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ULTRASOUND IMAGING OF THYROGLOSSAL CYSTS OF THE NECK TO THE HYOID BONE

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Abstract

Background: The present study attempted to clarify the typical anatomical variants of Thyroglossal cysts (TGC).

Patients and methods: Clinically and epidemiologically 67 previously non-experienced patients with TGC 1.5 to 73.0 years old were examined.

Results: Based on clinical and ultrasound examinations of 121 patients with 67 thyroglossal cysts, the most typical cyst of anatomical variations was specified. It was noted that, concerning the hyoid bone, thyroglossal cysts may be suprahyoid (located at the root of the tongue), parahyoid (broadly adjoining the hyoid), prelingual (located in the front of the hyoid in the hypo lingual region), postlingual (located behind the hyoid bone in the prenatal and peri-laryngeal spaces), or sublingual (located the book from the hyoid bone). An ultrasound examination facilitated the identification of thyroglossal cysts without clinical manifestations (23 sublingual cysts among 37 [62.2%] were incidentally revealed by the ultrasound examination), which is important when selecting the most appropriate surgical treatment.

Conclusion: Ultrasound studies facilitate the identification of TGCs located at the root of the tongue without any clinical manifestations, which is important when determining the degree of surgical treatment to perform.

Keywords: thyroglossal cysts, ultrasound, topographic, anatomical variants

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Introduction

Thyroglossal cysts (TGC) and fistulas (TGF) are formed as a result of the violation of the thyroid duct lining (TDL), a path of ontogenetic migration of the thyroid gland from the place of its foundation. From the root of the tongue to the site of its usual location on the front surface of the neck. TGC forms from days 16-24 of embryonic development at the bottom of the primitive pharynx in the zone that developed from days 12–18 of embryogenesis of the pharyngeal membrane separating the mouth fossa and the primary intestinal cavity. At this site, thickening of the entoderm occurs, and by day 28, it begins to sink to the subject mesenchyme and forms a thyroid diverticulum (diverticulum thyroideum). As the bookmark of the thyroid sinks into the tongue tissue and moves along the primary intestine, the diverticulum deepens and transforms into TDL. In week 5 of embryogenesis, the developing hyoid bone splits from the TGP, creating two unequal parts: the shorter tongue (ductus lingual) and the longer thyroid (ductus thyroids). In 5%–7% of cases, TDL is associated with the horn of the hyoid bone, while it is associated with the body of the hyoid bone in the remaining cases. Thus, the hyoid bone is the most important reference point among the topographic characteristics of the TGC[1-6)].

By days 40–50 of embryogenesis, the TGC reaches its usual position at the front surface of the neck. By week 8 of embryonic development, the TGP is obliterated, transforming into fibrous epithelium that is gradually reduced with age. On evaluating HR data, Harnsberger et al. detected residual elements of the reduced TGP in more than 7% of autopsies[4)]. Bogdanov et al. revealed induced TGF residues in 25% of patients with TGC[5)].

Anatomical evidence of the existence and ontogenetic migration of TGC is the blind tongue hole (natural boundary between the body and root of the tongue and site of the original location of the bookmark of the TGC and sometimes found a pyramidal fraction of the TGH,

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departing upwards from the isthmus of the TGC. In international medical practice, cysts and fistulae arising from the induced remnants of the TGP are considered thyroglossal, while in domestic practice the term "median cysts and fistulae of the neck" is used more often. In our opinion, these terms are not interchangeable, as the very definition of TGC reflects not only the etiology but also the probability of pathological changes throughout the thyroid duct, from the root of the tongue to the usual site of the thyroid, anddoes not correlate with the term "middle cysts and fistulae of the neck". At the same time, the understanding that in the presence of a "median cyst of the neck" is very likely the existence of changes in the root of the tongue (in the form of a cyst or a fistula), is otherwise organized the diagnostic process and, most importantly, determines the treatment tactics.

