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Thyroid isthmus thickness in prepubertal healthy children in an iodine-sufficient region

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Summary

The study presented the reference values for thyroid isthmus thickness in prepubertal healthy children. Ultrasound evaluation of the isthmus seems to be very useful in the diagnostic process and monitoring of thyroid diseases, especially the diffuse ones. The authors are not aware of the existence of any other publications on reference values of isthmus depth in children population. In our study, we evaluated isthmus thickness in a healthy population of prepubertal children from a seaside region. A total of 402 healthy children (214 boys and 188 girls) aged 7–12 years, underwent ultrasound examinations of the thyroid. We propose the following maximum values for isthmus depth: from 2.6 mm for boys at the age of 7–9 years to 3.3 mm for those aged 10–12 years and from 2.7 mm to 3.5 mm for girls, respectively.

Key words: isthmus depth • ultrasound • prepubertal children • reference values

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Background

Ultrasound examination of the thyroid gland plays a very important role in the diagnostic algorithm of thyroid disorders [1,2]. It allows for a precise evaluation of both focal and diffuse lesions of this gland. The volume of the thyroid gland is an essential and one of the most important parameters evaluated in every ultrasound examination. It is useful in the diagnostic process and monitoring of thyroid diseases, especially the diffuse ones [3,4]. The examination provided us with reference values for thyroid volume for each age and gender group [5]. The isthmus is a part of the thyroid gland not included in the sonographic assessment of the total thyroid volume. This follows most probably from technical difficulties connected with an accurate and repeatable evaluation of this parameter. However, the isthmus consists of the same tissue as both lobes. For that reason, it should be visualized in each ultrasound examination of the thyroid gland and its depth should be monitored. The literature does not provide us with precise reference values for isthmus depth. This hinders an appropriate interpretation of the thyroid examination. Therefore, it is important to establish reference values for thyroid isthmus thickness for each age and gender group of children. In our study, we evaluated isthmus

depth in a healthy population of prepubertal children in an iodine-sufficient area.

Material and Methods

A total of 402 healthy children (214 boys and 188 girls) aged between 7 and 12 years underwent ultrasound thyroid examinations according to the standards of the Polish Ultrasound Society. US evaluations of the thyroid were carried out by one operator with the use of a real-time Siemens, Erlangen, Germany equipment and a linear 7.5 MHz transducer, within the frames of a scientific program 'Evaluation of the thyroid struma in children living in the seacoast region'. Three boys were excluded from the study because of sonographic features of Hashimoto's thyroiditis. The thyroid isthmus was measured in transverse scans in its thickest part. The measurements were taken three times in each child and their median was used in the study. The statistical analysis was based on Student's t-test for median differences formula.

Results

The sonographic measurements of the thyroid isthmus were assessed for each age and gender separately and presented in the tables (Tables 1, 2). To visualize the

Table 1. Reference values for thyroid isthmus depth for male.

Age (years) male	Median depth of thyroid isthmus (mm)	±2 SD	Number of children
7	1.897	0.690	34
8	2.000	0.838	39
9	1.787	0.614	32
10	2.273	0.928	42
11	2.331	0.788	19
12	2.400	1.080	39

Table 2. Reference values for thyroid isthmus depth for female.

Age (years) female	Median depth of thyroid isthmus (mm)	±2 SD	Number of children
7	2.092	0.834	25
8	1.935	0.472	31
9	1.857	0.512	26
10	2.597	0.896	41
11	2.283	0.748	30
12	2.440	1.480	57

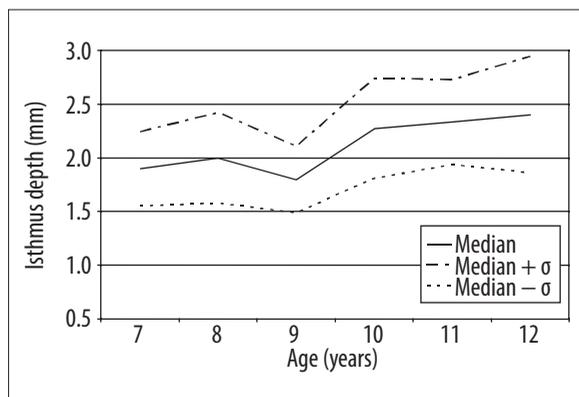


Figure 1. Correlation between thyroid isthmus depth and age in prepubertal girls.

