Tactical Combat Casualty Care for Medical Personnel
August 2017

(Based on TCCC-MP Guidelines 170131)

Tactical Field Care #1

OBJECTIVES

- **STATE** the common causes of altered states of consciousness on the battlefield.
- **STATE** why a casualty with an altered state of consciousness should be disarmed.
- **DESCRIBE** the progressive strategy for controlling hemorrhage in tactical field care.
- **DEMONSTRATE** the correct application of a CoTCCC-recommended hemostatic dressing.

OBJECTIVES

- **DEMONSTRATE** the correct application of a CoTCCC-recommended junctional tourniquet.
- **DESCRIBE** airway control techniques and devices appropriate to the Tactical Field Care phase.
- **DEMONSTRATE** the recommended procedure for surgical cricothyroidotomy.

OBJECTIVES

- **LIST** the criteria for the diagnosis of tension pneumothorax on the battlefield.
- **DESCRIBE** the diagnosis and initial treatment of tension pneumothorax on the battlefield.
- **DEMONSTRATE** the appropriate procedure for needle decompression of the chest.

OBJECTIVES

- **DESCRIBE** the appropriate use of pulse oximetry in pre-hospital combat casualty care.
- **STATE** the pitfalls associated with interpretation of pulse oximeter readings.

Tactical Field Care

- Distinguished from Care Under Fire by:
  - A reduced level of hazard from hostile fire
  - More time available to provide care based on the tactical situation
- Medical gear is still limited to that carried by the medic or corpsman or unit members (may include gear in tactical vehicles)

Tactical Field Care

- May consist of rapid treatment of the most serious wounds with the expectation of a re-engagement with hostile forces at any moment, ***or***
- There may be ample time to render whatever care is possible in the field.
- Time to evacuation may vary from minutes to several hours or longer.

Battlefield Priorities in the Tactical Field Care Phase

- This section describes the recommended care to be provided in TFC.
- You must deal with your tactical situation and your casualties.
- The sequence of care in TFC is compatible with the MARCH algorithm found in the USSOCOM Tactical Trauma Protocols.

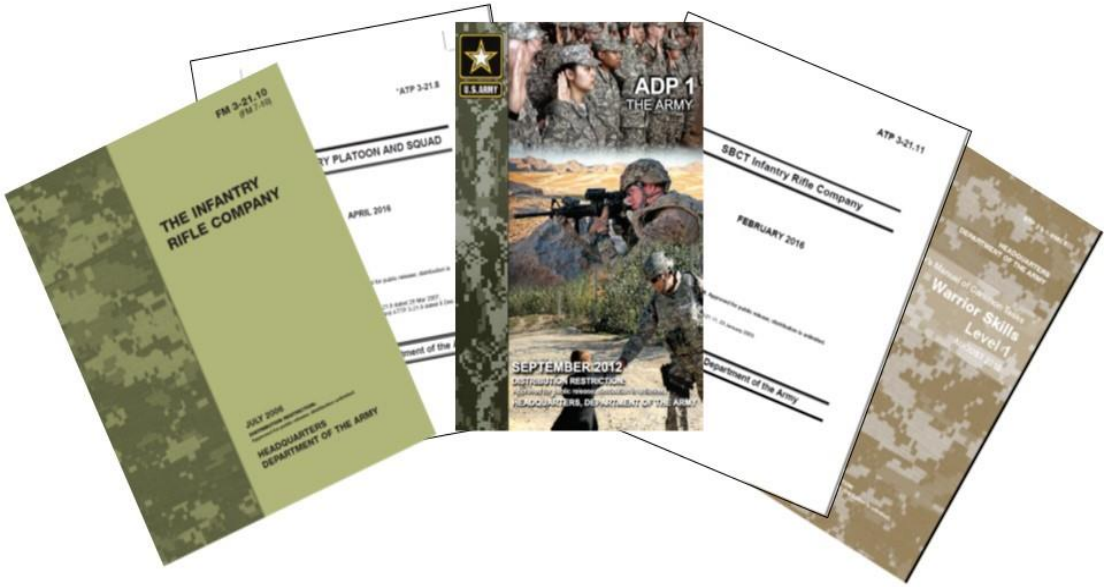
MARCH

- **M**assive hemorrhage – control life-threatening bleeding.
- **A**irway – establish and maintain a patent airway.
- **R**espiration – decompress suspected tension pneumothorax, seal open chest wounds, and support ventilation/oxygenation as required.

MARCH

- **C**irculation – establish IV/IO access and administer fluids as required to treat shock.
- **H**ead injury/**H**ypothermia – prevent/treat hypotension and hypoxia to prevent worsening of traumatic brain injury and prevent/treat hypothermia.

Tactical Field Care Guidelines



1. Establish a security perimeter in accordance with unit tactical standard operating procedures and/or battle drills. Maintain tactical situational awareness.

Tactical Field Care Guidelines

2. Triage casualties as required. Casualties with an altered mental status should have weapons and communications equipment taken away immediately.

Manage Casualties with Altered Mental Status

- Combatants with an altered mental status may use their weapons or radios inappropriately.
- Secure long gun, pistols, knives, grenades, explosives, and all communications gear.
- Possible causes of altered mental status are Traumatic Brain Injury (TBI), shock, hypoxia, and pain medications.
- Say to the casualty: “Let Smith hold your weapon for you while I check you out.”

Tactical Field Care Guidelines

3. Massive Hemorrhage
   a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended limb tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet use or for any traumatic amputation. Apply directly to the skin 2-3 inches above the bleeding site. If bleeding is not controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.

Tourniquets: Points to Remember

- All unit members should have a CoTCCC-approved tourniquet at a standard location on their battle gear.
  - **It should be easily accessible if wounded – DO NOT bury it at the bottom of your pack**
- Tourniquets should be left in their protective packaging until needed to treat casualties.
  - Harsh environments may contribute to tourniquet failure if not left in packaging

Tourniquets: Points to Remember

- **Training tourniquets should never be used as mission tourniquets!**
- **Repetitive applications of a tourniquet may cause it to fail.**

Tourniquets: Points to Remember

- **When a tourniquet has been applied, DO NOT loosen it intermittently to allow circulation to return to the limb.**
  - **Causes unacceptable additional blood loss**
  - **This HAS happened in the past, and was responsible for at least one near fatality.**

Tactical Field Care Guidelines

3. Massive Hemorrhage (continued)

b. For compressible (external) hemorrhage not amenable to limb tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze as the CoTCCC hemostatic dressing of choice.

- Alternative hemostatic adjuncts:
  - Celox Gauze or
  - ChitoGauze or
  - XStat (Best for deep, narrow-tract junctional wounds)

Tactical Field Care Guidelines

3. Massive Hemorrhage

   b. (continued)

   - Hemostatic dressings should be applied with at least 3 minutes of direct pressure (optional for XStat). Each dressing works differently, so if one fails to control bleeding, it may be removed and a fresh dressing of the same type or a different type applied. (Note: XStat is not to be removed in the field, but additional XStat, other hemostatic adjuncts, or trauma dressings may be applied over it.)

Direct Pressure without a Hemostatic Dressing

- Can be used as a temporary measure.
- It works most of the time for external bleeding.
- It can stop even carotid and femoral bleeding.
- Bleeding control requires very firm pressure.
- **Don’t let up pressure to check the wound until you are prepared to control bleeding with a hemostatic agent or a tourniquet!**
- It is hard to use direct pressure alone to maintain control of big bleeders while moving the casualty.

CoTCCC-recommended Hemostatic Agents

CoTCCC-Recommended
Hemostatic Agents

Combat Gauze

Celox Gauze

ChitoGauze

Combat Gauze

- Tested in the ISR safety model
- Widely fielded in the DoD
- Case series from the battlefield and the civilian sector:
  - CG is effective at stopping bleeding
  - No safety issues reported
- Recommended by CoTCCC as first choice for hemostatic dressing

Alternative Hemostatic Agents

- ChitoGauze & Celox Gauze
  - May be used if Combat Gauze is not available
  - Active ingredient is chitosan, a mucoadhesive
    - Function is independent of coagulation cascade
    - There are case series that report that chitosan dressings have stopped bleeding in surgical patients with life-threatening bleeding and severe coagulopathy
    - Does not cause reactions in persons allergic to shellfish
  - Are as effective as Combat Gauze at hemorrhage control in laboratory studies

Alternative Hemostatic Agents

- Neither ChitoGauze nor Celox Gauze have been tested in the USAISR safety model, but
- Chitosan-based hemostatic dressings have been used in combat since 2004 with no safety issues reported.

Combat Gauze
NSN 6510-01-562-3325

- Combat Gauze is a 3-inch x 4-yard roll of sterile gauze impregnated with kaolin, a material that causes blood to clot.
- Found in lab studies and actual use to be safe and effective in controlling bleeding that would otherwise be fatal.

Combat Gauze Directions (1)
Expose Wound & Identify Bleeding

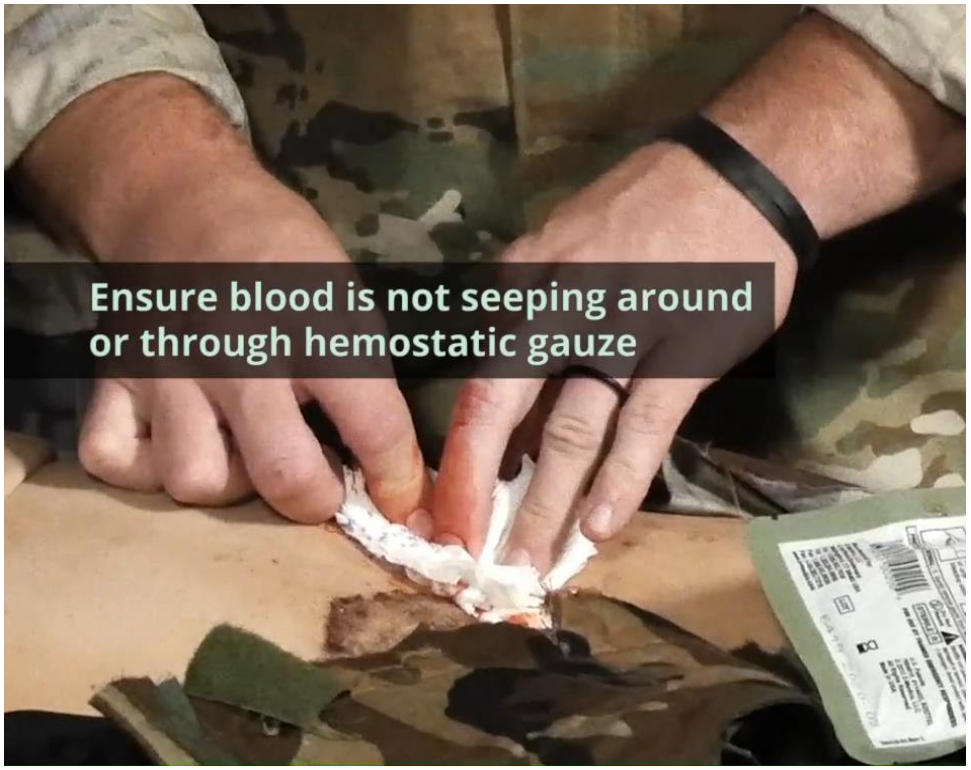
- Open clothing around the wound.
- If possible, remove excess pooled blood from the wound while preserving any clots already formed in the wound.
- Locate the source of the most active bleeding.

Combat Gauze Directions (2)
Pack Wound Completely

- Pack Combat Gauze tightly into the wound and directly onto the source of bleeding.
- More than one gauze may be required to stem blood flow.
- Combat Gauze may be re-packed or adjusted in the wound to ensure proper placement.

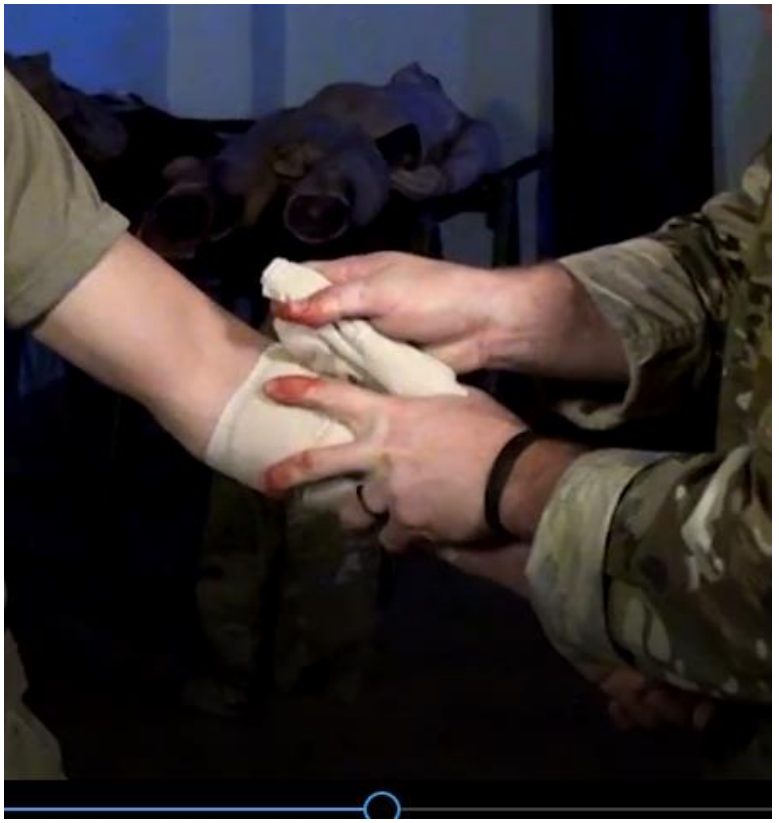
Combat Gauze Directions (3)
Apply Direct Pressure

- Quickly apply pressure until bleeding stops.
- **Hold continuous pressure for at least 3 minutes.**
- Reassess to ensure bleeding is controlled.
- Combat Gauze may be repacked or a second gauze used if initial application fails to provide hemostasis.



Combat Gauze Directions (4)
Bandage over Combat Gauze

- Leave effective Combat Gauze in place.
- Wrap pressure dressing to effectively secure the Combat Gauze on the bleeding site.



Although the Emergency Trauma Bandage is shown in this picture, the wound may be secured with any compression bandage, Ace wrap, roller gauze, or cravat.

Combat Gauze Directions (5)
Transport & Monitor Casualty

- **Reassess frequently to monitor for recurrent bleeding.**
- Evacuate casualty to next level of medical care as soon as possible.

Wound Packing with a Hemostatic Dressing

Link to Online Video


Questions?

