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The morphometric development of the fetal larynx during the fetal period

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Summary

Objective: The aim of the present study was to investigate morphometric growth patterns of the cartilaginous components and vocal cords in human fetal larynx.
Methods: This study was performed in the Anatomy Department of Meram Medicine Faculty in 2007. The fetuses were obtained from the Gynaecology Department of the Meram Medicine Faculty of Selcuk University, and Dr. Faruk Sükan Maternity Hospital (Konya, Turkey). Forty spontaneously aborted fetuses (25 males and 15 females) without detectable malformations were evaluated. The dimensions of the larynx and its cartilaginous components were measured and the relationship between the obtained data was statistically assessed with Student's *t*-test.
Results: Correlations were found between the cartilaginous components, size of the larynx, and gestational age. No gender differences were identified. The anatomical variations in the epiglottis cartilage dimensions and types were found in 15% of cases. The foramen thyroideum was observed in 12.5% of cases.
Conclusion: The data of this study may contribute to the knowledge of the fetal larynx regarding laryngomalacia.
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1. Introduction

The larynx should be thought of as a sphincteric valve mechanism in the neck. It is composed of a relatively rigid skeleton and an inner lining, which is displayed as a series of elastic folds [1]. When the embryo is approximately 4 weeks old, the primordium of the respiratory system appears as an outgrowth from the ventral wall of the foregut. The internal lining of the larynx is developed from endoderm, but the cartilages and muscles originate from mesenchyme of the fourth and sixth branchial arches [2].

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To determine congenital anomalies caused by external causes, such as genetic diseases, intrauterine infections and teratogenic agents in the early stages of gestation is important for prenatal diagnosis. Following fetal development consist of all structural parameters of the fetus. Fetal growth curves can be made for parametric assessments according to fetal age for all ethnic groups and may give us the normal standards of the fetal growth of a population. Both invasive and non-invasive techniques are in use for prenatal diagnosis. Fetal ultrasonography (USG), which is mostly used as non-invasive procedure has the advantage of showing all of the fetal formations. To assess all stages of embryogenesis with USG, fetal morphometric anatomy should be known for every week of gestation.

The morphometric dimensions of larynx were described in adults by several researchers [3—9]. In fetuses, the inadequate literatures regarding this subject were presented [8,10—12]. The obtained data from fetus studies did not detail in contrast to the adult studies. It was reported that the risk of laryngeal injury leading to stenosis increased with the usage of intubation in especially high-risk neonates like prematures [13,14]. Inequity in the size of endotracheal tube and the airway was blamed for that kind of an injury in the larynx. Using suitable endotracheal tubes especially for premature infants is important for effective airway management and for protecting larynx [9].

The type of the epiglottis cartilage is another factor which is suggested for etiology of laryngomalacia, difficult endotracheal intubation, snoring, aspiration and persistent laryngeal stridor [15—18]. Laryngomalacia is a common congenital disorder characterized by decreased laryngeal tone, supraglottic collapse, and stridor during inspiration [19]. An omega-shaped epiglottis, short and medial prolapse aryepiglottic folds and anteromedial prolapse of arytenoids mucosa is frequently associated with laryngomalacia [15,20]. Shohat et al. [21] reported a family which congenital stridor due to laryngomalacia was evident in nine individuals through three generations. This report confirmed the autosomal dominant transmission of at least one type of laryngomalacia.

Anatomic variations as anatomic openings (foramen thyroideum) in the posterosuperior portion of the thyroid lamina must be taken into consideration [22,23], because superior laryngeal vessels and a subdivision of the external branch of the superior laryngeal nerve may transit from these openings [24,25]. Knowledge of the incidence and location of these foramina is important because their contents may be preserved.

The object of this study was to establish the normal dimensions of the cartilaginous components of the larynx in human fetuses.

2. Methods

This study was carried out on spontaneously aborted 40 fetuses (25 males and 15 females) (23 second trimester and 17 third trimester) with no detectable congenital malformations or maternal history of risky pregnancy. The fetuses were obtained from the Gynecology Department of the Meram Medicine Faculty of Selcuk University, and Dr. Faruk Sükan Maternity Hospital (Konya, Turkey). The ages of the fetuses were determined as between the 13th and 40th postmenstrual weeks basing on the crown-rump length (CRL) measure-

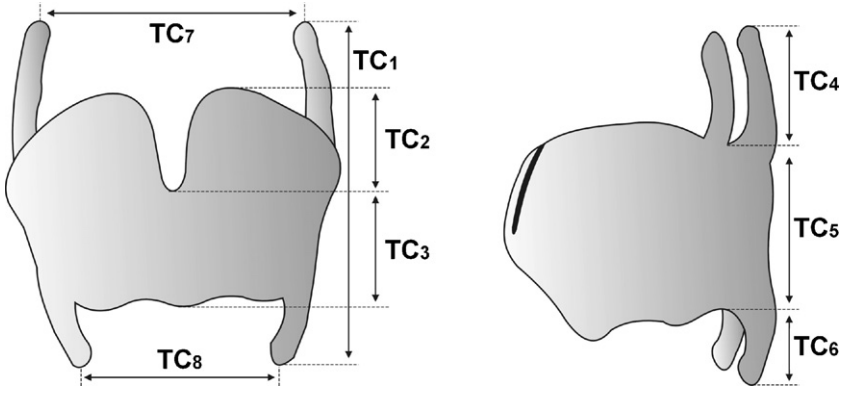

Fig. 1 The schematic drawing of the measured parameters of the thyroid cartilage (anterior view—lateral view): TC1, distance between greater and lesser cornua; TC2, height of thyroid notch; TC3, distance between thyroid notch and incisura thyroidea inferior; TC4, height of greater cornua; TC5, height of thyroid ala between base of greater cornu and base of lesser cornu; TC6, height of lesser cornua; TC7, distance between greater cornua of thyroid; TC8, distance between lesser cornua of thyroid.

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