Age-based analysis of pediatric upper airway dimensions using computed tomography imaging.


Abstract

BACKGROUND: Recent studies have challenged the historically accepted fact that the larynx is cone-shaped in infants and children. The present study used computed tomography (CT)-based measurements to evaluate airway dimensions. The purpose of this investigation was to determine the dimensional transition between the subglottic area and the cricoid ring in children.

METHODS: This is a retrospective review of 220 CT scans of children aged 1 month to 10 years undergoing radiological evaluation unrelated to airways symptomatology. The CT scans were evaluated in children either sleeping naturally or sedated throughout the study period. Anteroposterior (AP) and Transverse (T) diameters were measured at the subglottic level and at the cricoid ring.

RESULTS: The mean (±SD) age was 47.4 ± 33.1 months. The mean AP and transverse diameters were 9.2 ± 1.9 and 7.5 ± 1.6 mm at the subglottic area and 8.5 ± 1.7 and 8.3 ± 1.5 mm at the cricoid. AP dimension showed a decrease from the subglottis to the cricoid ring. A more rapid enlargement of the airway from the subglottis to cricoid ring is observed in the transverse dimension (P < 0.05). A linear progression in the size of airway dimensions between both levels was observed with age (r > 0.7).

CONCLUSION: The narrower transverse dimension compared to the AP diameter suggests that the airway is elliptical immediately below the vocal cords. The present study demonstrates that the airway characteristics in children between the subglottic area and the cricoid change from an elliptical to a round (circular) shape. The cone-shaped airway characteristic, which has been historically proposed, was not observed. Given that subglottic transverse diameter is the smallest area dimension, one must assume this is the most likely area of resistance to the passage of an endotracheal tube rather than only the cricoid.

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KEYWORDS: CT scan; Subglottis; cricoid; pediatric airway; video-bronchoscopy; vocal cords

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