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Tension Pneumothorax Management with Capnospot®

Clinical Procedural Guide

Purpose:

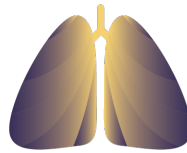
To provide procedural guidance for needle thoracostomy while utilizing the Capnospot®.

1. Indications for Use:

For patients with known or suspected tension pneumothorax. Used for more accurate placement of pneumothorax decompression devices than the current standard of care auditory assessments^{1,2}.

2. Signs and Symptoms of Tension Pneumothorax:

- a. **Self-Ventilating Patients:** Tension pneumothorax detected via advanced imaging, clinical suspicion, or known traumatic injury to the chest, back, or abdomen, with severe or progressive respiratory distress associated with **at least one or more of the following signs and symptoms**^{3,4}:
 - i. Severe or progressive tachypnea
 - ii. Severe or progressive dyspnea
 - iii. Tachycardia
 - iv. $\text{SpO}_2 < 90\%$
 - v. Absent or diminished lung sounds on the affected side
 - vi. Hypotension
 - vii. Persistent loss of consciousness
 - viii. Traumatic cardiac arrest without obviously fatal wounds
- b. **For Positive Pressure Or Mechanically Ventilated Patients:** Tension pneumothorax detected via advanced imaging, clinical suspicion, or known traumatic injury to the chest, back, or abdomen, and **at least two or more of the following symptoms presenting with a rapid onset**^{3,4}:
 - i. Severe and progressive respiratory distress in the conscious self-ventilating patient (CPAP or Bi-level Ventilation)
 - ii. Severe or progressive tachypnea during administration of CPAP or Bi-Level Ventilation
 - iii. Tachycardia
 - iv. $\text{SpO}_2 < 90\%$



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- v. Hypotension
- vi. Decrease of compliance during ventilation
- vii. Acutely increased or progressive ventilatory requirements (e.g. Reduced tidal volume with pressure control or high peak pressure with volume control)
- viii. Subcutaneous emphysema
- ix. Absent or diminished lung sounds on the affected side
- x. Loss of consciousness (while receiving CPAP or Bi-level Ventilation)
- xi. Cardiac arrest without other known etiology

3. Identification of Landmarks and Site Preparation for Needle

Thoracostomy:

a. 2nd Intercostal Space Midclavicular line:

- i. Identification of the sternal notch (Figure 1)
- ii. Identification of the sternoclavicular joint (Figure 1)
- iii. Identification of the acromioclavicular joint (Figure 1)
- iv. Identification of the clavicle mid-point (midclavicular line) (Figure 1.)
- v. Identification of the 2nd intercostal space (above the third rib – midclavicular line, at the sternal ridge, or sternal Angle of Louis) (Figure 1)
- vi. Identify the intersection between the vertical midclavicular line and a horizontal line running laterally from the Angle of Louis (Figure 1)
- vii. Confirm location by firmly palpating the 3rd rib on the midclavicular line (Figure 1)
- viii. Cleanse the site by applying antiseptic wipe or solution if available

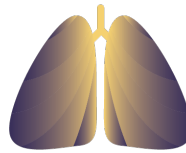
b. 4th or 5th Intercostal Space Anterior Axillary Line:

- i. Identify the Inframammary fold (Figure 2)
- ii. Moving laterally, the landmark is immediately behind the edge of the pectoralis major muscle (Figure 2)
- iii. Cleanse the site by applying antiseptic wipe or solution if available

4. Prepare Equipment:

- a. Affix the Capnospot[®] male Luer connector to the female Luer connection of an appropriately sized needle decompression device (Figure 3). This device features a built-in one-way valve

Insert the Decompression Device:

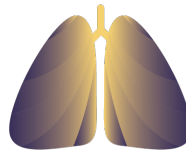


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- a. Penetrate the skin advancing the decompression device at a 90-degree angle through the chest wall just above the rib and into the plural space (Figure 4)^{3,4}
- b. Advance the catheter through the chest wall until a positive indication of CO₂ is observed via Capnospot[®] or a “pop” is felt upon entering the plural space²⁻⁶
- c. Hold the decompression device in place for approximately 10 seconds and observe for visible color change in the Capnospot[®] indication chamber (Figure 5). Even If no observed color change, proceed to step d³⁻⁶
- d. Advance the catheter hub of the decompression device over the needle to the plane of the patient's skin^{3,4}
- e. Remove Capnospot[®] from the needle of the commercially available (5-8cm, 10 gauge) decompression device and dispose of the needle in an appropriate sharp securement device^{3,7,8}
- f. Reapply the Capnospot[®] to the catheter for ongoing assessment of catheter patency based on the color changing indicator (Figure 6)⁵
- g. Secure the catheter per institutional policy

5. Monitor Patient for Improvement of Vital Signs:

- a. Monitor Capnospot[®] for continuous confirmation of catheter patency by visualization of a yellow color within color changing indicator⁵
- b. Increase in SPO₂; Improvement of patient blood pressure; improvement of tachypnea and shortness of breath^{3,4,7}
- c. If the Capnospot[®] color changing indicator presents a blue color, attach a 10mL syringe to the female Luer connection of Capnospot[®] and attempt to aspirate air. If the Capnospot[®] does not change to a yellow color or air is unable to be aspirated without resistance, evaluate the catheter for displacement or obstruction (Figure 7)^{3-5,7,9}
- d. If catheter displacement occurs, evaluate the patient for further clinical deterioration and consider the placement of a second commercially available decompression device with Capnospot[®] affixed^{3-5,9}
- e. The Capnospot[®] may be kept in place to confirm catheter patency until definitive care is reached⁵