Hemostatic Dressing Practical

XSTAT 12

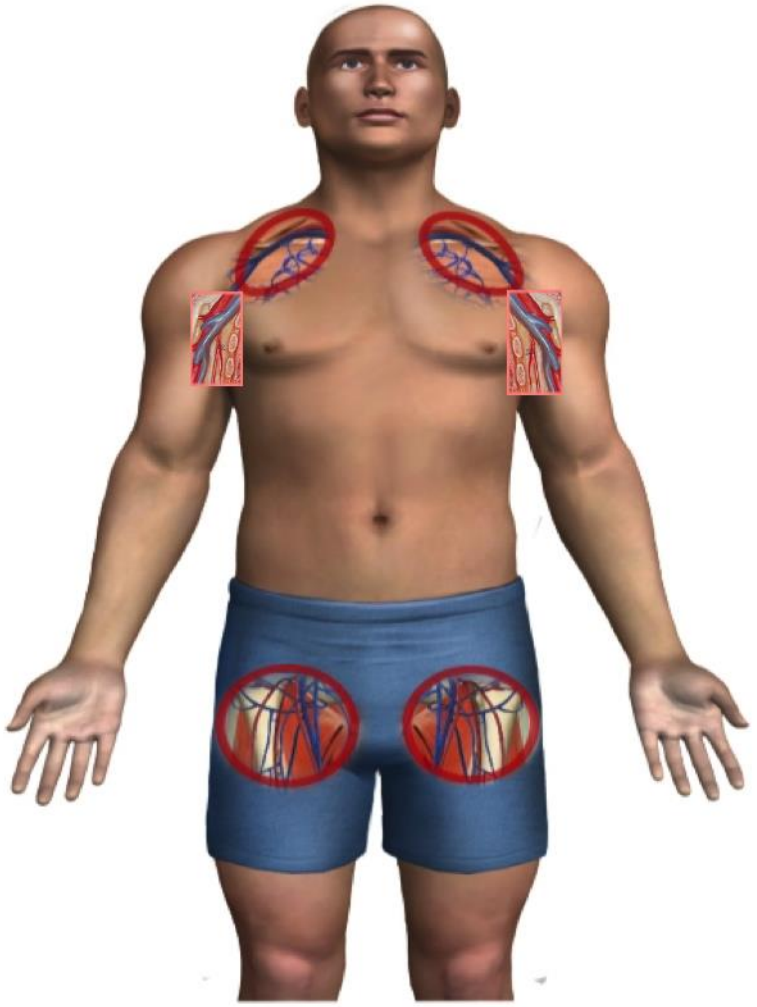
NSN 6510-01-657-4737

- First expanding wound dressing FDA-cleared for life-threatening junctional bleeding.
- Syringe-like applicator injects compressed minisponges into deep wounds.
- Minisponges rapidly expand on contact with blood – compressing the wound to stop bleeding.

RevMedx, 25999 SW Canyon Creek Road, Suite C, Wilsonville, OR 97070 wwww.revmedx.com

XSTAT 12 Indications For Use

XSTAT 12 is a hemostatic device for the control of severe, life-threatening bleeding from junctional wounds in the groin or axilla not amenable to tourniquet application in adults and adolescents.



XSTAT 12 Indications For Use

XSTAT 12 is a temporary device for use up to **four** hours until surgical care is acquired. It should only be used for patients at high risk for immediate life-threatening bleeding from hemodynamically significant, non-compressible junctional wounds when definitive care at an emergency care facility cannot be achieved within minutes.

XSTAT 12 is NOT indicated for use in: the thorax; the pleural cavity; the mediastinum; the abdomen; the retroperitoneal space; the sacral space; tissues above the inguinal ligament; or tissues above the clavicle.

XSTAT 12 Technical Characteristics

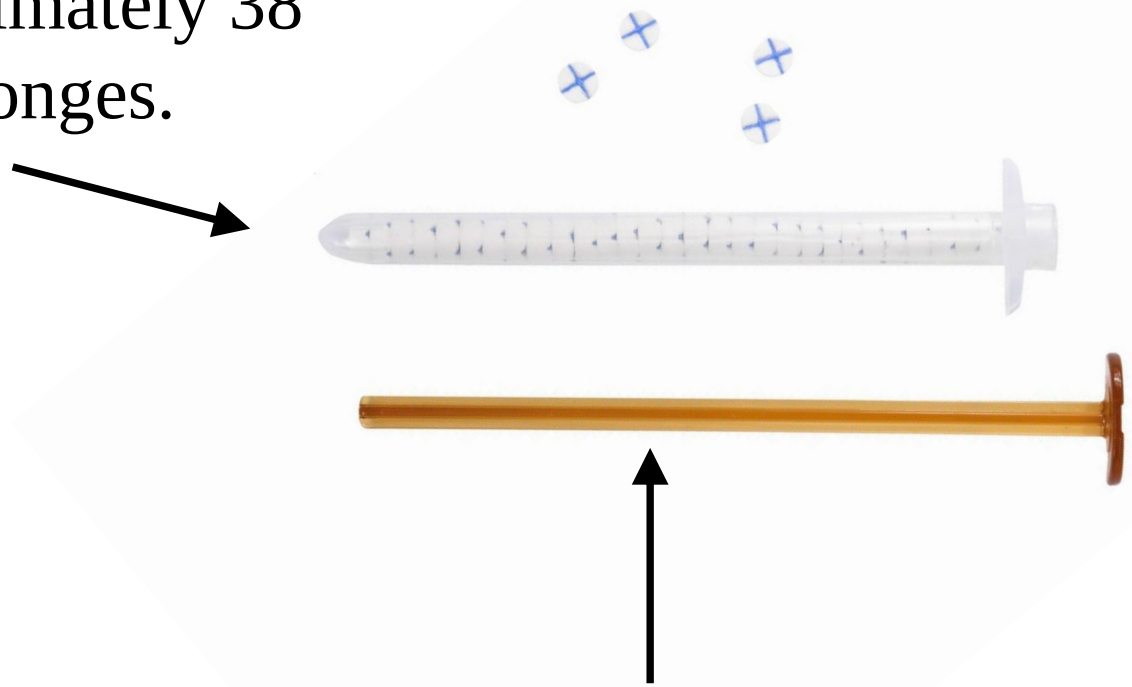
XSTAT 12 contains approximately 38 compressed minisponges.

Upon contact with blood, the minisponges absorb blood and, expand to 10 - 12 times their compressed volume within approximately 20 seconds.

A radiopaque marker is embedded into each of the minisponges to make them detectable by X-ray.

XSTAT 12 Applicator

Main body holds approximately 38 minisponges.



Plunger is inserted into applicator to deploy the minisponges into a wound.

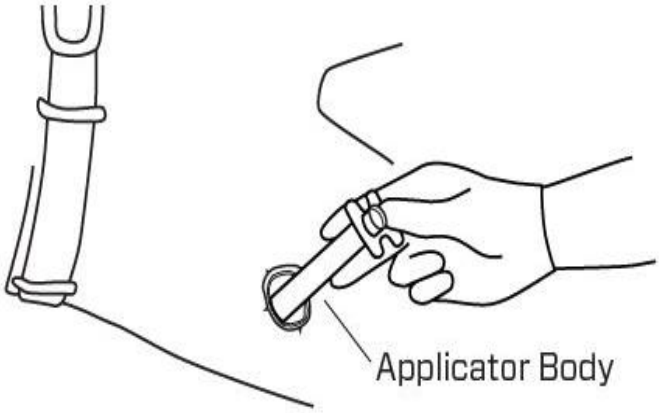
XSTAT 12 Packaging

XSTAT 12 is available as a three pack and single pack. Each applicator is individually sealed. Having three applicators available at the point of injury is recommended by the manufacturer.

XSTAT 12 Instructions for Use

Open the package and remove the applicator.

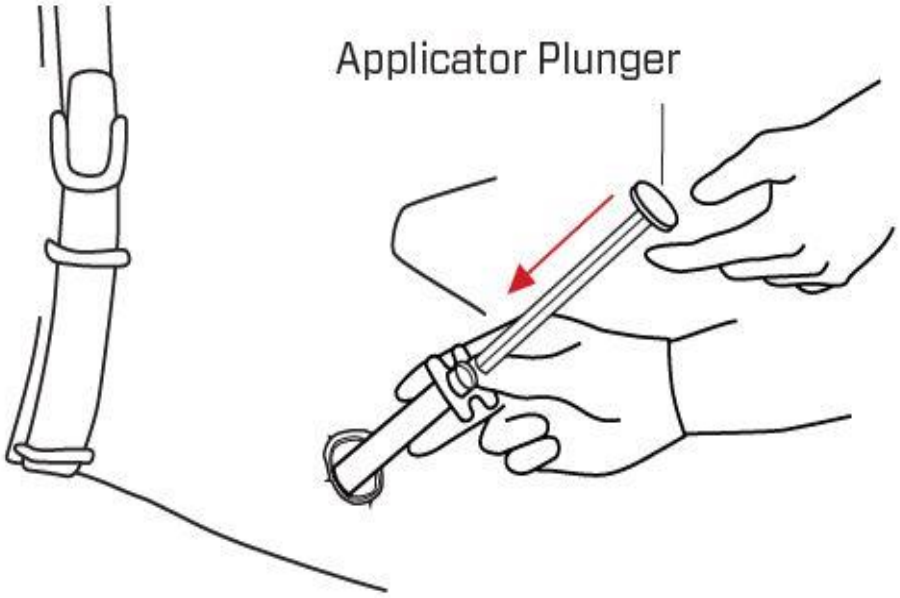
Insert the applicator into the wound track as close to the bleeding source as possible.



XSTAT 12 Instructions for Use

Insert the plunger into the applicator and push the plunger firmly down to deploy the minisponges into the wound.

DO NOT attempt to forcefully eject the minisponges from the applicator. If resistance is met, pull back slightly on the applicator to create additional packing space, then continue to depress the plunger.



XSTAT 12 Instructions for Use

Use additional applicators as necessary to completely pack the wound with mini-sponges.

Pack XSTAT into the wound to the same density you would gauze. The higher the sponge density in the wound cavity, the higher the pressure exerted on the damaged vessel.

XSTAT 12 Instructions for Use

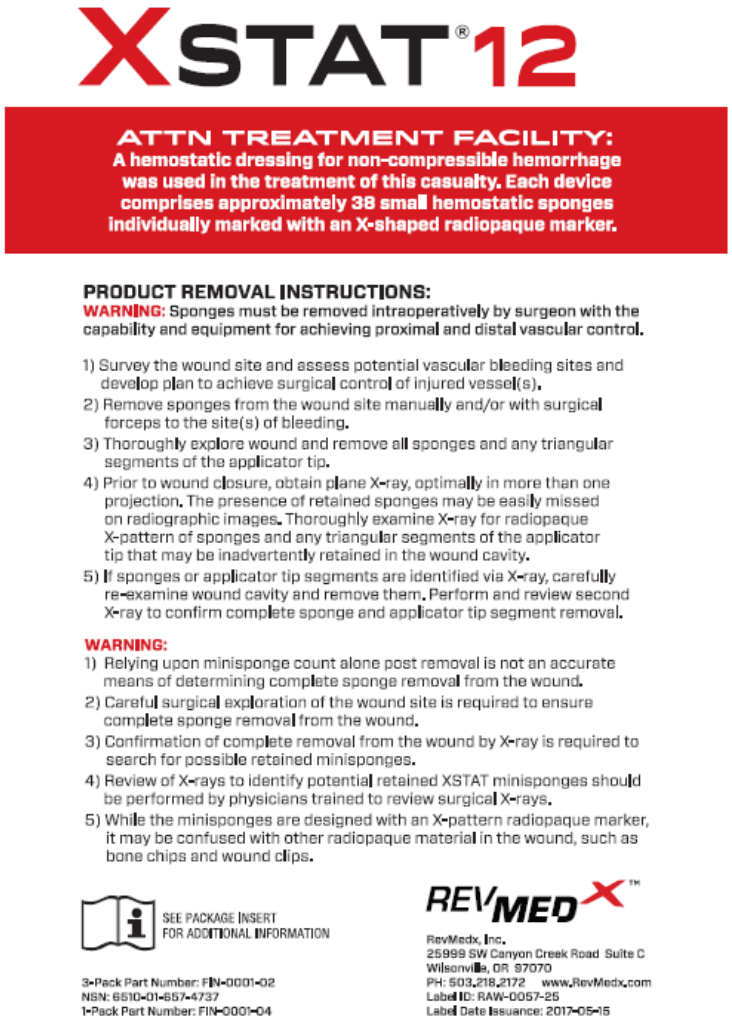
Cover the wound with a pressure dressing.

If bleeding persists, apply manual pressure until the bleeding is controlled.

Never attempt to remove the minisponges from the wound. They must be removed by a surgeon after achieving proximal and distal vascular control.

XSTAT Removal Instructions

The manufacturer includes a casualty card inside the XSTAT package.
Instructions to the surgeon for removing the sponges from the wound are included on the back of the card.
Record the use of XSTAT on the DD 1380, and forward these instructions along with it to the Medical Treatment Facility.



XSTAT®12

ATTN TREATMENT FACILITY:
A hemostatic dressing for non-compressible hemorrhage was used in the treatment of this casualty. Each device comprises approximately 38 small hemostatic sponges individually marked with an X-shaped radiopaque marker.

PRODUCT REMOVAL INSTRUCTIONS:
WARNING: Sponges must be removed intraoperatively by surgeon with the capability and equipment for achieving proximal and distal vascular control.

1) Survey the wound site and assess potential vascular bleeding sites and develop plan to achieve surgical control of injured vessel(s).
2) Remove sponges from the wound site manually and/or with surgical forceps to the site(s) of bleeding.
3) Thoroughly explore wound and remove all sponges and any triangular segments of the applicator tip.
4) Prior to wound closure, obtain plane X-ray, optimally in more than one projection. The presence of retained sponges may be easily missed on radiographic images. Thoroughly examine X-ray for radiopaque X-pattern of sponges and any triangular segments of the applicator tip that may be inadvertently retained in the wound cavity.
5) If sponges or applicator tip segments are identified via X-ray, carefully re-examine wound cavity and remove them. Perform and review second X-ray to confirm complete sponge and applicator tip segment removal.

WARNING:
1) Relying upon minisponge count alone post removal is not an accurate means of determining complete sponge removal from the wound.
2) Careful surgical exploration of the wound site is required to ensure complete sponge removal from the wound.
3) Confirmation of complete removal from the wound by X-ray is required to search for possible retained minisponges.
4) Review of X-rays to identify potential retained XSTAT minisponges should be performed by physicians trained to review surgical X-rays.
5) While the minisponges are designed with an X-pattern radiopaque marker, it may be confused with other radiopaque material in the wound, such as bone chips and wound clips.

SEE PACKAGE INSERT FOR ADDITIONAL INFORMATION

3-Pack Part Number: FIN-0001-02
NSN: 6510-01-657-4737
1-Pack Part Number: FIN-0001-04

REVMEDX™

RevMedx, Inc.
25999 SW Canyon Creek Road Suite C
Wilsonville, OR 97070
PH: 503.218.2172 www.RevMedx.com
Label ID: RAW-0057-25
Label Date Issuance: 2017-05-15

XSTAT 12 WARNINGS

WARNINGS/CAUTIONS:

- XSTAT 12 has not been tested for use in extremity wounds that are amenable to tourniquet application.
- XSTAT 12 use in conjunction with tourniquet application has not been assessed for use in extremity wounds that are amenable to tourniquet application.
- Sterility not guaranteed if the package is damaged.
- Larger wounds may require more than one applicator. Having at least three (3) XSTAT 12 devices available at all points of care is recommended.
- Injuries with significant cavitation, such as those from a high-velocity gunshot wound, may require more than 3 applicators to appropriately pack the wound.