In the existing topographic and anatomical classifications of TGC, the location of the cyst relative to the hyoid bone is emphasized. Authors have classified cysts located above the hyoid bone as being located in front of the hyoid bone, in the hypoplastic region of the front surface of the neck[1)]. This definition is easy for operating surgeons to comprehend but is not quite accurate with regard to the topographic anatomy. It should be noted that currently available classifications do not reflect the full range of anatomical variants of TGC, which may result in misunderstandings between diagnosticians and surgeons.

The present study attempted to clarify the typical anatomical variants of TGC.

Materials and Method

Clinically and epidemiologically 67 previously non-experienced patients with TGC 1.5 to 73.0 years old were examined. Echography was performed using ultrasound scanners (an SLE-501; Lithuania; and an Affiniti-70; Philips, Holland) with linear sensors with frequencies of 7.5-12 MHz.

If necessary, the differential diagnosis of cystic and solid formations (mainly lymph nodes) was performed by visualizing the blood flow (e.g. via color Doppler mapping or energy Doppler).

Results

The distribution of patients by age is presented in Table 1. As can be seen, the peak of detection of TGC not complicated by the presence of external cyst falls on the age of 3 to 12 years old (50.8%). In general, potential patients in children's specialized departments (under 17 years old) account for 67.2% of patients. A total of 90 cysts were detected among the 67 patients: 14 patients had 2 cysts each, 3 had 3 cysts each, and 1 had 4 cysts. Therefore, 18 (26.9%) patients with TGC had multiple cysts. In all cases, additional cysts (23 cysts in 18 patients) were located at the root of the tongue (Fig. 1). The following variants of TGC to the hyoid bone were revealed: suprahyoid cysts (located at the tongue root) (Figs. 2–4), parahyoid (widely adjoining to hyoid bone) (Fig. 5), sublingual (located in front of the hyoid bone in the sublingual region) (Fig. 6), located behind the hyoid bone in the prenatal and peri-laryngeal space (Fig. 7), and located behind the hyoid bone (Figs. 8, 9). All prelingual and sublingual cysts were associated with the hyoid bone either by a fibrous sore throat or by their spurs.

Table 1 Patients background

Total number of patients	Age ranges							
67	up to 3 years	3–7 years	8–13 years	14–17 years	between 18 and 25 years	26–45 years	46–60 years	over 60 years
Absolute	6	15	19	5	9	4	6	3
Relative, %	8.9	22.4	28.4	7.5	13.4	6.0	8.9	4.5

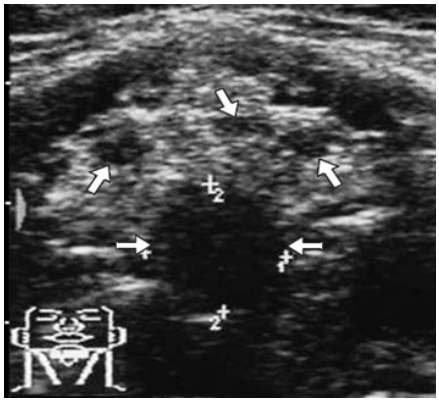

Fig. 1 THC. multiple cysts in the root of the language (arrow)

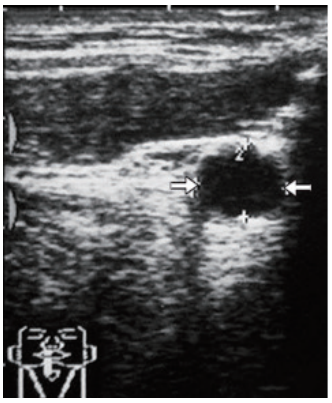

Fig. 2 THC. variant with central location of cyst in the root of language. The cyst is located in the line connecting the hyoid bone and the blind hole of the tongue (arrows).

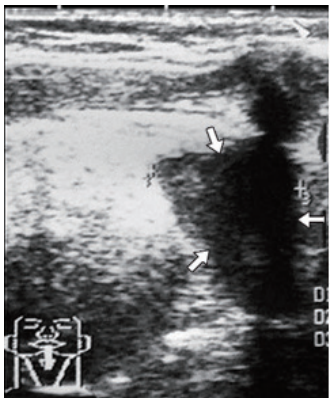

Fig. 3 THC. variant with rear position of cyst in the root of tongue. The cyst is located behind the line connecting the hyoid bone and the blind hole in the tongue, and has a sauce with oropharynx through the mucous root of the tongue (arrows).

