Comparison of the Adult and Infant Larynx

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Concern about the anatomical configuration of the infant and child larynx frequently arises during episodes of respiratory difficulty. Normal laryngeal architecture may become distorted by disease processes or may not be adequately visualized because of hurried attempts at intubation. In such instances the more familiar adult laryngeal relationships cannot be extrapolated to the young child. Pictorial renditions illustrating differences in infant and adult laryngeal anatomy are incomplete in the literature.[1-3] This report provides direct comparison of the gross anatomy of the pediatric and adult larynx.

Structure and Function

In order to achieve adequate function (namely, phonation, respiration, protection of the airway, assistance in swallowing, and fixation of the chest by the upper airway), the larynx must be both pliable, yet have the ability to form and maintain a stable luminal contour.[4] In the growing infant, laryngeal function slowly evolves from primary airway protection (as would be required for feeding while supine) to increasingly complex phonatory requirements and structural support (glottic closure) in order to assist in lifting and straining. The larynx cannot be viewed as a rigid box; rather it is as a dynamic structure able to fold and contour.[4] This is especially true in the infant, in whom cartilaginous support is more mobile and the submucosa more prominent, giving a sense of "flabbiness" to the young larynx. Palpation of the softer cartilaginous framework makes definition of the laryngeal structures more difficult when compared with the adult.

The fullness of the mucosal folds in the infant is exemplified by the relative thickness of the epiglottis, aryepiglottic folds and tissue overlying the arytenoid cartilages. Pathologically this is seen in the rapid swelling in the supraglottic structures that can involve the epiglottis, the vallecula, or the false cords (ventricular folds).

Similar submucosal swelling develops in the subglottis from diverse causes, leading to the various croup syndromes. Some possible inciting factors are viral disease, intubation, or an allergic response. The submucosal edema in a space tightly enclosed by the circumferential cricoid cartilage leads to airway obstruction. In this circumstance, the looseness of the submucosal tissue and the smaller size of the child's larynx produce "croup" when a similar symptom complex is not produced in the adult.[5,6]

The smaller total size of the pediatric larynx does not solely account for the uniqueness of the infant and young child's larynx. Size does appear to play a significant role at the level of the cricoid, as noted above. At the glottic (vocal fold) level, the newborn larynx is approximately one third the adult size, with growth occurring primarily in the first 18 months of life. One half of the infant vocal cord length is cartilaginous because of arytenoid size, whereas in the adult only one third is formed by cartilage, the remainder being membranous and more pliable.[7]

By using a tongue depressor during examinations in the healthy child, the tip of the epiglottis frequently projects from behind the tongue base.

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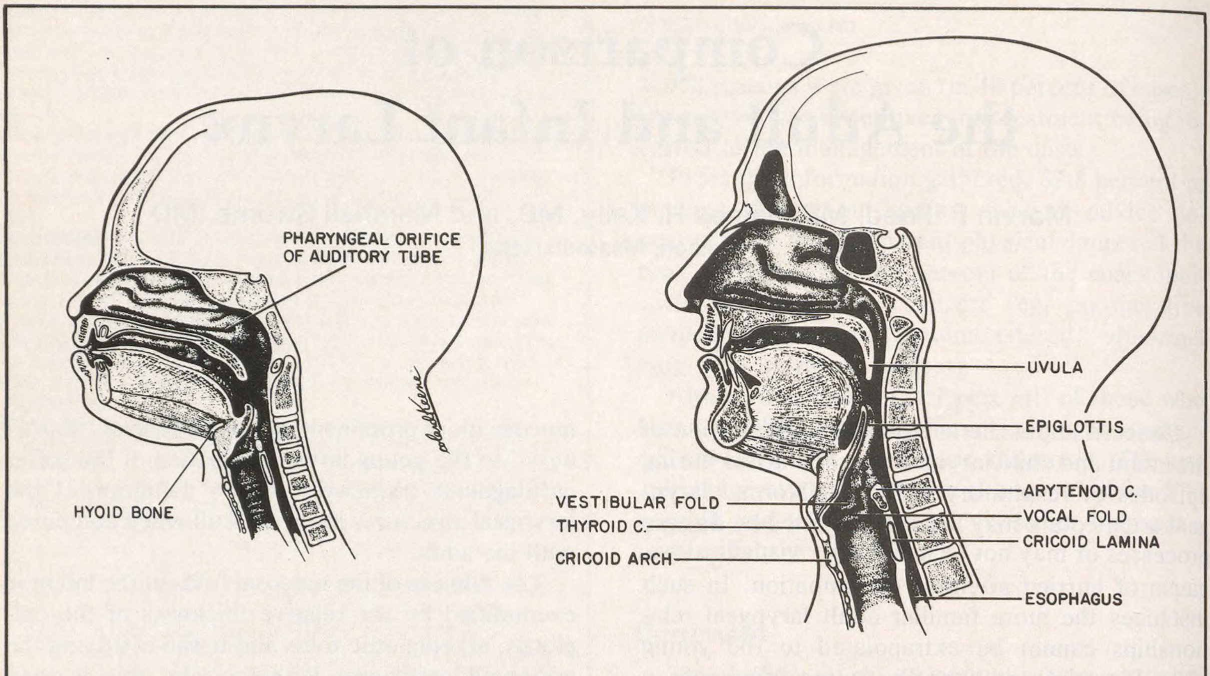

