Tension Pneumothorax Management with Capnospot®

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 assessments1,2.

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 symptoms3,4:

i. Severe or progressive tachypnea
ii. Severe or progressive dyspnea
iii. Tachycardia
iv. SpO2 < 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 onset3,4:

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. SpO2 < 90%
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
ii. Identification of the sternoclavicular joint
iii. Identification of the acromioclavicular joint
iv. Identification of the clavicle mid-point (midclavicular line)
v. Identification of the 2nd intercostal space (above the third rib midclavicular line, at the sternal ridge, or sternal Angle of Louis)
vi. Identify the intersection between the vertical midclavicular line and a horizontal line running laterally from the Angle of Louis
vii. Confirm location by firmly palpating the 3rd rib on the midclavicular line
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

ii. Moving laterally, the landmark is immediately behind the edge of the pectoralis major muscle

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. This device features a built-in one-way valve

Insert the Decompression Device:

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 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. 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 device3,7,8

f. Reapply the Capnospot® to the catheter for ongoing assessment of catheter patency based on the color changing indicator 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 breath3,4,7

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 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® affixed3–5,9

e. The Capnospot® may be kept in place to confirm catheter patency until definitive care is reached.