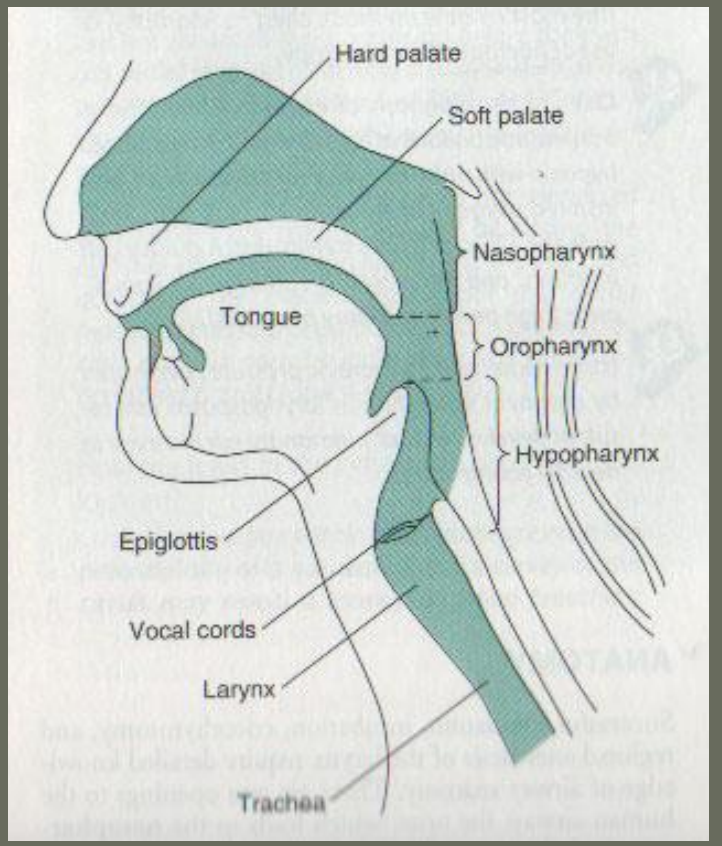
- EPIGLOTTIS – Leaf-shaped structure that acts like a gate, directing air into the trachea and solids/liquids into the esophagus.

- TRACHEA (windpipe) – Main trunk of the system of tubes air passes to and from the lungs.

ANATOMY

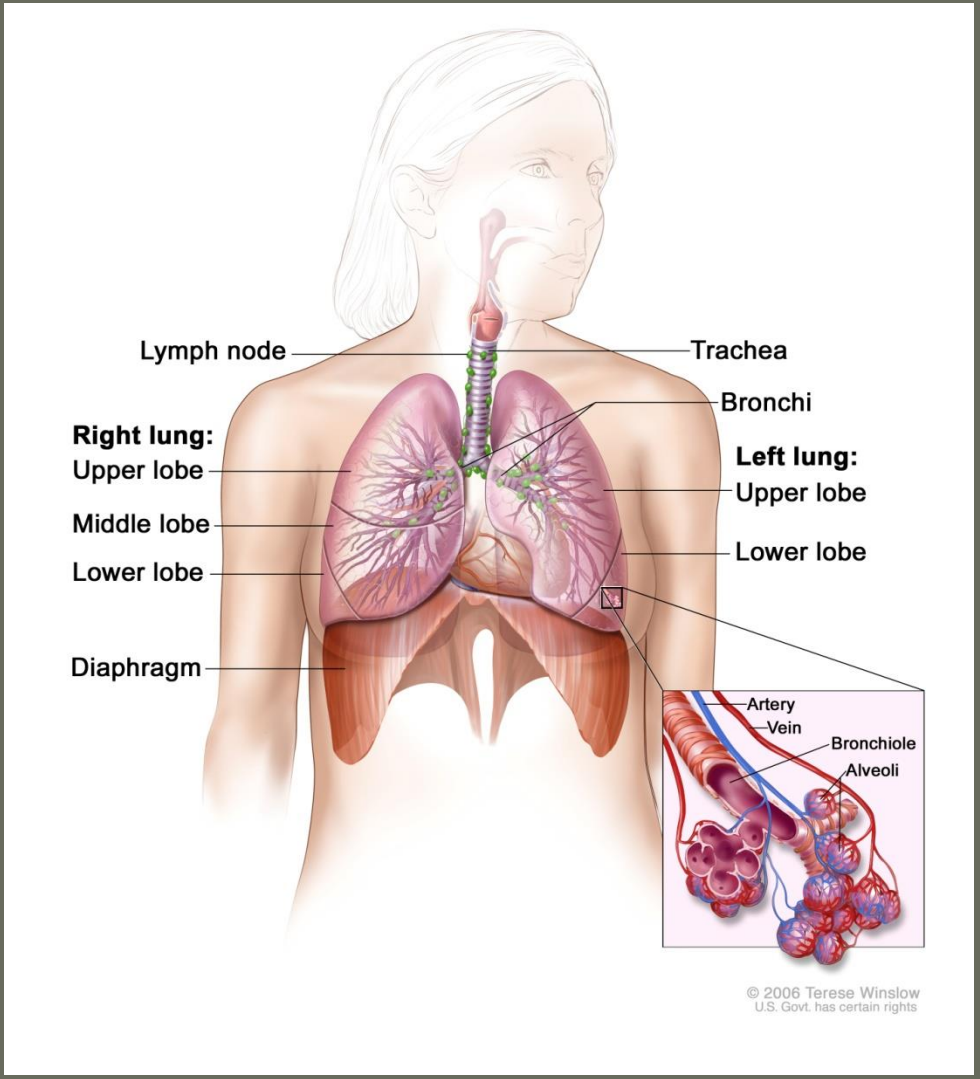
ANATOMY

- Upper Airway
  - Consists of nasal cavity and oral cavity



ANATOMY

- Lower Airway
  - Trachea
  - Branches
  - Lungs

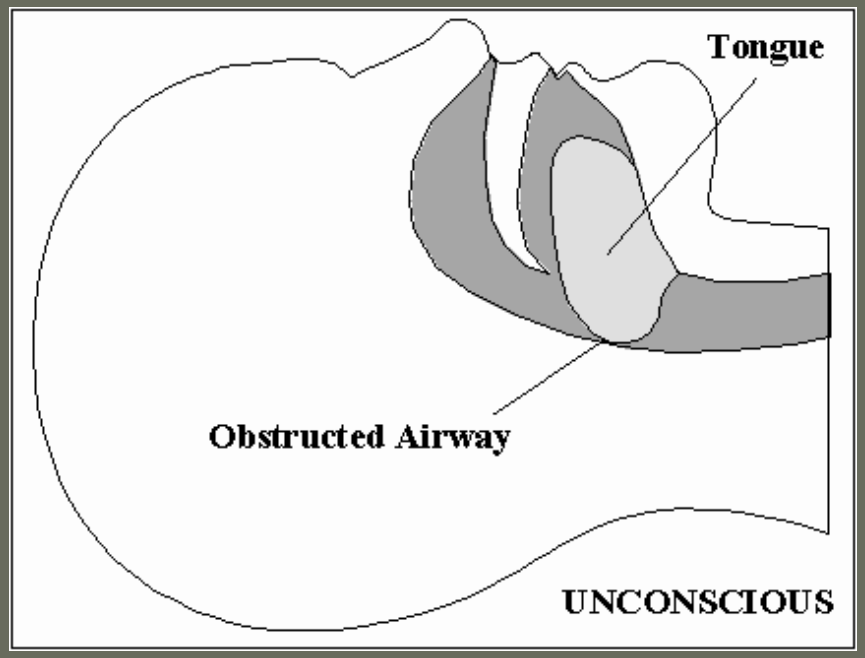


SIGNS & SYMPTOMS

SIGNS & SYMPTOMS

- Decreased Neurological Function
- Mechanical Obstruction

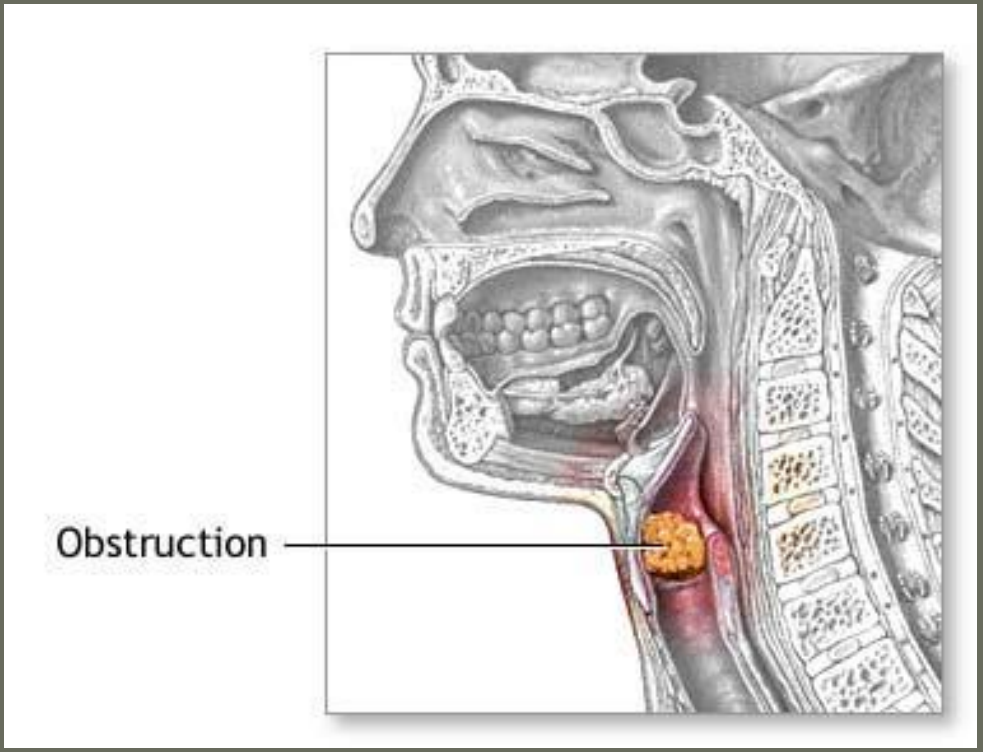
SIGNS & SYMPTOMS



- Decreased LOC
  - Affects ventilatory drive
- Flaccidity of the tongue
  - Occludes hypopharynx
  - Most common obstruction

SIGNS & SYMPTOMS

- Mechanical obstructions
  - Foreign bodies
    - Teeth
    - Gum
    - Chewing tobacco
    - Blood
    - Vomit
  - Outside materials



SIGNS & SYMPTOMS

SIGNS & SYMPTOMS

SIGNS & SYMPTOMS

- Assessment of the Airway
  - Look for obvious injuries; talk to casualty
    - Talking suggests open airway
  - Be aware of LOC when PT is in supine
  - PT may need to remain in position found to avoid aspiration

SIGNS & SYMPTOMS

Conduct a physical examination:

- Look
- Listen
- Feel, Feel

Look:

- Look at the face, lips, nose and neck of the casualty
  - Cyanosis/edema
  - Obvious injuries
  - Blood/debris
- Open and look into the mouth for foreign objects or deformities
  - Teeth
  - Tobacco/food
  - Debris
- Look for bilateral, normal chest rise and fall
  - Unilateral chest rise/fall
  - Paradoxical movement
- Look for use of accessory muscles and increased work of breathing

Listen:

- Listen for presence/absence of breath sounds
  - Basic quality
  - Tachypnea/bradypnea
  - Rhythm/depth

- Listen for any sounds signaling upper airway compromise
  - Tongue
  - Blood/vomit
  - Foreign bodies

Feel, Feel:

- Place hand on casualty's chest and lower ear to mouth
- Feel for warm breath against your face/ear
- Feel for chest rise and fall with hand

SIGNS & SYMPTOMS

TREATMENTS

TREATMENTS

Manual Clearing of Airway

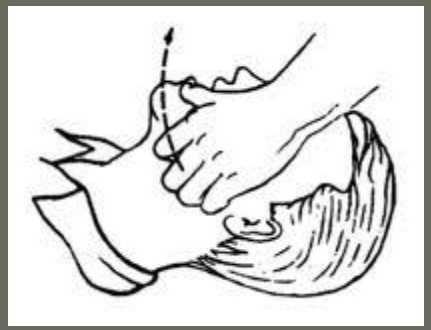
- Visual inspection
- Finger sweep (if visible)
- Position patient on side to allow gravity assisted clearing of airway

TREATMENTS

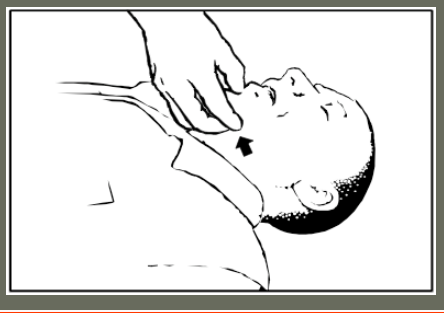
Manual Maneuvers

- The tongue is connected to the mandible moves forward with it

- 2 Methods:
  - Trauma Jaw Thrust



  - Trauma Chin Lift



TREATMENTS

Nasopharyngeal Airway (NPA)

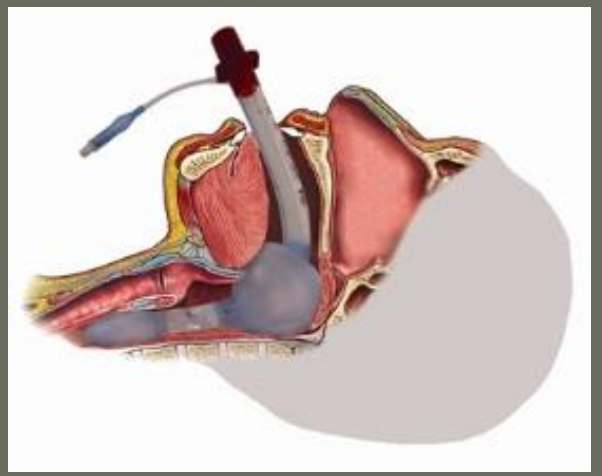
- Soft, rubberlike device inserted through one of the nares
- Used on conscious/unconscious casualties unable to maintain their own airway
- Must be long enough to bypass tongue in order to be effective

TREATMENTS

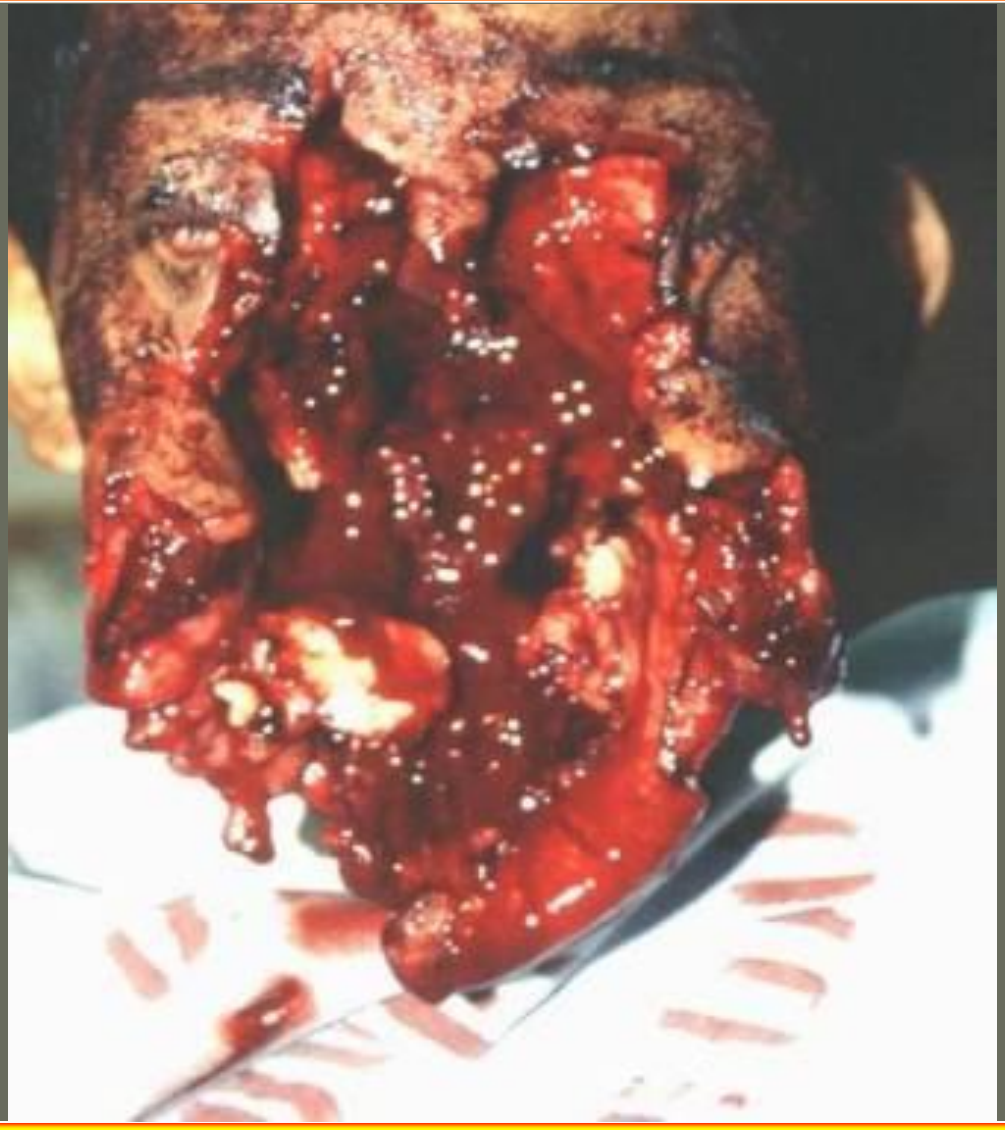
King Laryngeal Tracheal Tube (King LT)

- Single lumen, blindly inserted airway created as an alternate to tracheal intubation or mask ventilation, resulting in minimal airway trauma

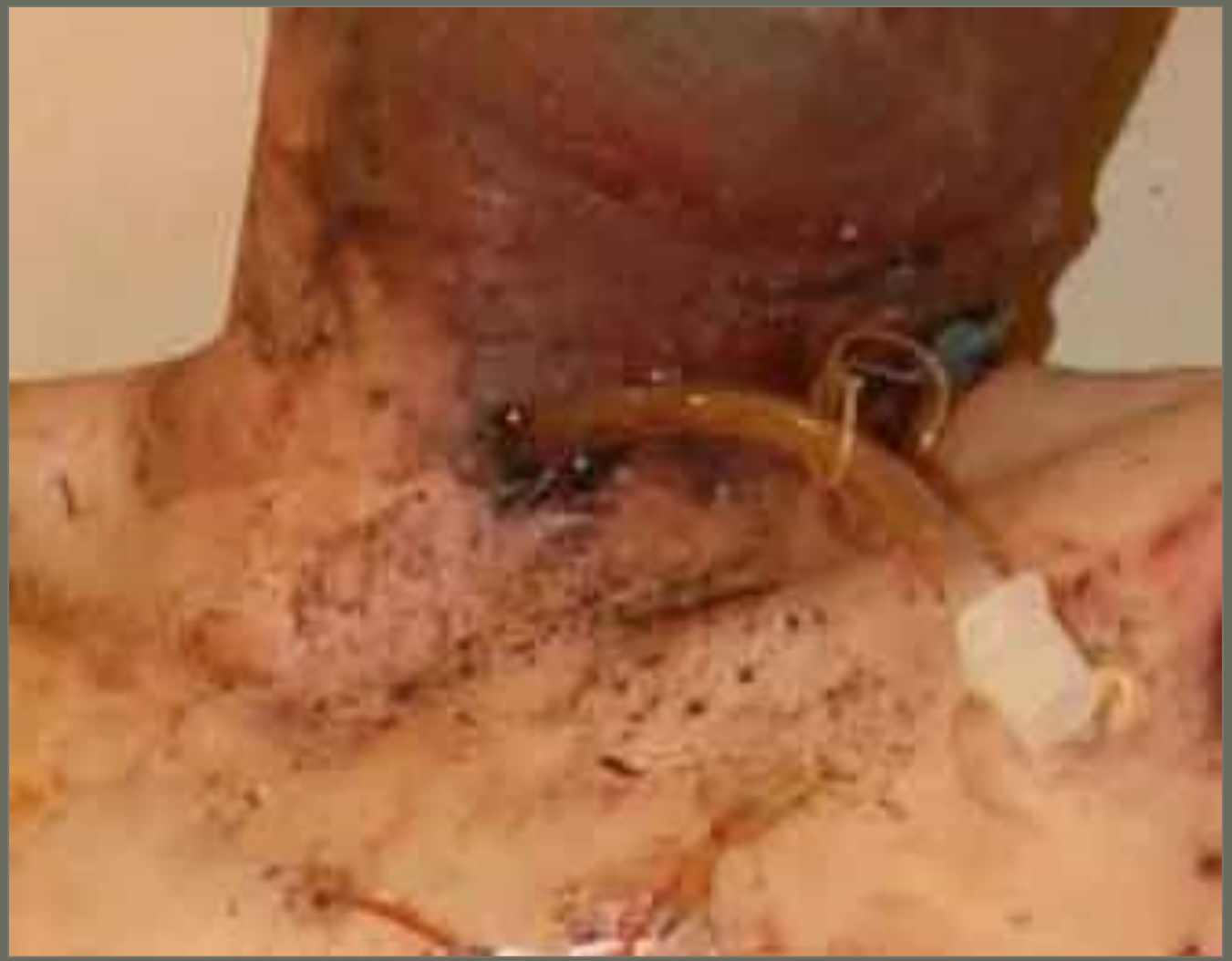
- Used only on unconscious patients, as the gag reflex may cause vomiting



MAINTAIN AIRWAY



EMERGENCY CRICOTHYROIDOTOMY



OVERVIEW

- Anatomical Landmarks
- Indications
- Proper Equipment
- Procedural Steps
- Complications

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

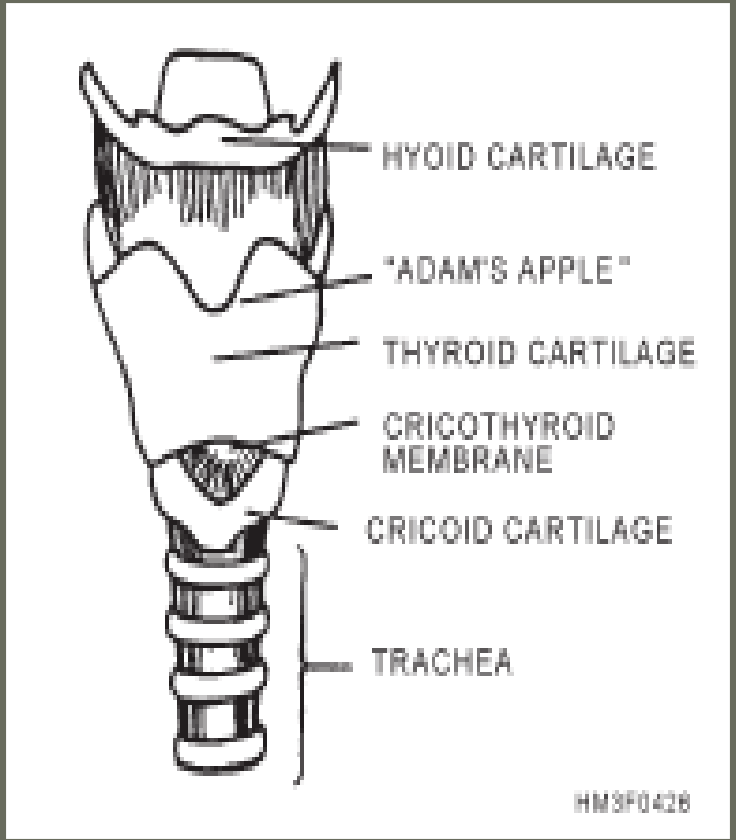
And

Enabling Learning Objectives

ANATOMICAL LANDMARKS

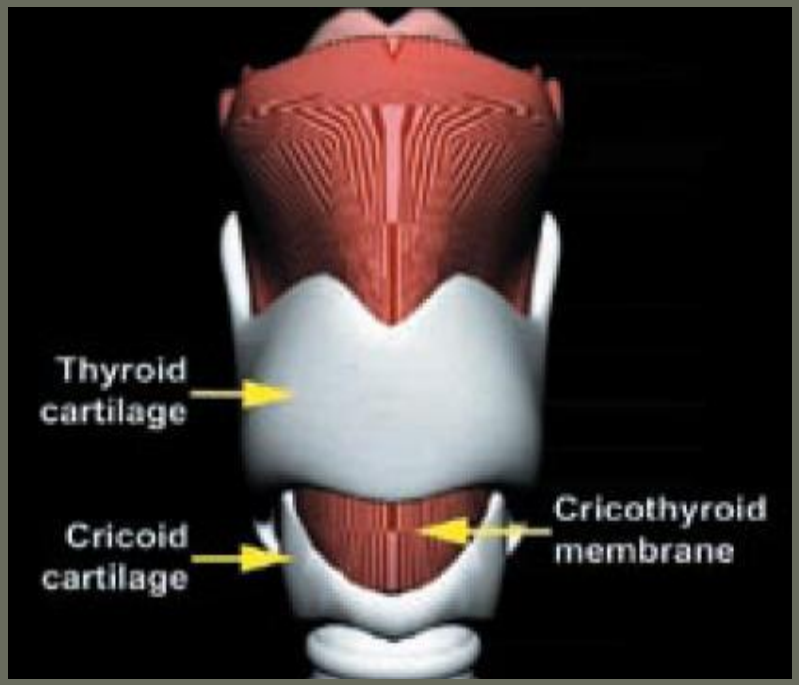
ANATOMICAL LANDMARKS

- TRACHEA
  - Windpipe
- THYROID CARTILAGE
  - Adam's Apple
  - Located in upper part of throat
  - More prominent in men



