

FEEDBACK TO THE FIELD (FT2F) #14:
*Needle Thoracentesis Observations**

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* RE-ISSUE: Original Released AFMES/OAFME Jul2013

** American Registry of Pathology in support of AFMES

DISCLAIMER

The opinions or assertions presented hereafter are the private views of the authors and should not be construed as official or as reflecting the views of the Department of Defense, its branches, the Armed Forces Medical Examiner System or the DHA Medical Logistics Division.

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INDEX CASE:

Medical intervention in this case autopsied at the Port Mortuary, Dover AFB included 4 needle thoracocentesis placements in the left hemithorax.



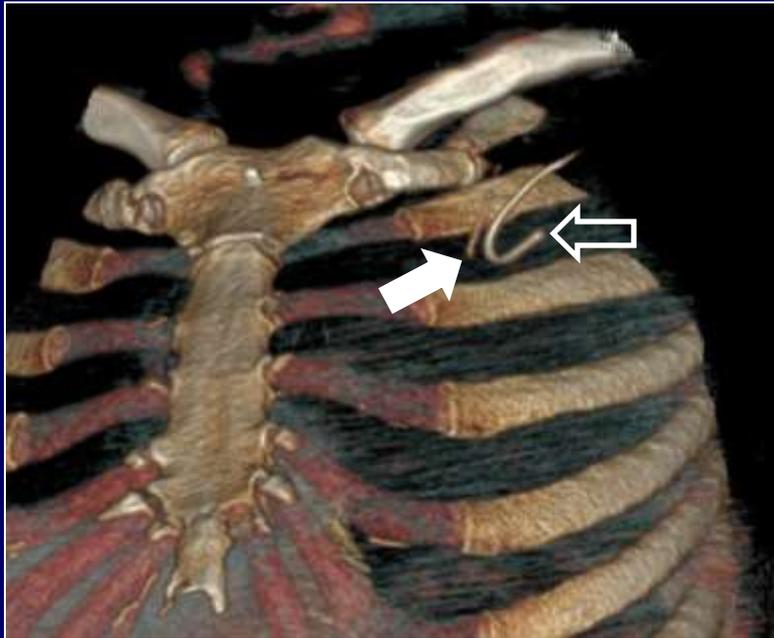
In the 2 anterior placements the angiocatheters remained in place.



Two lateral attempts were documented by autopsy findings (arrows).

INDEX CASE:

Neither of the 2 anterior placements entered the hemithorax.



One was not inserted deeply enough (distal end noted by closed arrows).



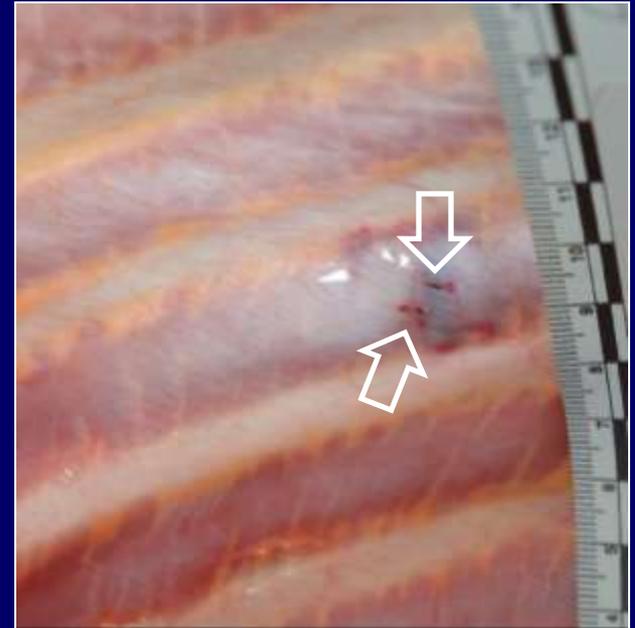
One was sharply curved in configuration (distal end noted by open arrows).

INDEX CASE:

Autopsy confirmed the anterior catheters never entered the pleural cavity and both lateral punctures did enter.



Tip of the curved angiocatheter (arrow) in chest wall.



Needle puncture marks (open arrows) on parietal pleural surface.