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Figures

Fig. 1

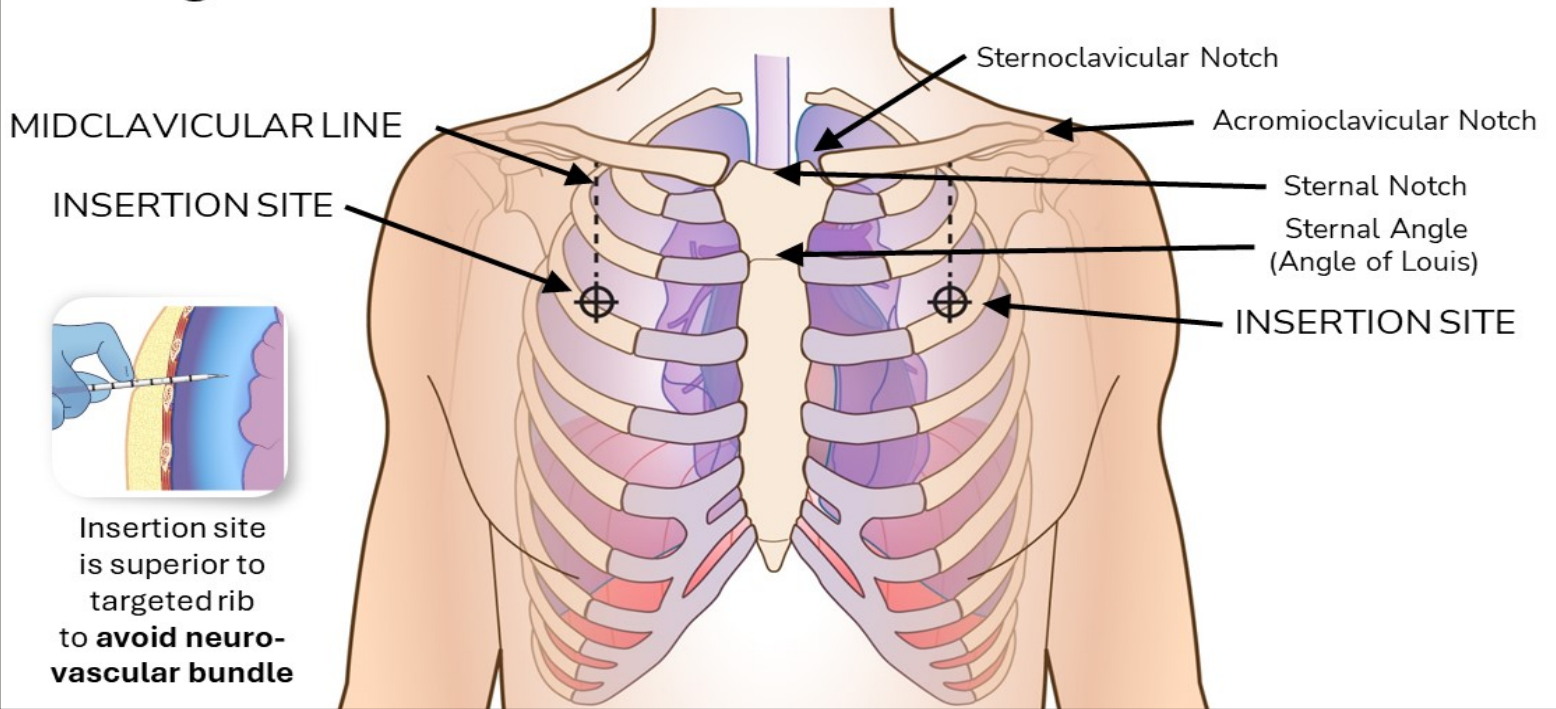
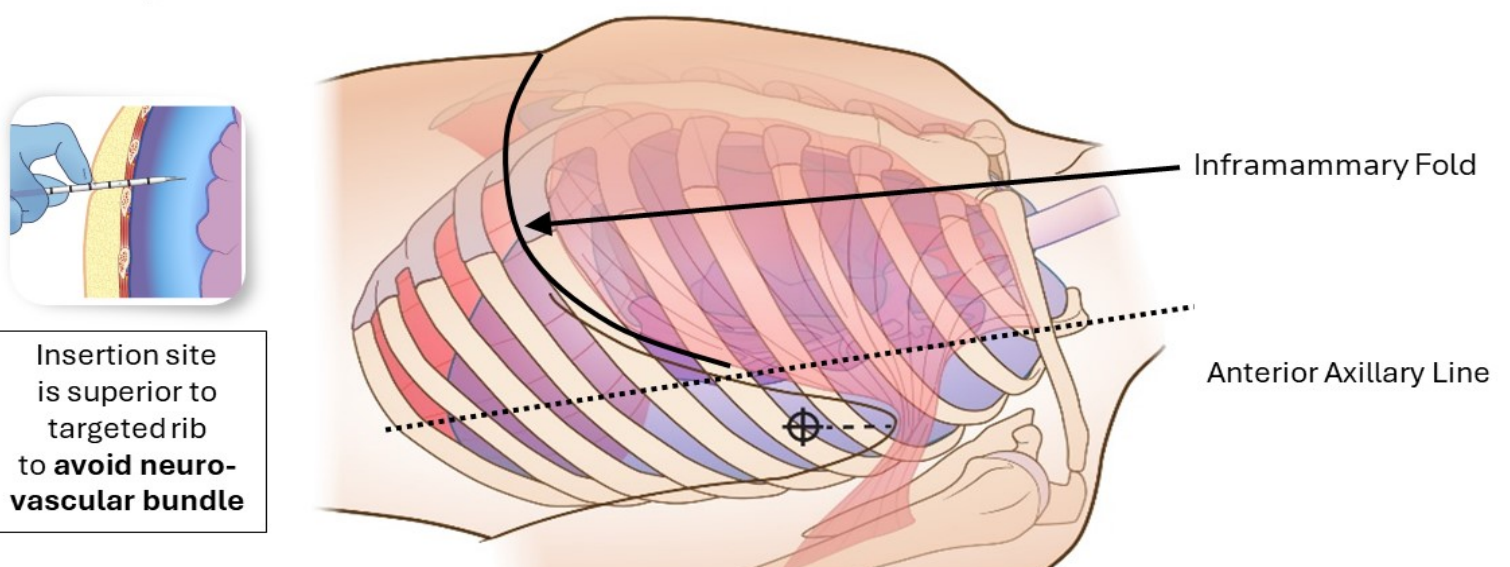
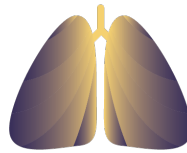