Table 3. Reference values for thyroid isthmus depth in each study group.

Gender	Age (years)	Median depth of thyroid isthmus (mm)	±2 SD	Number of children
Male	7-9	1.9	0.74	109
Male	10-12	2.3	0.96	104
Female	7-9	2.0	0.72	86
Female	10-12	2.4	1.08	100

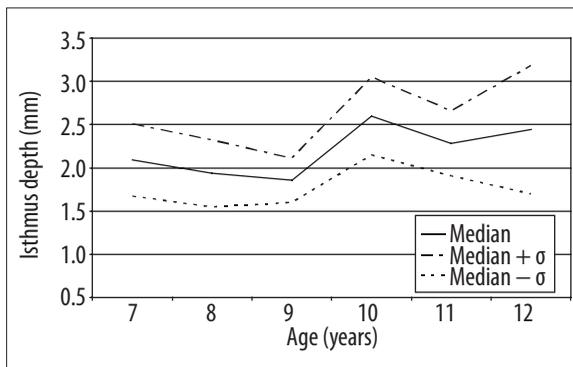


Figure 2. Correlation between thyroid isthmus depth and age in prepubertal boys.

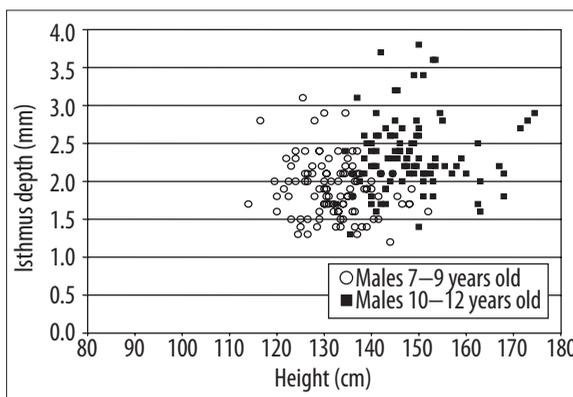


Figure 3. Correlation between thyroid isthmus depth and height in prepubertal boys.

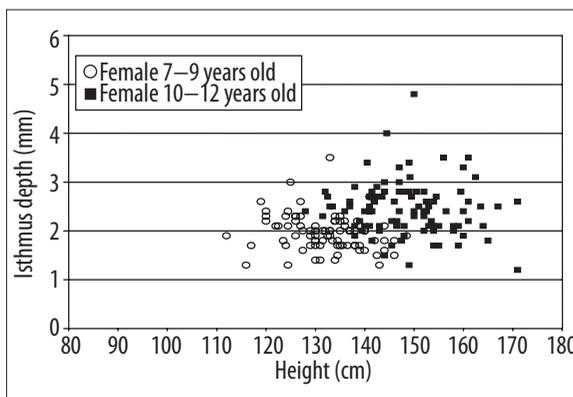


Figure 4. Correlation between thyroid isthmus depth and height in prepubertal girls.

age-dependent changes in isthmus depth, the data were transformed into appropriate charts (Figures 1, 2).

The results were divided into two age groups (7-9 years old and 10-12 years old) for each gender, which seems to be more practical (Figure 3, 4). The medians of the thyroid isthmus thickness in appropriate age and gender groups were presented in the tables (Table 3).

Discussion and Conclusions

According to our knowledge, this is the first report on reference values for thyroid isthmus thickness in prepubertal

children. The assessment of this parameter seems to be very useful, especially for the purposes of differential diagnosis of diffuse thyroid disorders (autoimmune thyroid diseases caused by iodine deficiency mostly). For clinical

practice, we propose to accept the following “cut off” values of isthmus depth: 2.6 mm for male and 2.7 mm for female aged between 7–9 years, 3.3 mm for male and 3.5 mm for female aged between 10–12 years.

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