Figure 1. Lateral view of the infant (left) and adult (right) larnyx comparing both size and location

The larynx is situated higher in the neck in the neonate and gradually descends (Figure 1). The infant cricoid is situated at approximately the level of the third cervical vertebra; in the adult it is opposite the fifth vertebra. The higher level of the larynx in the neonate allows for a tighter oral seal that improves sucking. The soft palate also opposes the tip of the epiglottis in the neonate, tending to naturally obstruct the oral airway.[2] The newborn is an obligate nose-breather for the first few weeks of life until the larynx begins to descend in the neck. This high laryngeal position has the detrimental effect of allowing the inflamed epiglottis to become easily stimulated by a tongue depressor (as in supraglottis), causing subsequent laryngeal spasm.

When viewed from above by mirror examination or direct laryngoscopy, the redundancy of the infant laryngeal mucosal folds becomes quite apparent (Figure 2). This is also noted on a posterior view (Figure 3). The thickness of the epiglottis and the medial bowing of the aryepiglottic folds give rise to the characteristic ''omega-shaped'' epiglottis. This is the normal configuration. When the mucosal folds become exaggerated, inspiratory stridor may be produced, especially during episodes of edema, as in an upper respiratory tract infection. The condition called exaggerated infantile larynx is also known as laryngomalacia and is the most common cause of laryngeal stridor in the young child. In the latter, thickened or elongated mucosal folds are drawn into the airway on inspiration producing the aberrant phonatory quality and in some instances associated respiratory symptoms.[8]

Comment

If an endotracheal airway has to be established, other anatomical differences in the infant larynx must be considered. The angle between the epiglottis and vocal cords is more acute in the infant, making direct visualization more difficult. The relatively larger size of the posteriorly situated arytenoid cartilages and covering mucosa tends to further diminish visualization by narrowing the airway posteriorly. Endoscopically one should be prepared to intubate the airway after the arytenoids are noted, even if the full glottic aperture is not visualized.

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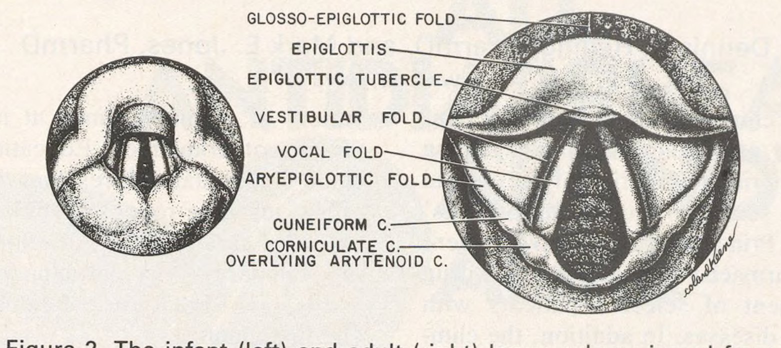

Figure 2. The infant (left) and adult (right) larynx when viewed from above. Note the relatively larger bulk of the arytenoid mass

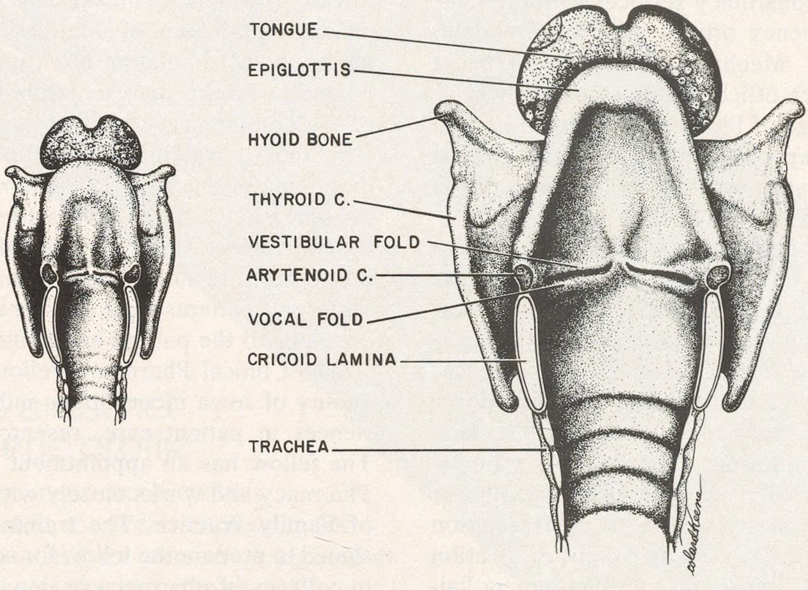

Figure 3. Posterior view of the infant (left) and adult (right) larynx cut laterally to the midline

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