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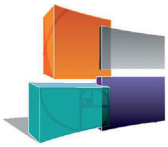

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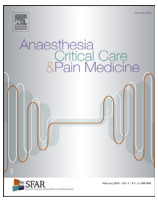

Letter to the Editor

Confirmation of endotracheal tube placement with ultrasound – direct visualisation with anterior neck compression and continued surveillance

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1. Main Letter

We read with interest the article 'Comparison of techniques for visualisation of the airway anatomy for ultrasound-assisted intubation: A prospective study of emergency department patients' [1]. This observational study was performed to image the airway rather than confirm airway placement. It provided evidence that imaging airway anatomy, particularly visualisation of the oesophagus, required pressure to be applied. As a matter of fact, traditional methods of endotracheal tube (ETT) confirmation through ultrasound are via indirect methods [2,3]. This requires non-visualisation of the ETT in the oesophagus and the inference of accurate placement in the trachea. False negatives occur when the ETT may be too shallow (in the mouth), or when the oesophagus shadow is not seen as it lies directly behind the trachea [2], leading to a single rather than double air-mucosal interface.

Direct visualisation of the ETT had previously been described in two studies [4,5]. In an adult study [5], without active pressure, the direct method was found to have high specificity but out of 8 cases diagnosed by ultrasound to have oesophageal intubation, only 6 cases were confirmed by capnography to be accurate, leading to a negative predictive value of 75%. Here, we describe 2 easy steps that could improve the sensitivity and negative predictive value of direct ultrasound visualisation of the ETT.

These images were obtained on an 88-year-old male of medium built who was intubated for airway protection in the emergency department following a massive intracranial bleed. The 1st method utilises gentle, graded pressure on the area between the cricothyroid membrane and sternal notch, similar to the suprasternal approach described in the journal article. Using a linear probe (Philips L 12–3 MHz) with a transverse plane, the ETT can be visualised within the lumen of the tracheal as 2 hyperechoic lines (Fig. 1 and Supplementary Video 1). Compression is necessary to expel intraluminal tracheal air and enable direct visualisation of both borders of the tube.

This step is easy to learn and leaves the operator no doubt that the ETT is within the trachea if 2 hyperechoic lines are visualized within the trachea. Images are easily obtained and interpreted.

The 2nd method involves continued surveillance. After a short time with pooling of secretions in the hypo pharynx, direct visualisation of the ETT becomes even easier (Supplementary Video 2). At this stage, pressure with the ultrasound probe is no longer required. Continued surveillance could serve the secondary purpose of confirming that the ETT had not been dislodged at any time during the period of the patient's intubation. This method could also be used without time delay should the patient have active oral secretions, as is often the case when managing the emergency airway.

False negatives could occur when the area of the inflated cuff is scanned and 2 hyperechoic lines are not identified. A properly inflated cuff is incompressible and would not yield the image of the intraluminal tube. This pitfall can be easily overcome by scanning the ultrasound probe transversely from thyroid cartilage downward to the sternal notch, which could help identifying the compressible area revealing the ETT and the position of the cuff (Supplementary Video 3).

To the best of our knowledge, this is the first description of ultrasound-graded compression for ETT confirmation during emergency airway placement. Performed well, this method has the potential to be the new gold standard for ETT placement confirmation. Validation studies are mandated to ascertain if this method is applicable in patients with distorted airway anatomy and by operators of varied proficiencies.

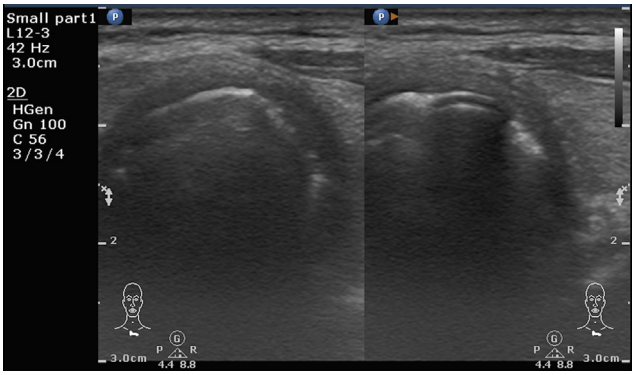

Fig. 1. Image on left is trachea without graded compression, no ETT can be seen. Figure on right is when graded compression is applied; 2 hyperechoic lines representing the intra-tracheal tube are clearly seen.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://doi:10.1016/j.accpm.2018.04.010.

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We declare that no funding was obtained for this letter.

Consent

Consent was taken from the patient's family and is available for viewing by the Editor of this journal.

Disclosure of interest

The authors declare that they have no competing interest.

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Jui Shih Kao[a], Desmond Mao[b,*], Ruei-Fang Wang[c], Chee-Fah Chong[a], Kuo-Chih Chen[d]

[a]*Emergency Department, Shin Kong Wu Ho-Su Memorial Hospital, 95, Wenchang Road, Shilin District, Taipei, Taiwan*

[b]*Acute and Emergency Department, Khoo Teck Puat Hospital, 90, Yishun Central, 768828 Yishun Singapore*

[c]*Emergency Department, Taipei City Hospital, Ren-Ai Branch, N° 10, Section 4, Ren'ai Road, Da'an District, Taipei, Taiwan*

[d]*Emergency Department, West Garden Hospital, N° 270, Section 2, Xiyuan Road, Wanhua District, Taipei, Taiwan*

*Corresponding author

E-mail address: drdesmondmao@gmail.com (D. Mao).

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