ANATOMICAL LANDMARKS

- CRICOID CARTILAGE
  - ¾ inch inferior to thyroid cartilage
  - Framework of the larynx
- CRICOTHYROID MEMBRANE
  - Soft tissue between thyroid cartilage and cricoid cartilage
  - Only covered by skin

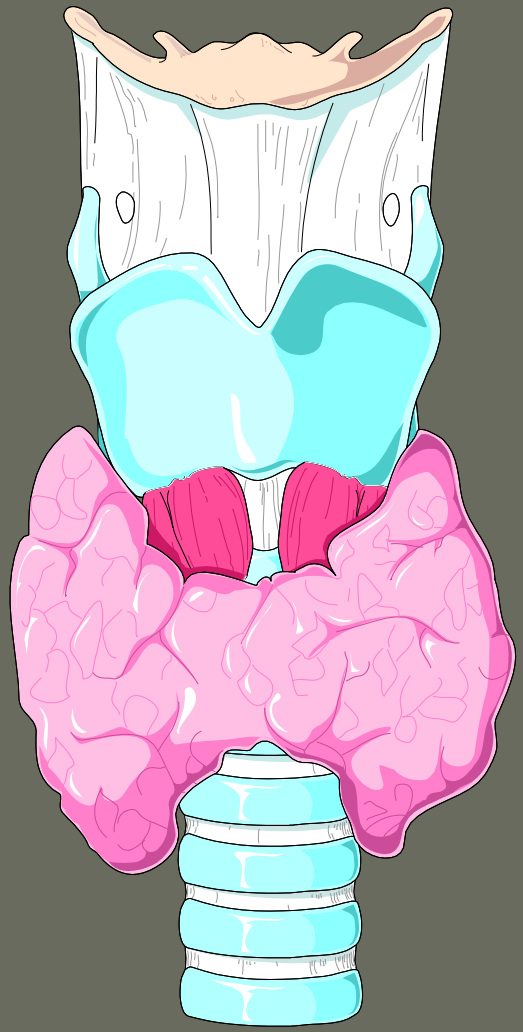


ANATOMICAL LANDMARKS

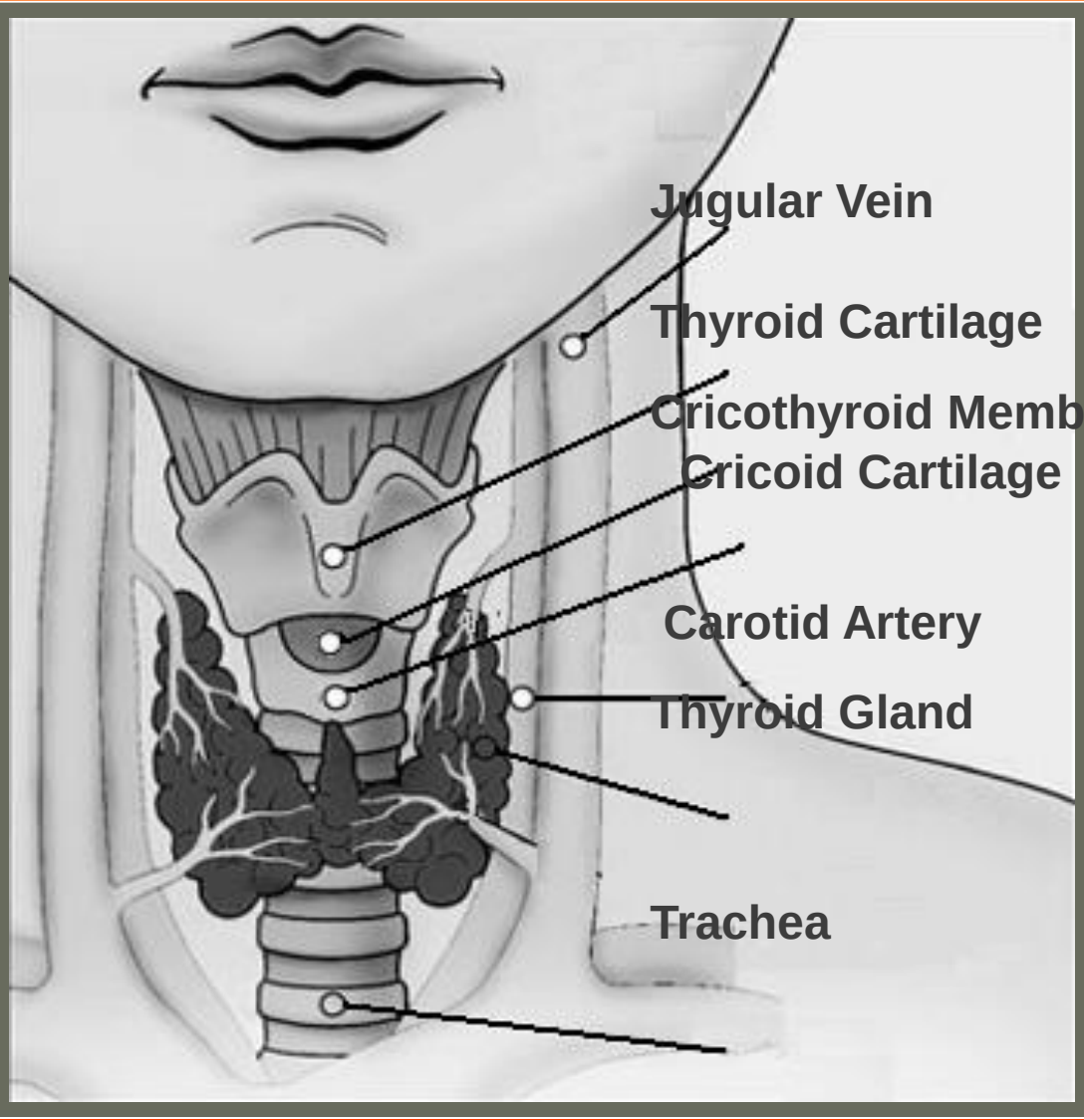
- CAROTID ARTERIES
  - Two principal arteries of the neck
- JUGULAR VEINS
  - Two principal veins of the neck

ANATOMICAL LANDMARKS

- ESOPHAGUS
  - Tube extending downward from pharynx to stomach
  - Lies posterior to the trachea
- THYROID GLAND
  - Located in front of the lower part of the neck on each side of the trachea



ANATOMICAL LANDMARKS



INDICATIONS

INDICATIONS

- Definition of Emergency Cricothyroidotomy
  - An emergency surgical procedure where an incision is made through the skin and cricothyroid membrane.
  - Allows for the placement of an airway into the trachea when other methods of airway management are not possible

INDICATIONS

- Obstructed airway:
  - Facial and oropharyngeal edema from severe trauma
  - Foreign objects
- Congenital deformities that inhibit intubation

INDICATIONS

- HEAD AND NECK TRAUMA
  - Facial and oropharyngeal edema
  - Facial fractures
  - Nasal fractures
  - Cribriform fractures
- C-SPINE FX
- LAST RESORT
- CONTRAINDICATIONS
  - Massive trauma to larynx

PROPER EQUIPMENT

PROPER EQUIPMENT

- Scalpel with no. 10 blade
- Antiseptic (alcohol or Providone Iodine)
- 6-7 mm endotracheal tube /10cc syringe
- Tape
- Instrument to expose/define opening
- Gauze (petroleum and sterile)
- BVM and oxygen source

* Most items are contained in the Cric Kit in the Corpsman Assault Pack*

PROPER EQUIPMENT

PROCEDURAL STEPS FOR EMERGENCY CRICOTHYROIDOTOMY

PROCEDURAL STEPS

(1) Assess the patient

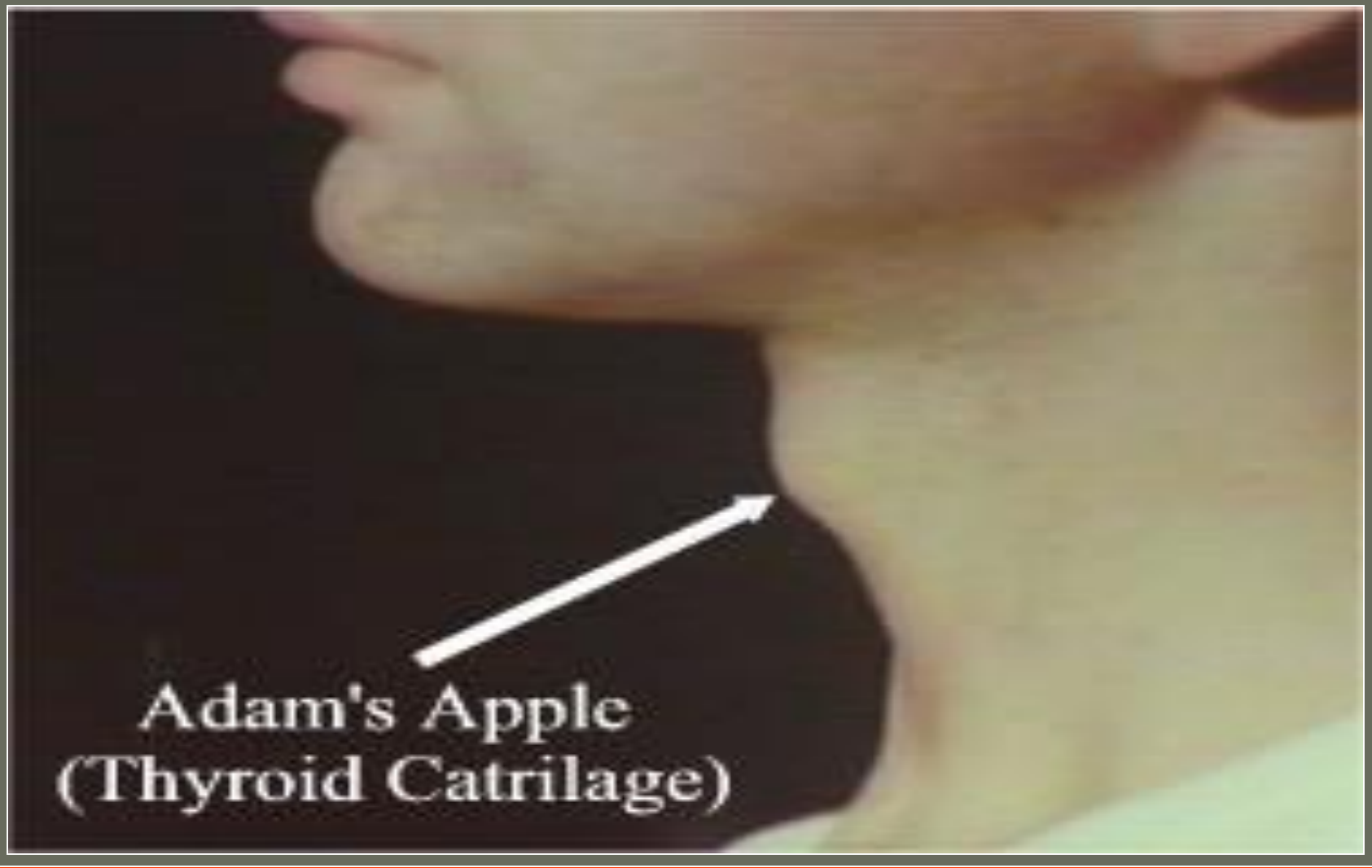
(2) Gather equipment

(3) Prepare and Position Patient

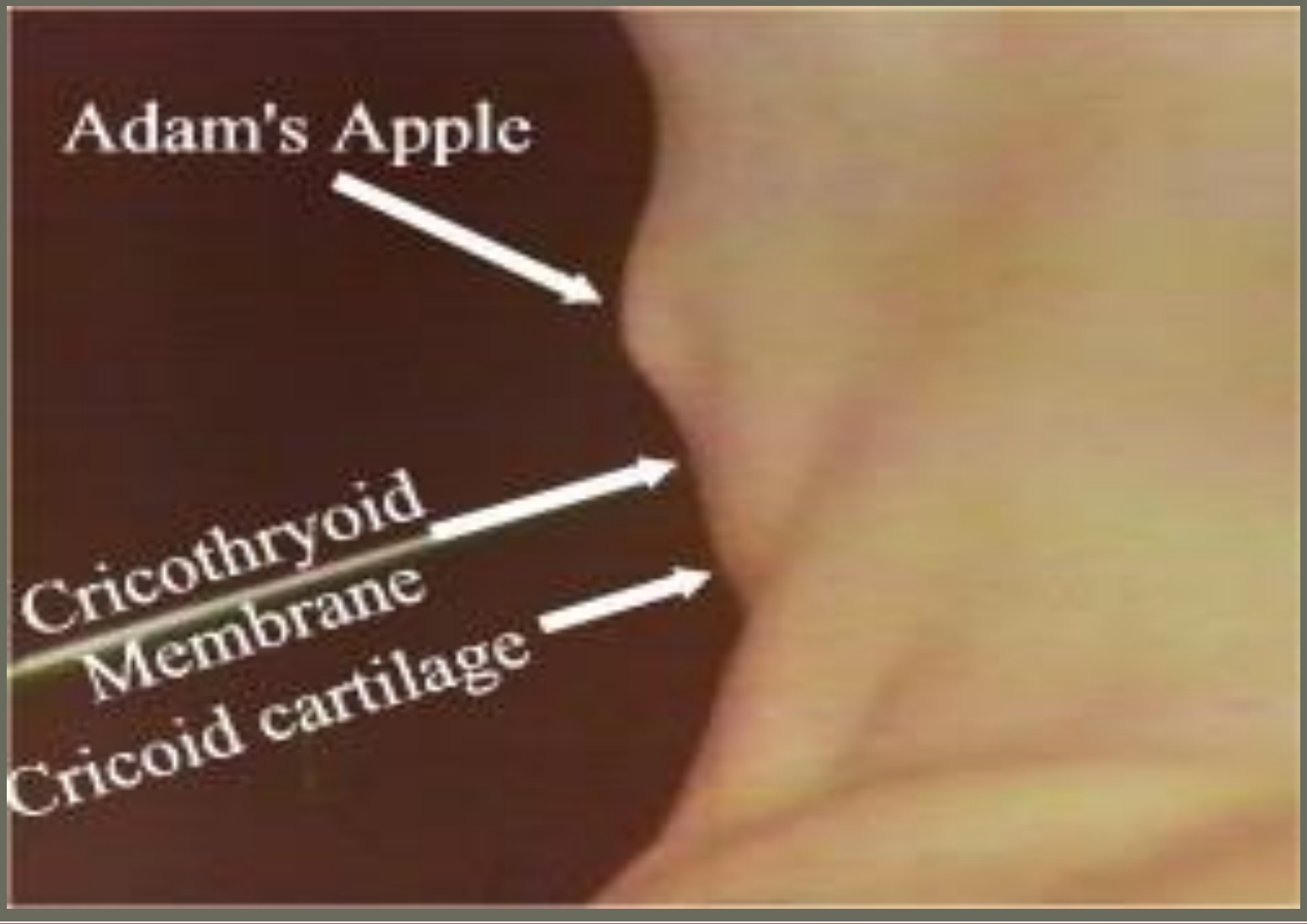
- Supine position
- Cleanse site with alcohol or betadine swabs
- Stand to one side of the patient

(4) Locate cricothyroid membrane

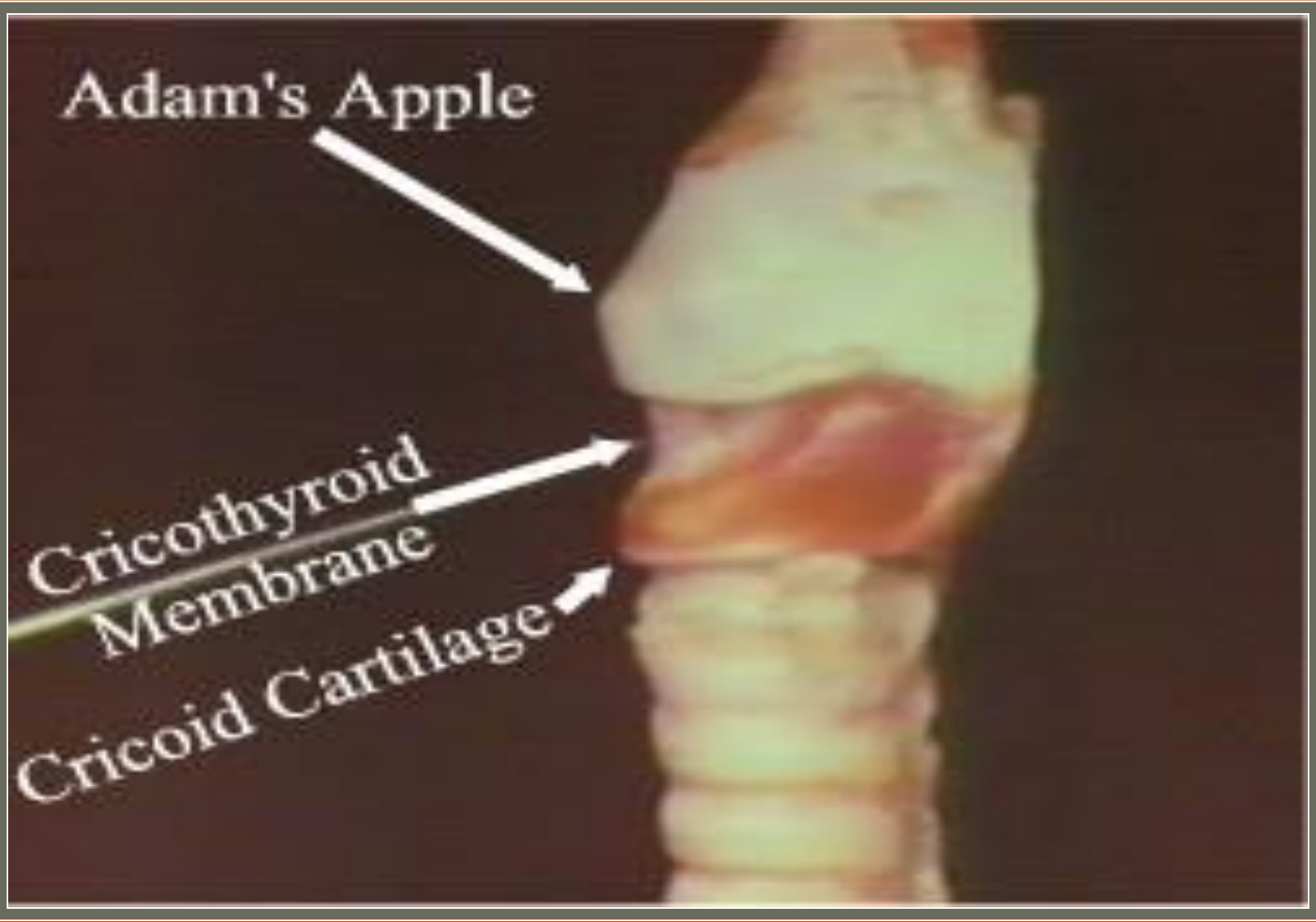
PROCEDURAL STEPS



PROCEDURAL STEPS



PROCEDURAL STEPS



(5) Make Incision

- Vertical incision through the skin about 1 inch long over the cricothyroid membrane
- Visualize the cricothyroid membrane
- Horizontal incision through the membrane
  - **DO NOT** make incision more than 1/2 inch deep or you may perforate the esophagus.

PROCEDURAL STEPS

(6) Open the Incision

- Use tracheal hook or hemostats

(7) Insert Tube

- Lubricate and insert tube
- No more than 3-4 inches
- Inflate balloon with 10cc of air

PROCEDURAL STEPS

(8) Check for proper placement

- Connect to Oxygen Supply (if available)
- Connect BVM
- Check for breath sounds
- Constantly recheck for breath sounds
  - If breath sounds are absent on the LEFT side only, tube should be pulled back

(9) Secure Dressing

- Secure with ribbon and/or tape
- Apply petroleum gauze followed by sterile gauze

PROCEDURAL STEPS

(10) Monitor patient

- Continuously reassess
- 1 breath every 5 seconds

ASSOCIATED COMPLICATIONS

COMPLICATIONS

- Hemorrhage (MOST COMMON)
  - Causes
    - Minor lacerations of superficial capillaries
    - Major lacerations of major vessels
  - Treatment
    - Minor Bleeding – direct pressure and dressing
    - Major Bleeding – same as minor, if unable to control bleeding the vessel may need to be tied off.