Fig. 2





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Fig. 3

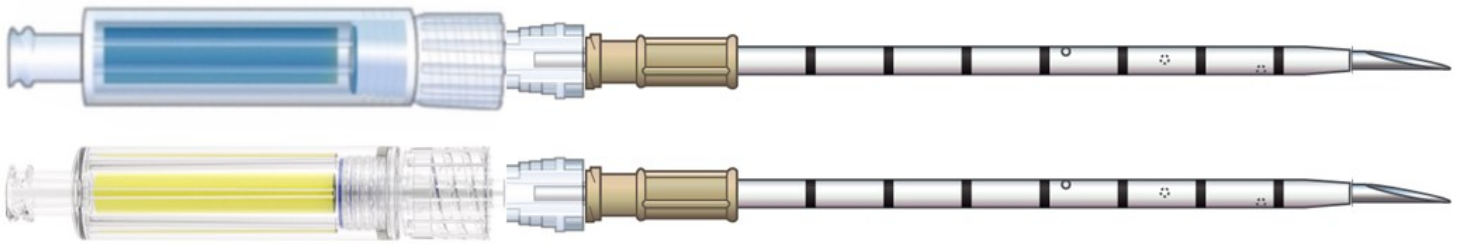
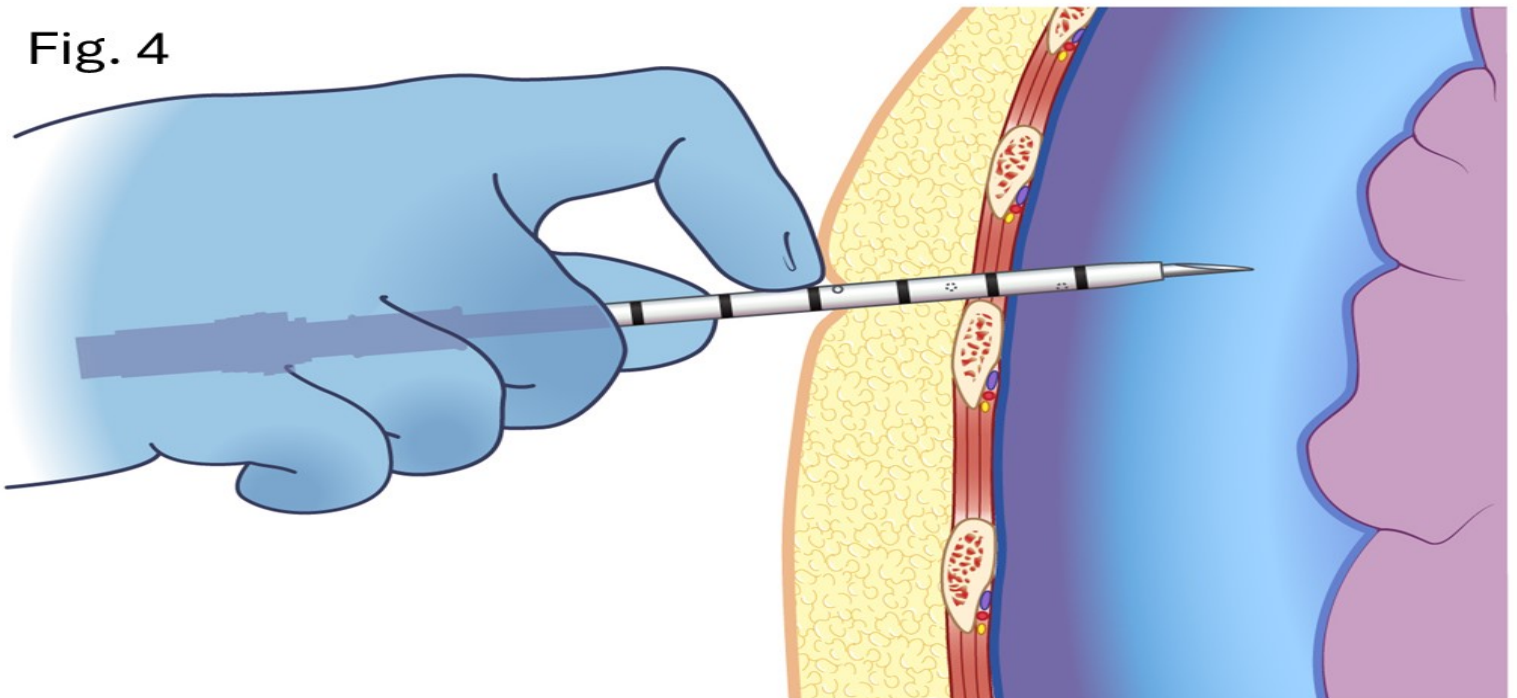
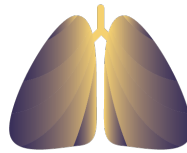