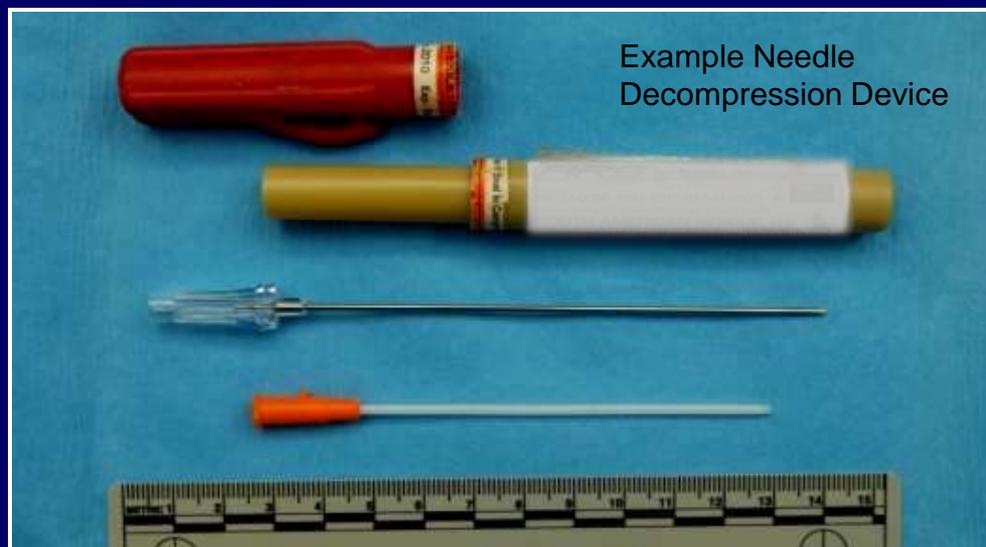
BACKGROUND:

- NEEDLE THORACENTESIS (NT) is an emergency procedure to relieve tension pneumothorax
- Past recommended location for needle insertion is on the mid-clavicular line through the second intercostal space, above the third rib
 - This avoids vessels which run below the ribs



BACKGROUND:

- An 8 cm angiocatheter is included in some medical sets and assemblages.* The size is based upon a prior study of chest wall thickness in servicemembers.#



* NSN: 6515-01-541-0635, Needle Decompression Device, 14-gauge by 3.25 inch

Harcke HT, Pearse LA, Levy AD, Getz JM, Robinson SR. Chest Wall Thickness in Military Personnel: Implications for Needle Thoracentesis in Tension Pneumothorax. *Military Medicine* 2007;172(12):1260-3.

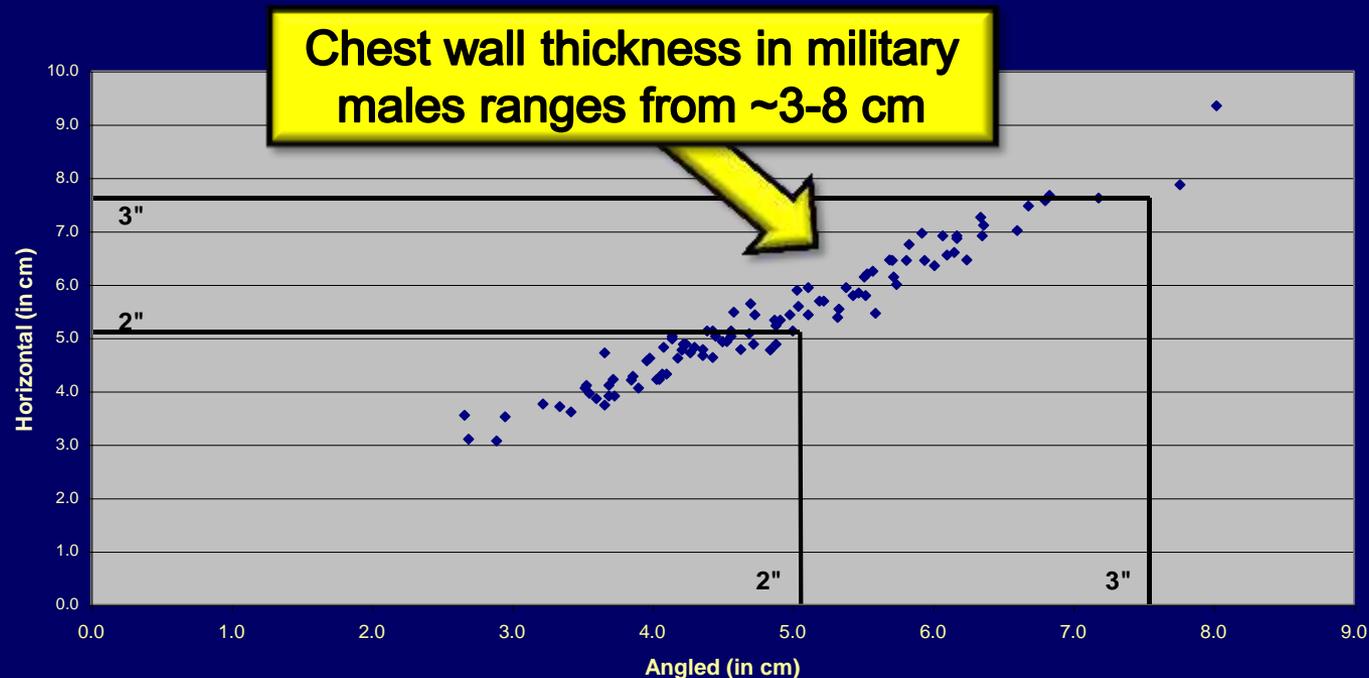
Chest Wall Thickness in Military Personnel: Implications for Needle Thoracentesis in Tension Pneumothorax