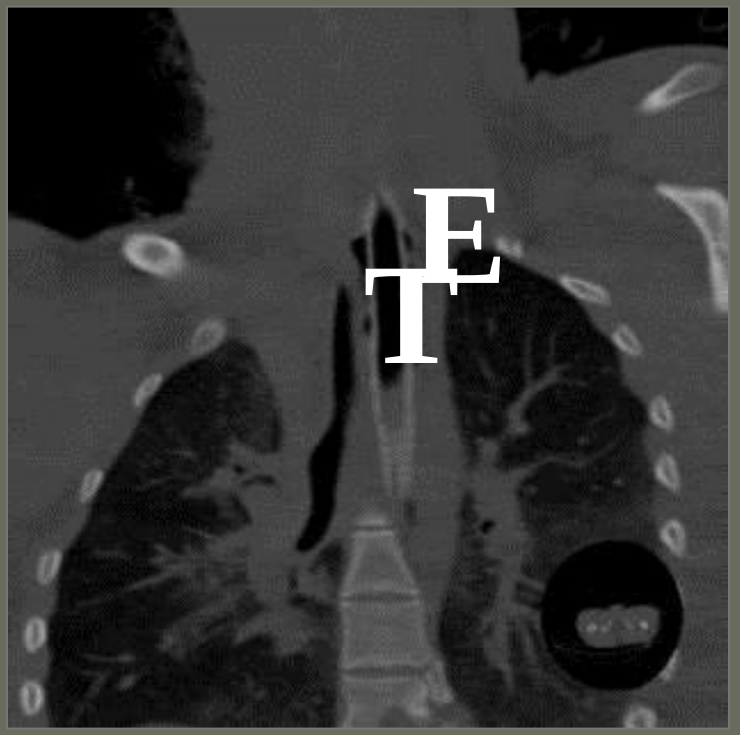
COMPLICATIONS

- ESOPHAGEAL PERFORATION – creating a hole between esophagus and trachea
  - Causes
    - Incision too deep
    - Forcing tube through trachea
  - Treatment
    - Requires surgical intervention
    - TACEVAC to higher level of care

COMPLICATIONS

ESOPHAGEAL PERFORATION

Tube entered through wound into esophagus



- "T" indicates trachea
- "E" indicates esophagus

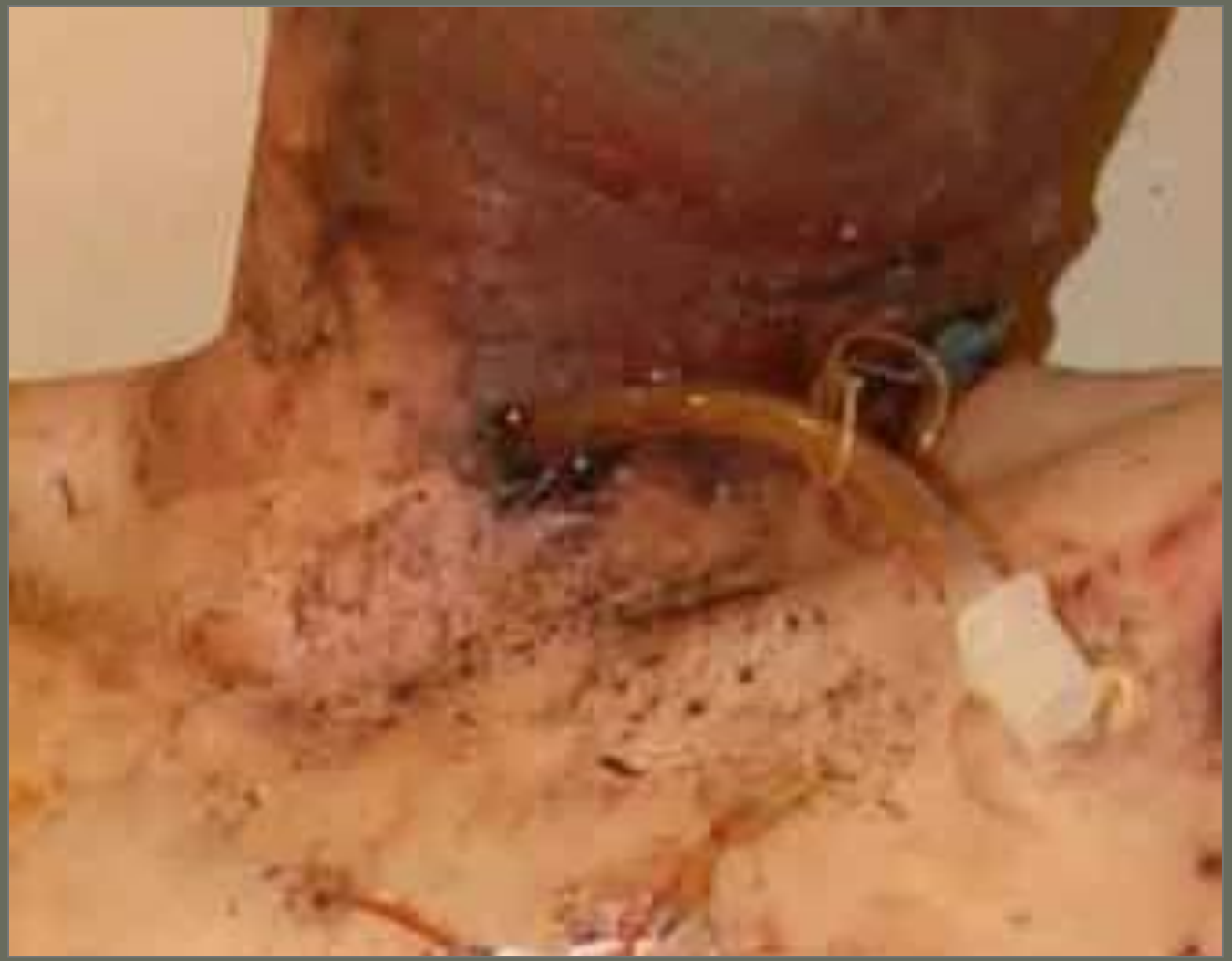
COMPLICATIONS

- SUBCUTANEOUS EMPHYSEMA – presence of free air or gas in the subcutaneous tissue, crackling sensation when palpated
  - Causes
    - Incision too wide
    - Air leaking out of insertion site
  - Treatment
    - None necessary
    - Resolves spontaneously
    - Use petroleum gauze to help reduce incidence

DEMONSTRATION

PRACTICAL APPLICATION

EMERGENCY CRICOTHYROIDOTOMY



MANAGE RESPIRATORY TRAUMA

OVERVIEW

- Terminology
- Anatomy
- Respiratory Trauma
- Needle Thoracentesis

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives

TERMINOLOGY

TERMINOLOGY

- DYSPNEA - Difficult or labored breathing
- WHEEZE - High pitched whistling sound that is caused by movement of air through a narrowed airway
- STRIDOR - A harsh shrill respiratory sound produced from the obstruction of the laryngeal area
- HYPERVENTILATION - Increase in the rate and depth of respiration causing a increase in O2 and a decrease in CO2
- HYPOVENTILATION - Loss of ventilation drive (TBI). Upper or lower airway obstruction, and decreased expansion of the lungs.

TERMINOLOGY

- TACHYPNEA - Abnormally excessive, rapid rate of respirations (>20 BPM)
- BRADYPNEA – Abnormally slow rate of respiration (<8 BPM)
- HYPOXIA - Insufficient concentration of O2 in the tissue in spite of an adequate blood supply
- HYPOXEMIA – Decreased level of O2 in the bloodstream
- APNEA - Total cessation of breathing, also known as a respiratory arrest

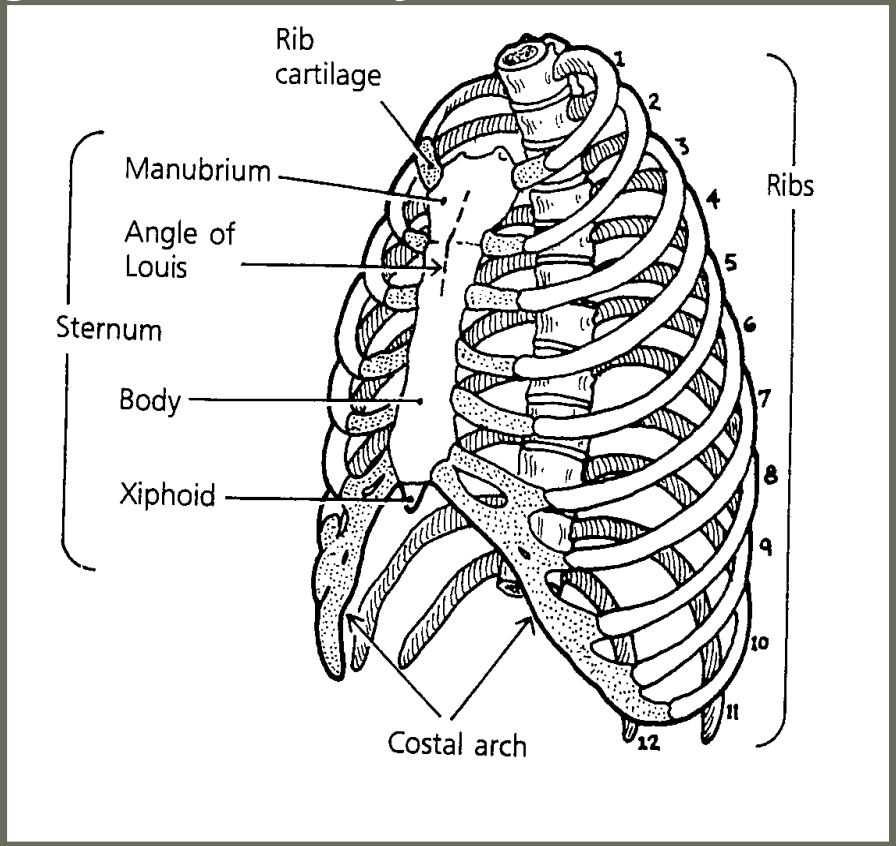
TERMINOLOGY

- SUBCUTANEOUS EMPHYSEMA - Presence of air or a gas in the subcutaneous tissues around the face, neck, and/or the chest
  - Skin may appear swollen and makes a CRACKLING sound when palpated
  - Sounds and feels like RICE CRISPIES

ANATOMY

ANATOMY

- Thorax (Chest Cavity)
  - Protected by a bony cage formed by the:
    - Sternum
    - Costal cartilages
    - Ribs
    - Vertebrae



ANATOMY

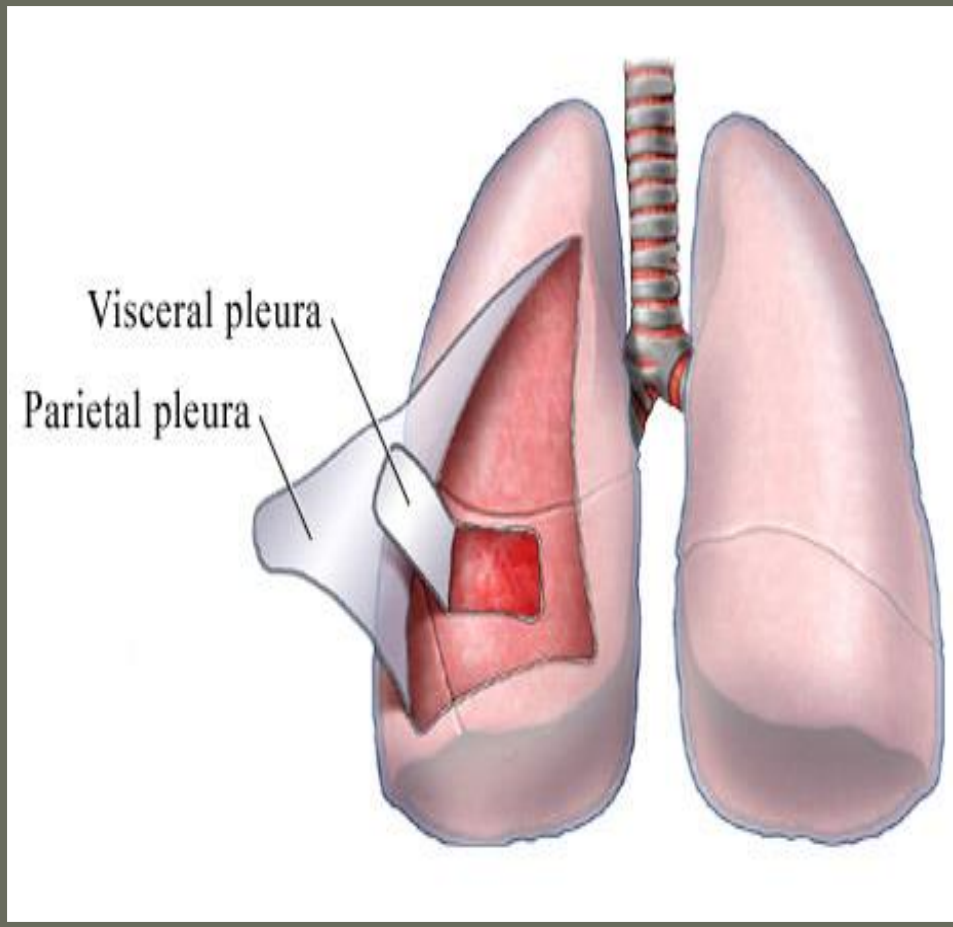
- THORAX (Chest Cavity)
  - Diaphragm
    - Primary muscle of respiration
    - Inferior border of the chest cavity

ANATOMY

- PLEURA
  - Thin membranes separated by a small amount of fluid
    - Fluid between the two pleural membranes create surface tension and causes the two pleura to stick together
    - Prevents lungs from collapsing

ANATOMY

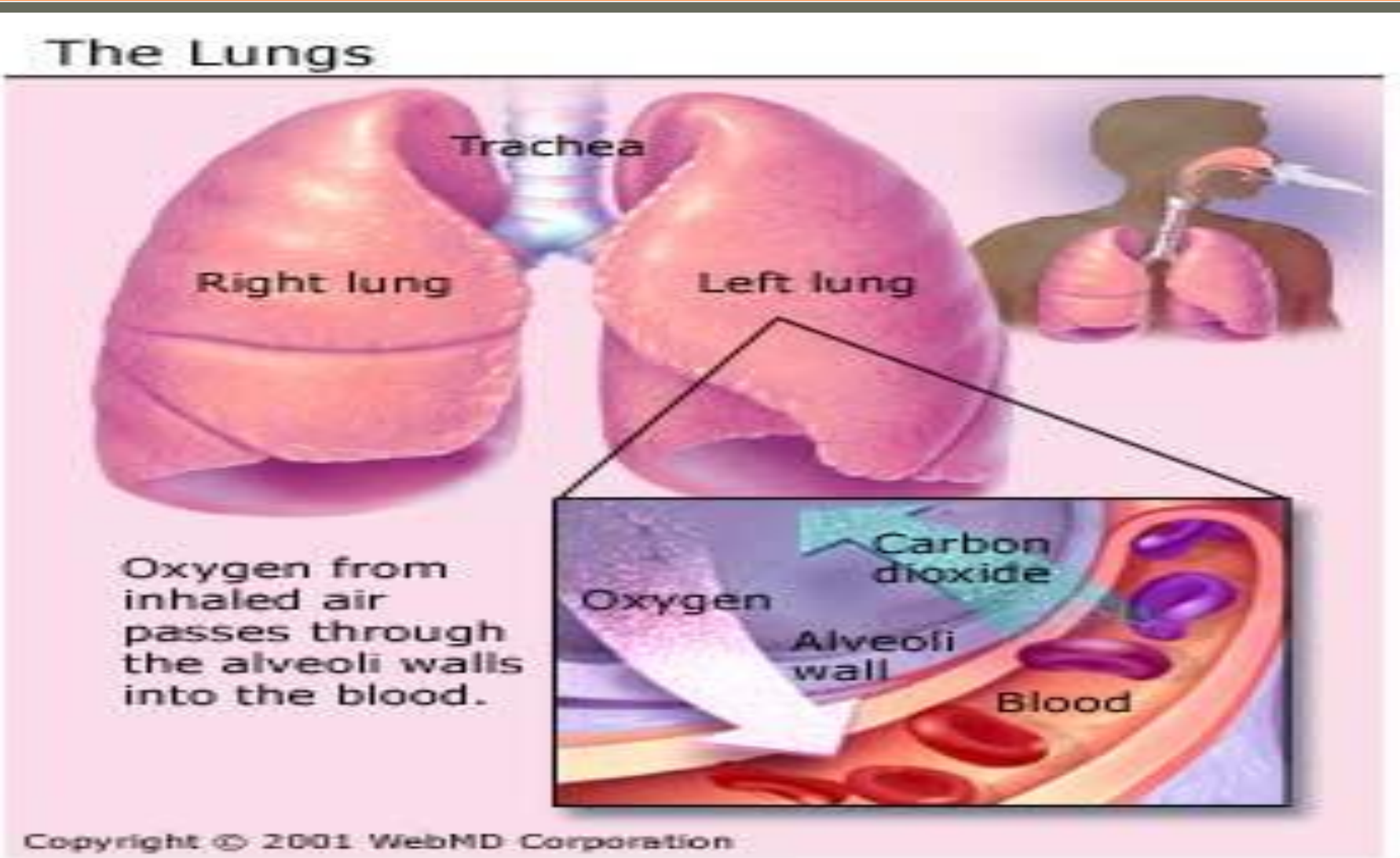
- PLEURA
  - **PARIETAL PLEURA** – Lines inner portion of the thoracic cavity
  - **VISCERAL PLEURA** – Lines the outer surface of the lung



ANATOMY

- LUNGS – occupy the left and right halves of the thoracic cavity
  - Left lung: 2 lobes
  - Right lung: 3 lobes, larger than the left
  - ALVEOLI: Smallest component of the lungs, saclike structures where CO_2 and O_2 exchange takes place

ANATOMY


The Lungs
Trachea
Right lung
Left lung
Oxygen from inhaled air passes through the alveoli walls into the blood.
Carbon dioxide
Oxygen
Alveoli wall
Blood
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ANATOMY

- MEDIASTINUM
  - Area in the middle of the thoracic cavity that encases:
    - Heart
    - Great vessels (aorta, superior / inferior vena cava)
    - Trachea (windpipe)
    - Bronchi
    - Esophagus

RESPIRATORY TRAUMA

RESPIRATORY TRAUMA

- Causes
- Signs & Symptoms
- Treatment

RESPIRATORY TRAUMA

- Chest injuries are the second leading cause of trauma deaths each year
- Many of these injuries can be managed without surgery
- Usually classified into 2 categories
  - Blunt and Penetrating

RESPIRATORY TRAUMA

- Penetrating Injuries
  - -Gun shot and stab wounds
  - -Organs in path of object are injured

RESPIRATORY TRAUMA

RESPIRATORY TRAUMA

- Blunt Injuries
  - -Caused by severe burst, shearing, or rapid deceleration
  - -May result in:
    - –Pulmonary contusion
    - –Pneumothorax
    - –Flail chest
    - –Pericardial tamponade
    - –Aortic Rupture

RESPIRATORY TRAUMA

Assessment of Respiratory Trauma

- Look for the obvious, but also communicate with the casualty if possible.
- Likely to be experiencing chest pain, frequently the pain is worse with respiratory efforts or movement.
- Shortness of breath.
- Apprehensive or lightheaded if shock is developing.

RESPIRATORY TRAUMA

Conduct a physical examination:

- Observation
- Auscultation
- Palpation

RESPIRATORY TRAUMA

Observation:

- Casualty is observed for pallor of the skin and sweating
- The presence of cyanosis
- Observe frequency of respirations (rate, rhythm, and depth)
- Look for gasping, contractions of the accessory muscles of respiration in the neck, or nasal flaring
- Look for signs of trachea deviation and distended jugular veins

Observation Cont.

- Chest is examined for contusions, abrasions, and lacerations

- Identify whether chest wall expands symmetrically with breathing.

- Identify whether any portion of the chest wall moves paradoxically with respiration

Auscultation:

- The entire chest is evaluated to identify decreased breath sounds on one side compared to the other which may indicate pneumothorax or hemothorax on the examined side.

- Pulmonary contusions may result in abnormal breath sounds (crackles).

Palpation:

By gently pressing the chest wall with hands and fingers to assess for the presence of tenderness, crepitus (either bony or subcutaneous emphysems), and bony instability of the chest wall is performed.

MANAGEMENT OF SPECIFIC INJURIES

-Rib Fracture

-Flail Chest

RIB FRACTURE

- Occurs when force applied is greater than the strength of the rib

REMEMBER!!

ANY rib fx can cause injuries to nearby structures

RIB FRACTURES

- SIGNS AND SYMPTOMS
  - Pain at the site with inhalation/exhalation
  - Shortness of breath (SOB)
  - Deformity
  - Crepitus
  - Bruising

RIB FRACTURES

- TREATMENT
  - Anticipate potential complications
    - Tension Pneumothorax
  - Simple Rib FX's
    - Usually require no tx other then analgesics
  - Multiple FX's
    - Can be immobilized to the affected side using patient's arm and a sling

RIB FRACTURES

- TREATMENT
  - Encourage coughing and deep breathing
  - Avoid bandaging or taping that encircles the chest
  - Monitor and TACEVAC as necessary

FLAIL CHEST

- A segment of 2 or more adjacent ribs fractured in at least 2 places
- The segment moves *IN* with inhalation and *OUT* with exhalation, called *Paradoxical Movement*
- Caused by blunt trauma to the chest wall

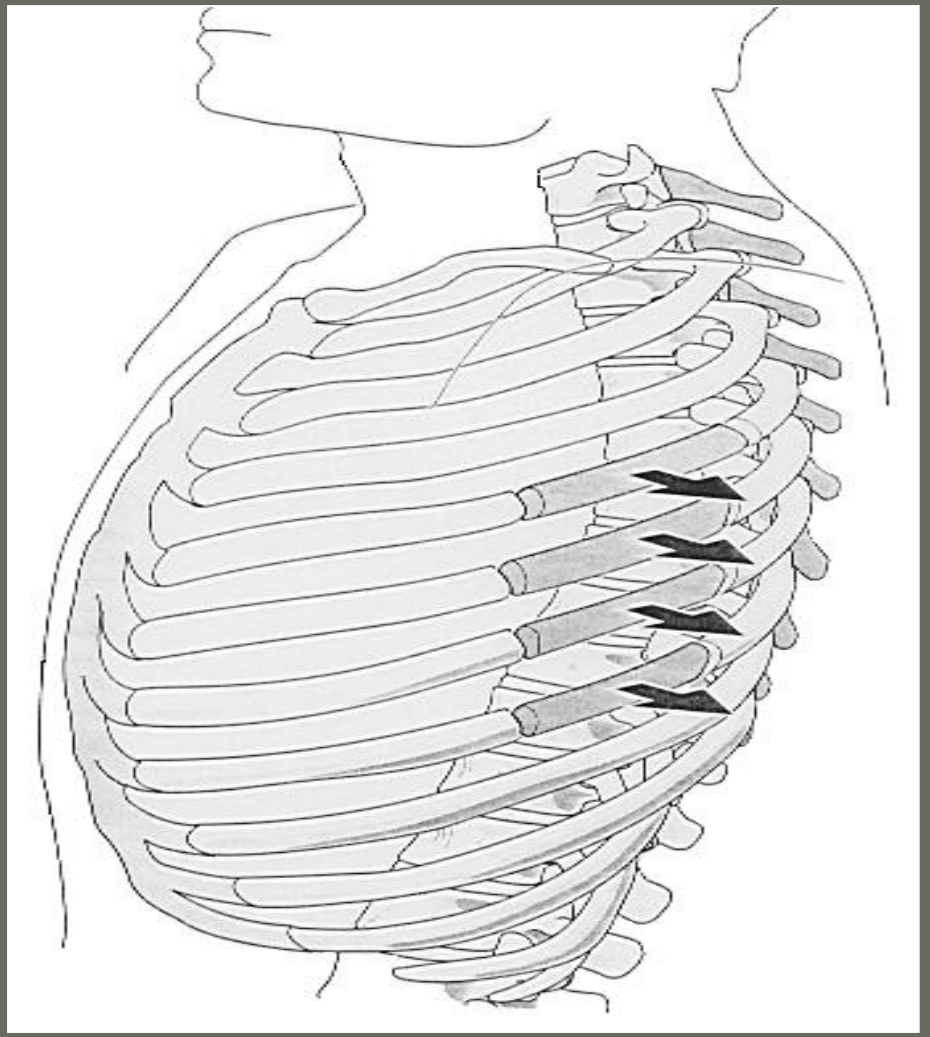
FLAIL CHEST

- SIGNS & SYMPTOMS
  - Localized chest pain, aggravated by breathing and coughing
  - Rapid, shallow respirations
  - Tenderness or crepitus upon palpation
  - Subcutaneous emphysema

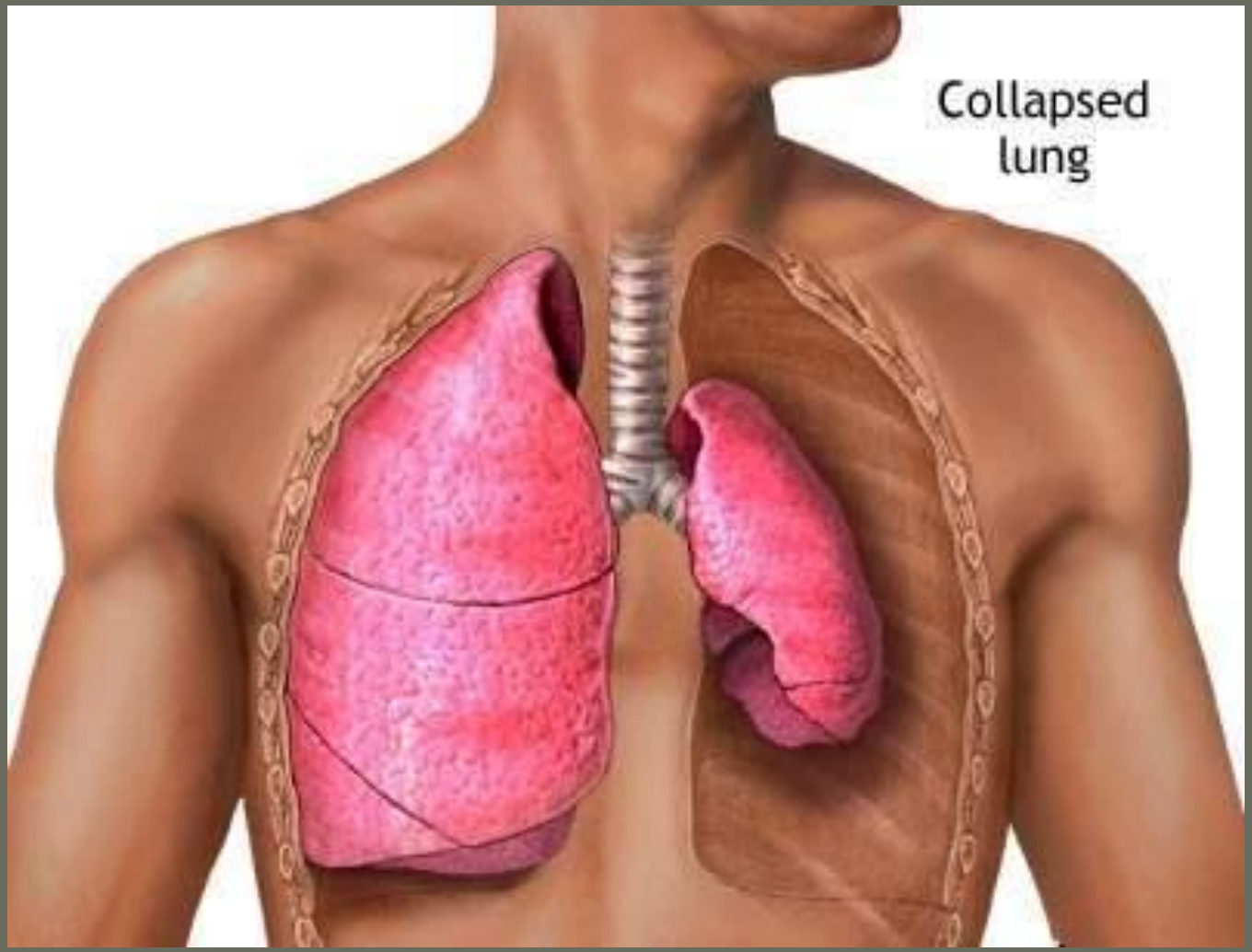
FLAIL CHEST

- TREATMENT
  - Immobilize flail segments upon inhalation using strips of tape
  - Positive pressure ventilation if you suspect respiratory failure
  - Analgesics
  - O2 if available
  - Monitor and TACEVAC as necessary

Flail Chest



PNEUMOTHORAX



DEFINITION OF PNEUMOTHORAX

- A simple pneumothorax is caused by the presence of air in the pleural space.