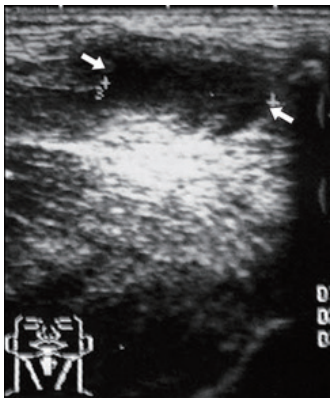

Fig. 4 THC. variant with a cyst in the front position at the root of the tongue. The cyst is located at the front of the line connecting the hyoid bone and the blind tongue opening, spreading over the mouth diaphragm from the hyoid bone in the direction of the chin austle (arrows).

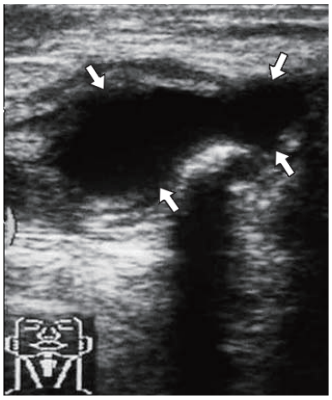

Fig. 5 THC. The cyst is widely adjacent to the hyoid bone (arrows).

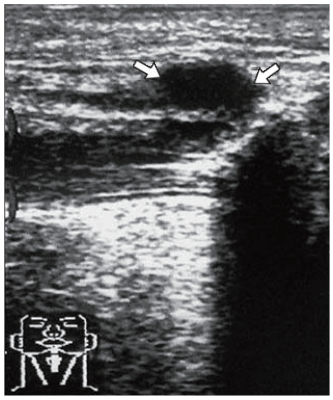

Fig. 6 The cyst is located at the front of the hyoid bone in the hypodlingual region (arrows).

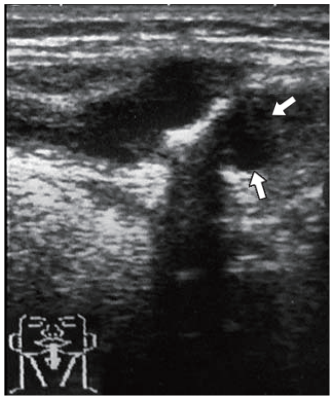

Fig. 7 THC. The cyst is located behind the hyoid bone in the prenatal glandular space (arrows).

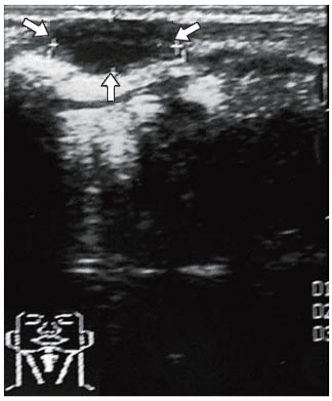

Fig. 8 THC. The upper position of the cyst between the muscles of the sublingual group (arrows).

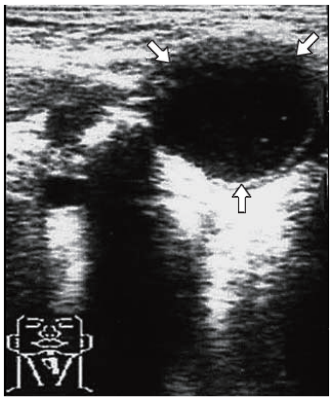

Fig. 9 Deep location of the cyst. The cyst reaches the cartilage or mucous membrane of the larynx (arrows).