TRAINING WEBSITE: WWW.REVMEDX.COM

Questions?

Tactical Field Care Guidelines

3. Massive Hemorrhage (continued)

   c. If the bleeding site is amenable to use of a junctional tourniquet, immediately apply a CoTCCC-recommended junctional tourniquet. Do not delay in the application of the junctional tourniquet once it is ready for use. Apply hemostatic dressings with direct pressure if a junctional tourniquet is not available or while the junctional tourniquet is being readied for use.

Junctional Hemorrhage

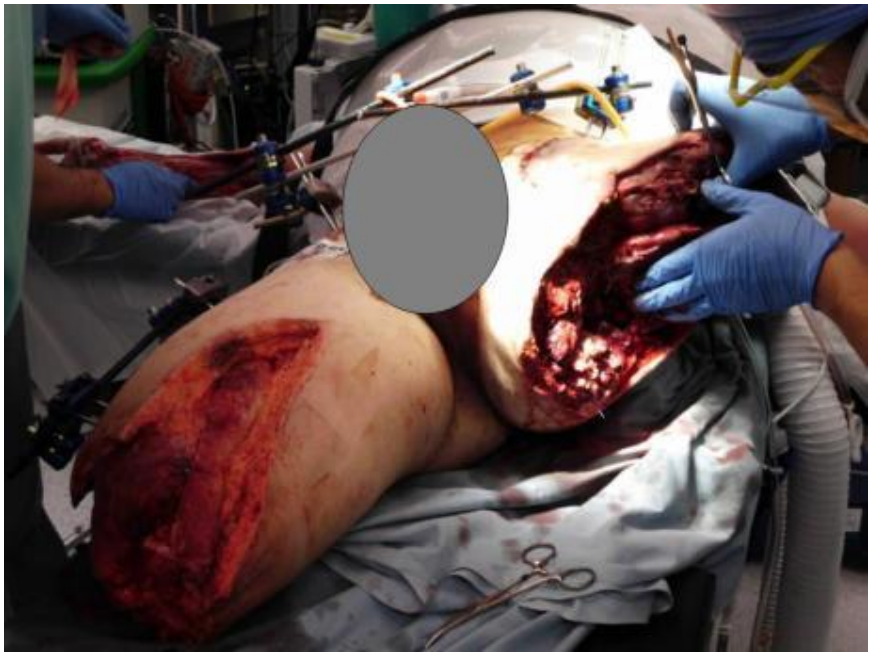
This term refers to bleeding from wounds to the:

- **Groin**
- **Buttocks**
- **Perineum**
- **Axillae**
- **Base of the neck**
- **Extremities at sites too proximal for a limb tourniquet**

Improvised Explosive Devices (IEDs)

- **Vehicle Targeting (Iraq)**
  - **Large amount of explosives – recycled 155 shells**
  - **Command or vehicle-detonated**
  - **Designed to destroy vehicles – created more blunt trauma and polytrauma from vehicle rollovers**
- **Personnel Targeting (Afghanistan)**
  - **Smaller amount of explosives**
  - **Homemade explosives**
  - **Personnel pressure-detonated**
  - **Designed to maim – lead to lower extremity junctional injury**

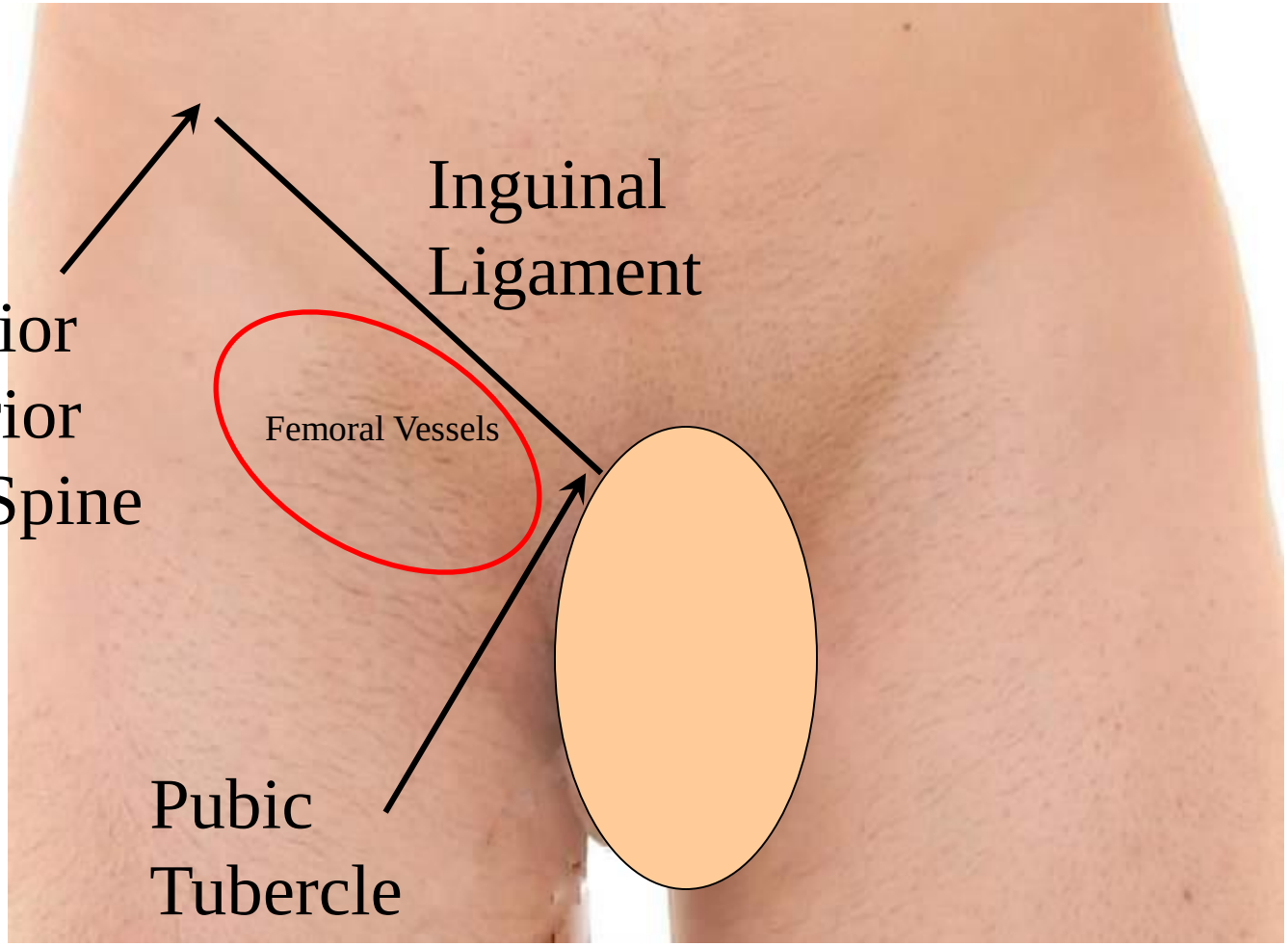
In 2010, there was a dramatic increase in lower extremity amputation rates in Afghanistan.



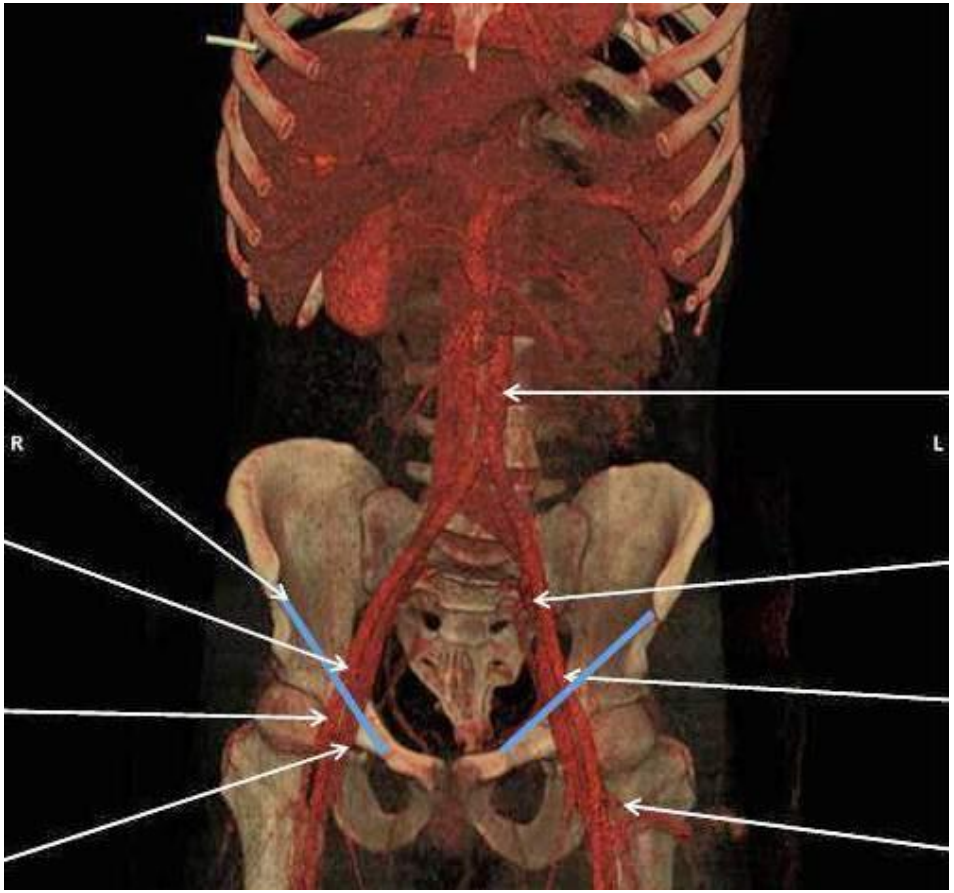
Dismounted Complex Blast Injury (DCBI)

- **DCBI causes junctional hemorrhage.**
- **By 2011, junctional hemorrhage was the leading cause of death from external hemorrhage.**
- **The proximal thigh and the groin were the most common sites of junctional hemorrhage**

Superficial Anatomy of the Groin



Vascular Anatomy of the Abdomen and Groin



Inguinal Ligament

Ext. iliac a. passing under inguinal lig.

Common femoral a. passing into the leg

Common femoral vein passing into the leg

Aorta posterior on the spine

Int. iliac a. bifurcates from common iliac a.

Ext. iliac a. rising out of pelvis

Bifurcation of common femoral a. into superficial femoral a. and femoral profunda a.

TCCC Management of Junctional Hemorrhage

- **The three CoTCCC-recommended junctional tourniquets are:**
  - **The Combat Ready Clamp (CRoC)**
  - **The Junctional Emergency Treatment Tool (JETT)**
  - **The SAM Junctional Tourniquet (SJT)**

TCCC Management of Junctional Hemorrhage

Combat Ready Clamp

Junctional Emergency Treatment Tool

SAM Junctional Tourniquet

Training materials for all 3 devices are contained in separate modules in the TCCC curriculum.

Continued Reassessment!

- Once applied, the junctional tourniquet, as well as the casualty's other hemorrhage control interventions, must be frequently reassessed to assure continued hemorrhage control.
  - **DO NOT EVER APPLY IT AND FORGET IT!**

Junctional Tourniquet Practical

Tactical Field Care Guidelines

4. Airway Management
   a. Unconscious casualty without airway obstruction:
      - Chin lift or jaw thrust maneuver
      - Nasopharyngeal airway
      - Place casualty in recovery position

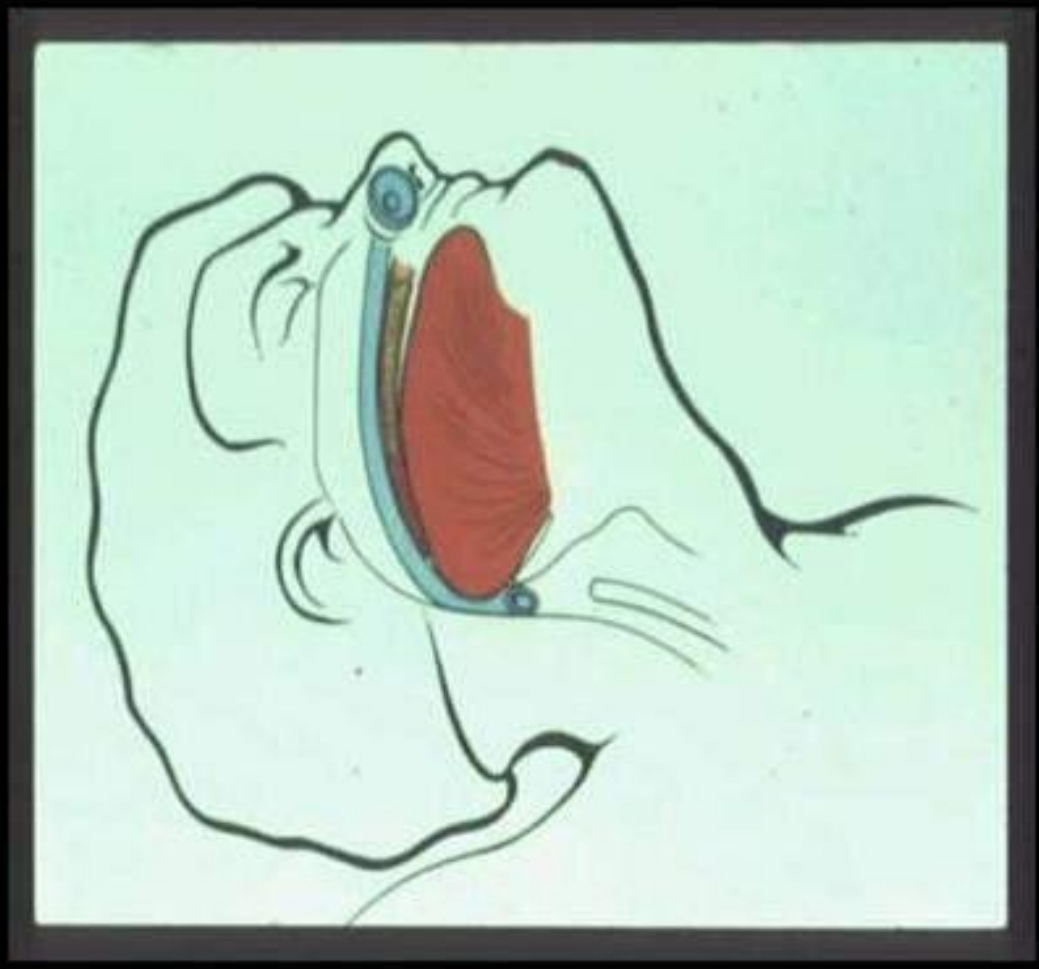
Nasopharyngeal Airway

- The “Nose Hose,” “Nasal Trumpet,” “NPA”
- Excellent success in Afghanistan and Iraq
- Well tolerated by the conscious patient
- Lube before inserting
- Insert at 90-degree angle to the face, NOT along the axis of the external nose
- Tape it in
- Don’t use an oropharyngeal airway (‘J’ Tube)
  - Will cause conscious casualties to gag
  - Easily dislodged