- The air separates the pleura causing the lungs to either partially or totally collapse

PNEUMOTHORAX

- CAUSES
  - Penetrating trauma of the chest
    - Also possible with abdominal injuries that cross the diaphragm
  - Blunt trauma
  - Spontaneous

PNEUMOTHORAX

- SIGNS / SYMPTOMS
  - Pleuritic chest pain
  - Tachypnea / Dyspnea
  - Decreased or absent breath sounds on affected side
  - Decreased chest wall motion

PNEUMOTHORAX

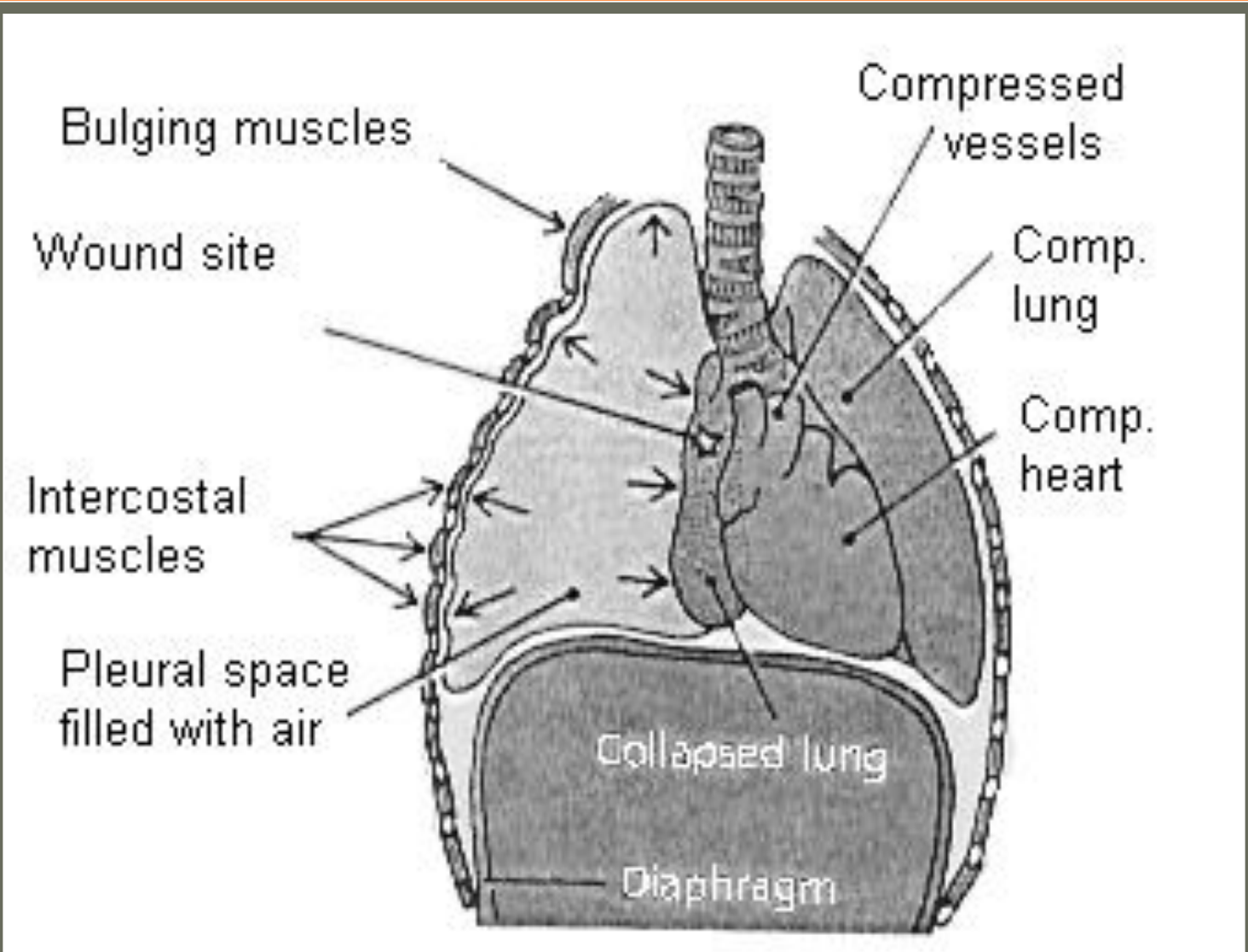
- TREATMENT
  - Place pt in Fowler's or Semi-Fowler's position
  - Administer O2 if available
  - Use BVM if hypoxia is present
  - If caused by wound, apply occlusive dressing
  - Monitor for s/sx's of tension pneumothorax
  - TACEVAC ASAP

TENSION PNEUMOTHORAX

TENSION PNEUMOTHORAX

- Air enters the pleural space and cannot escape
- Pressure builds in pleural space, the lung collapses and the mediastinum is forced to the opposite side
  - Breathing becomes more difficult
  - Cardiac blood flow is severely decreased

TENSION PNEUMOTHORAX



TENSION PNEUMOTHORAX

- *EARLY* SIGNS AND SYMPTOMS
  - Unilateral decreased or absent breath sounds
  - Dyspnea
  - Tachypnea

Tension Pneumothorax

- *PROGRESSIVE* SIGNS AND SYMPTOMS
  - Increased dyspnea
  - Increased tachypnea
  - Difficulty ventilating

TENSION PNEUMOTHORAX

- *LATE* SIGNS AND SYMPTOMS
  - Jugular Vein Distention (JVD)
  - Tracheal Deviation (towards unaffected side)
  - Signs of acute hypoxia
  - Narrowing pulse pressures
  - Signs of uncompensated shock

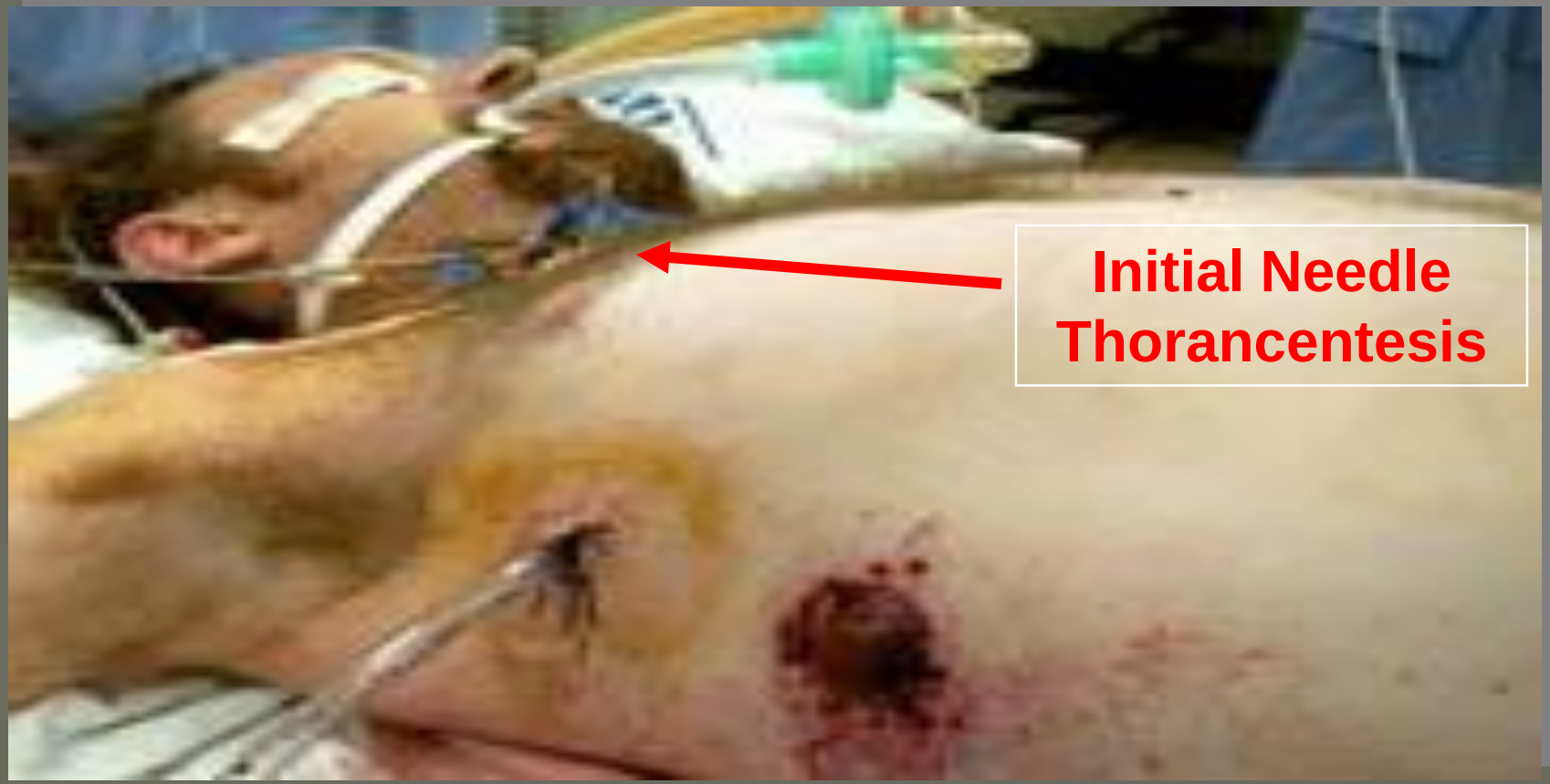
TENSION PNEUMOTHORAX

- In some cases the only signs of a developing tension pneumothorax are:
  - Compromised oxygenation
  - Tachycardia
  - Tachypnea
  - Unilateral decreased or absent breath sounds

TENSION PNEUMOTHORAX

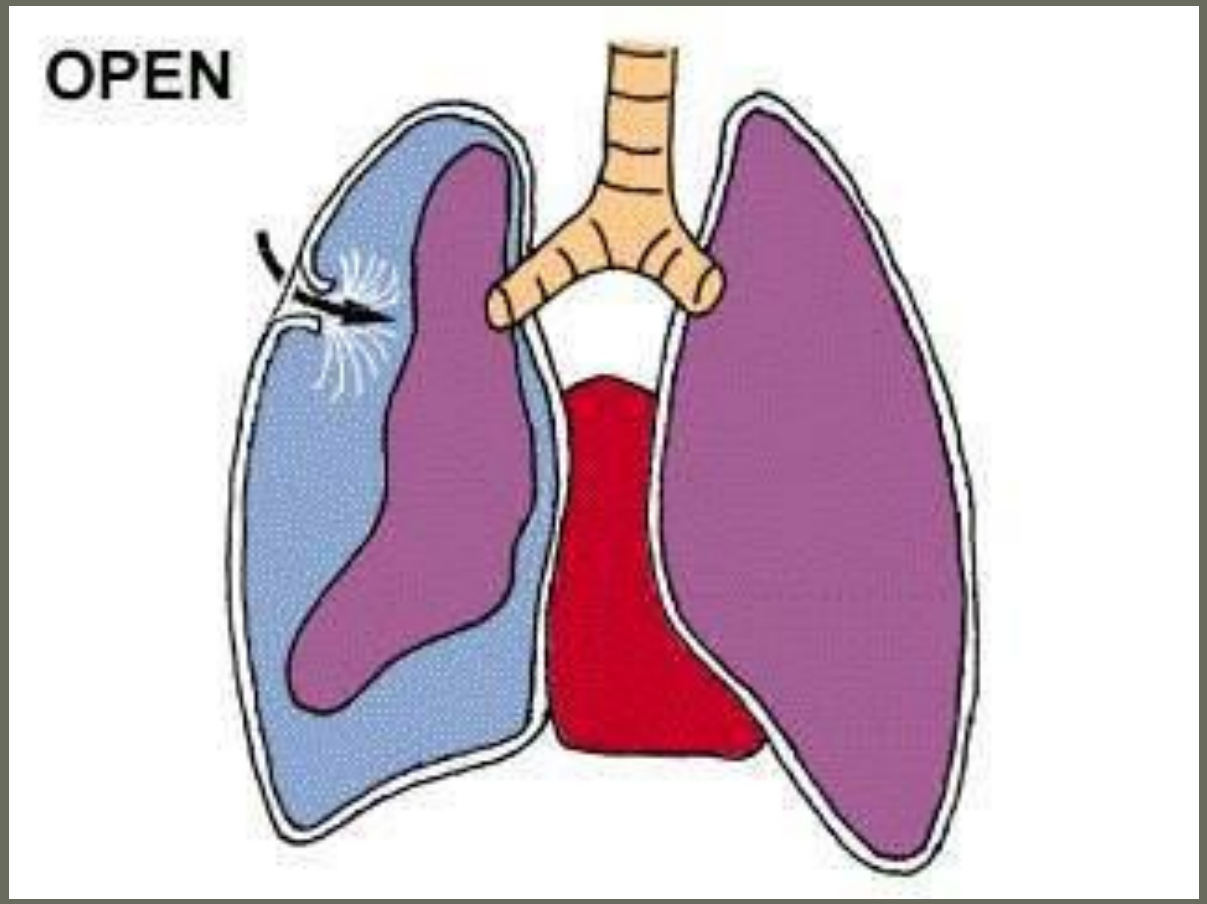
- TREATMENT
  - Treat all chest injuries
  - Perform needle thoracentesis
  - Administer oxygen (if available)
  - Pain management
  - Monitor and TACEVAC

SHOTGUN BLAST TO LOWER RIGHT CHEST / UPPER RIGHT ABDOMEN



OPEN PNEUMOTHORAX

(SUCKING CHEST WOUND)



OPEN PNEUMOTHORAX

- DEFINITION
  - A collection of air or gas in the pleural space that causes the lung to collapse
  - More than the normal amount of air will enter the lung adding stress and tension to affected side
- CAUSES
  - Gunshot, stab wounds, impaled objects, occasional blunt trauma

OPEN PNEUMOTHORAX

OPEN PNEUMOTHORAX

- SIGNS AND SYMPTOMS
  - Pain at the injury site
  - Chest wall trauma
  - Shortness of breath
  - Tachypnea
  - Decreased chest wall motion
  - May hear a sucking or bubbling sound as air moves through the wound

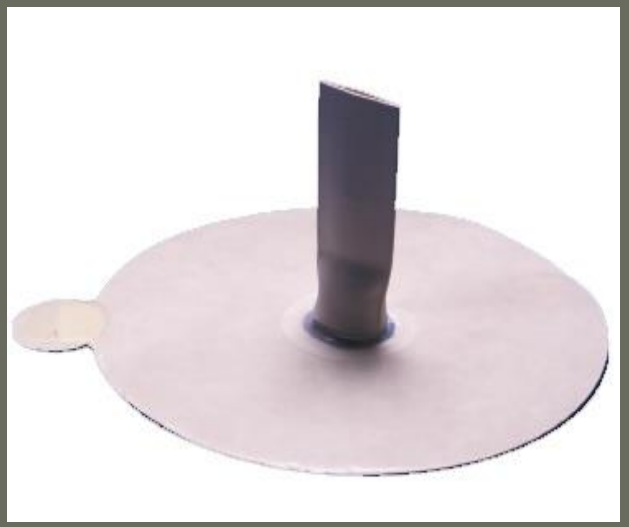
OPEN PNEUMOTHORAX

- TREATMENT
  - Occlusive Dressing
    - Apply chest seal
    - Improvised chest seal
      - Tape on all sides
    - Assess anterior and posterior torso for entrance/exit wounds

CHEST SEALS

Bolin Chest Seal

Asherman Chest Seal



H&H Wound Seal

OPEN PNEUMOTHORAX

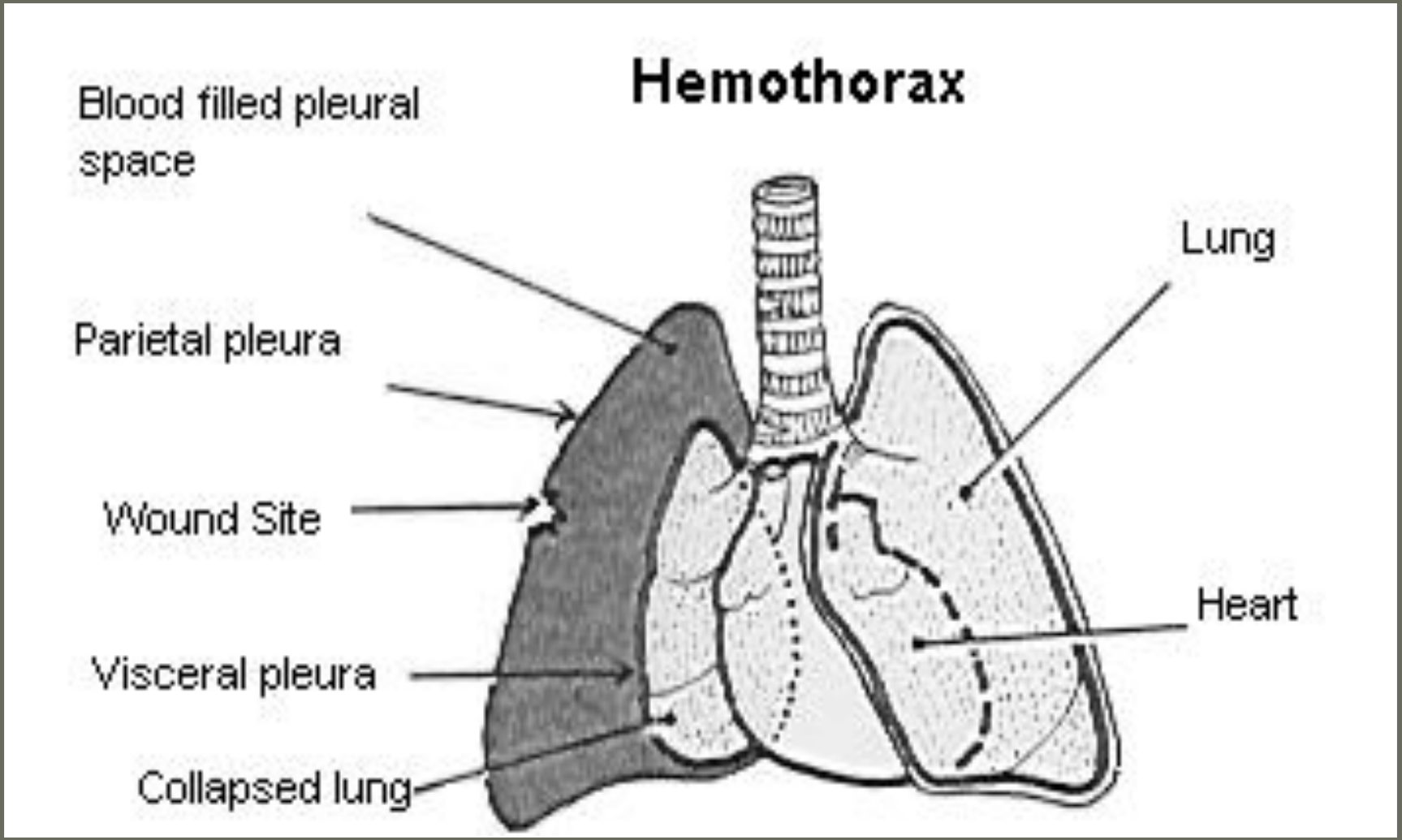
- TREATMENT (cont.)
  - Place patient on AFFECTED Side
  - Monitor for signs/symptoms of tension pneumothorax
  - Administer O2, if available
  - Pain management
  - Monitor and TACEVAC ASAP

HEMOTHORAX

HEMOTHORAX

- Blood accumulated into the chest cavity from lacerated vessels compressing the lung
- Prevents adequate ventilation
- Causes
  - Penetrating or blunt trauma

HEMOTHORAX


Hemothorax
Blood filled pleural space
Parietal pleura
Wound Site
Visceral pleura
Collapsed lung
Lung
Heart

HEMOTHORAX

- SIGNS / SYMPTOMS
  - SOB
  - Chest pain
  - Tachypnea
  - S/S of shock: pallor, confusion, hypotension
  - Decreased or absent breath sounds
  - Hemoptysis (coughing up blood)
  - Decreased chest wall motion

HEMOTHORAX

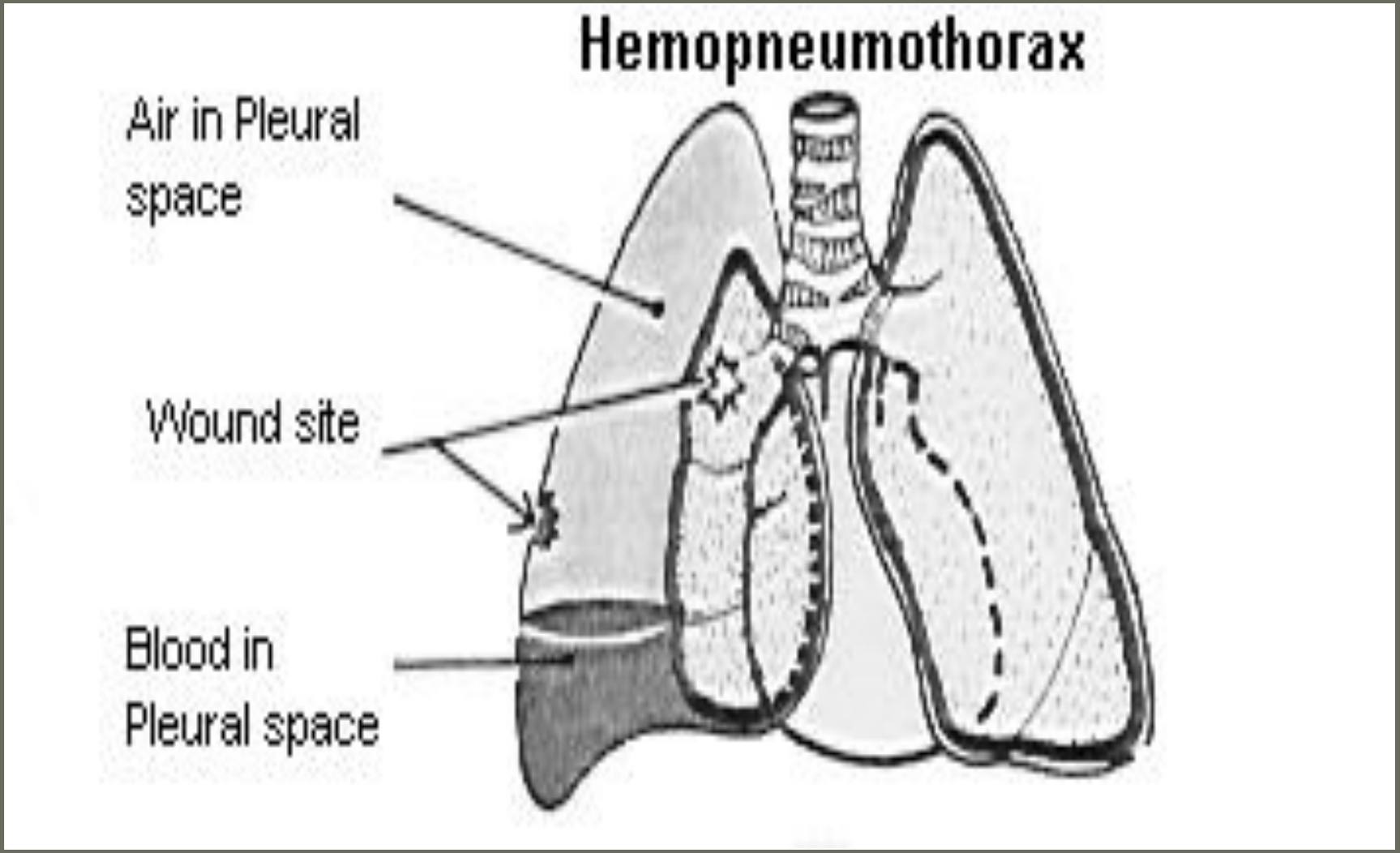
- TREATMENT
  - Place patient in Fowler's position
  - Treat chest injuries
  - Treat for shock
  - Administer O2, if available
  - Monitor and TACEVAC

HEMOPNEUMOTHORAX

HEMOPNEUMOTHORAX

- A collection of blood and air in the pleural space
- May result in a collapsed lung and pressure on the heart and uninjured lung
- Caused by penetrating trauma to the chest wall or the lungs

