# Ultrasound for Critical Care Physicians: Who Stole My Patient's Trachea?

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A 73-year-old man with a past medical history of asthma-chronic obstructive pulmonary disease overlap syndrome and coronary artery disease presented to the emergency department with acute on chronic respiratory failure. The patient failed to respond to initial bronchodilator treatment and non-invasive positive pressure ventilation. A decision was made to proceed with endotracheal intubation and mechanical ventilation. Upper airway ultrasonography was used to confirm positioning of the endotracheal tube and the following images were obtained:

Figure 1. Longitudinal view of the trachea.

Figure 2. Transverse view of the trachea at the level of the tracheal rings.

What does the ultrasound depict (see Figures 1 & 2)?

1. Endotracheal intubation
2. Esophageal intubation
3. Calcified tracheal rings
4. Thyroid

**Correct!**
**3. Calcified tracheal rings**

Ultrasound machines are bedside tools readily available in most intensive care units. They allow for rapid evaluation of the upper airway. Recently, ultrasound has been demonstrated to predict difficult endotracheal intubations (ETT) and to confirm positions of the endotracheal tube within the tracheal lumen while excluding inadvertent esophageal intubation.

In a successful endotracheal intubation, a “Bullet sign” is visualized. A “Bullet sign” is the loss of reverberations in the central part of the tracheal lumen that is occupied by the ETT. Esophageal intubation will display on the short axis neck ultrasound two side by side lumens, one being the trachea and the other the inappropriately positioned ETT within the esophagus, also referred to as the “double track sign”.

Tracheal cartilage is rich in water and hypoechoic to US, the bright line delineates the air-tissue interface beyond which ultrasound waves are not transduced. Artifact reverberations (note asterisk) can be appreciated within the lumen of the trachea (Figures 3 & 4).

Figure 3 Short axis neck ultrasound from a healthy individual.

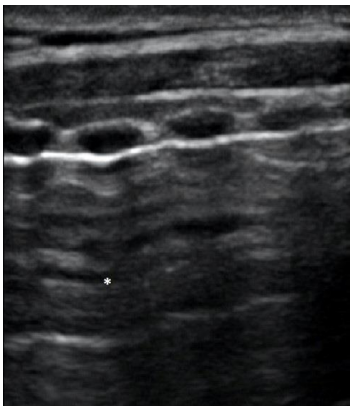

Figure 4. Long axis neck ultrasound from a healthy individual.

The thyroid gland is isoechoic to hyperechoic vascular tissue on both sides of the lower portion of the extra thoracic trachea (having an almost “granular” appearance) with an isthmus present anteriorly.

Figures 1, 2 and 5 belong to the patient in the clinical vignette, calcified tracheal cartilage acts as a barrier to US wave conduction and do not allow the normal ultrasound imaging of the tracheal wall. As stated, healthy tracheal rings are well delineated hypoechoic structures that cannot be clearly appreciated in (Figures 1 and 2). The presence of calcified trachea was confirmed on review of a recent CT of the chest (Figure 5).


Figure 5. Lateral view of thoracic CT scan in soft tissue windows showing the calcified tracheal rings.

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