Fig. 4





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Fig 5

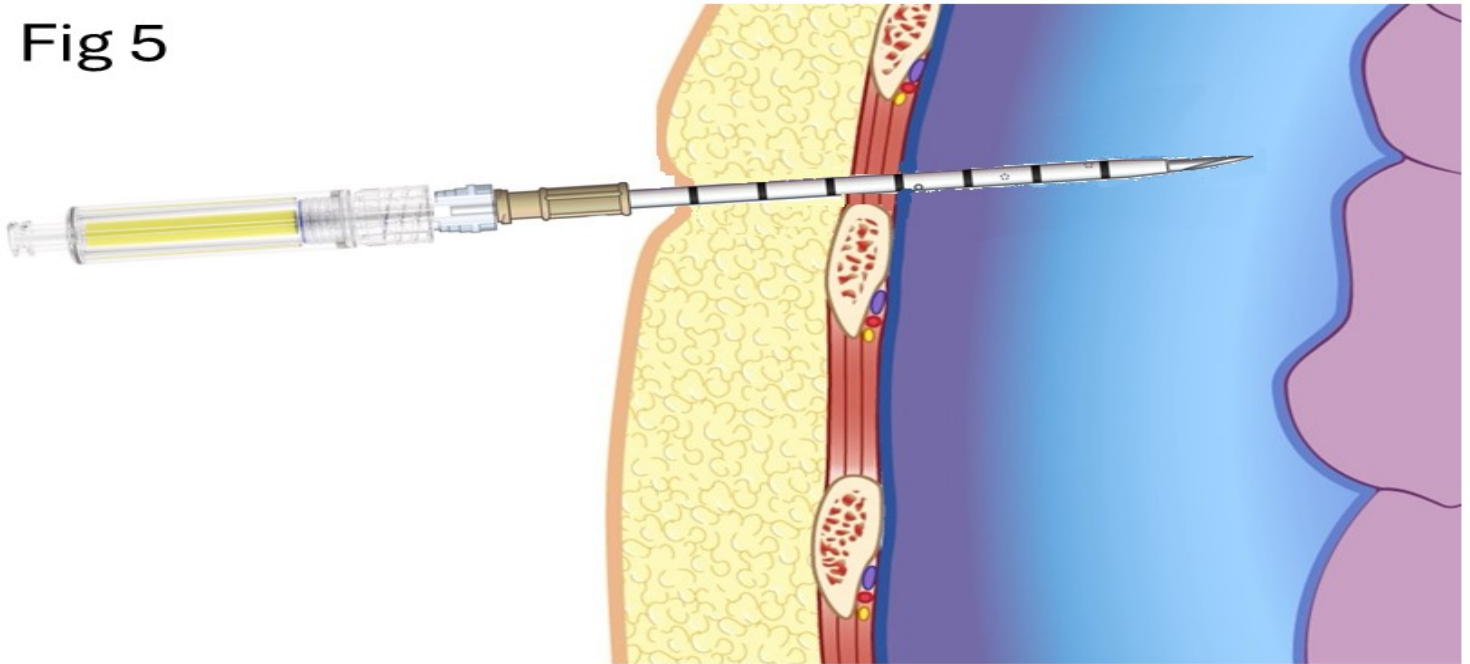