HEMO-PNEUMOTHORAX



HEMOPNUEMOTHORAX

- SIGNS / SYMPTOMS
  - Tachypnea
  - Decreased breath sounds
  - Signs of shock

HEMOPNUEMOTHORAX

- TREATMENT
  - Place patient In Fowler's Position
  - Perform needle thoracentesis to relieve pressure
    - If blood is withdrawn, immediately remove needle and catheter
  - Administer O2, if available
  - Treat for shock
  - Monitor and TACEVAC

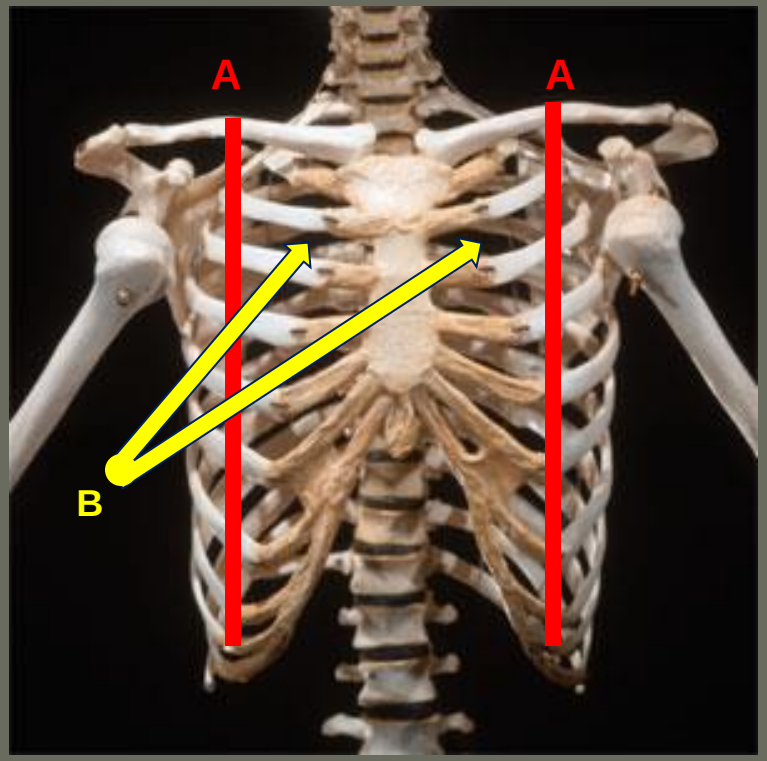
NEEDLE THORACENTESIS

PURPOSE

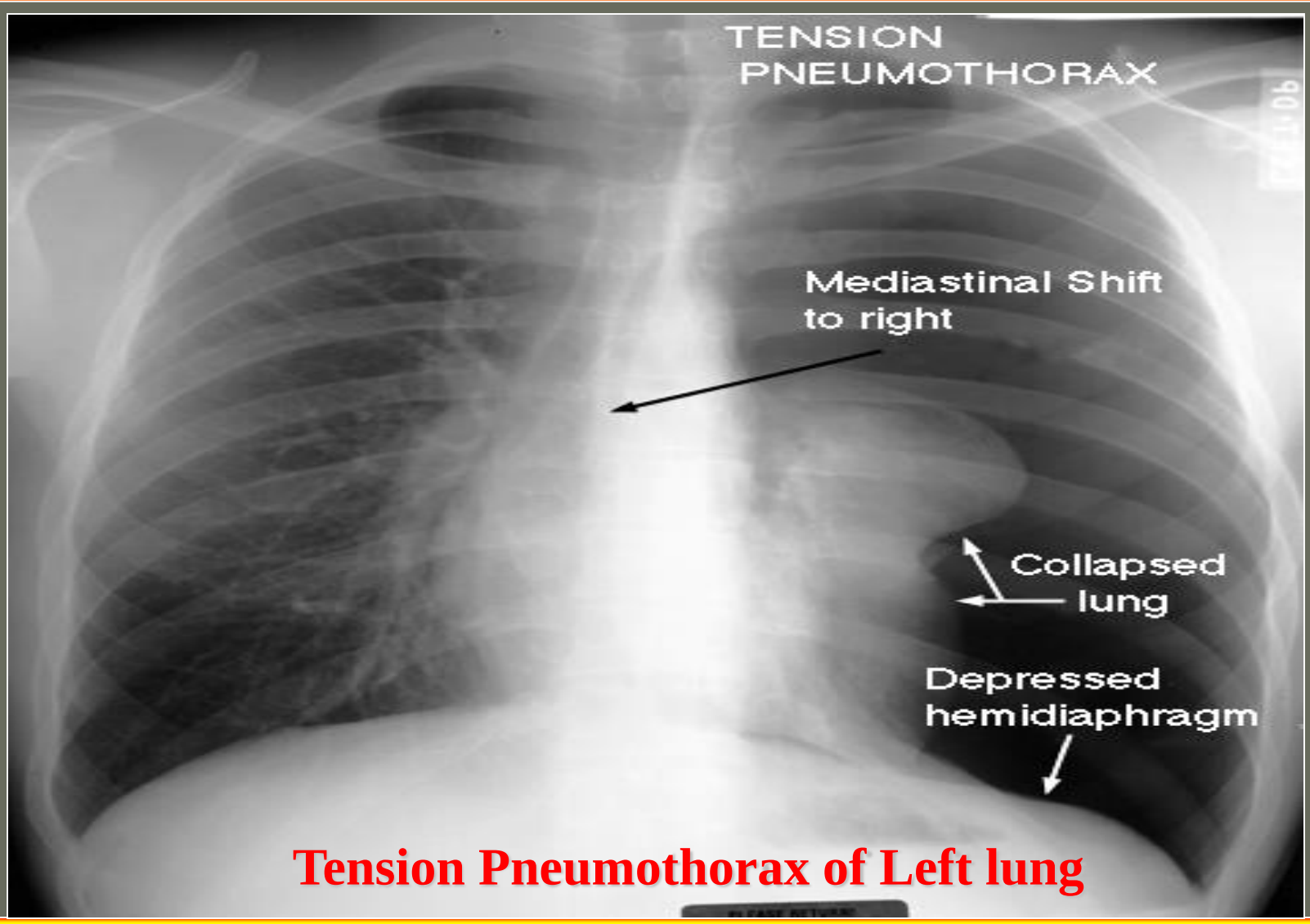
- Definition:
  - Procedure where a needle and catheter is inserted through the chest wall into the pleural space
- Purpose:
  - Relieves accumulated pressure in the pleural space
  - Reduces pressure on the heart, lungs, and chest cavity

ANATOMICAL LANDMARKS

- Mid-Clavicular Lines (A)
- 2nd Intercostal Space (B)



ANATOMICAL LANDMARKS



Tension Pneumothorax of Left lung

INDICATIONS

- Any casualty with thoracic injury is at risk of a tension pneumothorax
- Casualties with penetrating wounds to the chest and those with signs of rib fracture are at risk
- There are NO significant contraindications

PROPER EQUIPMENT

- 14-gauge, 3.25 inch needle catheter
- Antiseptic solution
- Gloves

PROCEDURAL STEPS

- Assess Casualty and Make Decision
  - Based on MOI
  - Noted increase in difficult breathing
- Inspect
- Auscultate
- Palpate

PROCEDURAL STEPS

- Assemble and Check Equipment
  - 14-gauge, 3.25 inch needle/catheter
  - Antiseptic Solution
  - Gloves

PROCEDURAL STEPS

- Prepare Patient
  - Upright position
  - Explain procedure
  - Expose chest

PROCEDURAL STEPS

- Identify Landmarks
  - Midclavicular Line
  - 2nd Intercostal Space

PROCEDURAL STEPS

- Perform the Procedure
  - Cleanse area
  - Insert needle/catheter (over the rib, NOT below)
  - Puncture parietal pleura
  - Remove needle
  - Secure catheter

PROCEDURAL STEPS

- Reassess Patient
  - IAP the chest
  - Visually inspect neck
  - Monitor patient's response
  - Continue monitoring and reassessing

COMPLICATIONS

- Hemothorax
  - Blood within the pleural space
  - Caused by needle puncturing any vessel within the chest
- Cardiac Tamponade
  - Pressure on the heart that occurs when blood or fluid builds up in the space between the heart muscle and the pericardium.
  - Ensure needle is at or lateral to the nipple line

COMPLICATIONS

- Subcutaneous Emphysema
  - Released air becomes trapped under skin
  - Feels like “rice crispies”

- Misdiagnosis
  - Performing a needle thoracentesis on a casualty with non-penetrating torso trauma could result in a pneumothorax if not already present.

DEMONSTRATION

PRACTICAL APPLICATION

MANAGE RESPIRATORY TRAUMA

MANAGE ABDOMINAL INJURIES

OVERVIEW

- Major Abdominal Organs
- Significance of Abdominal Organs
- Blunt and Penetrating Trauma
- Signs and Symptoms
- Treatment

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives

MAJOR ABDOMINAL ORGANS

OVERVIEW

• Unrecognized abdominal injury is one of the major causes of death in the trauma casualty.

• Early deaths typically result from massive blood loss caused by either penetrating or blunt injuries.

• The abdomen contains the major organs of digestion and excretion.

• The simplest and most common method of describing the portions of the abdomen is by quadrants. In this system, the abdomen is divided into four equal parts by two imaginary lines that intersect at right angles at the umbilicus.

MAJOR ABDOMINAL ORGANS

Separated into 4 equal quadrants

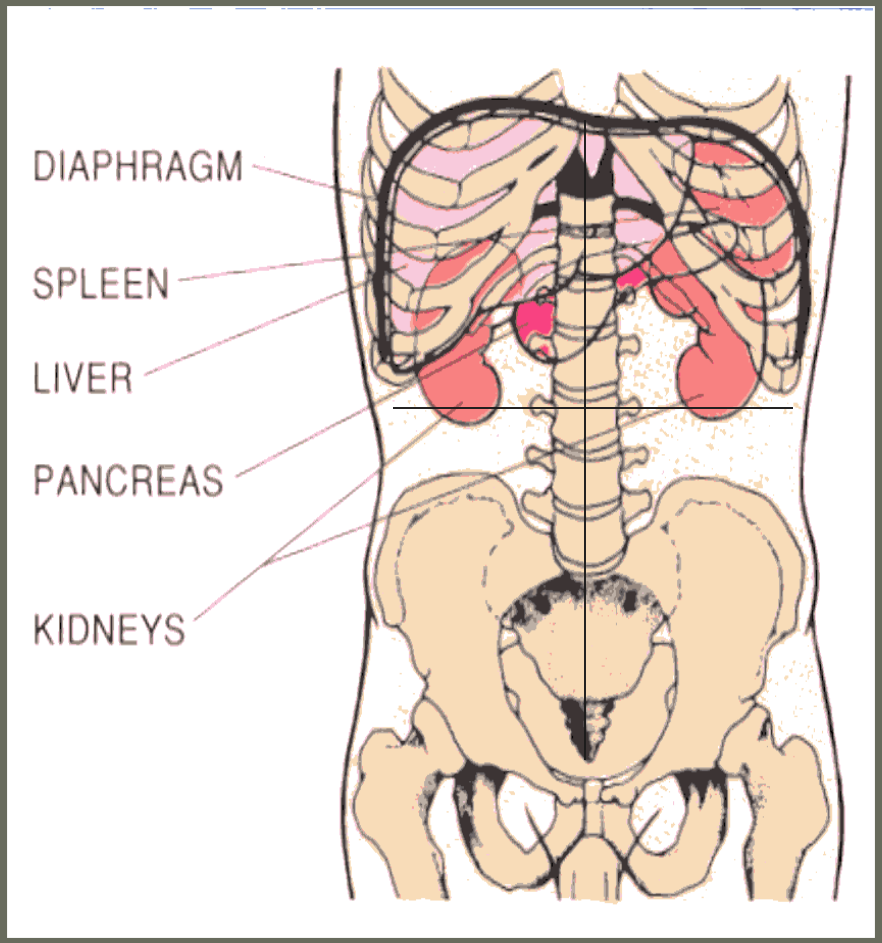
- RUQ
  - Colon
  - Right Kidney
  - Pancreas – small portion
  - Liver
  - Gallbladder
- LUQ
  - Colon
  - Left Kidney
  - Pancreas
  - Spleen
  - Stomach

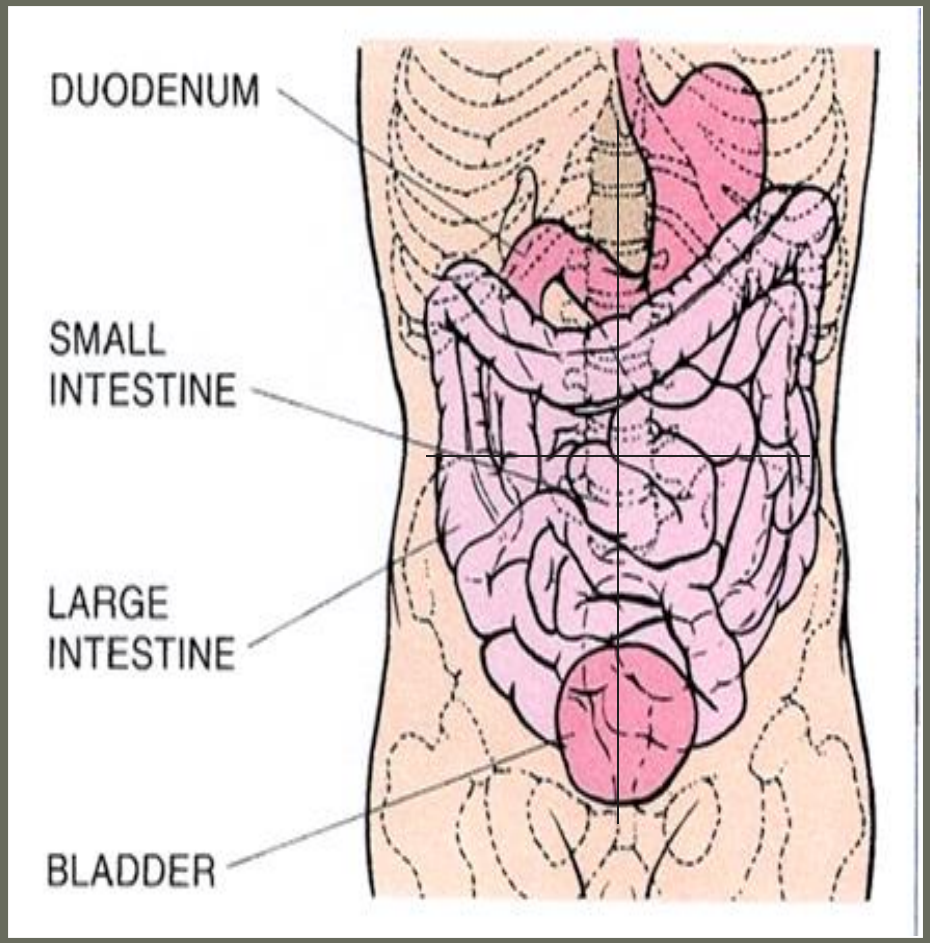
MAJOR ABDOMINAL ORGANS

Separated into 4 equal quadrants

- RLQ
  - Ascending Colon
  - Small Intestine
  - Major artery and vein for right leg
  - Appendix
- LLQ
  - Descending Colon
  - Small Intestine
  - Major artery and vein for left leg

ORGANS OF THE ABDOMEN





SIGNIFICANCE OF ABDOMINAL ORGANS

ABDOMINAL ORGANS

- HOLLOW ORGANS – Gastrointestinal and urinary tract through which material pass
  - Stomach
  - Intestines
  - Bladder

  – Rupture causes septicemia and toxicity
  – Bleeding is generally minimal

ABDOMINAL ORGANS

- SOLID ORGANS – Solid masses of tissue
  - Liver
  - Pancreas
  - Spleen
  - Kidneys

  - Highly vascular, injury results in severe bleeding

MECHANISM FOR ABDOMINAL INJURIES

- Assessing the patient for abdominal injuries begins with knowledge of the MOI. Numerous mechanisms lead to the compression and shear forces that may damage abdominal organs. Abdominal Injuries can be caused by:
  - Blunt Trauma
  - Penetrating Trauma

MECHANISM FOR ABDOMINAL INJURIES

Blunt Trauma

– Great threat to life because injuries are more difficult to diagnose

– The injuries to abdominal organs result from either compression or shear forces.

MECHANISM FOR ABDOMINAL INJURIES

Penetrating Trauma

- A foreign object enters the abdomen and opens the peritoneal cavity to the outside
- Penetrating trauma is more readily visible than blunt trauma
- Multiple organ damage can occur in penetrating trauma
- A mental visualization of the potential trajectory

SIGNS AND SYMPTOMS

SIGNS AND SYMPTOMS

- Note any protective gear worn by the casualty
- History of the injury

- Focus on the weapon, number of times shot or stabbed, and amount of blood at the scene

SIGNS AND SYMPTOMS

- Unless there are associated injuries, casualties with abdominal trauma generally present with a patent airway.

- When abnormalities are found it should be exposed and examined in greater detail.

- This involves inspection and palpation of the abdomen looking and feeling for soft tissue injuries and distention.

SIGNS AND SYMPTOMS

- Soft tissue injuries include contusions, abrasions, stab or gunshot wounds, obvious bleeding, and unusual findings such as evisceration or impaled objects.

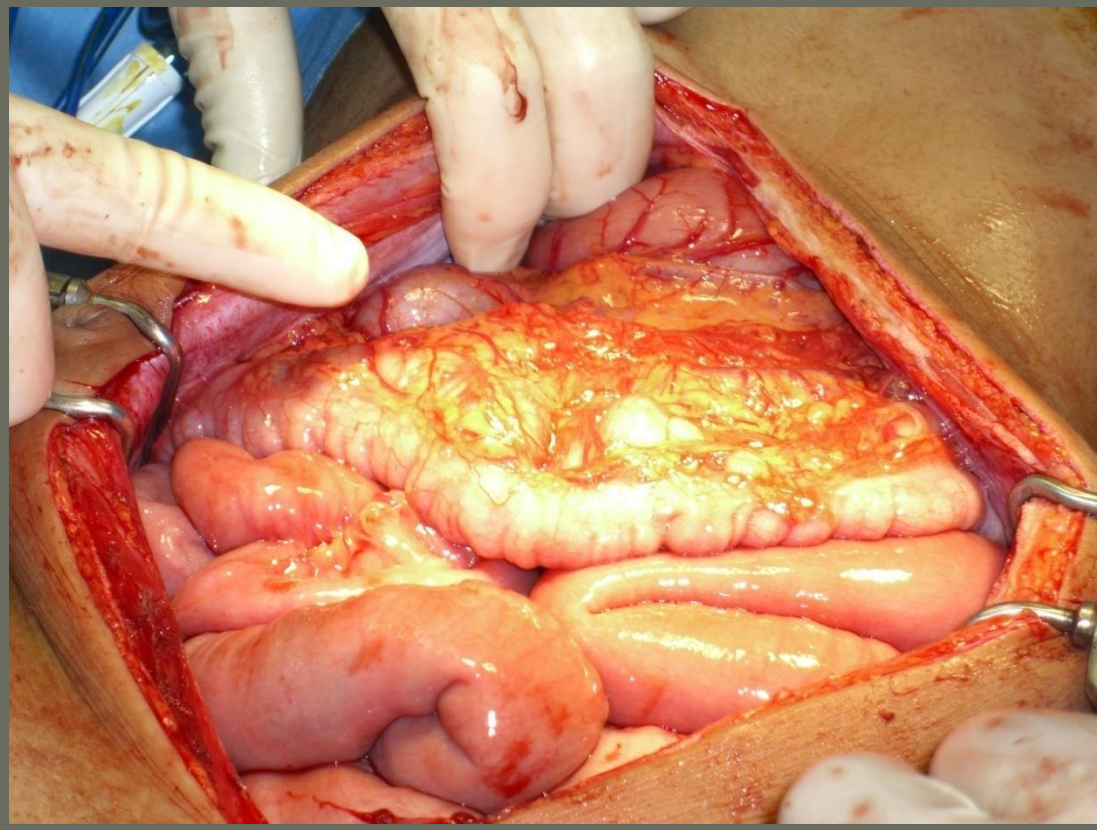
- Palpate to identify areas of tenderness.

- Begun in an area where the casualty does not complain of pain. Then, each abdominal quadrant.

- While palpating a tender area, the provider may note that the casualty “tenses up” the abdominal muscles in that area. This reaction, called voluntary guarding, serves to protect the patient from pain.

SIGNS AND SYMPTOMS

- Deep palpation of obvious injuries should be avoided
- Be careful around impaled objects



SIGNS AND SYMPTOMS

- Auscultation of bowel sounds is generally not a helpful field assessment tool.
- Time should not be wasted to determine their presence or absence as this diagnostic sign will not alter the field management of the casualty.

SIGNS AND SYMPTOMS

- The assessment of abdominal injuries can be difficult. Some signs that raise the index of suspicion are:
  - Mechanism of injury
  - Soft tissue injuries to the abdomen, flank, or back
  - Shock without an obvious cause
  - Level of shock greater than explained by other injuries

SIGNS AND SYMPTOMS

Some signs that raise the index of suspicion continued:

- Abdominal tenderness
- Involuntary guarding
- Percussion tenderness
- Diminished or absent bowel sounds

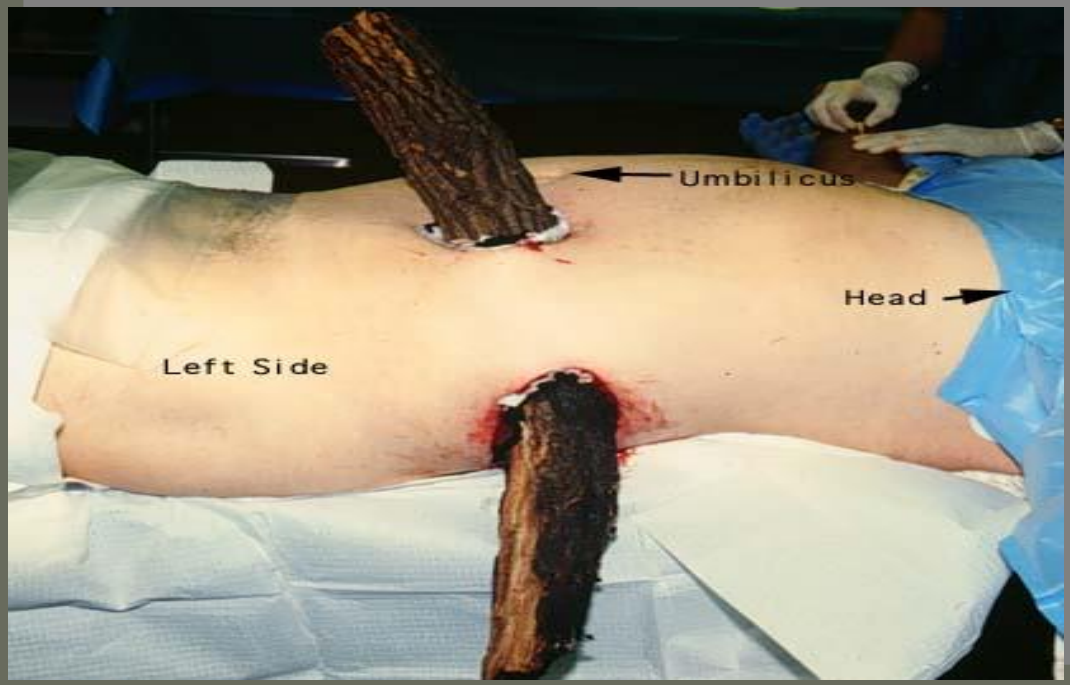
TREATMENT

BLUNT ABDOMINAL INJURIES

- TREATMENT
  - Maintain ABC’s
  - Establish baseline vital signs
  - Place in supine position with knees slightly flexed
  - History
  - Keep calm
  - Treat for shock
  - DO NOT strongly palpate the abdomen
  - Monitor and TACEVAC