Military Medicine 2007;172(12):1260-3.

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Conclusion of Chest Wall Measurement Study:
--- 8 cm (3.25 inch) needle length is required ---

BACKGROUND:

- Tactical Combat Casualty Care (TCCC) Guidelines* state:
 - “...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.*”

A new recommendation is also included...

- “*An acceptable alternate site is the 4th or 5th intercostal space at the anterior axillary line (AAL).*”

* Dated 17 September 2012. Available at:

http://www.health.mil/Education_And_Training/TCCC.aspx

STUDY POPULATION:

- This report is based upon analysis of 16 autopsied cases where NT catheters were present at the time of postmortem examination (Index Case and 15 others)
- Selection was based upon Medical Examiner anatomic confirmation of the NT catheter position and the appearance of the parietal pleura (needle mark)
- Cases were deaths in theater during Operation Iraqi Freedom (OIF), Operation Enduring Freedom (OEF), or Operation New Dawn (OND). The circumstances of NT placement are unknown and no relationship to outcome can be established

DATA:

A total of 23 catheter placements were studied by postmortem computed tomography (CT) with autopsy correlation:

- One case with 2 catheters and 2 punctures

- Four cases with 2 catheters present

- Eleven cases with 1 catheter present

DATA:

- In 7 placements, the NT catheter was in the pleural cavity, per CT and autopsy analysis
- In 1 placement, the NT catheter was not located in the pleural cavity on CT, but autopsy showed that chest wall penetration had occurred
- In 2 placements, the NT catheter was not present, but chest wall penetration had occurred
- In 7 placements, the NT catheter was not in the pleural cavity on CT, and autopsy showed no penetration
- In 6 placements, the NT catheter was not in the pleural cavity on CT, and at autopsy no conclusion regarding NT catheter penetration could be made – *These data have been removed from further analysis*

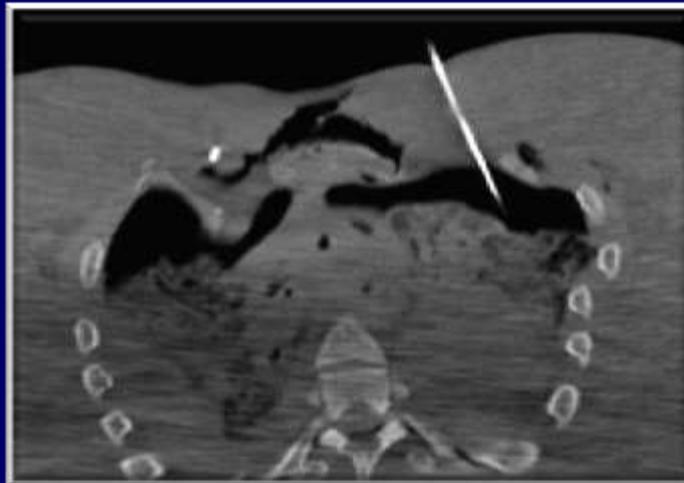
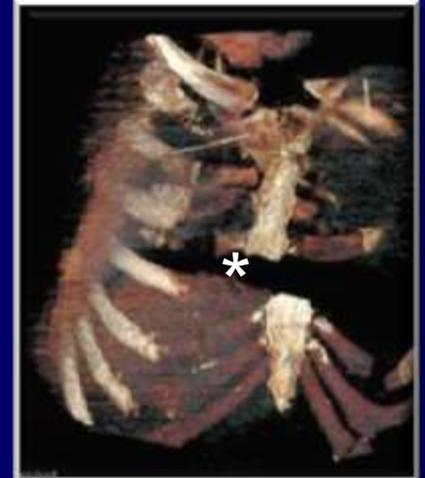
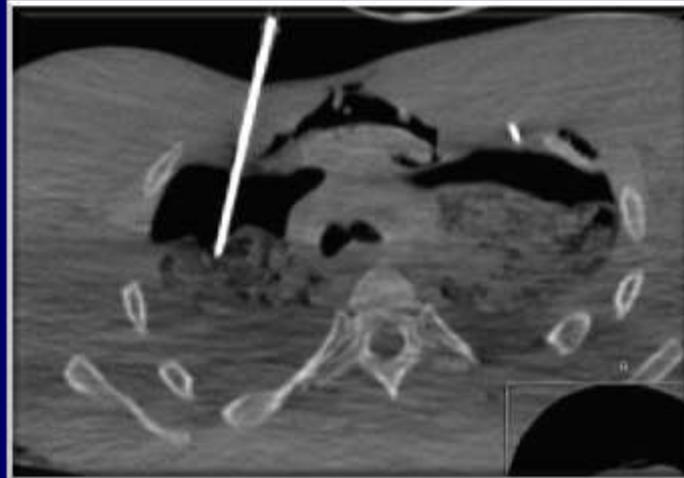
DATA:

- In 10 of 17 placements the angiocatheter was either in the pleural cavity or showed evidence of prior catheter entry.
- In 7 of 17 placements the angiocatheter was not in the pleural cavity on CT and autopsy showed no evidence of prior catheter penetration.

This sample of NT placements with CT and autopsy correlation showed that NT was successful in only 59% of the attempts.

EXAMPLE CASE 1:

- Bilateral NT placement at the 1st ICS medially and directed downward
- Both enter the pleural cavity. Lung appears to be penetrated on the right side.

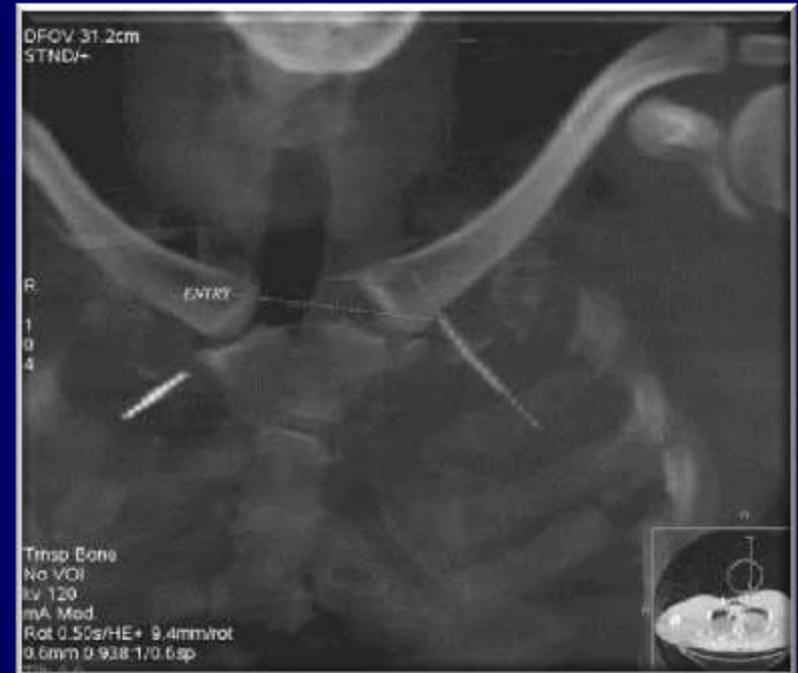
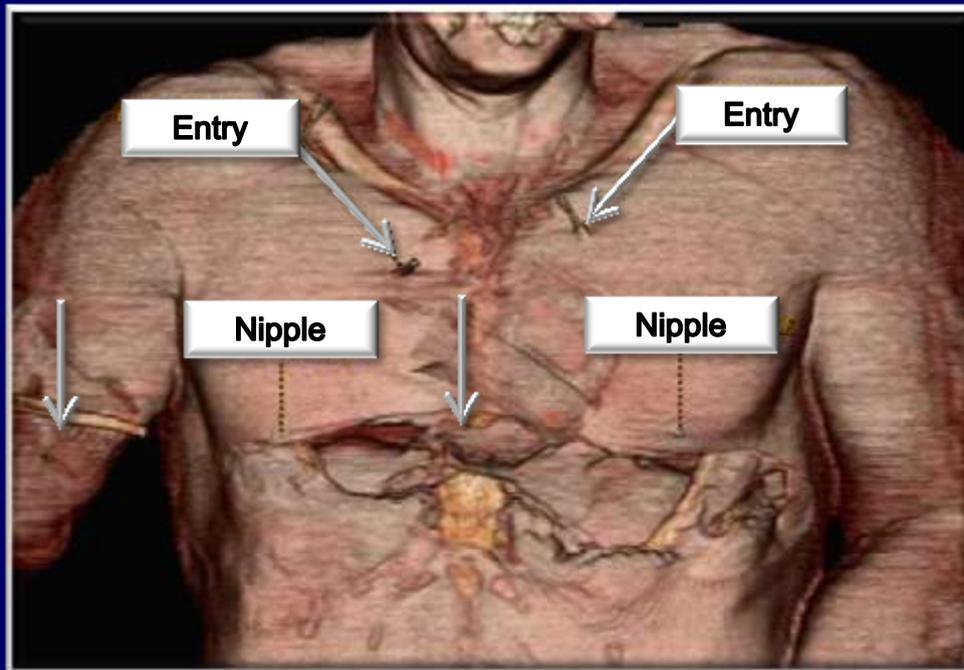