Discussion

According to clinical examination data, the most frequently identified types were sublingual (40.3%) and circumlingual (25.4%) cysts, while the most frequently found type was supra-lingual (root) cysts (20.9%). An ultrasound investigation enabled the identification of cysts at the root of the tongue without clinical manifestations, which changed the idea about the frequency of TGC of different localization. The most common TGC variant was supernodalinguous cysts (41.1% of observations). Twenty-three of 37 sublingual cysts (62.2%) were randomly detected on ultrasound and had no clinical manifestations. Of the 37 sublingual TGCs, 17 (45.9%) had a central position at the root of the tongue (along the line connecting the hyoid bone and the blind hole of the tongue, the conditional course of the tongue portion of the thyroid duct), not adjoining the mucous membrane of the tongue root; 14 (37.9%) were located behind this line, widely adjoining the mucous membrane of the tongue root or with a source in the oropharynx through the mucous membrane of the tongue root; and 6 (16.2%) were in front of this line, spreading over the jaw-lingual muscles (mouth diaphragm) from the hyoid bone in the direction of the chin. Of the 27 TGCs with hyoid localization, 19 (70.3%) were superficially located (between the breast hyoid and shield hyoid muscles or in front of them), and 8 (29.7%) were deeply located, reaching the cartilage or laryngeal mucosa.

Thus, the existing TGC classifications can be refined with the detailed elaboration of the anatomical cyst layout topography while still meeting the needs of surgeons. To the hyoid bone, TGC can be defined as suprahyoid (located at the root of the tongue), sublingual (located in the root of the tongue), above sublingual (located at the front of the hyoid bone - above the hyoid region), behind the hyoid (located behind the hyoid bone at the epiglottis), and behind sublingual (located behind the hyoid bone in the epiglottis and collateral regions). Sublingual TGCs may be centrally located at the root of the tongue, along a line connecting the hyoid bone and the blind hole of the tongue. A third type of tongue root cysts according to Bezrukov[1)]; rear position relative to this line, broadly adjoining the mucous membrane of the root of the tongue or originating in the oropharynx through the mucous root of the tongue (second type of cysts of the root of the tongue according to Bezrukov[1)]) and the front position relative to this line, spreading over the mouth diaphragm from the hyoid bone in the board of the chin muscle (first type of cysts of the root of the tongue according to Bezrukov)[1)].

Ultrasound studies facilitate the identification of TGCs located at the root of the tongue without any clinical manifestations, which is important when determining the degree of surgical treatment to perform. Sublingual TGCs may be located superficially (between the muscles under the sublingual group) and deeply (near the throat, reaching the cartilage or laryngeal mucosa). Of note, the proposed classification of TGC describes only the most frequently occurring (and therefore typical) variants and does not reflect the diversity of manifestations of this malformation. However, a thorough understanding of the anatomical variants of TGC will help improve the reliability of the diagnosis of this type of pathology, and detailing the peculiarities of TGC location is important for planning the scope of surgery.

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References

1) Moshe Yehuda, Melissa E. Schechter, Nora Abu Ghanem, Gilad Golan, Gilad Horowitz. European Archives of Oto-Rhinolaryngology. 2017;16:15–19.
2) Wei S., Livolsi V.A., Baloch Z.W. Pathology of thyroglossal duct: an institutional experience. Endocr. Pathol. 2015;26:75–79.
3) Hilary Pitner. Diagnostic Accuracy of Midline pediatric neck masses. American Academy of Otolaryngology–Head and Neck Surgery Foundation, 2019;46:55–69.
4) Erikci V., Hosgr M. Management of congenital neck lesions in children. J. Plast. Reconstr. Aesthet. Surg. 2014;67:e217–22.
5) Hill S., Maddalozzo J. Congenital lesions of epithelial origin. Otolaryngol Clin. N. Am. 2015;48:209–223.
6) Lim-Dunham J.E., Toslak E., Alsabban K., Aziz A., Okur G., Longo K.C. Ultrasound risk stratification for malignancy using the 2015 American Thyroid Association management guidelines for children with thyroid nodules and differentiated thyroid cancer. Pediatr Radiol. 2017;47(4):429–436.