Ultrasound assessment of the larynx and trachea in the neonatal population – development of reference values.

Summary

The larynx and trachea represent crucial components of the respiratory system. Disorders related to their structure and function can have both a direct and indirect impact on postnatal adaptation and the further development of the newborn.

In clinical practice, the diagnosis of the larynx and trachea is based on laryngoscopy, endoscopy, computed tomography, and magnetic resonance imaging. These are well-known methods that allow for accurate imaging of the structures and functions of these organs, but they are not without their disadvantages. These include discomfort, the frequent need for patient sedation, transport and limited availability.

Ultrasonography is a non-invasive, safe diagnostic method that has been successfully utilised for many years in the diagnosis of neonatal diseases. Despite its widespread utilisation, knowledge concerning the ultrasound examination of the larynx and trachea in newborn remains limited. the available literature comprises studies that detail ultrasound images of the larynx in cases of specific congenital defects or vocal fold dysfunction. However, to date, no studies have been published that describe a comprehensive ultrasound examination of the larynx and trachea in the neonatal period.

This dissertation summarises a series of studies that were conducted with the objective of providing a complete description of the ultrasound examination of the larynx and trachea in a population of newborns born between 32 and 42 weeks of gestation.

In view of the paucity of similar studies in the extant literature, the initial publication delineated a protocol comprising a comprehensive description of the examination methodology. The examination's technical aspects were discussed in detail, including patient positioning, ultrasound machine settings, equipment used, ultrasound projections, and the method of image acquisition, analysis, and measurement of individual structures of the larynx and trachea.

The published protocol was used to conduct a prospective study on a group of 300 healthy newborns who underwent ultrasound examinations of the larynx and trachea. The findings from the measurement of individual structures of these organs, obtained

from the examination of 298 participants, were utilised for further statistical analysis, which resulted in two subsequent publications.

The second of the presented studies published standards for the size of the larynx and trachea in girls and boys. Statistically significant differences in the size of most of the examined structures in both sexes were also demonstrated. Moreover, no statistically significant difference in glottis width was identified between boys and girls.

The third publication presented the findings of a correlation analysis between the measurements of the larynx and trachea and their lumen, in relation to anthropometric measurements of newborns. Statistically significant correlations were identified between the majority of the analysed structures and the body weight of newborns. Furthermore, centile charts were developed to facilitate the evaluation of the obtained measurements of the larynx and trachea structures in relation to the body weight of newborns of both sexes.

The fourth publication presented is a response to a letter to the editor of the European Radiology journal. the present article addresses the authors' questions regarding the second of the articles discussed. Furthermore, it draws attention to the differences in ultrasound examination of newborns, who constitute a special group of patients requiring particular care to ensure their comfort during the examination.

The series of studies presented in this dissertation concluded that the ultrasound method enables imaging and measurement of laryngeal and tracheal structures in newborns. the results obtained in the conducted studies determined the first, as yet unpublished, size standards and centile charts for laryngeal and tracheal structures in the neonatal population.