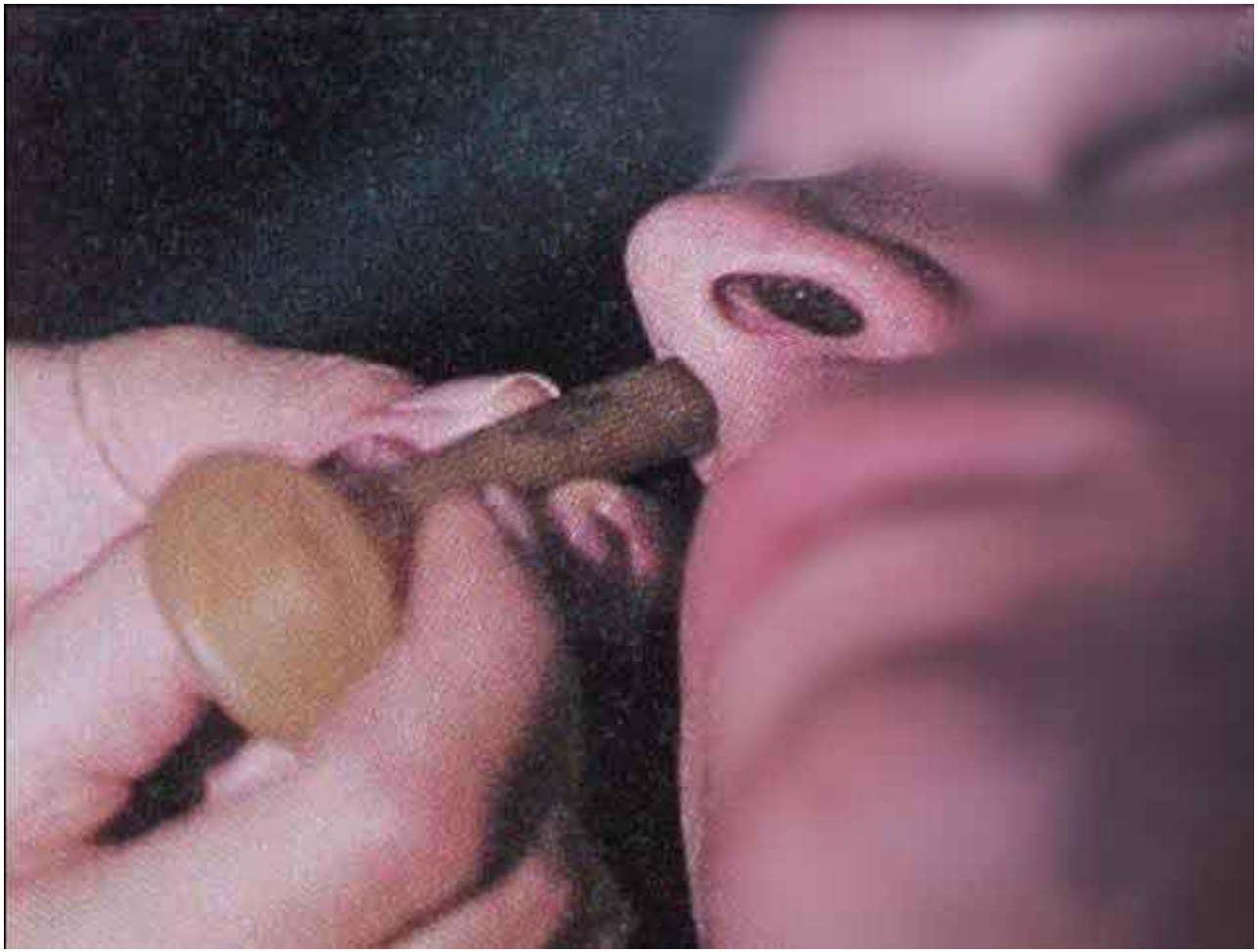
Nasopharyngeal Airway:

(Note that the NPA is positioned at a 90º angle to the front plane of the face.)

- Lubricate !
- Insert along floor of nasal cavity
- If resistance met, use back-and forth motion
- Don't Force – Use other nostril
- If patient gags, withdraw slightly



Nasopharyngeal Airway



What's wrong with this NPA insertion?

Nasopharyngeal Airway

Airway Support

Place unconscious casualties in the recovery position after the airway has been opened.

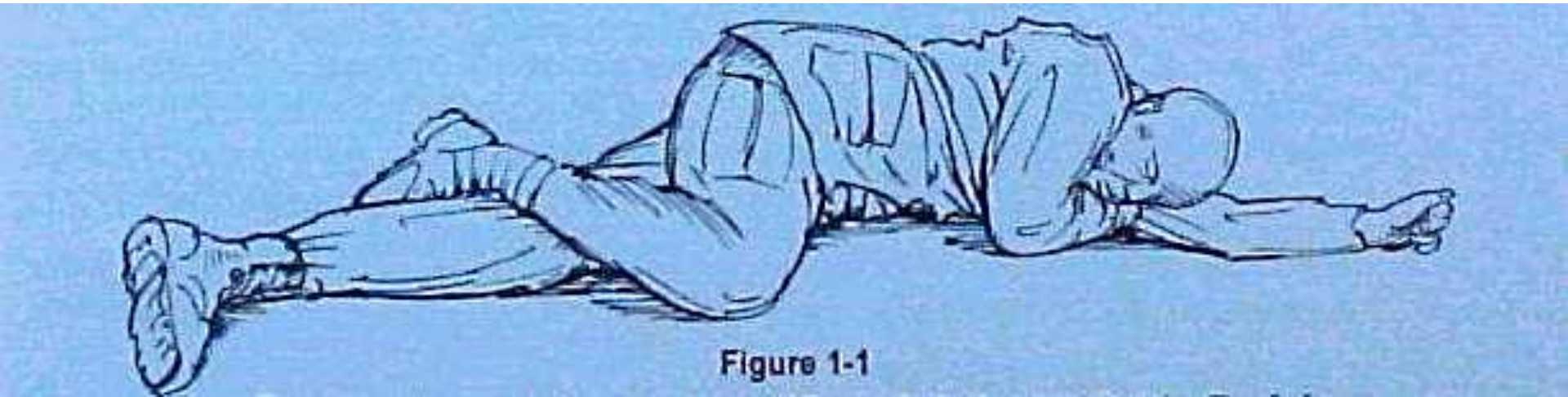


Figure 1-1

Tactical Field Care Guidelines

4. Airway Management (continued)
   b. Casualty with airway obstruction or impending airway obstruction:
      - Chin lift or jaw thrust maneuver
      - Nasopharyngeal airway
      - Allow a conscious casualty to assume any position that best protects the airway, to include sitting up.
      - Place an unconscious casualty in the recovery position.

Maxillofacial Trauma

- Casualties with severe facial injuries can often protect their own airway by sitting up and leaning forward.
- Let them do it if they can!

Tactical Field Care Guidelines

4. Airway Management (continued

c. If the previous measures are unsuccessful, perform a surgical cricothyroidotomy using one of the following:

- Cric-Key technique (preferred option)
- Bougie-aided open surgical technique using a flanged and cuffed airway cannula of less than 10 mm outer diameter, 6-7 mm internal diameter, and 5-8 cm of intratracheal length
- Standard open surgical technique using a flanged and cuffed airway cannula of less than 10mm outer diameter, 6-7 mm internal diameter, and 5-8 cm of intratracheal length (least desirable option)
- Use lidocaine if the casualty is conscious.

d. Spinal stabilization is not necessary for casualties with penetrating trauma.

The Need for Cricothyroidotomy

- 4,596 battlefield fatalities in Operation Iraqi Freedom and Operation Enduring Freedom combat casualties from October 2001 to June 2011
  - 87.3% of all injury mortality occurred in the prehospital environment (n = 4013)
  - Of the prehospital deaths, 24.3% were deemed potentially survivable. (n = 976)
  - The second most common cause (8%) of potentially preventable deaths was upper airway obstruction due mostly to direct injury to the airway structures of the face and neck. (n = 78)

Eastridge, et al. *Death on the battlefield (2001Y2011): Implications for the future of combat casualty care*. J Trauma Acute Care Surg. 73; 6: Supplement 5

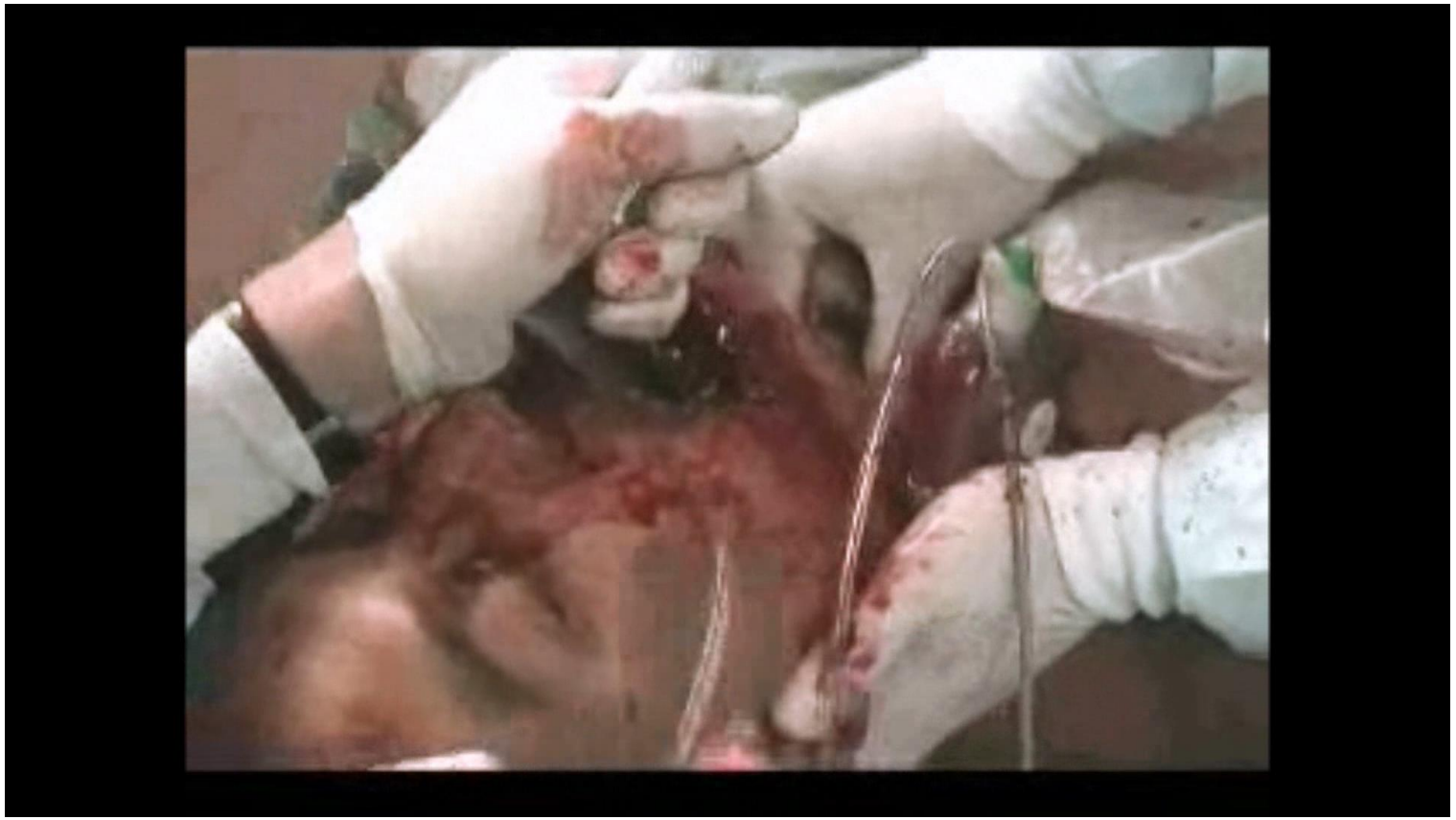
Battlefield Cricothyroidotomy

- "Military medics have a 33% failure rate when performing this procedure."*

- This is the most technically difficult procedure we ask medics, Corpsmen, and PJs to do.

* Mabry RL, Frankfurt A. *An Analysis of Battlefield Cricothyrotomy in Iraq and Afghanistan*
J Spec Oper Med. 2012 Spring;12(1):17-23.

Video: An Actual Cricothyroidotomy Using Standard Open Surgical Technique



Courtesy Dr. Peter Rhee,
Univ. of Arizona

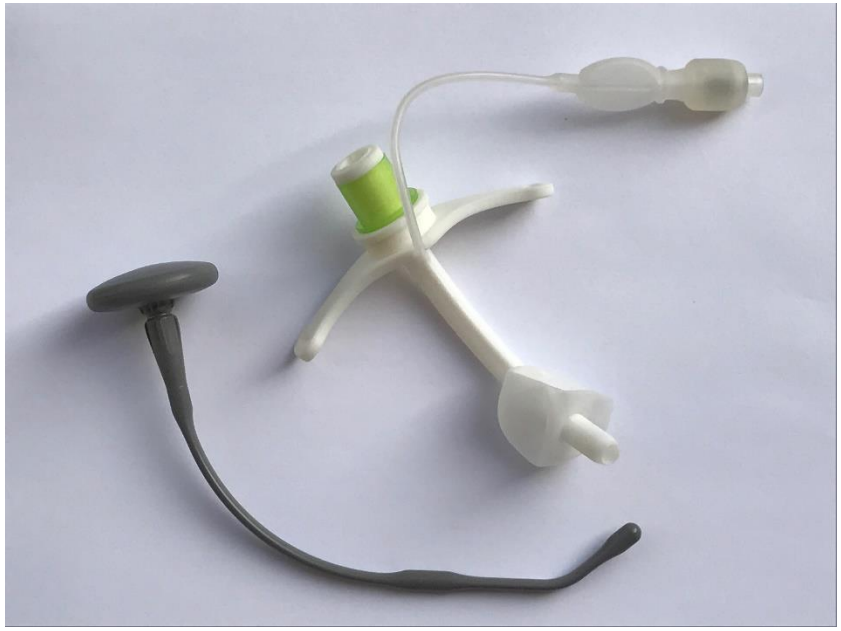
Link to Online Video

Preferred Surgical Airway Technique

- Cric-Key evaluation
  - Fifteen military medics with minimal training performed one Cric-Key technique and one open surgical technique on cadavers.
    - Medics were able to insert the Cric-Key in significantly less time (34 sec vs 65 sec.)
    - Though not statistically significant, there were three failures with the open surgical technique, and none with the Cric-Key.

