



Case of the Month

Dr. Martin Joseph

Point of Care Ultrasound in ED Airway Management The How & the Why?

POCUS in the confirmation of endotracheal intubation

Intubation of critically ill patients is a commonly performed intervention in the emergency department (ED). Direct visualization of the endotracheal tube passing through the cords is often relied on for initial localization, followed by a confirmatory technique. However, direct visualization of endotracheal tube passage may be limited during difficult intubations, and approximately 3.3% of emergency intubations are oesophageal.

Confirmatory devices, such as end-tidal CO₂ detection and colorimetric capnography, require at least 5 “breaths” for confirmation, which can lead to gastric distention and an increased risk of aspiration if the endotracheal tube was incorrectly placed in the oesophagus. Additionally, capnography may not be as reliable in certain patient groups, including those with previous bag-valve-mask use or recent carbonated beverage ingestion, or when there is a paucity of carbon dioxide produced (i.e., during cardiac arrest). In fact, quantitative waveform capnography has been demonstrated to be only 65% to 68% sensitive for detecting the correct endotracheal tube location during cardiac arrest.

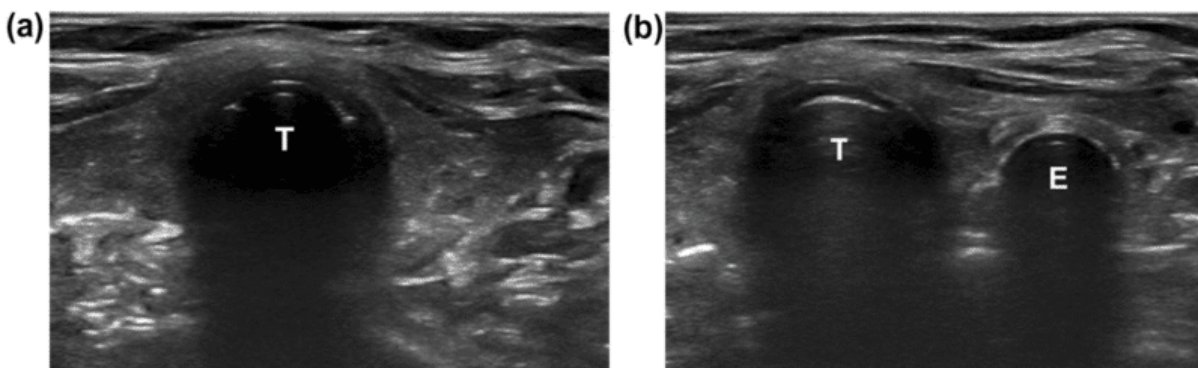
The increasing availability and comfort of use of ultrasonography in the ED makes it a promising tool for endotracheal tube placement confirmation. A Systematic review and meta-analysis of 17 studies involving 1,595 patients found that ultrasonography was 98.7% sensitive and 97.1% specific for confirmation of tube placement. This was consistent across extensive subgroup analysis. Therefore, ultrasonography is a valuable adjunct and should be considered when quantitative capnography is unavailable or unreliable.

Technique

- Place linear probe transversely on the suprasternal notch.
- Trachea is located midline behind the thyroid gland appearing as a hyperechoic circular structure.
- Static method: look for the presence of a tube in the trachea and laterally at the oesophagus for possible incorrect tube placement. The oesophagus normally appears small and deflated but may appear as a smaller circle lateral to the trachea if the tube is incorrectly placed. Twisting the tube can also show motion artefact where the tube is present.
- Dynamic technique: watch the tube pass through the cords in real time; there will be a flutter of activity as it passes through the vocal cord. Disadvantages include making difficult intubations even more challenging and being difficult to perform with a single provider.



Orientation of probe for trans tracheal ultrasound (source: CJEM)



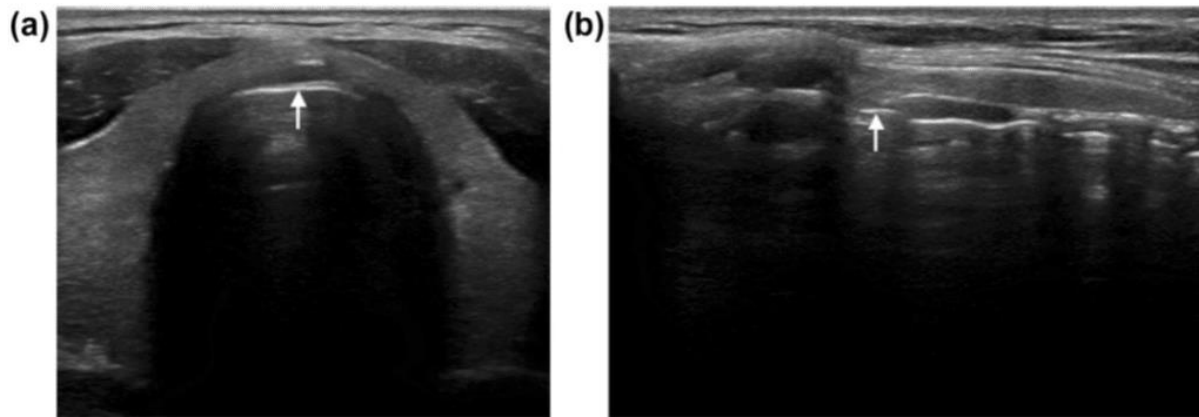
(a) Tracheal Intubation (b) Oesophageal Intubation (source: CJEM)

POCUS in land marking for cricothyroidotomy

Point of care Ultrasound (POCUS) has been shown to be superior to the landmark technique and can be performed in under 30 seconds. Ultrasound can assist the physician in identifying relevant anatomy including bone and soft tissues of the hypopharynx and anterior neck, cricothyroid membrane, tracheal cartilages, oesophagus, and aerated lung in a simple, rapid, and non-invasive manner.

Technique

Place the probe transversely across the cricoid cartilage and identify the thyroid cartilage superiorly (hyperechoic triangular structure). Move caudally to visualize the cricoid membrane (large circular ring followed by a series of smaller rings inferiorly). The cricothyroid membrane is just above, appearing as a hyperechoic white line with distal reverberation artifact. Identify important structures around this and mark the skin.



Cricothyroid membrane (arrow) in transverse (a) and longitudinal plane (b) (source: CJEM)

POCUS in difficult airway assessment

In patients with stridor, POCUS allows visualization of a mass or subglottic pathology that will make intubation more challenging.

In children and adults who have been intubated before, POCUS allows visualization of subglottic stenosis that may be difficult to predict externally.

Videos on POCUS in airway management

<https://www.youtube.com/watch?v=fiCcwatO73g>

<https://www.youtube.com/watch?v=0O7F7EVSPGQ>

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