CORRESPONDENCE

Effect of respiratory changes in tracheal length on computed tomographic study of bronchial anatomy

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To the Editor,

The length of the right main stem bronchus is an important measurement for positioning a right-sided double-lumen tube (R-DLT). Previous work by Kim *et al.*¹ suggested that R-DLTs may be misplaced when the length of the right mainstem bronchus is < 23 mm. Bussieres and colleagues² report a new “carina-to-carina” measurement, which they believe may be simpler and just as effective as the earlier method suggested by Kim *et al.* They note strong correlation between the measures (intraclass correlation coefficient = 0.93; $P < 0.001$). Approximately 25% of their population had a right mainstem bronchus measuring < 23 mm by Kim *et al.*'s method. The corresponding length using their new method was 26.7 mm (95% confidence interval, 23.1 to 30.2).

It has long been known that the lower end and carina of the trachea are shifted inferiorly during inspiration.^{3,4} The parts of the chest wall that move most are the diaphragmatic and sterno-costal planes; the lung therefore expands in an inferior and anterior direction. In young adults, the carina can descend by 25 mm with deep inhalation, i.e., about 20% of the original length of the trachea. Even the bronchi lengthen with inhalation.³ This variation in anatomy with respiratory cycle raises a concern with respect to the computerized tomographic (CT) measurement of the tracheobronchial tree.

Given that placement of R-DLTs using direct laryngoscopy occurs in paralyzed patients, the clinically relevant phase of respiration for calculating lengths on CT scans would be end-expiration. It is unclear if the measurements obtained from the spontaneously breathing patients reported by Bussieres *et al.* were standardized to phase of respiration. The possibility of error in these measurements could be as high as 30 mm (25 mm is the maximum length that the lower end of the trachea could shift with deep inspiration plus 5 mm CT slice size).

We suggest that calculating the length of the right bronchus and selection of appropriate means to separate ventilation for surgery be supplemented by: 1) understanding of the dynamic alterations in the airway length, 2) standardization of phase of respiration in which the measurement are made, 3) specialist skill to reconstruct CT scans so as to site the markers at appropriate points for making such measurements, and 4) understanding of the distinct manufacturer's R-DLT design.

Conflicts of interest None declared.

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This letter is accompanied by a reply. Please see Can J Anesth 2020; 67: this issue.

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