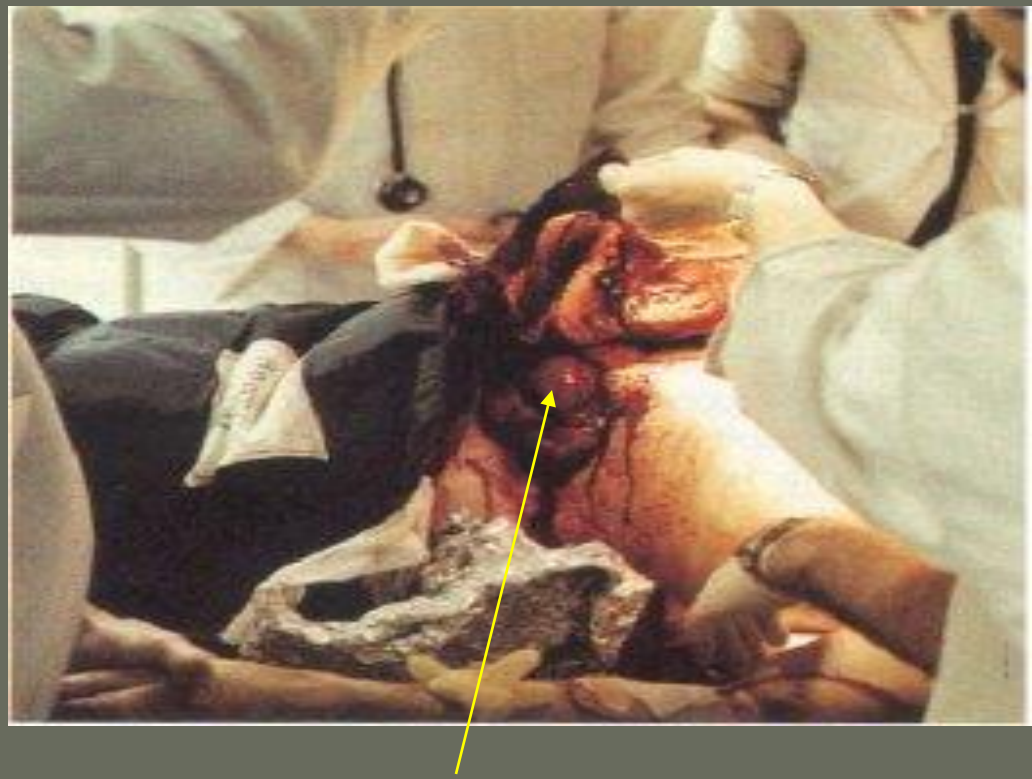
PENETRATING ABDOMINAL INJURIES

- *DO NOT* remove impaled objects
  - Leave in place
  - Secure with bulky dressings



PENETRATING ABDOMINAL INJURIES

- TREATMENT
  - Maintain ABC's
  - Inspect for exit wounds
  - If intestines *ARE NOT* exposed
    - Apply dry, sterile dressing



EVISCERATED BOWEL

PENETRATING ABDOMINAL INJURIES

- If intestines *ARE* exposed:
  - Apply moist sterile dressing soaked in normal saline
  - Gently secure eviscerated bowel
  - Treat for shock
  - *DO NOT* probe for objects
  - Monitor and TACEVAC

DEMONSTRATION

MANAGE
ABDOMINAL INJURIES

MANAGE MUSCULOSKELETAL INJURIES

OVERVIEW

- Anatomy
- Types of Musculoskeletal Injuries
- Types of Splints

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

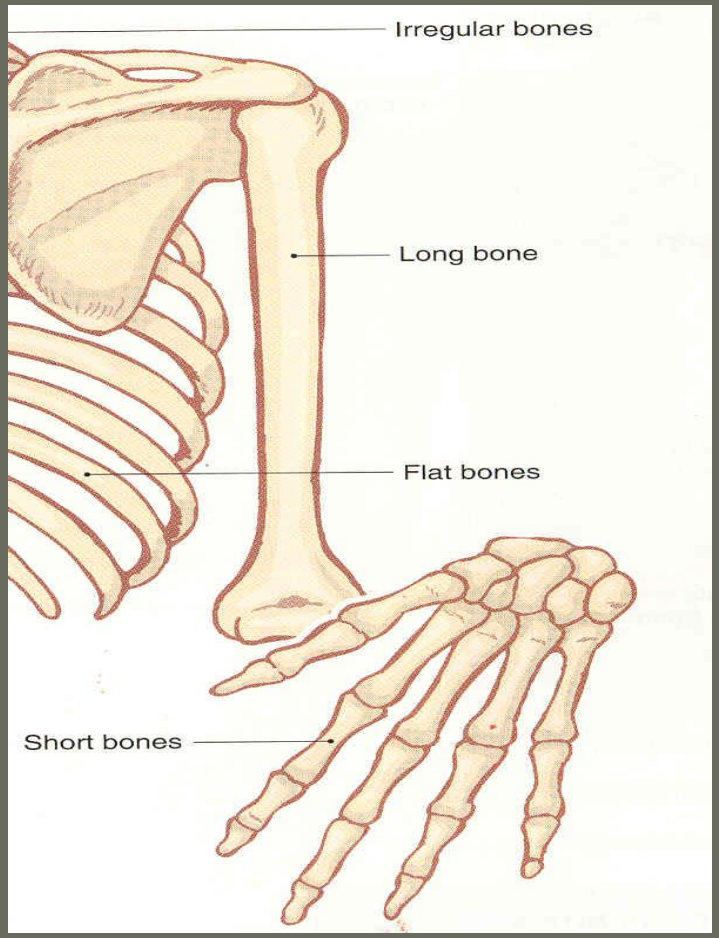
Enabling Learning Objectives

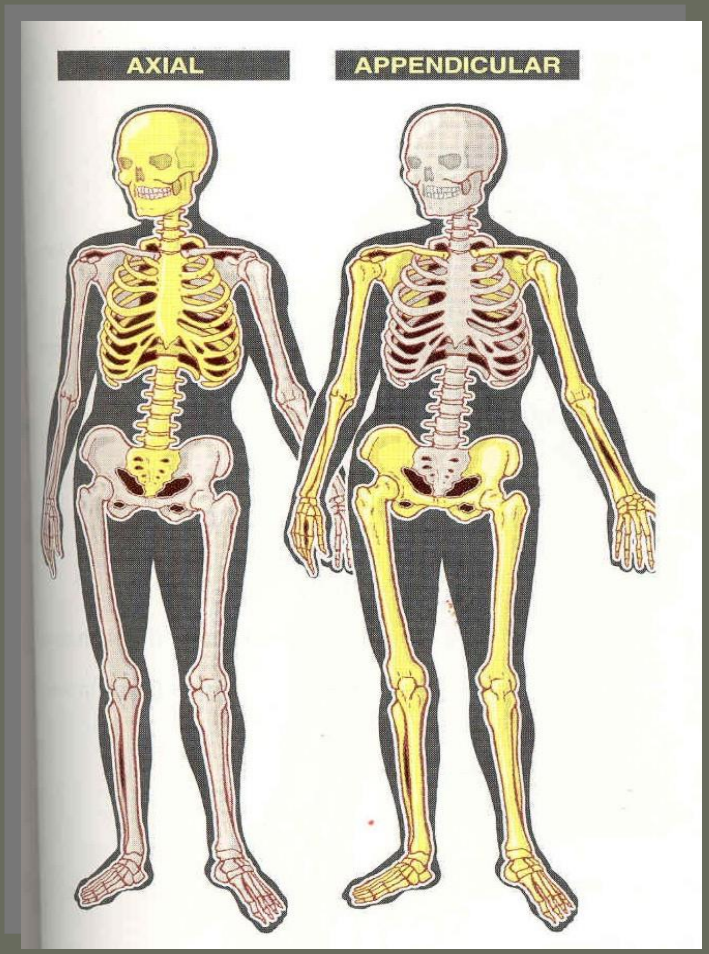
ANATOMY OF THE MUSCULOSKELETAL SYSTEM

SKELETAL SYSTEM

- Boney framework consisting of 206 bones
- Classifications
  - Long, Short, Irregular and Flat
- Divisions
  - Axial Skeleton
  - Appendicular Skeleton

SKELETAL SYSTEM

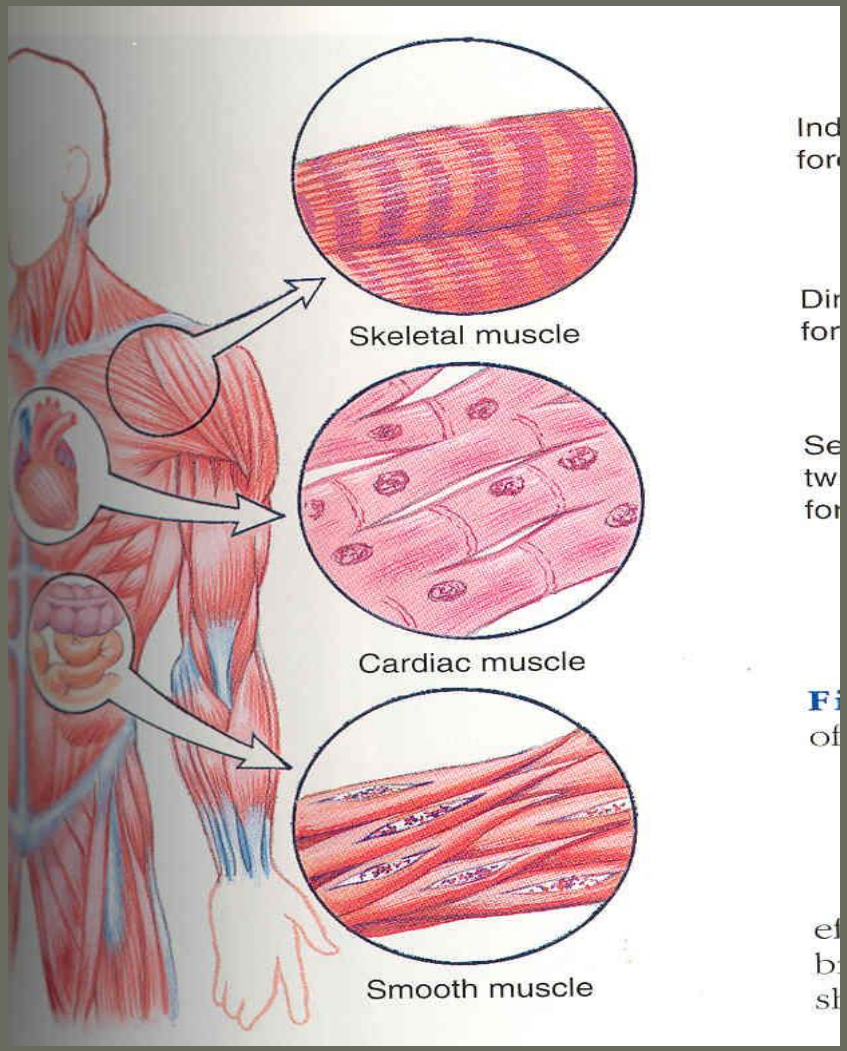


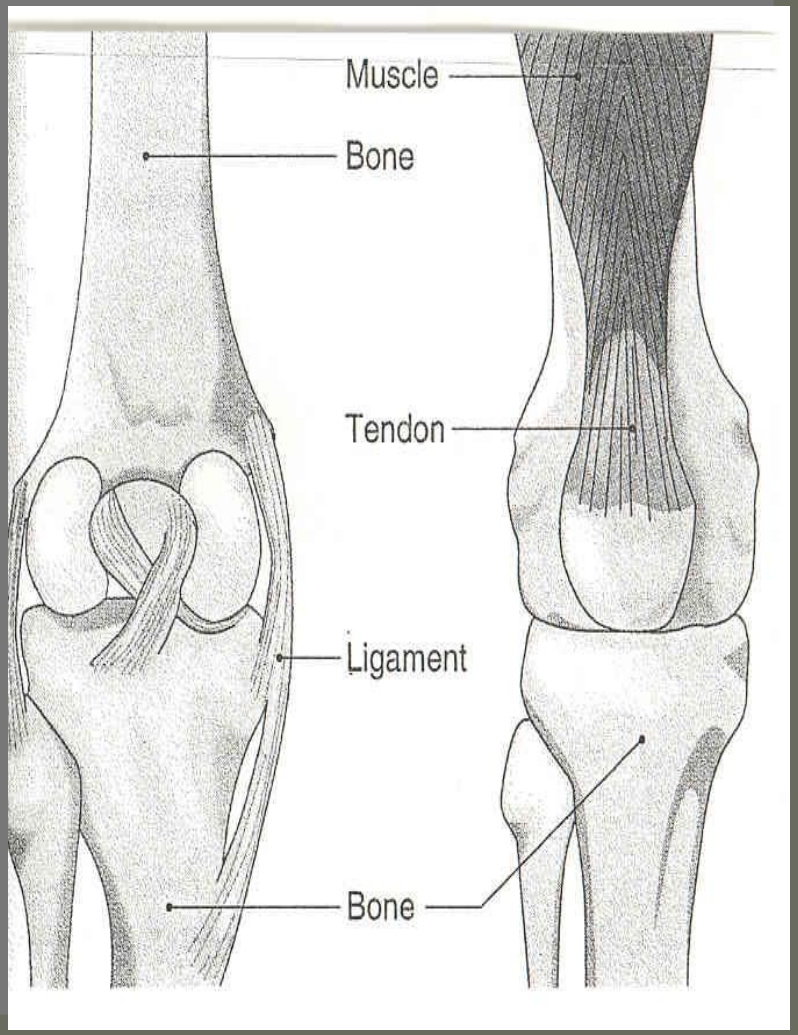


MUSCULAR SYSTEM

- Consists of tissues, muscles, cartilage, tendons and ligaments
  - Functions: Movement, Posture, Heat, Bodily Functions
  - Muscle Types:
    - Skeletal (Voluntary)
    - Smooth (Involuntary)
    - Cardiac (Myocardium)

MUSCULAR SYSTEM





TYPES OF MUSCULOSKELETAL INJURIES

SOFT TISSUE INJURIES

- Involve the skin and underlying musculature
- Injury to the tissues is commonly referred to as either a closed or open wound

OPEN WOUNDS

- Injury in which the skin is interrupted, or broken, exposing tissues underneath

CLOSED WOUNDS

- SKIN IS NOT BROKEN

ABRASIONS

- Superficial scratches of the skin surface
- Oozing blood from injured capillaries
- Painful due to nerve ending damage

ABRASIONS

- Also known as “Road Rash”
- “Rug Burns”
- “Mat Burns”

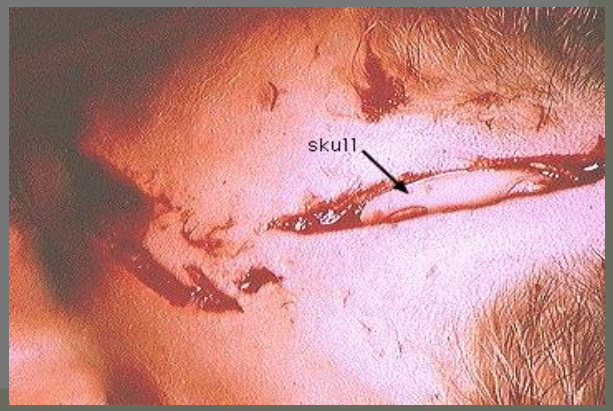
ABRASIONS

- Treatment
  - Cleanse the wound
  - Cover injury with a small bandage
  - Prevent infection - use anti-bacterial ointment

LACERATIONS

- Produced by objects with sharp edges
- A blow from a blunt object
- Can be smooth or jagged

LACERATIONS



- Treatment
  - Hemorrhage control
  - Immobilization - if major tendons and muscles are severed
  - Treat for shock
  - TACEVAC as needed

AVULSIONS

- AVULSION
  - Flap of skin that is torn loose or completely pulled off.

AVULSIONS

"Degloved" finger, caused by forcible removal of tight ring.
Sandzen, Atlas of Acute Hand Injuries, 1980.

AVULSIONS

- Treatment
  - Control bleeding, apply dressing to avulsed area
  - Replace flap
  - If completely torn off:
    - Wrap in saline soaked gauze or pack in ice
    - Transport with the patient
    - Immobilize extremity as indicated

TRAUMATIC AMPUTATIONS

- Non-surgical removal of limb or appendage
- There may be less bleeding when blood vessels spasm and retract

TRAUMATIC AMPUTATIONS

TRAUMATIC AMPUTATIONS

- TREATMENT
  - Hemorrhage control
    - Tourniquet to control life-threatening hemorrhage
  - Treat for shock
  - Preserve amputation in sterile dressing
    - Pack in ice and send with patient
  - TACEVAC ASAP

STRAINS, SPRAINS AND DISLOCATIONS

STRAINS, SPRAINS & DISLOCATIONS

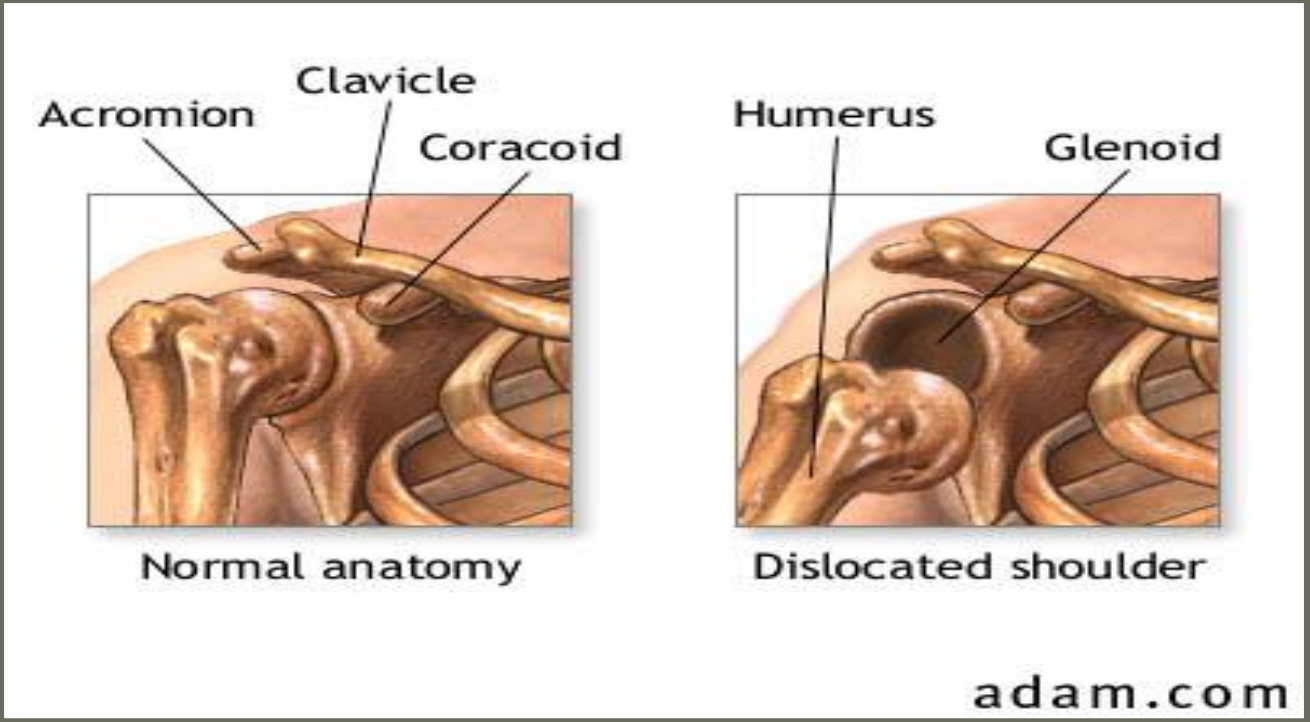
- STRAIN
  - Injury to *MUSCLE* or tendon resulting from over exertion or over stretching

- SPRAIN
  - Partial or complete tearing or stretching of a supporting *LIGAMENT* within a joint

STRAINS, SPRAINS & DISLOCATIONS

STRAINS, SPRAINS & DISLOCATIONS

- DISLOCATION
  - Displacement of bone ends at the joints resulting in an abnormal stretching of the ligaments around the joints



STRAINS, SPRAINS & DISLOCATIONS

Figures: Courtesy of Mark Tranovich, MD

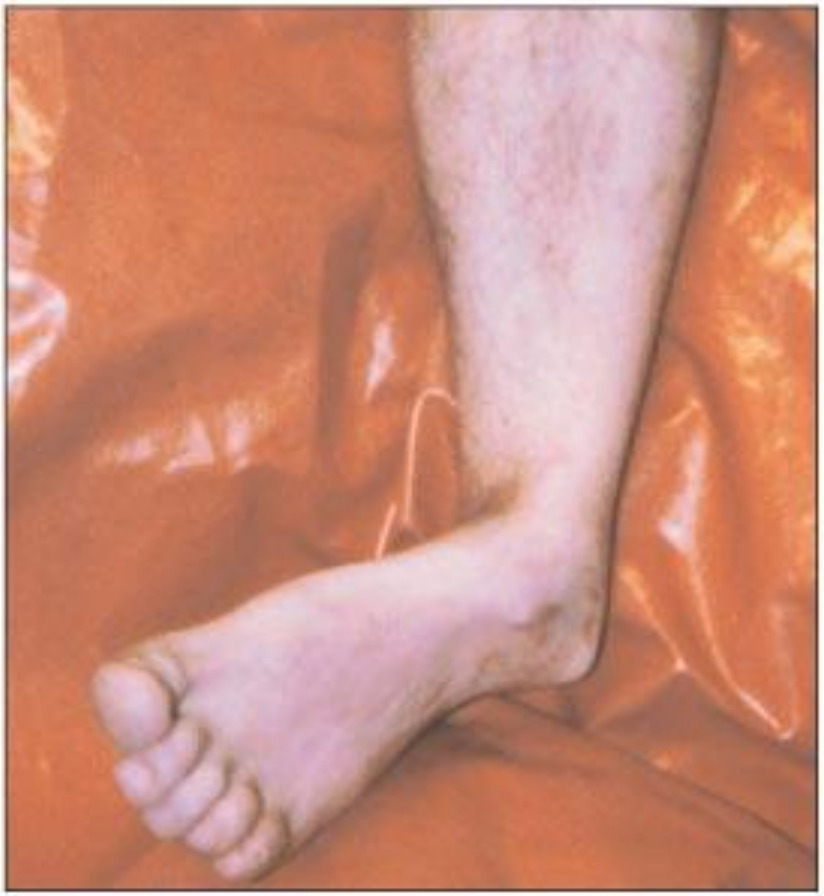


FIGURE 1. Photo (A) of the left ankle of a 33-year-old male recreational softball player shows tibiotalar dislocation of the ankle. The foot is displaced medially, and the skin is tented over the prominence of the lateral malleolus. Anterolateral radiograph of the same ankle (B) shows that the talus is completely disassociated from the ankle mortise (arrow), and a small avulsion of the fibula is evident (arrowhead).

STRAINS, SPRAINS & DISLOCATIONS

- SIGNS AND SYMPTOMS
  - Point tenderness or burning sensation
  - Marked deformity of joint
  - Pain and edema
  - Complete loss or decreased range of motion (ROM)

TREATMENT

- STRAINS
  - Supportive bandaging
  - Immobilize
    - Ensure muscle is in relaxed position
      - RICE
        - » Rest
        - » Ice
        - » Compression
        - » Elevation

TREATMENT

- SPRAINS
  - Treat like a fracture
  - Supportive Bandage / Immobilize
  - RICE
  - Relieve pain
  - TACEVAC

TREATMENT

- DISLOCATION
  - Attempt to reduce only if no pulse is present
  - Splint in position it was found
  - Pain management
  - TACEVAC

COMPLICATIONS

- Hemorrhage
  - Separated bone ends may tear muscle tissue and lacerate blood vessels
- Nerve Damage
  - Bone ends may cut or pinch nerves

TYPES OF FRACTURES

TYPES OF FRACTURES

- Break in the continuity of a bone
- Two Types:
  - Open
  - Closed

OPEN FRACTURES

- Breaks through overlying tissues
- Bone may protrude through the skin
- Penetrating object breaks through skin to the bone

CLOSED FRACTURES

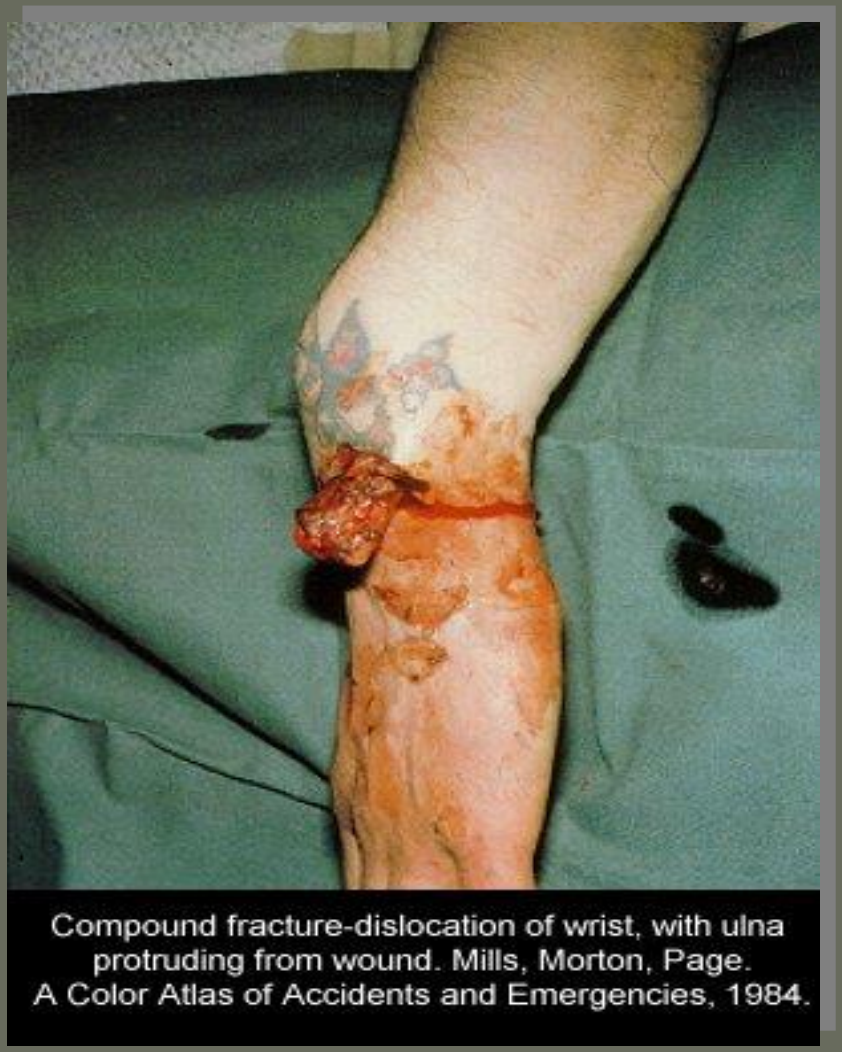
- Bone does not break through the skin
- Tissue beneath the skin might be damaged

SIGNS & SYMPTOMS

- Inability to move extremity
- Discoloration
- Deformity
- Edema
- Pain with or without movement

SIGNS & SYMPTOMS

- Exposed bone fragments (open fractures)
- Crepitus/Grating
- Injury indicating fracture (e.g. gunshot wounds)



Compound fracture-dislocation of wrist, with ulna protruding from wound. Mills, Morton, Page. A Color Atlas of Accidents and Emergencies, 1984.