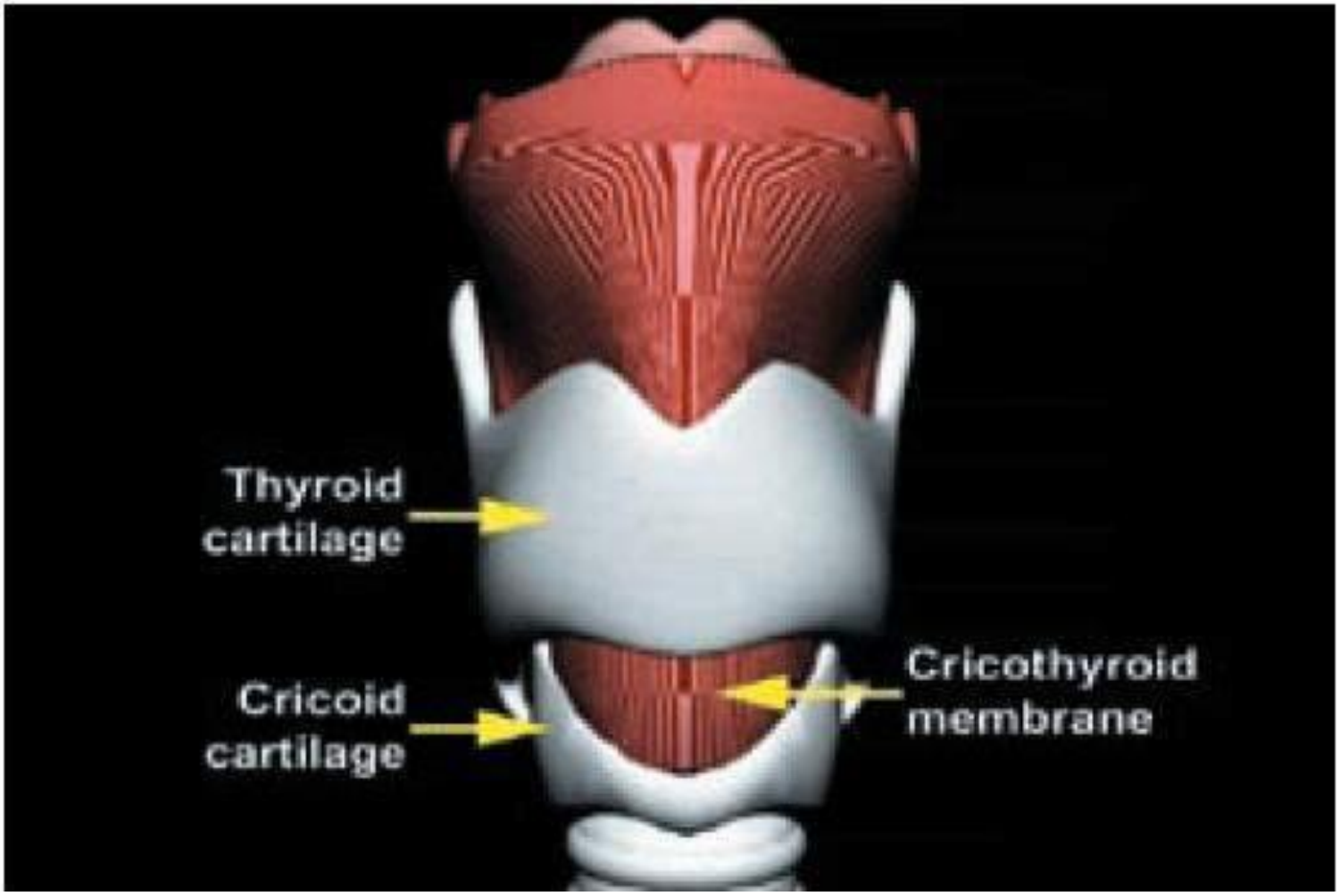
Mabry, et al. *A Comparison of Two Open Surgical Cricothyroidotomy Techniques by Military Medics Using a Cadaver Model*. Ann Emerg Med. 2014 Jan;63(1):1-5.

Cric-Key

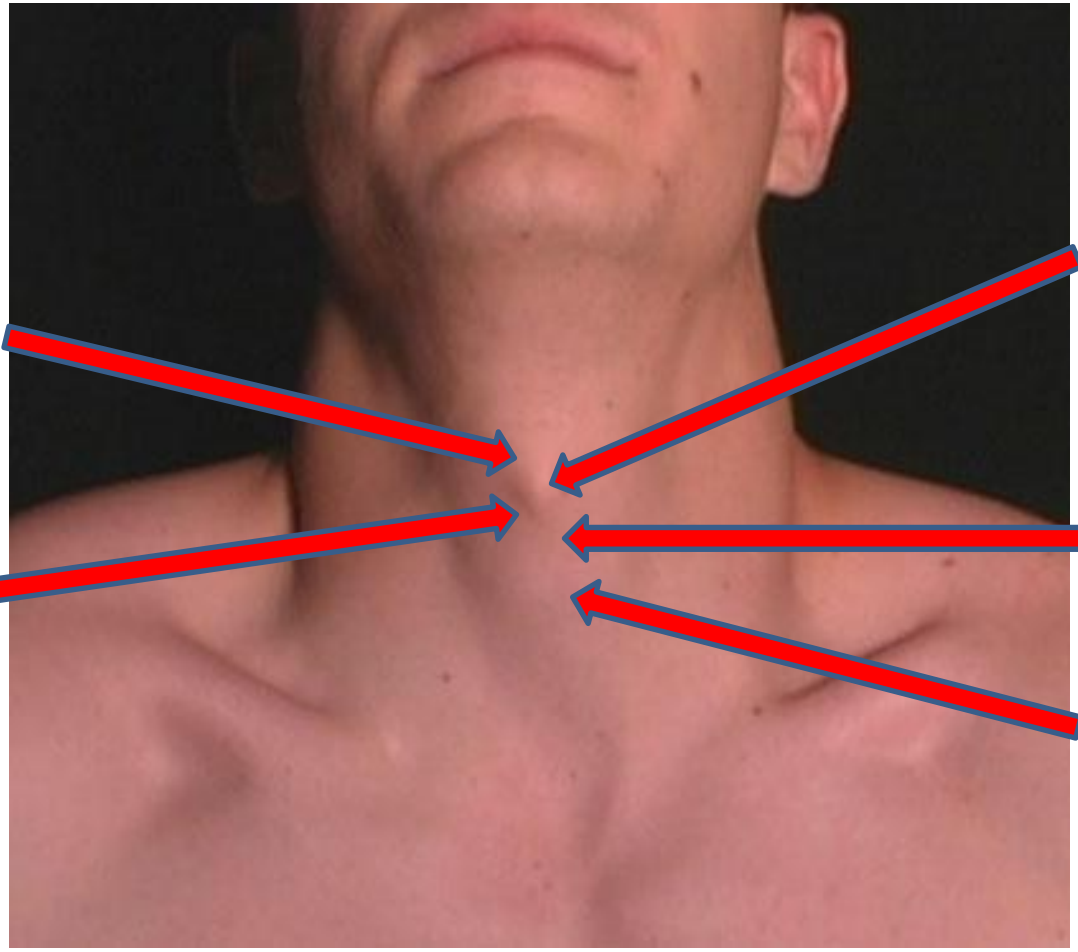


- The Cric-Key introducer is curvilinear, with an overall length of 19 cm, and an anteriorly directed distal tip.
- Designed to guide insertion of a 5.0 cuffed Melker cricothyroidotomy airway cannula.
- Combines the functions of a tracheal hook, stylet, dilator, and bougie when incorporated with the Melker airway.

Cricothyroid Membrane



Surface Landmarks for Cricothyrotomy



Top of thyroid cartilage

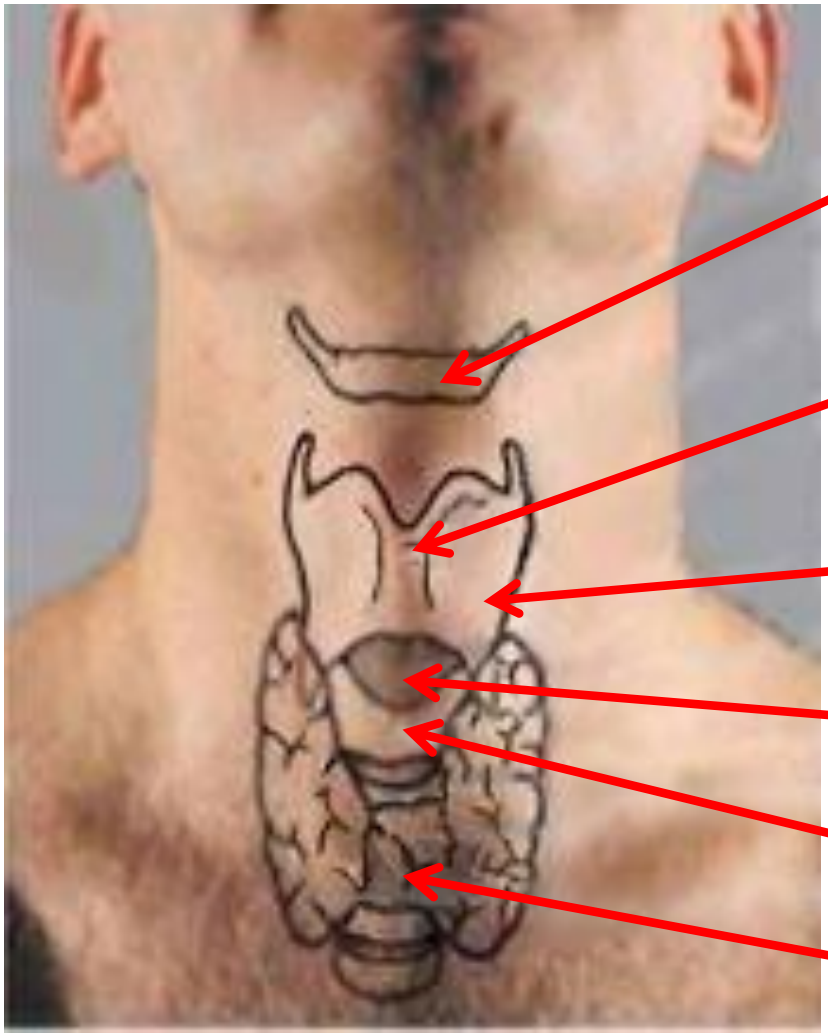
Bottom of thyroid cartilage

Thyroid prominence – Adam's apple usually visible only in males

Cricothyroid membrane

Cricoid cartilage

Beneath the Surface Landmarks



Hyoid Bone

Thyroid prominence (Adam's apple) - usually visible only in males

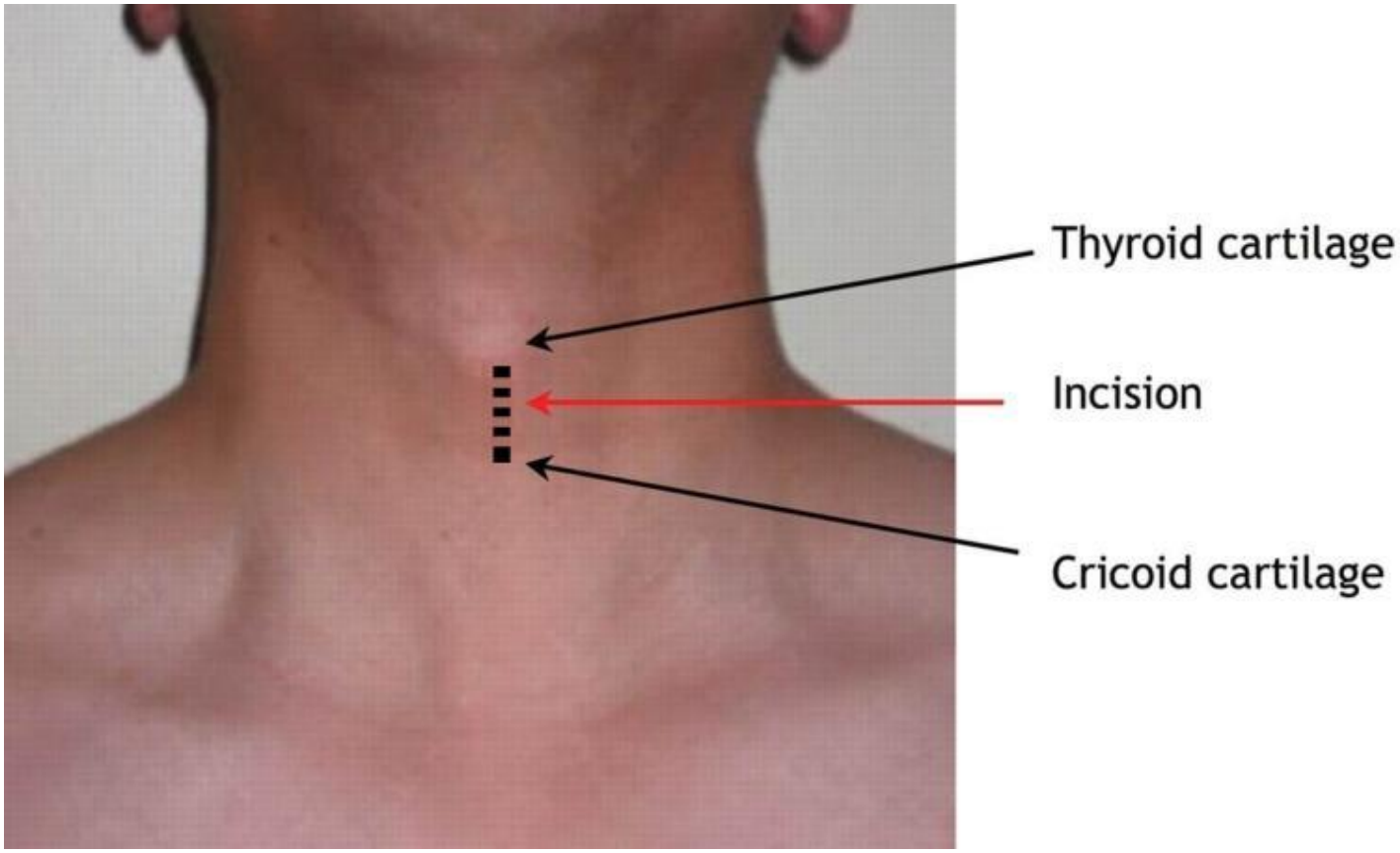
Thyroid cartilage

Cricothyroid membrane

Cricoid cartilage

Thyroid gland

Locating the Cric Skin Incision with a Dotted Line



Macdonald JC , Tien HC. ***Emergency Battlefield Cricothyrotomy.*** **CMAJ 2008;178:1133-1135**

Bennett BL, Cailteux-Zevallos B, Kotora J. ***Cricothyroidotomy bottom-up training review: battlefield lessons learned.*** **Mil Med. 2011 Nov;176(11):1311-9.**