Notes:

- Needles have not been withdrawn from the angiocatheters
- * A thoracotomy has been performed

EXAMPLE CASE 1:

- Note that needle placements are medial to the nipple line
- Since needles remain in the angiocatheters, the tracks are straight and directed downward & lateral



EXAMPLE CASE 2:

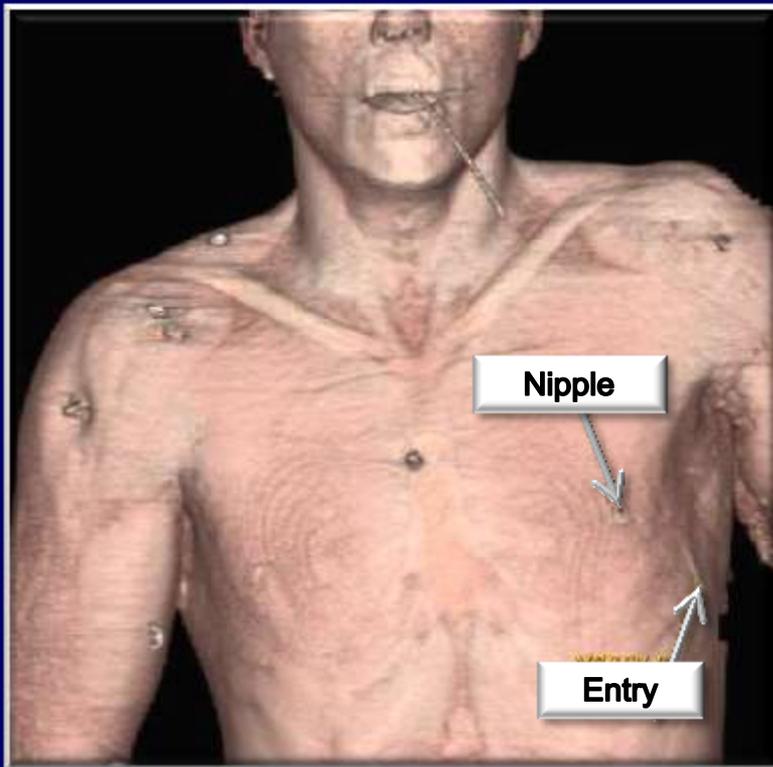
- Lateral NT placement at 5th left intercostal space, anterior axillary line:



[General Note: In this dataset, for placements where a lateral NT approach was used, all 4 entered the pleural cavity]