GENERAL PRINCIPLES FOR TREATMENT OF FRACTURES

TREATMENT

- Control hemorrhage
- Treat for shock
- Check distal pulses
- Immobilize with splint
- Recheck PMS

TREATMENT

- Relieve pain
- Reduce only if no distal pulse
- Document treatment
- Monitor and TACEVAC

TYPES OF SPLINTS

SPLINTING

- PURPOSE OF SPLINTING
  - To immobilize that portion of the body which is injured
  - Prevent further damage
  - Decrease pain

RIGID SPLINTS

- Cannot change shape
- Body part positioned to fit splint
- Examples:
  - Wood
  - Plastic
  - Metal

FORMABLE SPLINTS

- Wrap around extremity
- Can be molded
- Examples:
  - Pillows
  - Ponchos
  - Blankets

IMPROVISED SPLINTS

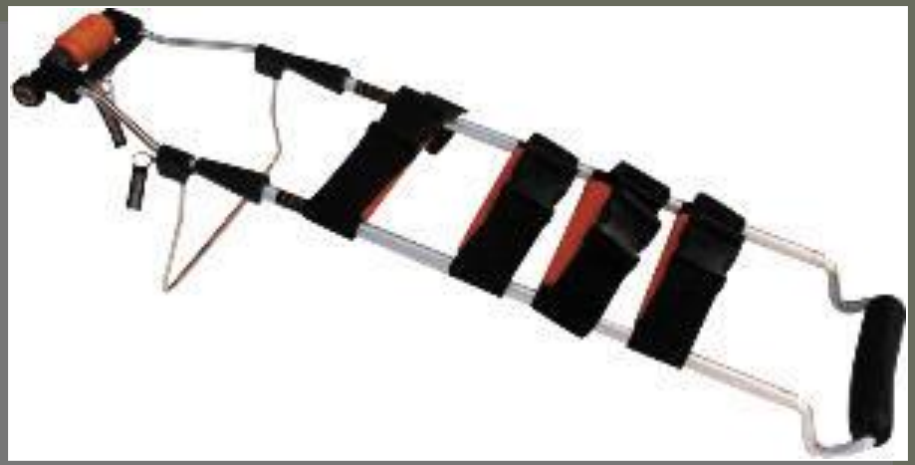
- Made from any available material that can be used to stabilize a fracture
- Only limited by your creativity!
- Examples
  - Sticks
  - Branches
  - Tent poles

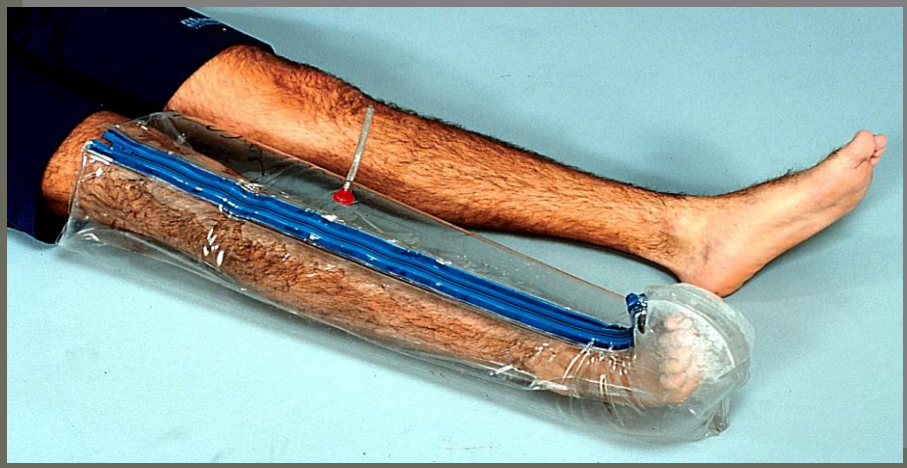
ANATOMICAL SPLINTS

- Readily available
- Use the casualty's body as splint
- Examples
  - Strap legs together
  - Secure arm to body
  - Tape fingers together

MANUFACTURED SPLINTS

- Designed for specific injuries & applications
- Examples in AMAL 635:
  - Thomas Half-Ring Telescopic Splint
  - Pneumatic “air” Splint





BANDAGES IN SPLINTING

- Used to bind or wrap a body part
- Hold splints in place
- Protect body part from further injury
- Examples:
  - Sling
  - Swathe

GENERAL RULES FOR SPLINTING

- Control hemorrhage (Dressing/Bandage)
- Expose fracture site
- Establish distal pulse
- Exposed bone
  - Cover ends with sterile dressing
- Splint in position found

GENERAL RULES FOR SPLINTING

- Attempt to straighten closed fx ONLY if there is no pulse
- DO NOT retract exposed bone (Open Fractures)
- Immobilize above and below fracture
- Reassess pulse after splinting
- When in doubt SPLINT!!
- TACEVAC as needed

TECHNIQUES FOR SPLINTING

JAW FRACTURES

- Apply Modified Barton splint
- Designed to pull lower jaw forward
- Support on head, not neck
- Do not lay patient on their back

CLAVICLE FRACTURES

- Immobilize with Figure 8 bandage
- Use sling and swathe




HUMERUS FRACTURES

- Upper arm near shoulder
  - Place pad in arm pit
  - Bandage to body

- Middle of upper arm
  - Use splint on outside of arm
  - Secure to body
  - Support with sling

FOREARM FRACTURES

- If only one bone is broken
  - You may use other bone as splint
- Apply two splints above and below forearm
- Cover from wrist to elbow
- Support with sling

WRIST/HAND FRACTURES

- Splint in position of function
- Leave fingers exposed
- Support with sling

RIB FRACTURES

- Assess ABCs
- Single fx
  - Immobilize using arm
  - Sling and secure with bandage

- Mulitiple fx
  - Immobilize flail segment with tape

PELVIC FRACTURES

- Position of comfort (knees bent or straight)
- Pillow or padding between legs
- Wrap sheet around pelvis
- Tie knees and ankles together

FEMUR FRACTURES

- Use anatomical splint
- Splint in 4 places
  - Above/below fx
  - Above/below knees
  - Around feet

- Consider traction splint for mid-shaft fx

PATELLAR FRACTURES

- Position of comfort
- Place splint underneath leg
-
- Padding under knee
- Immobilize in four places
  - Around thigh
  - Above/below knee
  - Around ankle

LOWER LEG FRACTURES

- If only one bone is broken
  - You may use the other to splint

- Utilize stirrup with SAM splint

ANKLE/FOOT FRACTURES

- Wearing boots
  - Use Figure 8 with cravat

- No boots
  - Wrap ankle with bandage or ace wrap
  - Use Figure 8 to secure ankles

SPINAL FRACTURES

- Indications
  - MV accident, Fall (2-3x height), blunt trauma
- Immobilize from head to toe
  - Spine board if available
- Use C-collar for neck
- Maintain & monitor ABCs

MANAGE HEAD, NECK AND FACE INJURIES

OVERVIEW

- Anatomy of the Head
- Types of Head Injuries
- Treatment of Head Injuries
- Anatomy of the Neck
- Types of Neck Injuries
- Treatment of Neck Injuries
- Anatomy of the Face
- Types of Facial Injuries
- Treatment of Facial Injuries

LEARNING OBJECTIVES

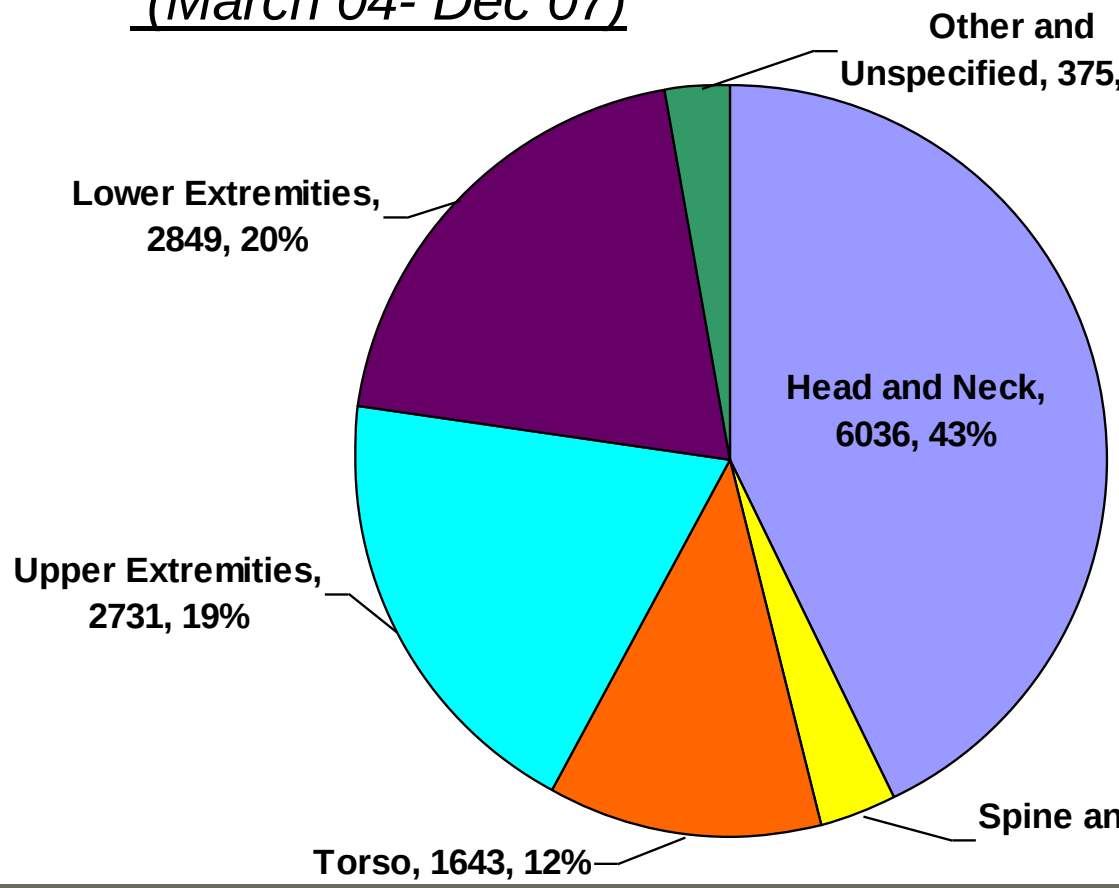
Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives

Number of Injuries by Body Region (March 04- Dec 07)



3,817 Patients

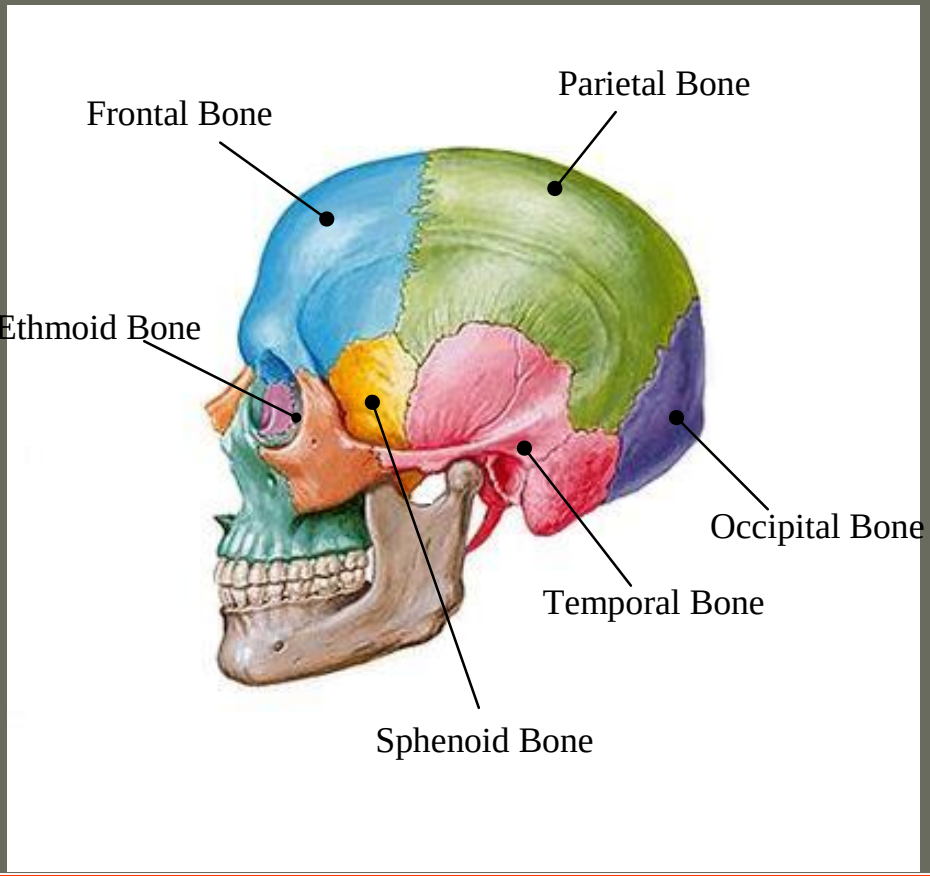
This does include TBI.

ANATOMY

ANATOMY

Cranial Vault – part of the skull that contains the brain

- Occipital
- Temporal
- Parietal
- Frontal
- Sphenoid
- Ethmoid



ANATOMY

- Major areas of the brain:
  - Cerebrum
  - Cerebellum
  - Brain Stem
    - Medulla
    - Pons
    - Midbrain
    - Reticular Activating System

TYPES OF HEAD INJURIES

TYPES OF HEAD INJURIES

SOFT TISSUE INJURIES

- Injury to overlying skin of scalp
- May be combined with other injury

CAUSES

- Penetrating trauma
- Blunt trauma

TYPES OF HEAD INJURIES

SIGNS & SYMPTOMS OF SOFT TISSUE INJURIES:

- Obvious injury
- Profuse bleeding
- Pain
- Anxiety
- Edema
- Ecchymosis
- Signs / symptoms of hypovolemic shock

TYPES OF HEAD INJURIES

SKULL INJURIES

– Open Skull Injury

– Closed Skull Injury

Injury From Landmine

TYPES OF HEAD INJURIES

Open Skull Injury

Injury where cerebral substance is visible through a scalp laceration.

The brain may be relatively untouched, or it may be extensively bruised or lacerated.

Causes

- Penetrating trauma
- Blunt trauma

TYPES OF HEAD INJURIES

SIGNS & SYMPTOMS OF OPEN SKULL INJURIES:

- Profuse bleeding
- Crepitus
- Edema
- Depressions
- Deformities
- Visualization of skull or bony fragments

TYPES OF HEAD INJURIES

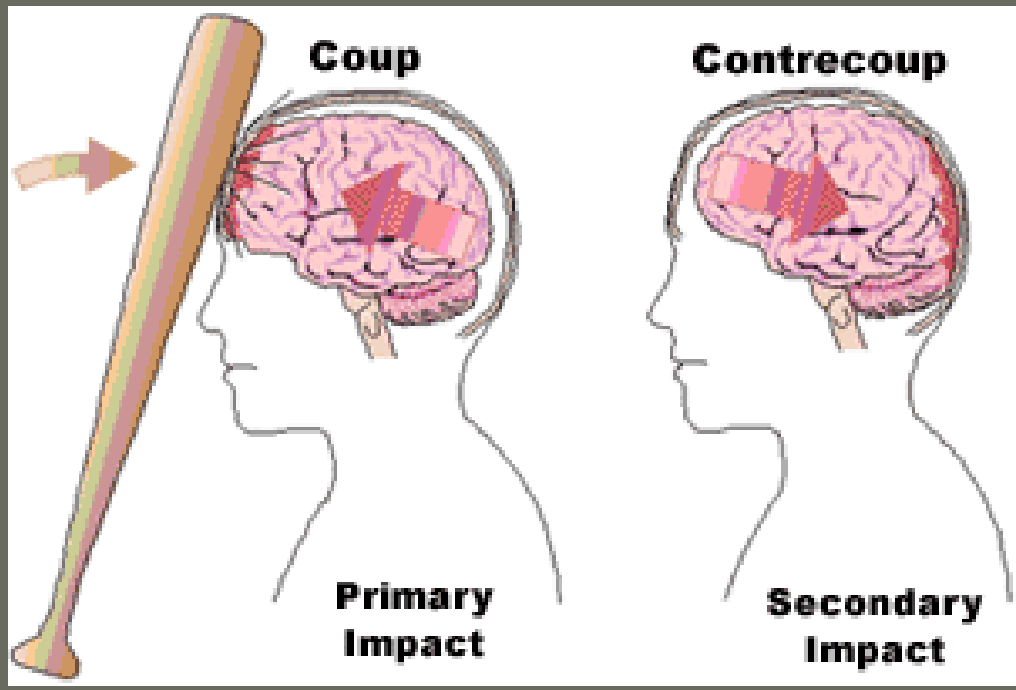
CLOSED SKULL INJURIES

- May or May NOT have scalp lacerations
- Skull is intact with no opening to the brain
- Brain Injury may be MORE extensive in closed head injuries due to pressure build up

TYPES OF HEAD INJURIES

CAUSES CLOSED SKULL INJURIES

- Coup-Countercoup
- Traumatic Brain Injury (TBI)
- Rising intracranial pressure produces complications because the brain is enclosed a rigid box



TYPES OF HEAD INJURIES

S/S OF CLOSED SKULL INJURIES:

- Crepitus around injury
- Headache
- Altered LOC
- Bruising..Raccoon Eyes, Battle's sign
- Bradycardia
- Increased SBP
- Nausea / Vomiting
- Decreased Respiration
- Deformity of the skull

TYPES OF HEAD INJURIES

BRAIN INJURIES

-Results from contusion, hemorrhage, and/or edema

-May occur with or without lacerations/fractures

CAUSES

- Blunt or penetrating trauma
- Coup-Countercoup injuries

TYPES OF HEAD INJURIES

S/S OF BRAIN INJURIES:

- All signs and symptoms of closed skull injuries
- Unusual behavior (#1 indicator)
- Altered LOC
- Paralysis
- Convulsions/seizures
- Hyperthermia

LEVEL OF CONSCIOUSNESS

The Glasgow Coma Scale

Eye Opening	
Spontaneous eye opening	4
Eye opening on command	3
Eye opening to painful stimulus	2
No Eye opening	1
Best Verbal Response	
Answers appropriately (oriented)	5
Gives confused answers	4
Inappropriate responses	3
Makes unintelligible noises	2
Makes no verbal response	1
Best Motor Response	
Follows command	6
Localizes painful stimuli	5
Withdrawal to pain	4
Responds with abnormal flexion to painful stimuli (decorticate)	3
Responds with abnormal extension to pain (decerebrate)	2
Gives no motor response	1
	Total _____

TREATMENT OF HEAD INJURIES

TREATMENT OF HEAD INJURIES

- Maintain airway
- C-Spine precautions
- Hemorrhage control
- Fluid resuscitation PRN
- Check for CSF drainage
- NPO
- TACEVAC in high Fowlers
- Do NOT give pain medications

ANATOMY OF THE NECK

ANATOMY OF THE NECK

Structures

- Esophagus
- Trachea
- Thyroid gland
- Larynx
- Pharynx
- Epiglottis

ANATOMY OF THE NECK

Vasculature

- Arteries – Carry oxygenated blood to the brain
- Veins – Carry blood away from the brain

Cervical Spine

- Vertebrae
- Spinal cord

TYPES OF NECK INJURIES

TYPES OF NECK INJURIES

Structures

- Injury to the associated anatomy of the neck

Causes

- Blunt Trauma
- Penetrating Trauma

STAB WOUND TO NECK / TRACHEA

TYPES OF NECK INJURIES

S/S of Structure Injuries:

- Subcutaneous emphysema
- Hematemesis
- Hemoptysis
- Dysphagia
- Dyspnea
- Hoarseness
- Deformity

TYPES OF NECK INJURIES

Vasculature

- Injury to the carotid arteries and/or jugular veins

Causes

Blunt Trauma

Penetrating Trauma

TYPES OF NECK INJURIES

S/S of Vasculature Injuries:

- Hemorrhage
- Hemoptysis
- Hematemesis

TYPES OF NECK INJURIES

Cervical Spine

Injury to the cervical vertebrae, may result in irreversible spinal cord injury

Causes

Compression injury

Flexion (bending too far forward or backward)

Lateral bending

TYPES OF NECK INJURIES

S/S of Cervical Injuries:

- Deformity
- Head fixed in abnormal position
- Muscle spasms
- Parasthesia in the arms
- Pain
- Paralysis or other neural deficits

TREATMENT FOR NECK INJURIES

TREATMENT OF NECK INJURIES

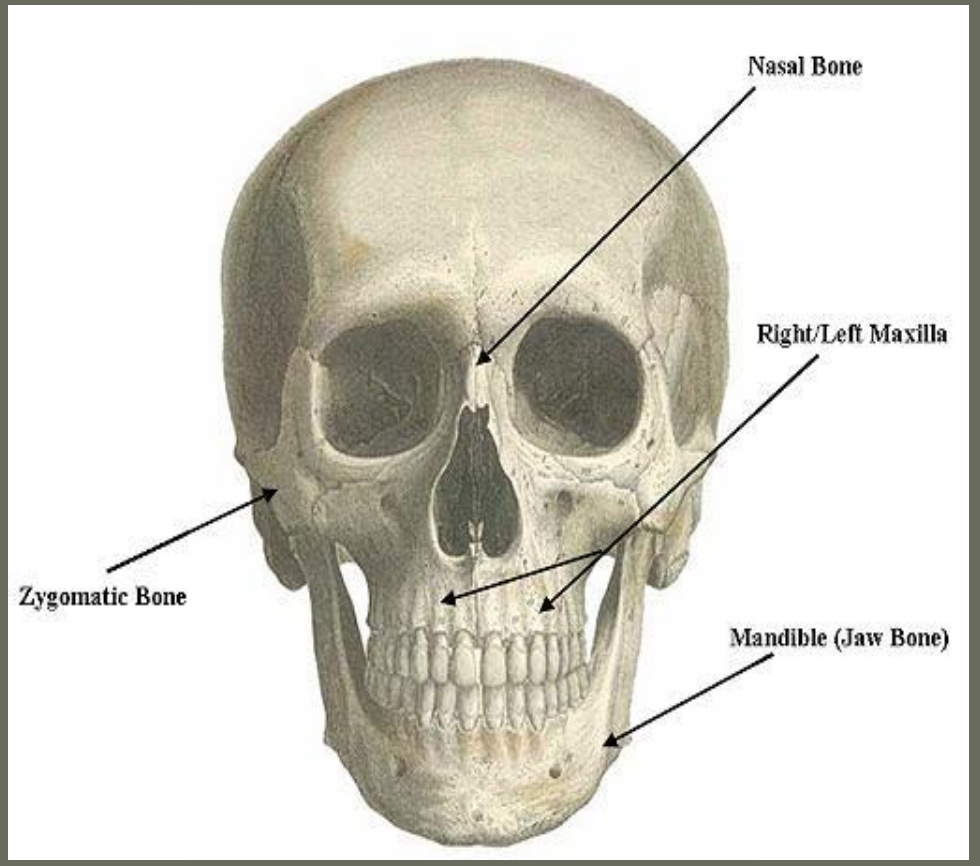
- C-Spine precautions (assume injury)
- Hemorrhage control
- Consider cricothyroidotomy for airway
- Fluid resuscitation
- NO PAIN MEDICATIONS
- TACEVAC

ANATOMY OF THE FACE

ANATOMY

Bones of the face:

- Nasal bone
- Zygomatic
- Maxillary bones
- Mandible



FACIAL INJURIES

FACIAL INJURIES

Soft Tissue Injuries

- Injury of the soft tissue with NO injury to the bone
- <u>Causes</u>

  Blunt Trauma

  Penetrating Trauma

FACIAL INJURIES

S/S of Soft Tissue Injuries:

- Massive hemorrhage
- Edema
- Laceration
- Ecchymosis
- Avulsion

FACIAL INJURIES

Bone Injuries

- Injuries around the face, mouth and jaw are serious because of closeness of airway

- <u>Causes</u>
  - Blunt Trauma
  - Penetrating Trauma

FACIAL INJURIES

S/S of Bone Injuries:

- Obvious injury (lacerated gums, unable to open mouth, misaligned teeth, etc)
- Difficulty swallowing
- Pain
- Edema/ecchymosis
- Facial asymmetry
- Epistaxis
- Lacerations
- Visual disturbances
- Limited occular movements
- Crepitus

FACIAL INJURIES

Eye Injuries

Causes

- Blunt Trauma
- Penetrating Trauma
- Burns
- Foreign Objects

FACIAL INJURIES

S/S of Eye Injuries

- Loss of vision
- Pain
- Anxiety
- Hemorrhage
- Subconjunctival hemorrhage
- Orbital bony deformity
- Intraorbital deformity

FACIAL INJURIES

SEPTAL HEMATOMA

(Rifle Butt)

Nasal Injuries

- Before controlling hemorrhage, it is important to determine if there is CSF present

- If CSF is present:

  Treat as skull fracture!!