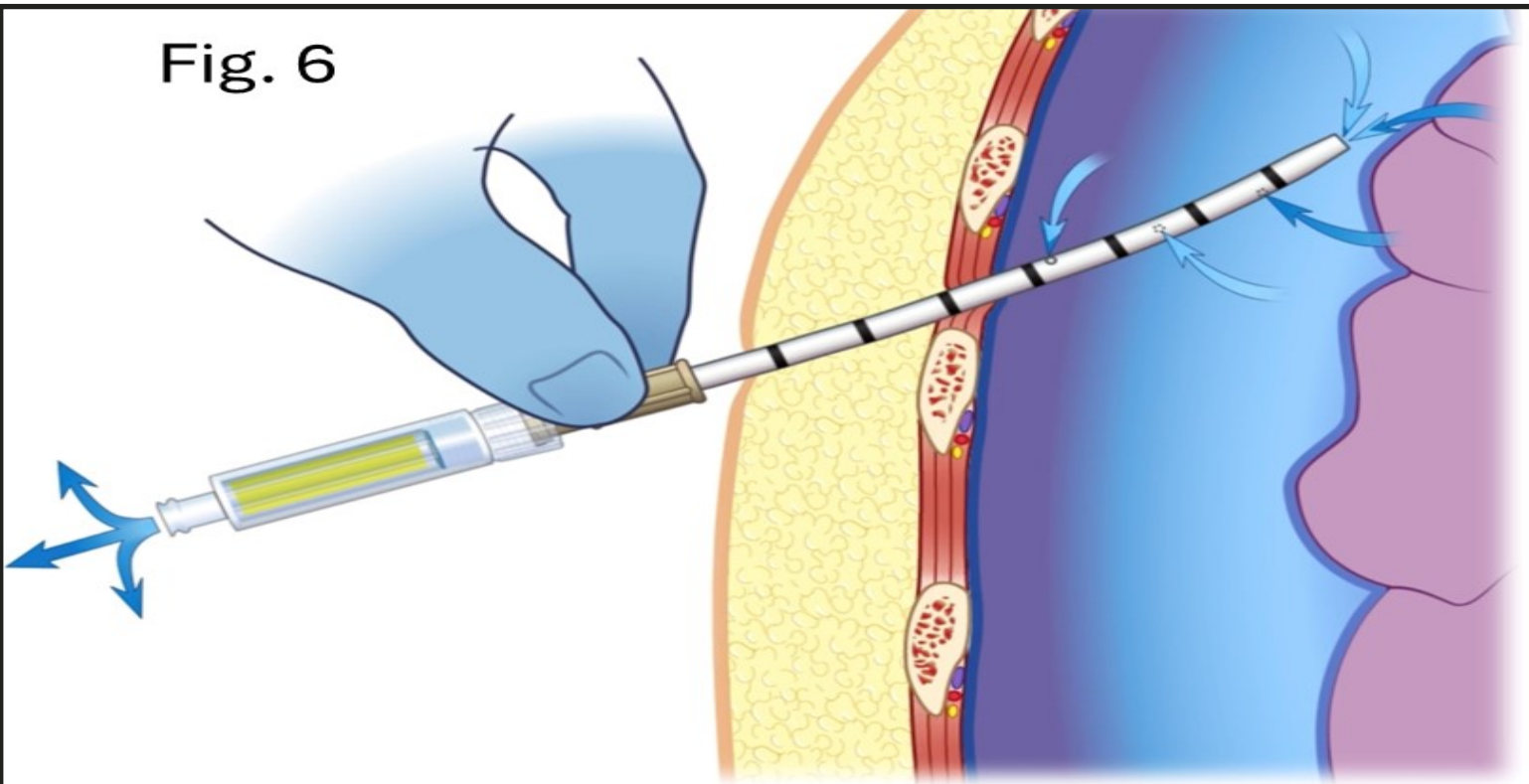
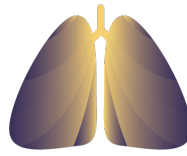