Cric-Key Technique

1. Identify the cricothyroid membrane (CTM) between the thyroid cartilage and the cricoid cartilage.

Cric-Key Technique

2. Grasp and hold the trachea, stabilizing the airway.

Cric-Key Technique

3. Make a vertical skin incision down to the cricothyroid membrane using a #10 scalpel.

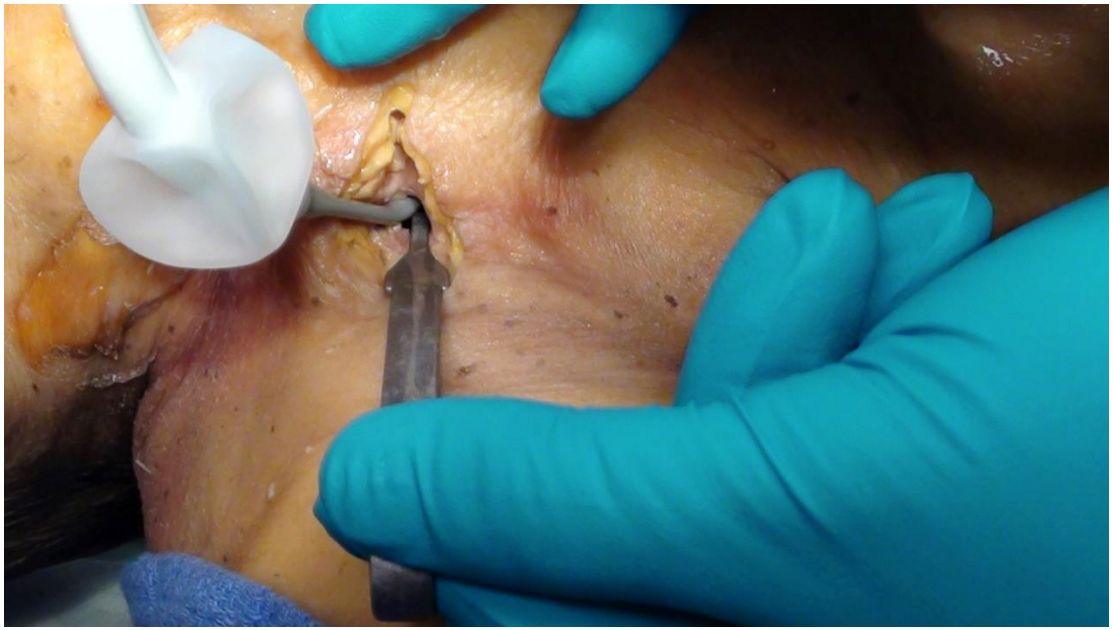
Cric-Key Technique

4. Dissect the tissues to expose the membrane.

Cric-Key Technique

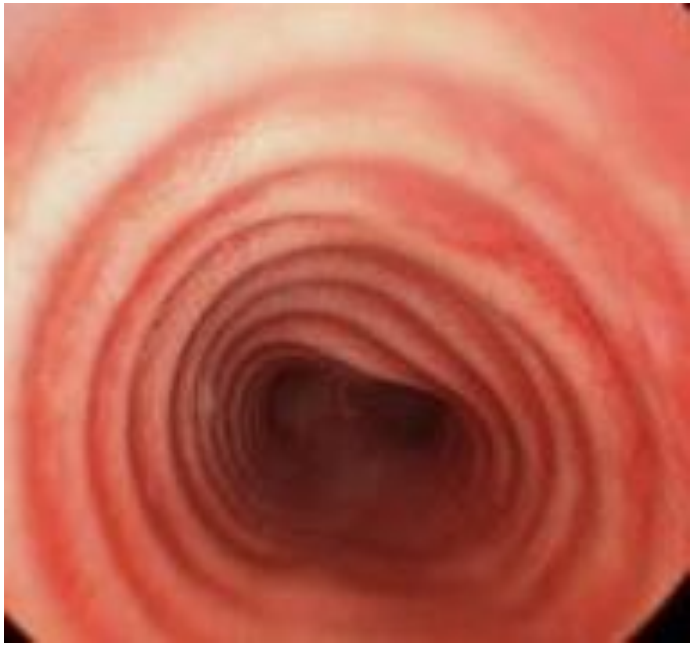
5. Make a horizontal incision through the cricothyroid membrane.

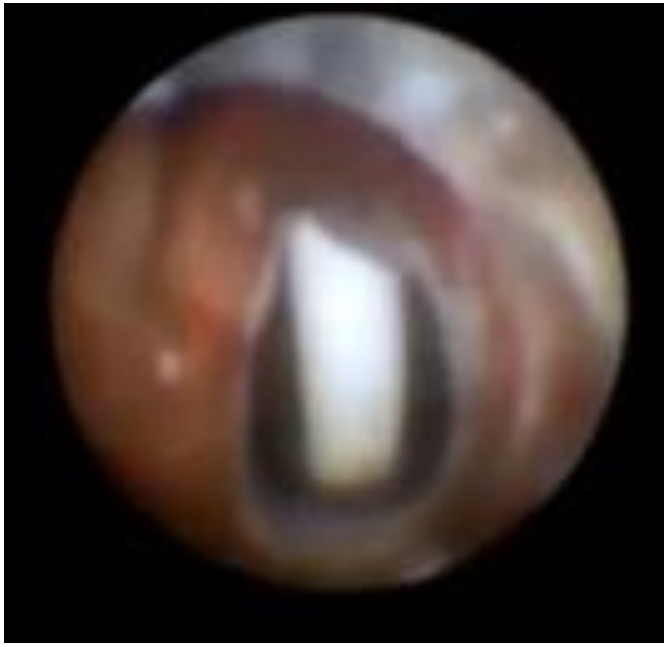
Cric-Key Technique



6. Insert the Cric-Key with the Melker airway.

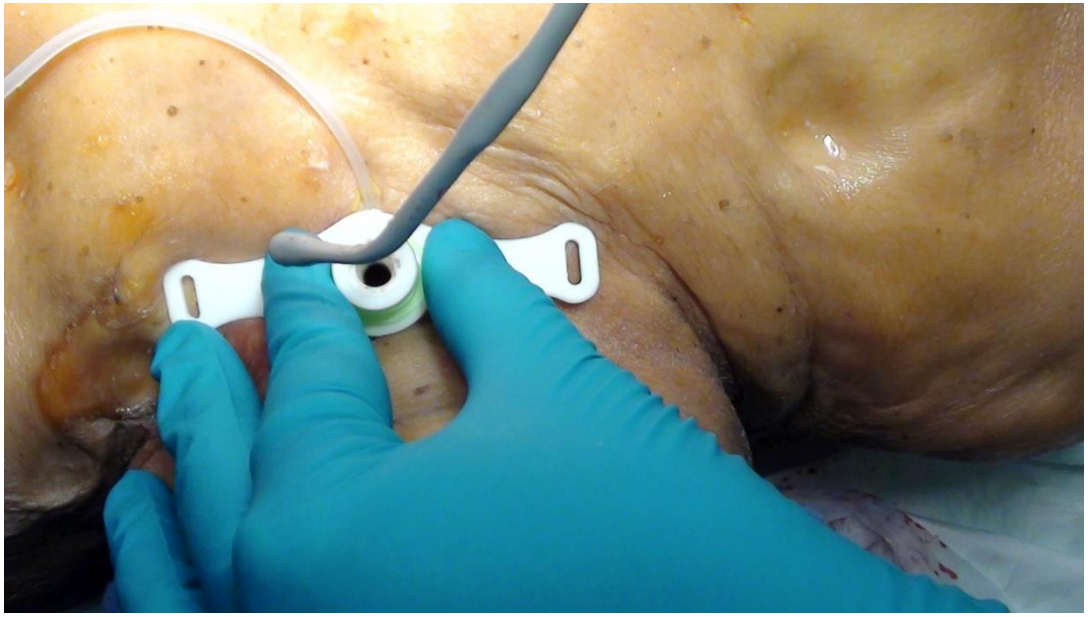
Cric-Key Technique





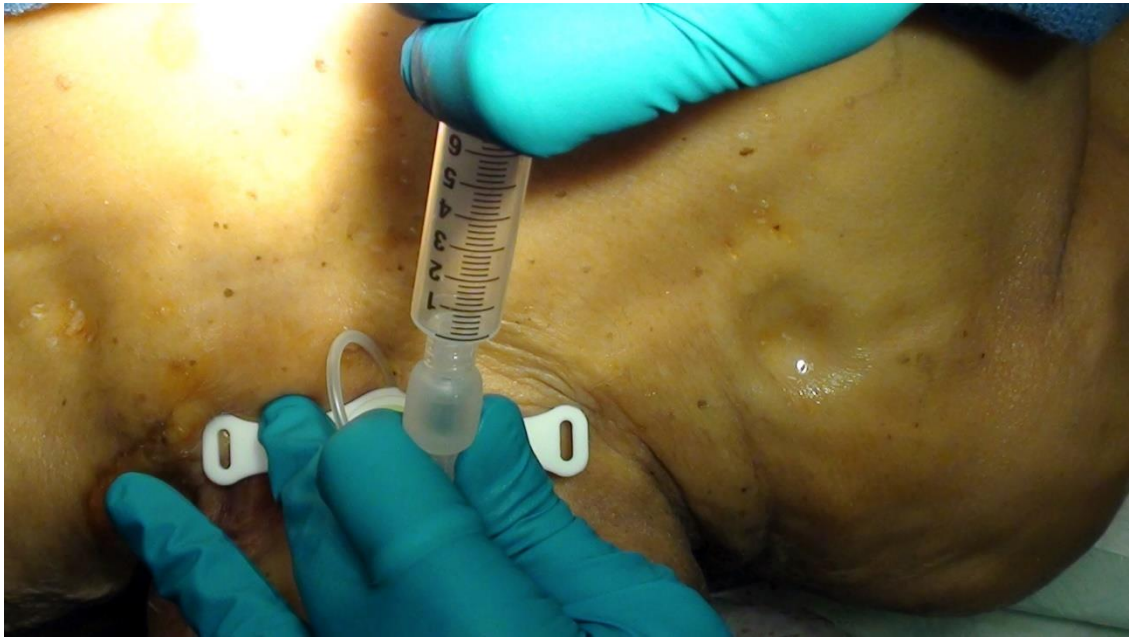
7. Confirm placement by feeling the tracheal rings and looking for skin tenting.

Cric-Key Technique



8. Remove the Cric-Key leaving the airway in place.

Cric-Key Technique

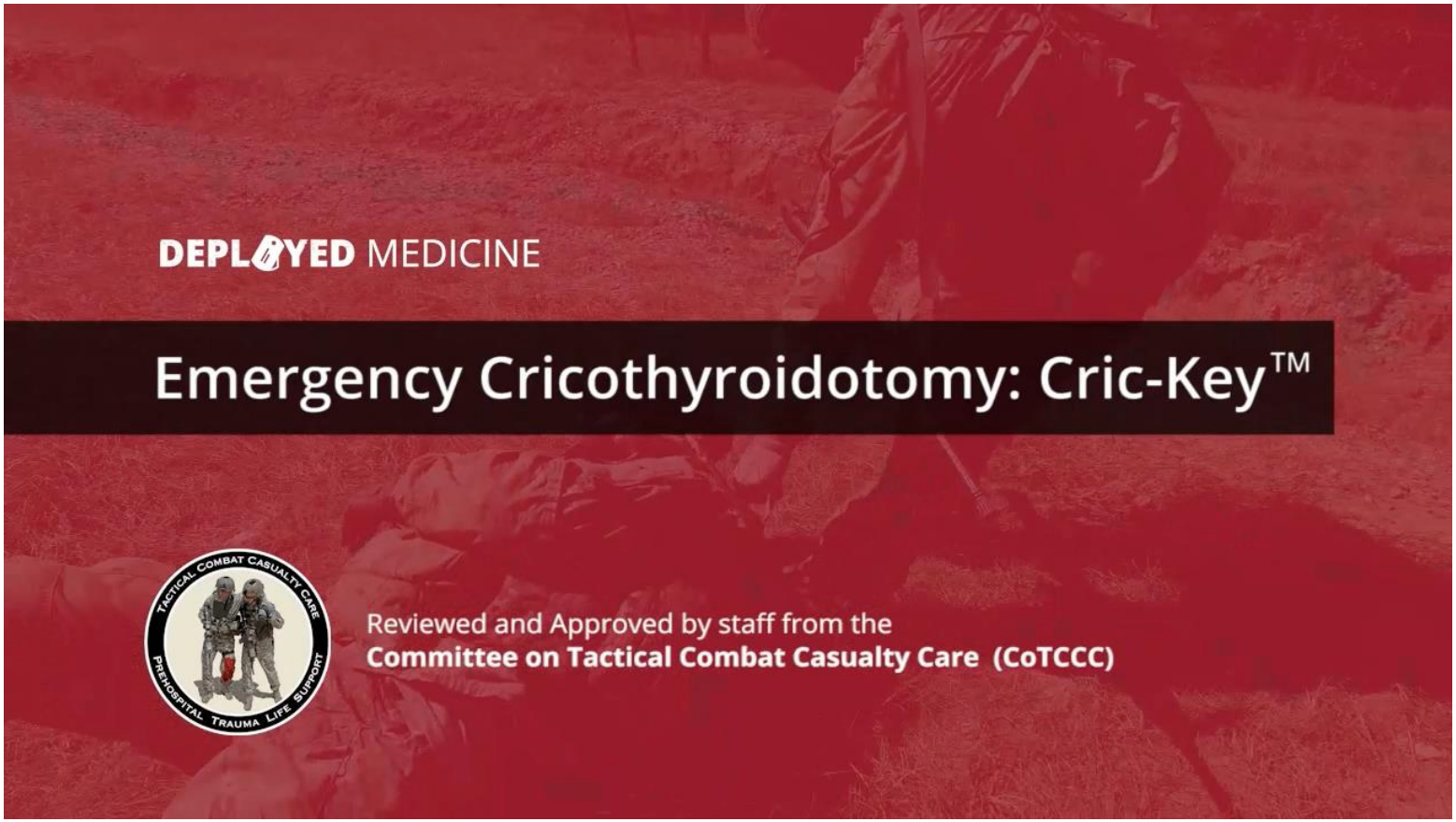


9. Inflate the cuff with 10cc of air.

Cric-Key Technique

10. Connect a bag and valve, and ventilate the casualty. Check for breath sounds bilaterally. Secure the airway.

Video: Surgical Airway Using the Cric-Key



NOTE: Cric-Key is the preferred technique.

Link to Online Video

Repetition and Realism in Cric Training

To prepare for scenarios like this one, combat medics should perform cricothyrotomy at least five times during training on an anatomically realistic model.

Airway Practical

Nasopharyngeal Airway

Surgical Airway

Tactical Field Care Guidelines

5. Respiration/Breathing

a. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25-inch needle/catheter unit inserted in the second intercostal space at the midclavicular line. Ensure that the needle entry into the chest is not medial to the nipple line and is not directed towards the heart. An acceptable alternate site is the 4^{th} or 5^{th} intercostal space at the anterior axillary line (AAL).

Tactical Field Care Guidelines

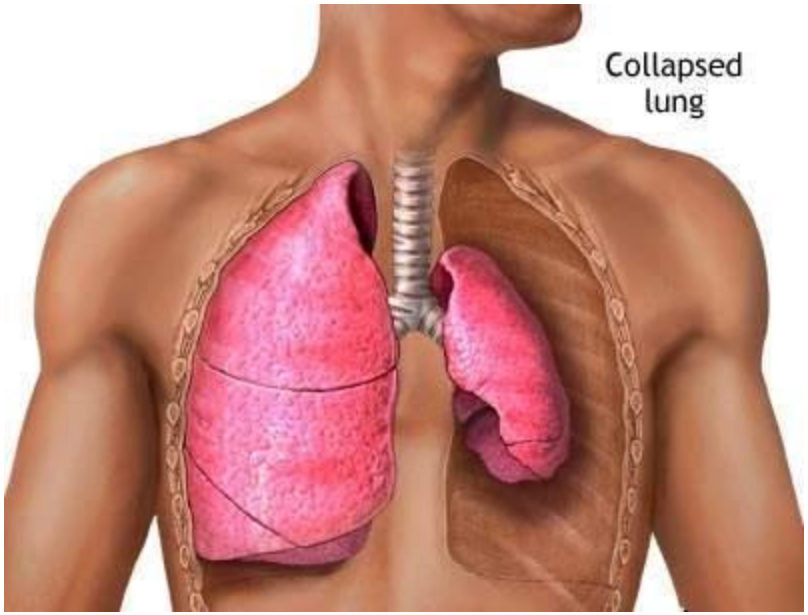
5. Respiration/Breathing

   b. All open and/or sucking chest wounds should be treated by immediately applying a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-vented chest seal. Monitor the casualty for the potential development of a subsequent tension pneumothorax. If the casualty develops increasing hypoxia, respiratory distress, or hypotension and a tension pneumothorax is suspected, treat by burping or removing the dressing or by needle decompression.