TREATMENT OF FACIAL INJURIES

TREATMENT OF FACIAL INJURIES

Soft Tissue:

- Consider C-spine precautions
- Maintain airway
- Control hemorrhage
- Consider fluid resuscitation

TREATMENT OF FACIAL INJURIES

Bone Injuries:

- Maintain airway
- Control hemorrhage
- NO PAIN MEDS!
- Cold pack to injury
- Apply modified Barton bandage for mandibular fracture
- TACEVAC

TREATMENT OF FACIAL INJURIES

Eye Injuries

- In combat, only patch affected eye
- If the injury is clearly a *MINOR* one:

  REFRAIN FROM INTERFERENCE!!

Penetrating Eye Injuries

- Check casualties vision

- Cover eye immediately with a rigid eye shield – NOT a pressure patch.

- Have casualty take 400 mg moxifloxacin in his/her Combat Pill Pack

- Give IV/IM antibiotics if unable to take PO meds

TREATMENT OF FACIAL INJURIES

Eye Injuries

- **Chemical Burns**
  - **Copious amounts of water**
  - **TACEVAC**

TREATMENT OF FACIAL INJURIES

Eye Injuries

Thermal Burns

- Cover w/ loose dry dressing

Heat (flash) Injury (Welding without Dark Helmet)

TREATMENT OF FACIAL INJURIES

Impaled Objects

- Do NOT remove
- Pass dressing over object
- Cushion object

TREATMENT OF FACIAL INJURIES

Eyelid Laceration

- Direct pressure

Eyeball Laceration

- No pressure
- Cover with dressing

Eyelid Laceration (Dog bite)

Protruding Globe

- Do NOT place eye back into socket
- Apply bulky moist dressing around eye and a cup to secure eyeball

TREATMENT OF FACIAL INJURIES

Nose Injuries

Control Hemorrhage

- Pinch nostrils, do not tilt head back

Apply Ice

Padded splint

- Cotton/gauze rolls to each side
- Tape lightly

Monitor and TACEVAC

DEMONSTRATION

PRACTICAL APPLICATION

MANAGE HEAD, NECK, & FACE INJURIES

TACTICAL FLUID RESUSCITATION

IV OVERVIEW

- Terminology
- Indications and Contraindications
- Types of Fluids
- Equipment Required
- Procedural Steps
- Complications

IO OVERVIEW

- IO Supplies
- FAST1 Sequence
- FAST1 Complications
- Fluids
- FAST1 Removal

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives

TERMINOLOGY

- Homeostasis
  - a balance within the body between all the chemical reactions
- Electrolyte
  - an element that when melted or dissolved in a solvent, disassociates into ions and is able to carry an electrical current
- Crystalloids
  - IV solution consisting mostly of sodium chloride and other electrolytes; volume expander

TERMINOLOGY

- Colloids
  - Large molecules such as proteins; hypertonic volume expanders
- Body Fluid Compartments
  - spaces in the body where fluids are distributed
- Isotonic
  - solution that triggers the least amount of water movement

TERMINOLOGY

- Hypotonic
  - solution that causes water to leave the vascular system and enter cells or surrounding tissues
- Hypertonic
  - solution that draws water from the surrounding cells and tissues back into the vascular system

INDICATIONS AND CONTRAINDICATIONS FOR PO FLUIDS

PO FLUIDS

- Indications
  - Normal level of consciousness
  - Ability to swallow
- Contraindications
  - Decreased Level of consciousness

INDICATIONS AND CONTRAINDICATIONS FOR IV THERAPY

INDICATIONS

- Indications
  - Uncontrolled hemorrhage
  - Diarrhea or vomiting
  - Unable to tolerate fluids PO
  - To give IV meds
  - Burns
- Contraindication
  - Absence of signs and symptoms of above

TYPES OF IV SOLUTIONS

TYPES OF IV SOLUTIONS

- Crystalloids
- Water and Glucose
- Colloids
- Whole Blood

TYPES OF IV SOLUTIONS

- CRYSTALLOIDS
  - Effective for short term volume replacement
  - Does NOT have oxygen carrying capacity
  - Does NOT contain proteins
  - After 1 hour administered, only 1/3 remains in cardiovascular system
  - Most common crystalloids
    - Normal Saline (NS)
    - Lactated Ringers (LR)

CRYSTALLOIDS

- Indications
  - NS and LR are safe for most situations
  - Acceptable alternate to Hextend if not available
- Contraindications/Precautions
  - ALWAYS consider the risk of fluid volume overload
  - Excessive infusion may cause electrolyte imbalances

TYPES OF IV SOLUTIONS

- WATER AND GLUCOSE SOLUTIONS
  - Hypotonic solutions
  - Most common concentrations:
    - D5W
    - D50W

WATER AND GLUCOSE

- Indications
  - D5W – fluid replacement and caloric supplementation
  - D50W – for adults with hypoglycemic emergencies
- Contraindications
  - Do NOT use in head injuries
  - Do NOT use in massive tissue injuries
  - Will cause cellular swelling

TYPES OF IV SOLUTIONS

- COLLOIDS AND PLASMA SUBSTITUTES
  - Hypertonic
  - Hextend (Fluid of choice for volume replacement in tactical situation)
  - Used to increase B/P
  - Possible increased bleeding time
  - Do NOT use more than 1000cc

TYPES OF IV SOLUTIONS

- WHOLE BLOOD
  - Not readily available in combat
  - MUST be ordered by a Medical Officer
  - Indications:
    - Acute massive blood loss

IV THERAPY EQUIPMENT

EQUIPMENT REQUIRED

PROCEDURAL STEPS

PROCEDURAL STEPS

- Make your decision
- Assemble and check gear
- Prepare the administration set
- Prepare patient
- Select vein
- Insert IV
- Connect tubing
- Secure IV and start fluids

COMPLICATIONS OF IV THERAPY

INFILTRATION

- Escape of fluid from vein into tissue when catheter dislodges from the vein

- Symptoms
  - Edema
  - Localized pain or discomfort
  - Coolness to touch at the
  - Blanching of the site
  - IV flow slows or stops

INFILTRATION

- Treatment
  - Discontinue IV
  - Select an alternate site
  - Apply a warm compress to the affected area
  - Elevate the limb

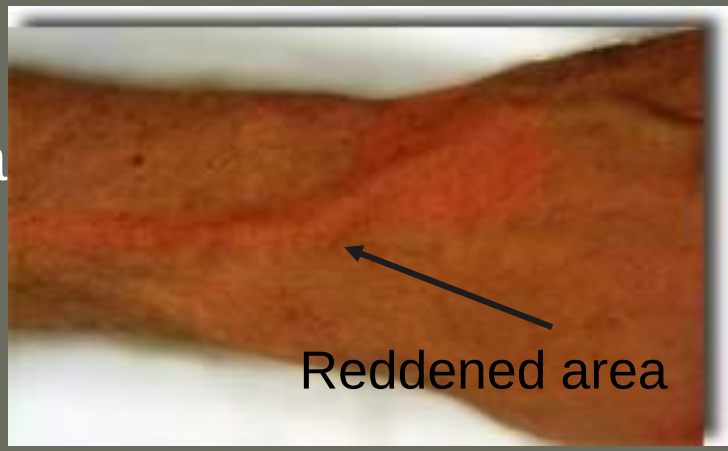
- Prevention
  - Secure the catheter properly
  - Limit movement of the limb

PHLEBITIS

- Inflammation of a vein due to bacterial, chemical or mechanical irritation
- Symptoms
  - Pain along the course of the vein
  - Redness appears as a streak above vein and above the IV site
  - Warm to the touch
  - Vein feels hard or cordlike

PHLEBITIS

- Treatment
  - Discontinue IV
  - Warm compress to affected area
  - Antibiotics
- Prevention
  - Ensure aseptic technique
  - Place date/time when catheter was inserted on the tape
  - Rotate infusion sites based on local policies (usually every 72 hours)



NERVE DAMAGE

- Results from arm secured tightly, compressing nerves
- Symptoms
  - Numbness of fingers and hand
- Treatment
  - Reposition and loosen arm board
- Prevention
  - Ensure tape is not applied to tightly

CIRCULATORY OVERLOAD

- Increased fluid volume leading to heart failure and pulmonary edema.
- Results from infusing too much IV fluid too rapidly
- Symptoms
  - Headache
  - Venous distention
  - Dyspnea
  - Increased blood pressure
  - Cyanosis
  - Anxiety
  - Pulmonary Edema

CIRCULATORY OVERLOAD

- Treatment
  - Slow down the flow rate
  - Place patient in high fowlers position (sitting position)

- Prevention
  - Monitor and control flow rate

AIR EMBOLISM

- Air introduced into the blood through the IV tubing

- Symptoms
  - Cyanosis
  - Hypotension
  - Weak and rapid pulse
  - Shortness of breath
  - Tachypnea

AIR EMBOLISM

- Treatment
  - Place patient on left side in Trendelenburg
  - Administer oxygen
  - Notify Medical Officer
  - Monitor vital signs

- Prevention
  - Flush IV line thoroughly to remove air prior to insertion
  - Monitor tubing during therapy
  - Avoid introducing air through a syringe or extension tubing

SYSTEMIC INFECTION

- Caused by poor aseptic technique or contaminated equipment

- Symptoms
  - Sudden rise in temperature and pulse
  - Chills and shaking
  - Blood pressure changes

SYSTEMIC INFECTION

- Treatment
  - Look for other sources of infection
  - DC IV and restart in other limb
  - Notify MO and anticipate antibiotic treatment

- Prevention
  - Ensure aseptic technique when starting IV
  - Place date/time when catheter was inserted
  - Rotate infusion sites based on local policies (usually every 72 hours)

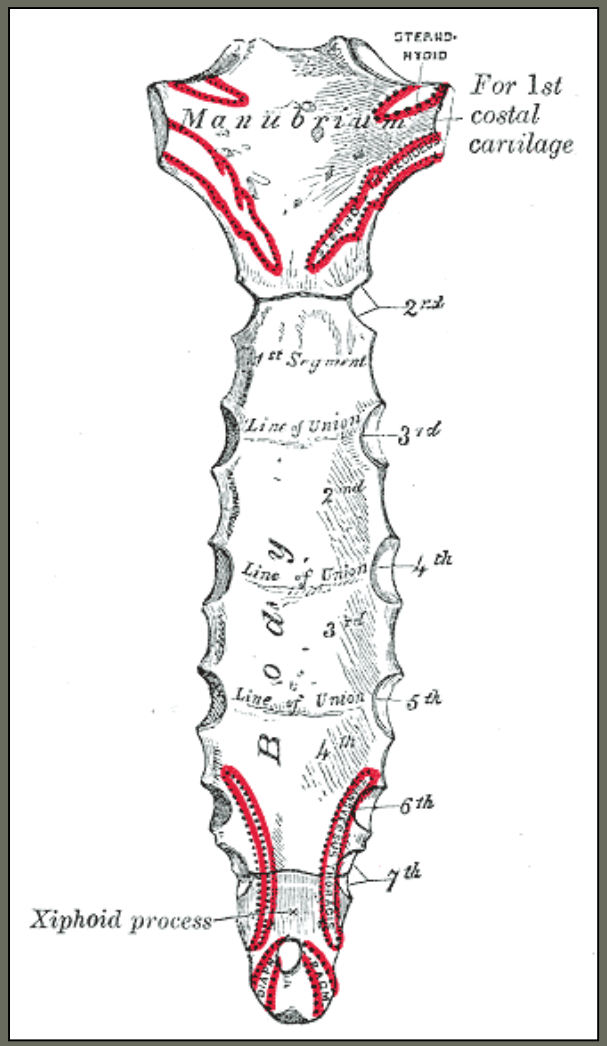
INTRAOSSEOUS INFUSION

IO INFUSION

- Offers an alternate route for fluids
- Not meant to replace IV
- Used when IV access cannot be obtained
- Quick, reliable vascular access
- Fluids that can go IV can go IO

ANATOMY

- Manubrium
- Body
- Xiphoid Process
- Jugular Notch



IO SUPPLIES
FAST1 KIT

FAST1 COMPONENTS

- First Access for Shock and Trauma (FAST1)

- Target/Strain Relief Patch
  - Match notch with sternal notch
  - Must be midline
  - Circular hole indicates target for IO

FAST1 COMPONENTS

- Introducer
  - Hand held
  - NOT spring loaded
  - Depth control mechanism prevents over or under penetrating bone

FAST1 COMPONENTS

- Infusion Tube
  - Tube that sits inside the bone
  - Flexible

Quarter shown to illustrate size of tube

FAST1 COMPONENTS

- Protector Dome
  - Fits over Target/Strain Relief Patch
  - Velcro fastened
  - Covers and protects

FAST1 COMPONENTS

- Sharps Protection
  - Covered before use
  - Replace after use for additional protection

- Remover
  - Enables Infusion Tube to be removed

PROCEDURAL STEPS FOR FAST1 INITIATION

FAST1 PROCEDURAL STEPS

- Use aseptic technique
- Align with jugular notch and verify midline
- Place Introducer over target area
- Press down using continuous pressure
- Pull Introducer straight back
- Connect tubing
- Place Dome over patch
- Start fluids
- Attach Remover package to patient

FAST1 PROCEDURAL STEPS

- Do NOT pull back and re-push
- Do NOT use extreme force
- Insert Introducer perpendicular to sternum
- Ensure Remover package goes with casualty during TACEVAC

POTENTIAL COMPLICATIONS OF FAST1 INSERTION

COMPLICATIONS AND TREATMENT

- Sternal notch cannot be located
  - Abort procedure
- Patch incorrectly placed
  - Remove and reposition
- Patch will not stick
  - Shave or tape it down

COMPLICATIONS AND TREATMENT

- Introducer doesn't release
  - Re-attempt with new FAST1
- Introducer doesn't release with force
  - Check angle of insertion or the patient has hard bones
- Infusion tube falls out
  - Re-attempt with a new FAST1
-

COMPLICATIONS AND TREATMENT

- Low or no flow through Infusion tube
  - Check for kinks, attempt to flush line
- Leakage at insertion site
  - Sometimes occurs and is acceptable

HOW MUCH FLUID AND WHAT TYPE?

HOW MUCH?

- Give 500 cc's of Hextend to shock casualty. If no improvement, give 500 cc more.

- Do NOT give more than 1000 cc

WHAT TYPE?

- Hextend is the fluid of choice in a tactical situation!
  - Thicker, stays in vascular system longer
  - Smaller, lighter, easier to carry
- No Hextend? Give LR or NS
- Minimal Fluid Resuscitation
  - Give enough fluid to return radial pulse

DEMONSTRATION

PRACTICAL APPLICATION

TACTICAL FLUID RESUSCITATION

PERFORM CASUALTY ASSESSMENT

OVERVIEW

- Purpose of Casualty Assessment
- Care Under Fire
- Tactical Field Care
- Tactical Evacuation Care

LEARNING OBJECTIVES

Please Read Your

Terminal Learning Objectives

And

Enabling Learning Objectives

PURPOSE OF CASUALTY ASSESSMENT

CASUALTY ASSESSMENT

- A systematic process for assessment of a trauma casualty
- Essential for identifying and treating life-threatening conditions
- Determines priorities of care based on assessment findings
  - Use the MARCH algorithm

CASUALTY ASSESSMENT

- M – Massive Hemorrhage Management
- A – Airway Management
- R – Respiratory Management
- C – Circulatory Management
- H – Head Trauma/Hypothermia Management

CASUALTY ASSESSMENT

- Three phases of Tactical Combat Casualty Care (TCCC)
  - Care Under Fire
  - Tactical Field Care
  - Tactical Evacuation (TACEVAC) Care

CARE UNDER FIRE

CARE UNDER FIRE

- First step in saving a casualty is to *control the tactical situation*.
- Suppress hostile fire
- Move the casualty to a safe position
- “The best medicine on the battlefield is fire superiority”

CARE UNDER FIRE

- Develop a rescue plan if a casualty is responsive but unable to move.
  - Potential risks to rescuers
  - Assets
  - Understand roles
  - Airway management deferred temporarily
- ONLY extremity ***life-threatening bleeding*** warrants any intervention during Care Under Fire!

TACTICAL FIELD CARE

TACTICAL FIELD CARE

- The Corpsman and the casualty are no longer under hostile fire OR an injury has occurred, but hostile fire has not been encountered.
- More in-depth evaluation and treatment of the casualty.
- Focus on conditions not addressed during Care Under Fire phase.
- Casualties who show signs of altered mental status should be disarmed immediately.

TACTICAL FIELD CARE

- Massive bleeding assessment/treatment
  - Combat gauze for neck/high groin/high axillary wounds
  - Any wounds previously missed on the “X”
- Reassess tourniquet if placed during CUF

Airway

- Casualties that can talk, scream, or yell are presumed to have a patent airway
  - For unconscious patients use:
    - Chin lift
    - Jaw thrust
  - Inspect the airway for obstructions and clear them with a finger sweep
    - NO “blind” finger sweeps
  - Insert NPA
  - Reassess any interventions performed

TACTICAL FIELD CARE

Respiratory Management

- Rule out thoracic wounds
- Expose the chest, sweep for injuries
- Log roll, assess the back
  - High axillary and shoulder areas are at greater risk
- Apply an occlusive dressing, perform needle thoracentesis if warranted

TACTICAL FIELD CARE

REASSESS AFTER ANY MOVEMENT OF CASUALTY!!

I LOC ABCs

- I – Interventions
- LOC – Level of consciousness
- ABCs – Airway, Breathing, Circulation

Circulatory Management

- Assess for presence of carotid pulse
- BLOOD SWEEP
- Assess for bilateral radial pulses
- Estimate palpated blood pressure
- Peripheral perfusion
  - color, temp, condition, capillary refill

Consider Fluid Resuscitation

- If NOT in shock: NO IV fluids, PO fluids if conscious
- If in shock: Hextend 500 mL bolus
  - Titrate to radial pulses to maintain a systolic of 80
- Use IV or IO to administer fluids based on access

Full Body Assessment

- DCAP-BTLS of the entire body
  - Treat any and all injuries as you find them
- Assess for the possibility of tourniquet conversion
  - Use a pressure dressing or hemostatic agent as appropriate

TACTICAL FIELD CARE

Hypothermia Prevention/Management

- Remove or replace wet clothing
- Use a Blizzard Rescue Blanket
- Unless prohibited by wounds, cover the head
- Beware – Trauma Triad of Death!

Head Trauma

- Leave helmet on if possible
- ENT
  - PERRLA-EOMI, blood, CSF

TACTICAL FIELD CARE

Pain Management

- Conscious casualties who remain in the fight:
  - Mobic and Tylenol Bi-layer caplet
- Out of the fight, but no need for an IV:
  - Oral Transmucosal Fentanyl Citrate
- Out of the fight and need an IV/IO:
  - Morphine
- Narcan available
- Promethazine to counteract nausea

Antibiotics

- Can tolerate oral medications:
  - Moxifloxacin
- Cannot tolerate oral medications:
  - Cefotetan or Ertapenum

TACTICAL EVACUATION CARE

TACTICAL EVACUATION CARE

- Factors
  - Casualty Movement
  - Torso Trauma
    - Low O_2 saturation
    - Lower air pressure at altitude
  - Management and Prevention of Hypothermia

TACTICAL EVACUATION CARE

- Document
  - Wounds
  - Treatments
  - Responses
- Vital Signs
  - Pulse, respirations, B/P, SPO_2
- Reassess Constantly

TACTICAL EVACUATION CARE

- ZMIST Report
  - Zap Number
  - Mechanism of Injury
  - Injuries sustained
  - Signs & Symptoms
  - Treatment rendered

DEMONSTRATION

PRACTICAL APPLICATION

PERFORM CASUALTY ASSESSMENT

MANAGEMENT OF PAIN

OVERVIEW

- Pain Relief
- Antibiotics

Learning Objectives

There are NO Learning Objectives associated with this lesson, therefore this information is NON-testable.

For Your Enhanced Warfighter Knowledge Only

Pain Management

Pain Relief

- The CoTCCC has recently reviewed and updated their pain management protocol

- The choice of medications to be used is based on the needs each individual casualty, and the tactical situation

Background

- IM Morphine has received criticism, but remains most commonly used analgesic

- Offers easy administration, but a well-known side effect profile
  - High incidence of addiction
  - Limited effectiveness due to delayed onset
  - Hypotension
  - Increased intracranial pressure
  - Acute respiratory depression

Background

- Ketamine is a highly lipid soluble
  - Clinical effects present within 1 min IV/IO, 5 min IM/IN
  - Does NOT impair airway/spontaneous respirations
  - INCREASES blood pressure and heart rate

- Side Effects:
  - Laryngospasm
  - Emergence reaction (spontaneous utterances, purposeless motions)

- NOT advised for casualties with suspected TBI/increased IOP

Mild to Moderate Pain:

Casualty *IS* still able to fight (self administration)

Pain Relief

Mobic (meloxicam)

- NSAID, 15mg PO once a day
- Part of combat pill pack
- Long duration
- Does NOT interfere with clotting abilities

Pain Relief

Tylenol (acetaminophen)

- Analgesic/Antipyretic, 2 650mg PO, q8h
- Intended for use with Mobic
- Quick acting
- Given to casualties still able to fight for pain relief

Moderate to Severe Pain:

Casualty *NOT* in shock or respiratory distress *AND* casualty *NOT* at risk of developing either condition

Pain Relief

Oral Transmucosal Fentanyl Citrate (OTFC)

- Opiod (narcotic), 800ug
- “Lozenge-on-a-stick”
- Rapid onset, without IV access
- Placed between cheek and gum (transbucal)

Moderate to Severe Pain:

Casualty *IS* in shock or respiratory distress *OR* casualty *IS* at risk of developing either condition

Pain Relief

Ketamine

- 50mg IM/IN
  - Repeat q30 mins PRN

OR

- 20mg slow IV/IO
  - Repeat q20 mins PRN

- Control of pain/development of nystagmus

Pain Relief

Phenergan (promethazine)

- Neuroleptic/antihistimine, 25 mg IV/IO/IM q6h PRN
- Strong sedative and antiemetic properties
- Aids in controlling post-narcotic nausea/vomiting

Antibiotics

Antibiotics

IF *Able* to Take PO

- Avelox (moxifloxacin), 400mg PO once a day
- Synthetic fluoroquinolone
- Should NOT be used in pediatric or pregnant patients, or those known to have diabetes

Antibiotics

IF *Unable* to Take PO

- Cefotan (cefotetan)
  - 2g IV/IO, slow push over 3-5 mins

  OR
  - 2g IM q12h

- Injectable cephamycin

- NOT to be used on patients with allergies to cephalosporin medication group

Antibiotics

IF *Unable* to Take PO (continued)

- Invanz (ertapenum), 1g IV/IO/IM once a day
- Alternative to cefotetan if allergic/non-available
- Carbapenum antibiotic

Points of Interest

- Ultimate authority of medication use is unit-dependent
- Use extreme caution when administering ANY medication
- Documentation for turnover is a MUST

MANAGEMENT OF PAIN