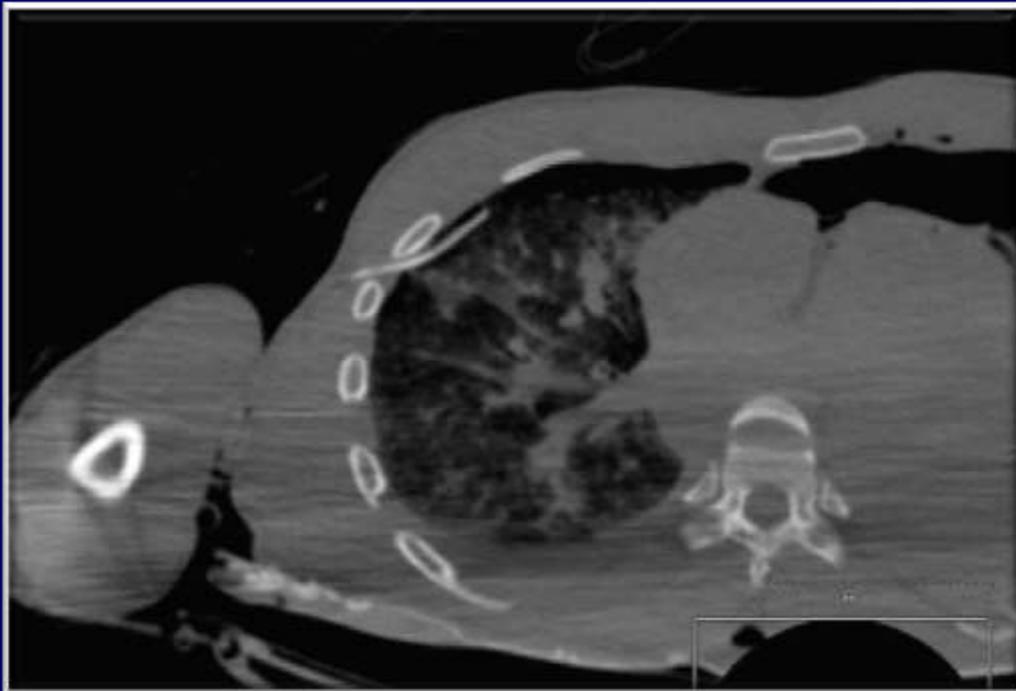
EXAMPLE CASE 2:

- Note that needle placement is lateral to the nipple line
- The angiocatheter follows a curved track, but does enter the thorax



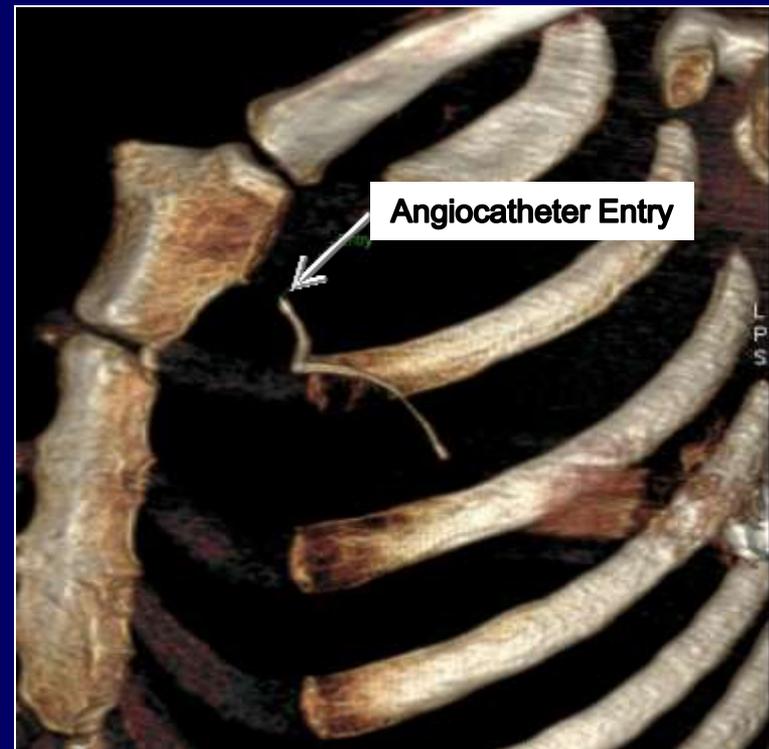
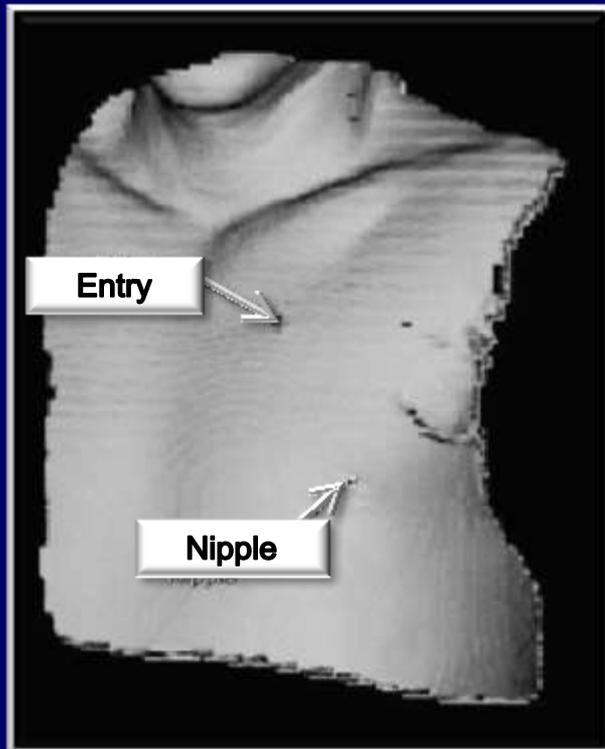
EXAMPLE CASE 3:

- Lateral NT placement at 4th right intercostal space, anterior axillary line
- An example of other successful NT placement made from a lateral approach



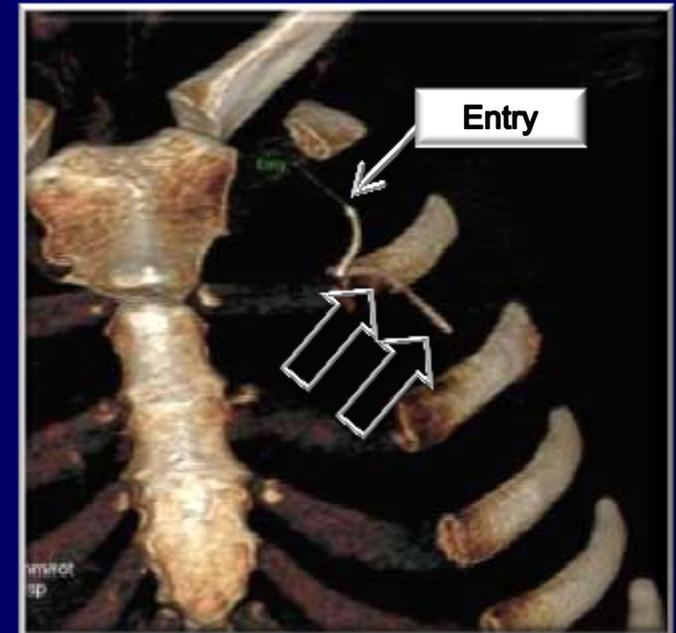
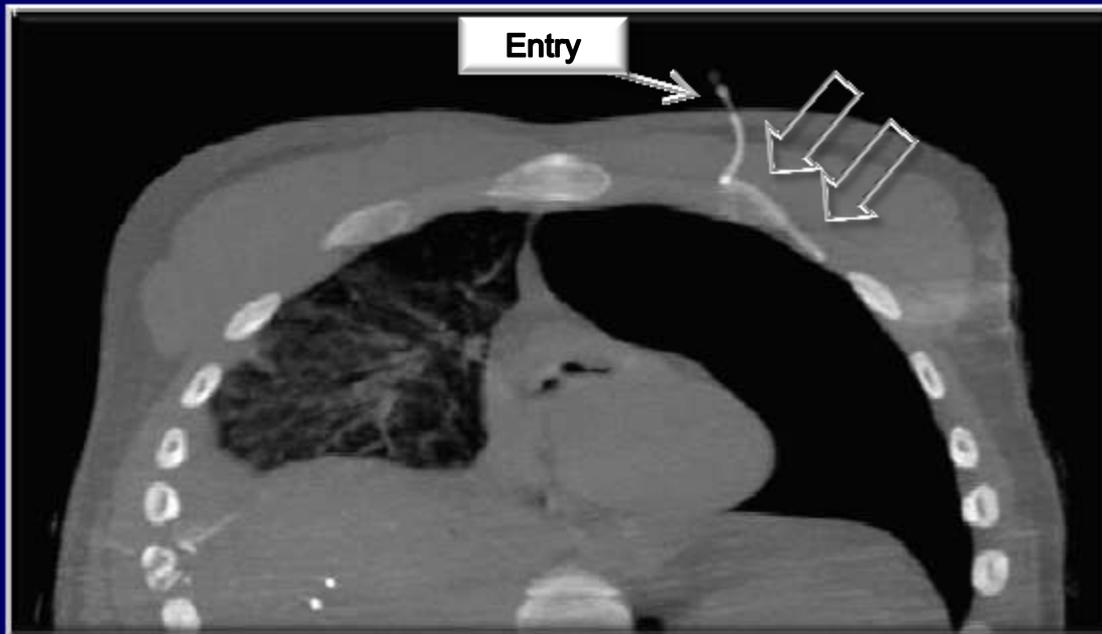
EXAMPLE CASE 4:

- Left NT placement, medial to the nipple line, at the 1st intercostal. Passes laterally & downward over the 2nd rib
- At autopsy, there was no evidence of pleural cavity penetration



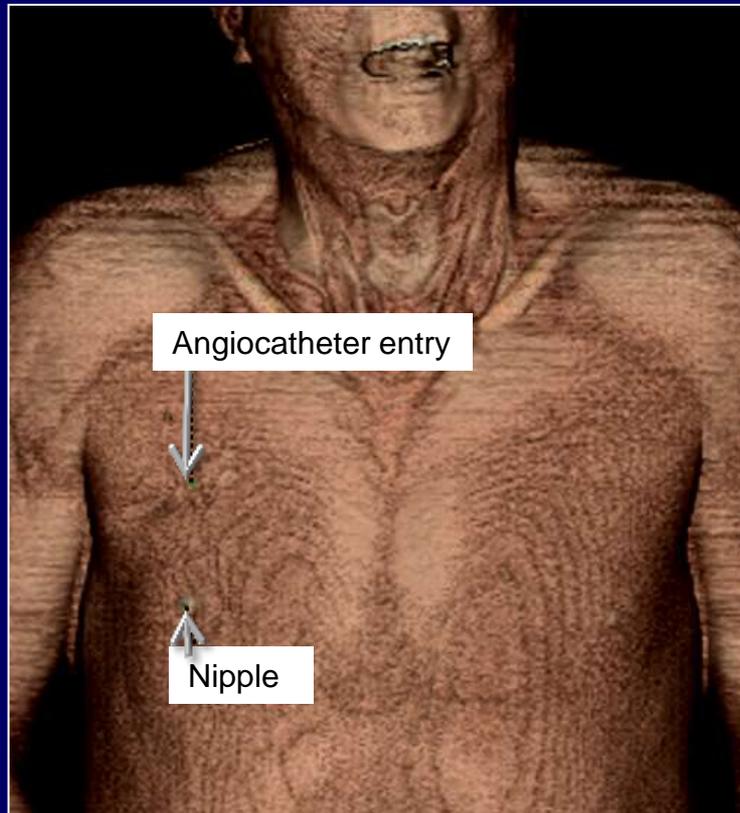
EXAMPLE CASE 4:

- Note that the angiocatheter is curved. Curvature may have occurred during insertion if needle was withdrawn as the angiocatheter was advanced
- The angiocatheter tracks along the rib which appears to have been struck (open arrows)



EXAMPLE CASE 5:

Right NT placement at the 3rd ICS passes laterally and downward over the 4th rib. At autopsy there was no evidence of pleural cavity penetration.



EXAMPLE CASE 5:



Note the angiocatheter is curved. Curvature may have occurred during insertion if needle was withdrawn as the angiocatheter was advanced. The rib may have been struck.

SUMMARY:

- In 17 NT attempts where the angiocatheter position and/or track could be documented, pleural cavity entry was noted in 10 (*overall 59% success rate*). Of the 17 NT attempts...
 - Thirteen used an anterior entry; Six successfully entered the pleural cavity
 - Four used a lateral entry; all 4 entered the pleural cavity
- NT entry locations were varied with regard to rib space and the nipple line
- Angiocatheters often show a curved configuration after core needle removal. It is not known if this relates to insertion technique, particularly if a rib is encountered

DMMPO RECOMMENDATIONS:

- First Responders should be aware of new TCCC Guidelines*: NT placement on the battlefield can be made from anterior or lateral approaches
- Military training centers should utilize data from this presentation to educate deploying medical personnel about proper NT placement and potential challenges/pitfalls

* Available at: http://www.health.mil/Education_And_Training/TCCC.aspx

This material is intended for educational and training purposes. If portions are extracted, the following statement must be included:

“Source: Armed Forces Medical Examiner System and DHA Medical Logistics Division”

NOTES of CAUTION:

- The clinical circumstances and details surrounding emergency treatment in these cases is unknown
- This presentation makes no association between device placement and outcome of treatment
- This case series is drawn from cases with fatal injuries, which may skew data

For FT2F Comments / Questions / Requests:
Contact the Armed Forces Medical
Examiner System (AFMES)

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