Tension Pneumothorax

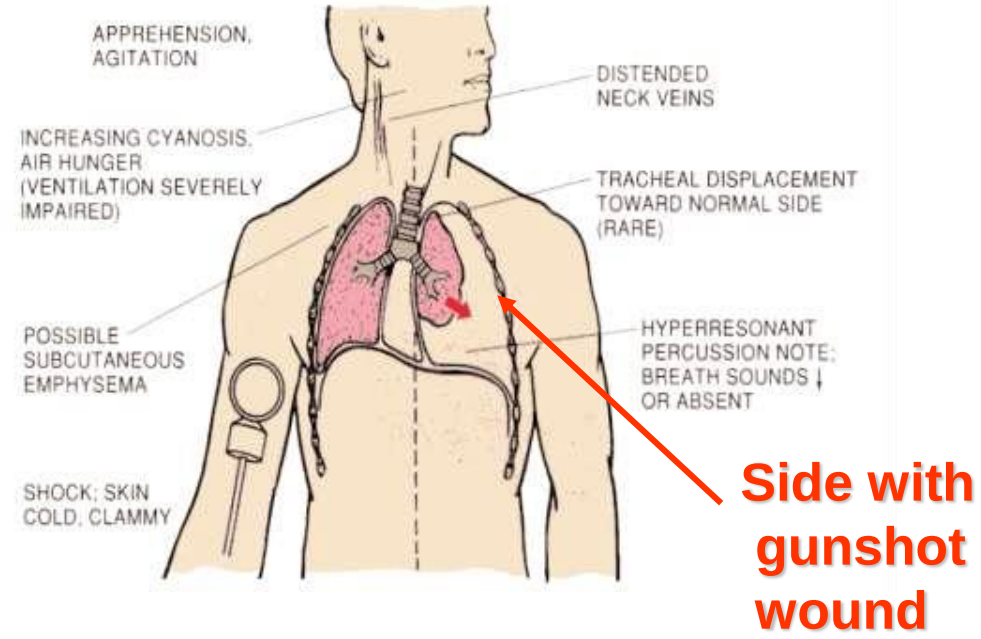
- **Tension pneumothorax is another common cause of preventable death encountered on the battlefield.**
- **It's easy to treat.**
- Tension pneumo may occur with entry wounds in the abdomen, shoulder, or neck.
- Blunt (motor vehicle accident) or penetrating trauma (GSW) may also cause it.

Pneumothorax



A pneumothorax is a collection of air between the lung and chest wall due to an injury to the chest and/or lung. The lung then collapses as shown.

Tension Pneumothorax



A <u>tension</u> pneumothorax is worse. Injured lung tissue acts as a one-way valve, trapping more and more air between the lung and the chest wall. Pressure builds up and compresses both lungs and the heart.

Tension Pneumothorax

- **Both lung function and heart function are impaired with a tension pneumothorax, causing respiratory distress and shock.**
- The treatment is to let the trapped air under pressure escape.
- This is done by inserting a needle into the chest.
- The recommended needle size is 14-gauge x 3.25 inches.

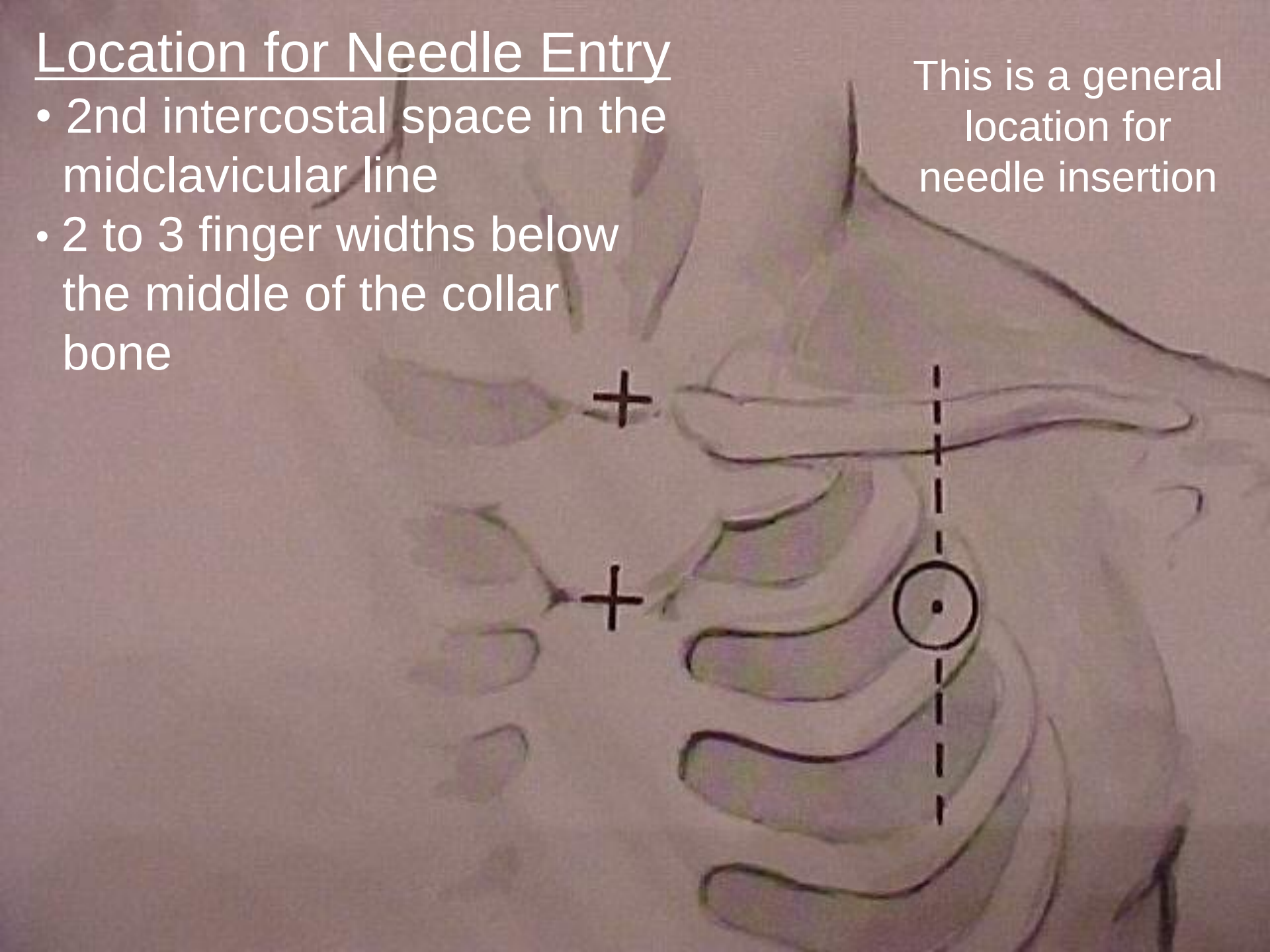
Tension Pneumothorax

- Question: “What if the casualty does not have a tension pneumothorax when you do your needle decompression?”
- Answer:
  - If he has penetrating trauma to that side of the chest, there is already a collapsed lung and blood in the chest cavity.
  - The needle won’t make it worse if there is no tension pneumothorax.
  - If he DOES have a tension pneumothorax, you will save his life.

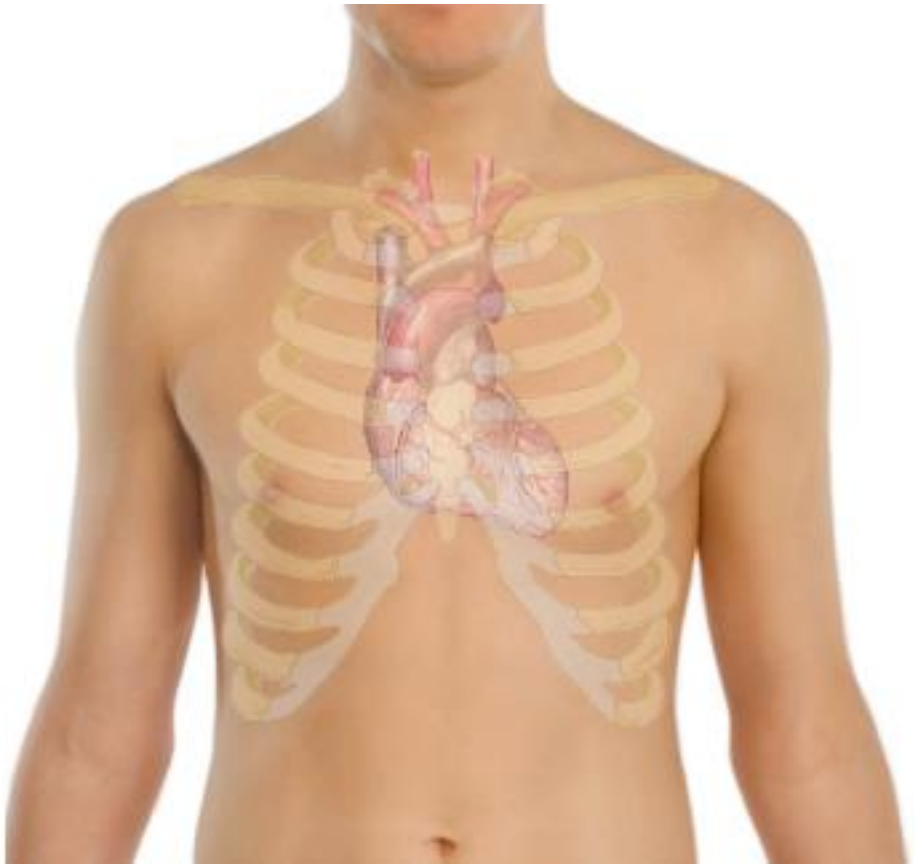
Location for Needle Entry

- 2nd intercostal space in the midclavicular line
- 2 to 3 finger widths below the middle of the collar bone

This is a general location for needle insertion

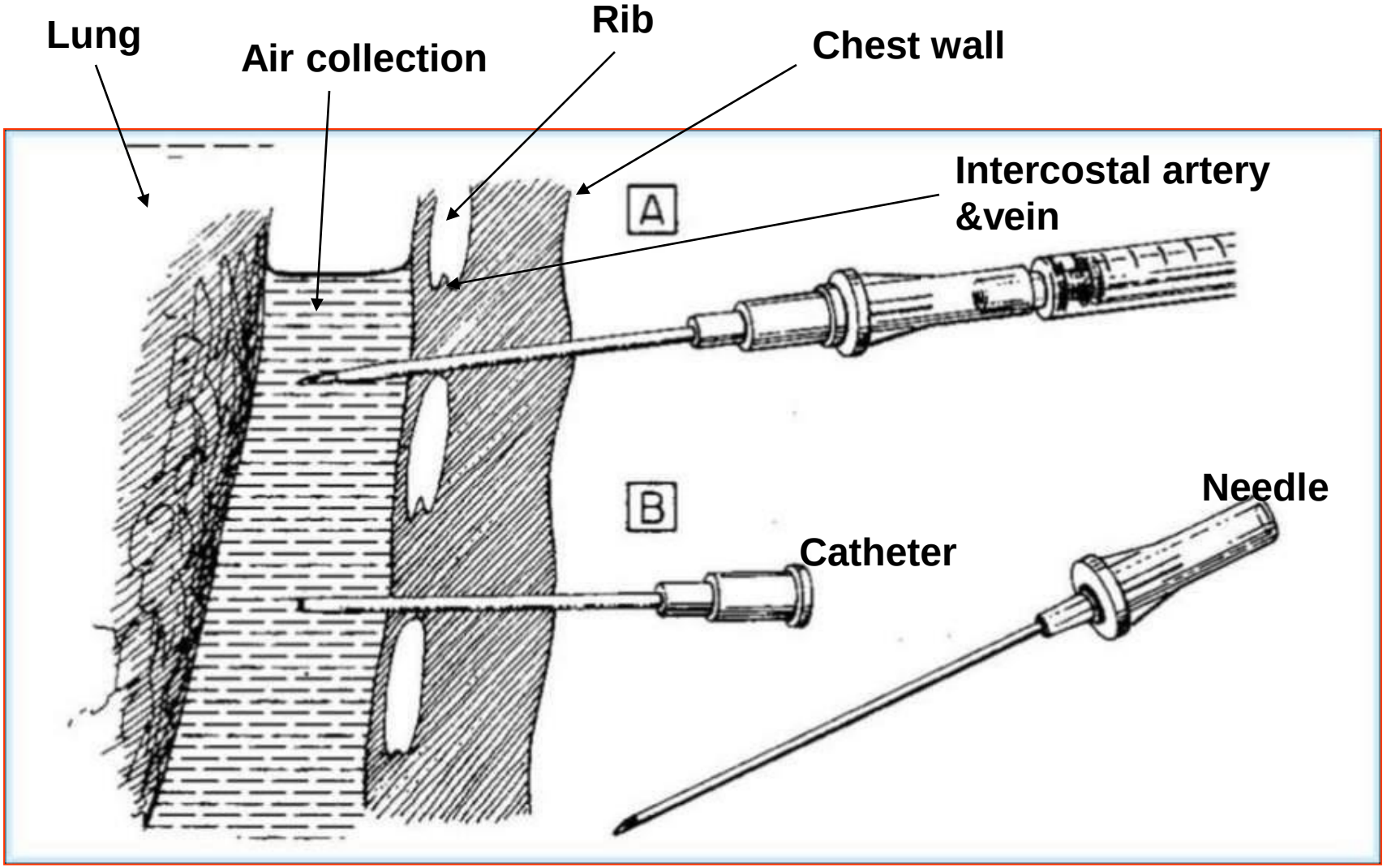


Warning!



- The heart and great vessels are nearby.
- Do not insert needle medial to the nipple line or point it towards the heart.