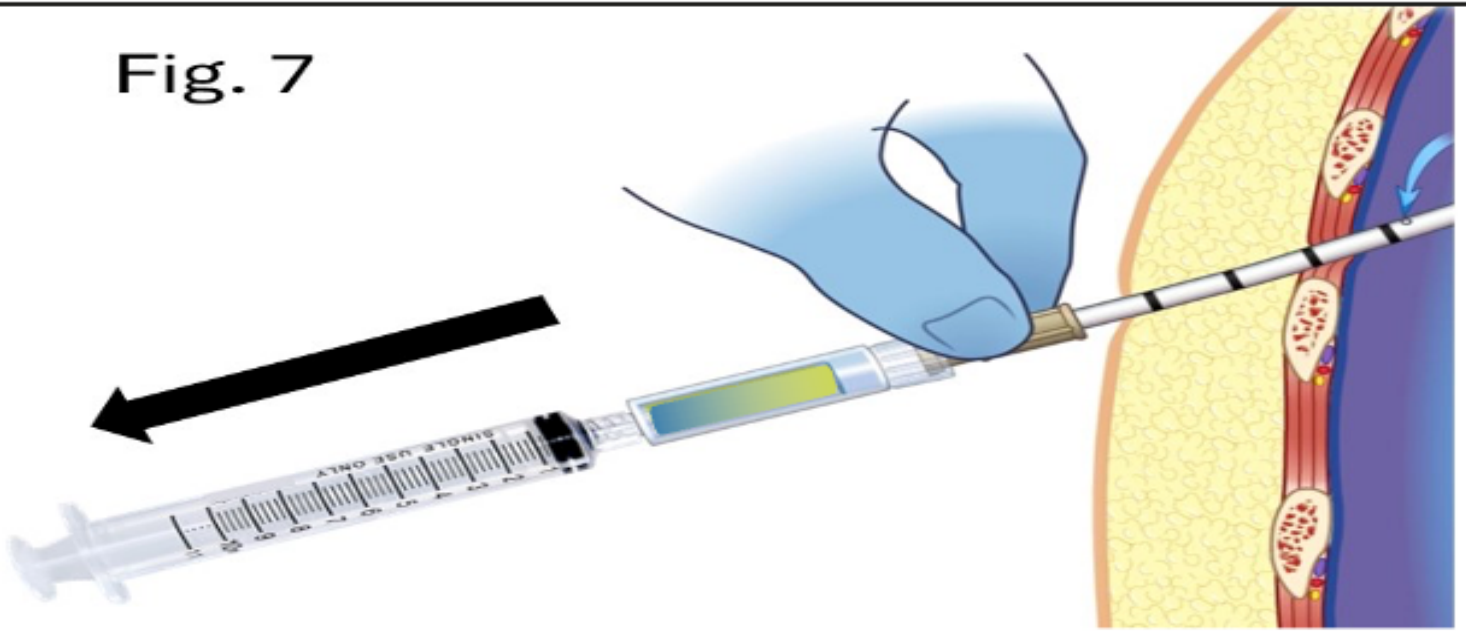
Fig. 6

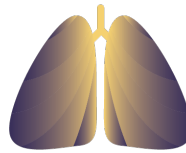




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Fig. 7





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Works Cited

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