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CORRESPONDENCE

Confirmatory tests for endotracheal tube insertion depth

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To the Editor,

McKay *et al.*[1] used suprasternal tracheal palpation (TP) during endotracheal tube (ETT) insertion to ensure a mid-tracheal position of the distal tip. The advancing tip was never or barely felt in 15 of 92 subjects. Furthermore, Fig. 1 shows that the tip position was either too close to the carina (less than 2.5 cm) or too close to the vocal cords (more than 7.5 cm away from the carina) in 18 of the remaining 77 subjects in whom the tip was felt. Thus, this actually shows that the use of TP results in accurate mid-tracheal positioning in only 59 of the 92 subjects. Importantly, TP cannot be used to verify the depth in an existing ETT because the technique, as described by the authors, depends on progressively feeling the advancing tip during placement. As the authors correctly stated, it behooves anesthesiologists as well as other providers to use measures to guarantee a mid-tracheal placement of the ETT distal end to avoid mainstem intubation or accidental dislodgement with changes in the patient's head and neck position. We prefer cuff ballottement to TP as this maneuver yields a high success rate.[2] For the last ten years, we have used a slight modification to the original cuff ballottement maneuver with excellent results as verified by fibreoptic examination. We inject 5 mL of air rapidly while feeling the ETT cuff in the suprasternal notch using two fingers of the other hand. Because of its simplicity, this maneuver can be taught very easily to our trainees. In our experience, only very few situations could render our maneuver (and TP) difficult to interpret, e.g., massive obesity, huge thyroid tumours, and excessive neck scarring. It has also been suggested that inserting the ETT with the upper edge of the ETT cuff lying 2 cm below the vocal cords ensures mid-tracheal positioning of its tip,[3] but this approach remains to be investigated. There is no doubt that fibreoptic and radiological confirmation are the most reliable confirmatory methods,[4,5] but they are not simple to perform and require additional equipment that is not always convenient or immediately available. While we commend the authors for investigating a new technique that may enhance accurate ETT positioning, we also highlight the importance of using multiple confirmatory techniques to avoid any uncertainty due to the shortcomings that may be inherent in any single technique.

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References

1. *McKay WP*, *Klonarakis J*, *Pelivanov V*, *O'Brien JM*, *Plewes C*. Tracheal palpation to assess endotracheal tube depth: an exploratory study. Can J Anesth 2014; 61: 229-34.
2. *Pattnaik SK*, *Bodra R*. Ballotability of cuff to confirm the correct intratracheal position of the endotracheal tube in the intensive care unit. Eur J Anaesthesiol 2000; 17: 587-90.
3. *Salem MR*, *Baraka AS*. Confirmation of endotracheal intubation. In: Hagberg CA, editor. Benumof and Hagberg's Airway

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Management. 3rd ed. Philadelphia, PA: Saunders Elsevier; 2013. p. 657-82.
4. *Benumof JL*. Management of the difficult airway with special emphasis on awake tracheal intubation. Anesthesiology 1991; 75: 1087-110.
5. *Silverstein DS*, *Livingston DH*, *Elcavage J*, *Kovar L*, *Kelly KM*. The utility of routine daily chest radiography in the surgical intensive care unit. J Trauma 1993; 35: 643-6.

Reply

We thank Drs. El-Orbany and Salem for their interest in our study of tracheal palpation (TP)[1] to assess endotracheal tube (ETT) depth and also for their keen eye in identifying some reporting errors that may have contributed to some questions regarding our outcomes. These errors have now been corrected in a published erratum.[2] You expressed concern that palpated ETT tips of 18 of 77 subjects (Fig. 1) were either too close to the carina (12 subjects with ETT tips < 2.5 cm from the carina) or too close to the vocal cords (which you interpreted as being the six subjects with an ETT tip > 7.5 cm from the carina). The number is more accurately 14 subjects, however, as we did not assess the ETT as being too close to the vocal cords by measuring the distance away from the carina, but more directly by measuring the ETT tip distance < 3.5 cm away from the vocal cords (see the two subjects in corrected Fig. 2).

We are not at all satisfied that the TP technique as described should preclude further improvements. We are motivated by two patients who had tracheal intubation out of hospital and were recently brought profoundly hypoxic to our emergency department with misplaced ETTs. Both patients suffered severe complications as a result. We are continuing to investigate refinements and other techniques. For example, we have completed a study of TP in children which shows that it worked nearly perfectly in that age group (except for one ETT that was placed 1 mm too deep). The more compliant pediatric tracheal rings facilitate palpating the ETT.

As we point out, TP does not preclude other techniques. We are intrigued by your use of a rapid injection of 5 mL of air while using cuff ballottement and encourage you to conduct a clinical trial, which might begin with a dose-finding pilot to delineate the optimal size of the air bolus and the speed of injection.

Conflicts of interest None declared.

References

1. *McKay WP*, *Klonarakis J*, *Pelivanov V*, *O'Brien JM*, *Plewes C*. Tracheal palpation to assess endotracheal tube depth: an exploratory study. Can J Anesth 2014; 61: 229-34.
2. *McKay WP, Klonarakis J, Pelivanov V, O'Brien JM, Plewes C*. Erratum to: Tracheal palpation to assess endotracheal tube depth: an exploratory study. Can J Anesth 2014; 61: this issue.

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