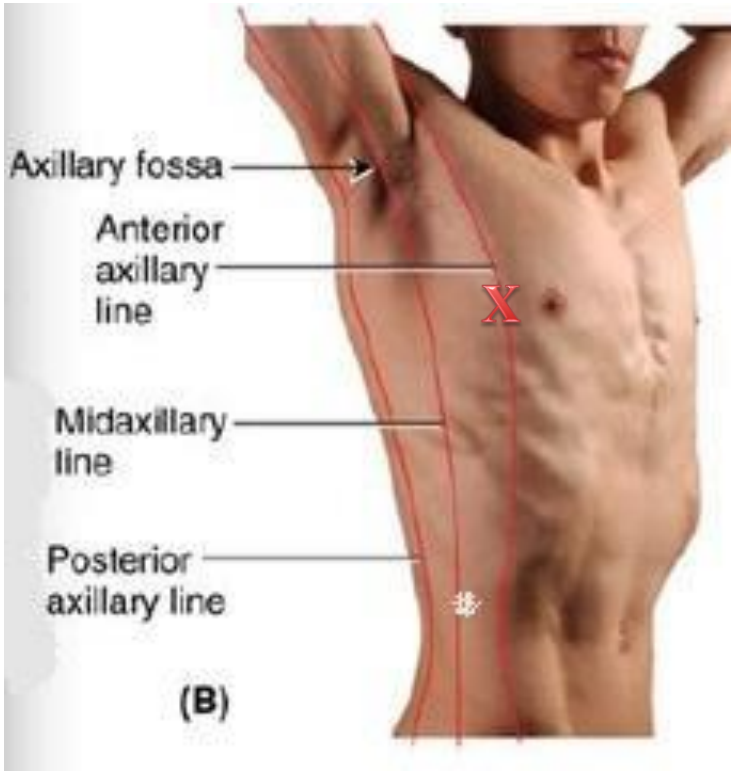
Needle Decompression – Enter Over the Top of the Third Rib



- This avoids the artery and vein on the bottom of the second rib.

Alternate Site for Needle Decompression

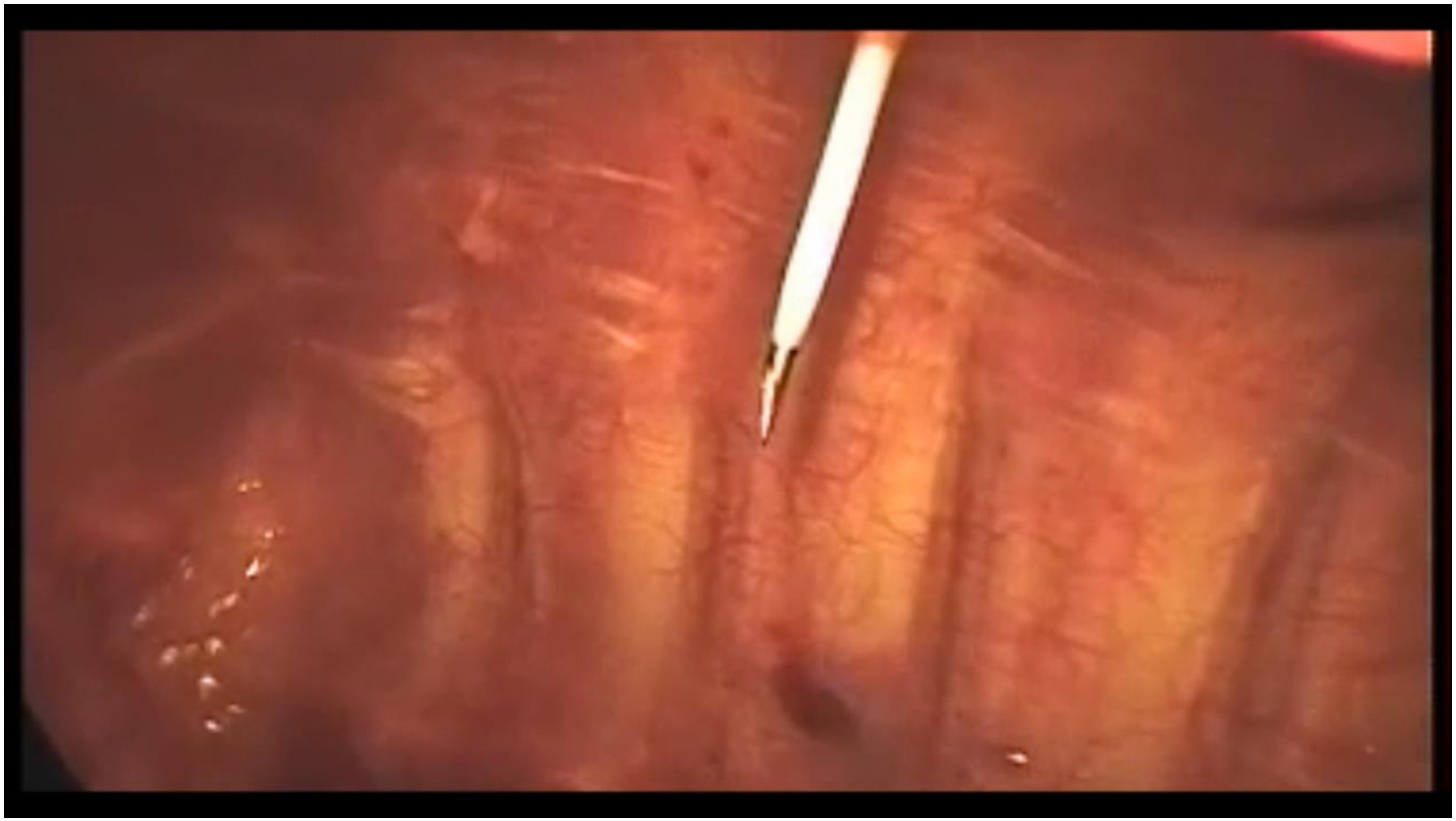
- An acceptable alternate site is the 4th or 5th intercostal space at the anterior axillary line.
- The 5th intercostal space is located at the level of the nipple in young, fit males.
- The AAL is located at approximately the lateral aspect of the pectoralis major muscle.



Remember!!!

- Tension pneumothorax is a common but easily treatable cause of preventable death on the battlefield.
- Diagnose and treat aggressively!

Needle Decompression Works



Video courtesy Dr. Oleksandr Linchevskyy
Medical Director, Patriot Defence
Ukraine

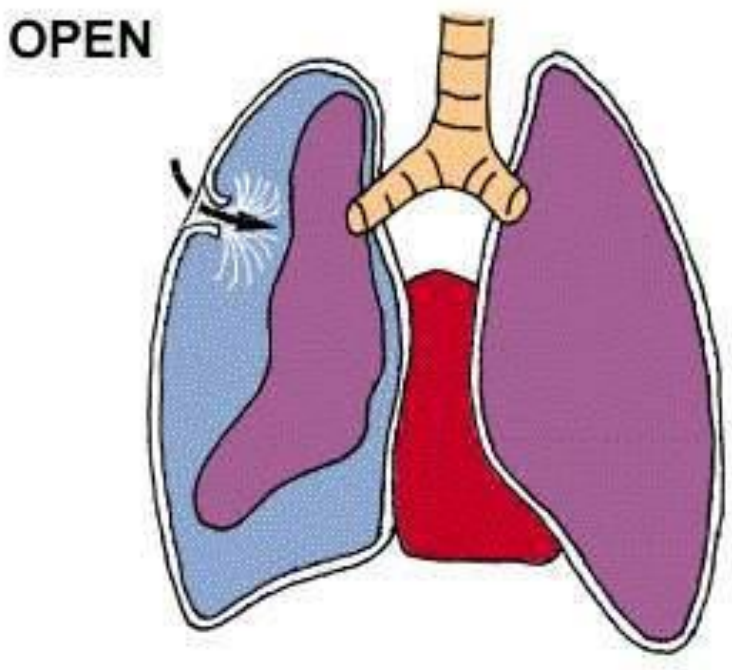
Link to Online Video

Needle Decompression

- After decompression of a tension pneumothorax with a 14-gauge, 3.25” needle/catheter unit:
  - **Remove the needle**
  - **Secure the catheter in place**

Needle Decompression Practical

Sucking Chest Wound (Open Pneumothorax)



It takes a hole in the chest the size of a nickel or bigger for this to occur.

Open Pneumothorax

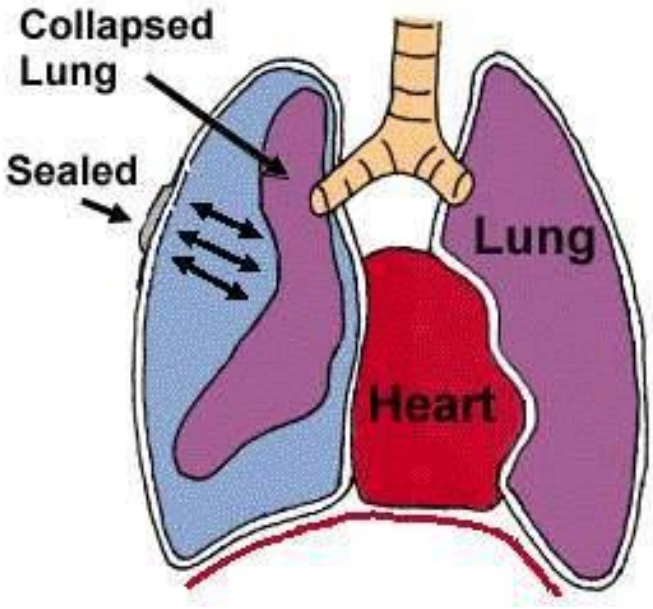
Management of Open Pneumothorax

- Input from the USCENTCOM/JTS assessment of prehospital trauma care in Afghanistan questioned the use of unvented chest seals in the treatment of open pneumothorax.
- New animal research from both USAISR and Naval Medical Center Portsmouth has shown that vented chest seals work reliably to prevent a tension pneumothorax in the presence of an open pneumothorax and an ongoing air leak from the lung, but non-vented chest seals do not.

Sucking Chest Wound

- May result from large defects in the chest wall and may interfere with ventilation
- **Treat it by applying a vented occlusive dressing completely over the defect at the end of one of the casualty's exhalations.**
- Monitor for possible development of subsequent tension pneumothorax.
- Allow the casualty to adopt the sitting position if breathing is more comfortable.

Sucking Chest Wound (Treated)

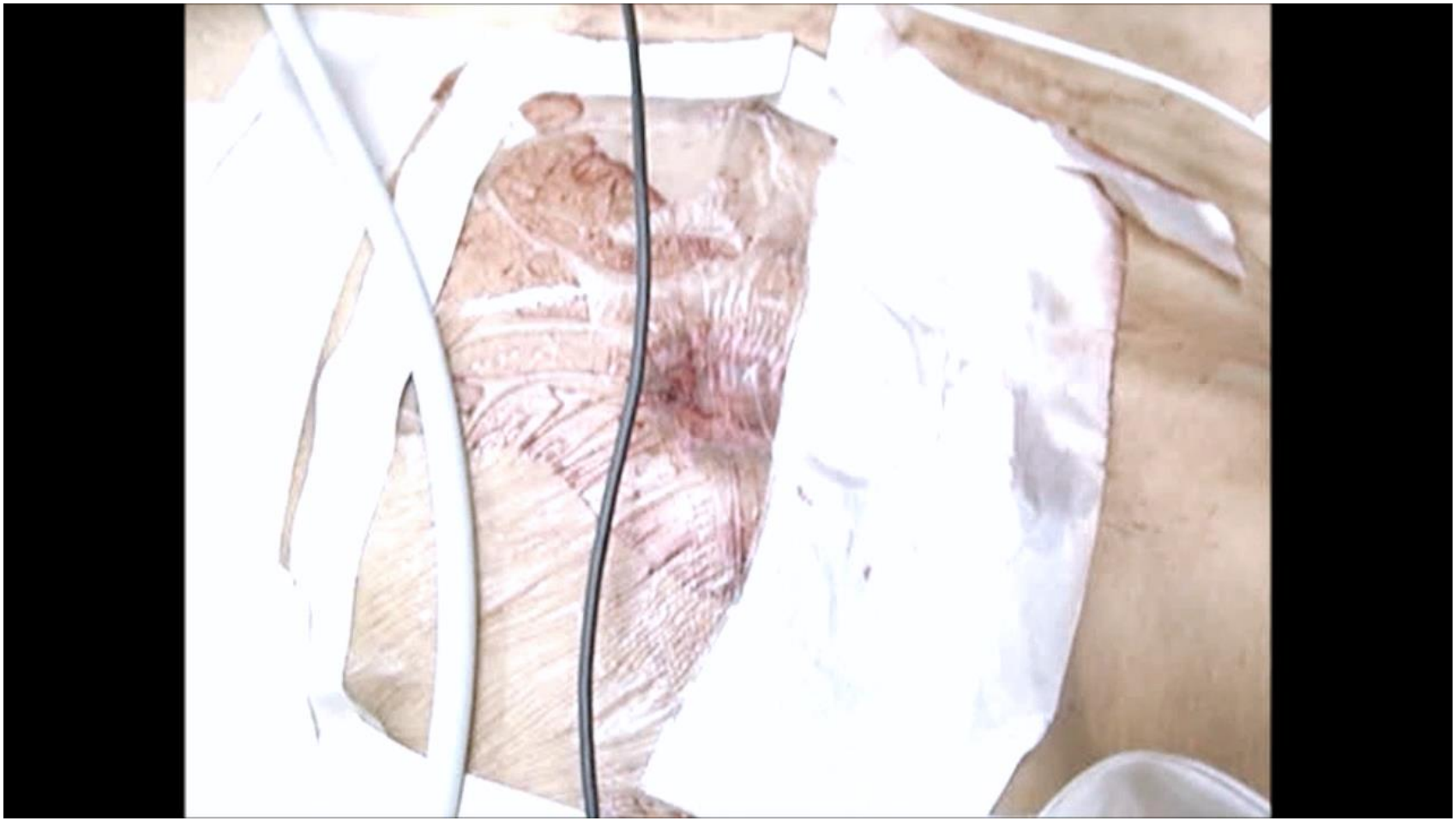


Key Point: If signs of a tension pneumothorax develop – lift one edge of the seal and allow the tension pneumothorax to decompress ("burping" the seal). Alternatively, remove the seal for a few seconds to accomplish the decompression, then re-apply.

Video: Sucking Chest Wound

Link to Online Video

Video: Sucking Chest Wound (Treated)



Link to Online Video

Tactical Field Care Guidelines

5. Respiration/Breathing (continued)

   c. Initiate pulse oximetry. All individuals with moderate/severe TBI should be monitored with pulse oximetry. Readings may be misleading in the settings of shock or marked hypothermia.

Pulse Oximetry Monitoring

- Pulse oximetry tells you how much oxygen is present in the blood.
- Shows the heart rate and the percent of oxygenated blood (“O2 sat”) in the numbers displayed.
- 98% or higher is normal O2 sat

  at sea level.
- 86% is normal at 12,000 feet due to lower oxygen pressure at that altitude.

Pulse Oximetry Monitoring

Consider using a pulse ox for these types of casualties:

- TBI – good O2 sat is very important for a good outcome
- Unconscious
- Penetrating chest trauma
- Chest contusion
- Severe blast trauma

Pulse Oximetry Monitoring

Oxygen saturation values may be inaccurate in the presence of:

- Hypothermia
- Shock
- Carbon monoxide poisoning
- Very high ambient light levels

Tactical Field Care Guidelines

5. Respiration/Breathing (continued)
    d. Casualties with moderate/severe TBI should be given supplemental oxygen when available to maintain an oxygen saturation > 90%.


Questions?