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DISTORTION OF THE MAXIMUM NORM OF THYROID VOLUME IN ADULTS

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Analysing the sample having served as the basis for defining such a general standard norm revealed non-parametric distribution of people by the thyroid volume. The third standard deviation included only 3% of people accounting for 24.2% of the thyroid volume from the “mean+2SD” of this sample. Therefore, the calculation formula “mean+3SD” substantially distorts the norm for 94% of persons. Along with it, the second deviation of the sample, uniting only 7% of people represents 32% from the “mean + SD”, thus distorting the norm for 87% of persons.

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CONTENTS

SUMMARY

Currently available scientific publications for practicing specialists as a criterion for goitre propose the norm according to the formula “mean+3SD”: 18 ml for women and 25 ml for men. These values are nearly three times greater than the mean volume and are of rare occurrence in healthy people, hence giving rise to doubts.

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The rational upper limit of the norm of the thyroid volume is the formula “mean+SD”. It reliably reflects the natural and initial compensatory hypertrophy and excludes people with excessive (pathological) enlargement of the volume. Applying the formula of the extremal norm of the thyroid gland “mean+SD” should also take into account three main criteria: gender, body weight, and height.

INTRODUCTION

Ultrasonographic estimation of the thyroid gland volume has received justified recognition by many specialists as more accurate compared to palpation. In 1994 and 2001, the World Health Organization (WHO) also reported advantages of ultrasound diagnosis in determining defining goitre of the thyroid gland [1, 2].

The use of ultrasound used instead of palpation should have simplified detection of goitre. However, specialists having gained obtained a more accurate method of diagnosis encountered another problem, i.e., difficulty of determining the normal volume of the thyroid gland, which should serve as the key reference point for instrumental determination of goitre.

The difficulty of solving such a problem is associated with several circumstances. The main obstacle for making up a representative sample of healthy people became the selection of criteria that would exclude the circumstances and states of the body, provoking thyroid hypertrophy. Other difficulties related to search of the formula for calculating the volume, standardization of measurements, and professional skills. During several past decades these conditions have been taken into consideration and predominantly overcome.

What has been gained and what normative value of the thyroid volume is recommended to sonologists and clinicians for revealing goitre? Search for the normal thyroid volume has over the past decade demonstrated a substantial

spread in data for citizens of various countries, reaching 100% [3 – 6]. Along with it, irrespective of the differences of these normative values and without regard for taking into consideration individual anthropometric measures (body weight and height) influencing the thyroid volume [7, 8], all professional world has for a third decade been dealing with and using the common standard of the maximum norm of the thyroid volume, i. e., 18 ml for women and 25 ml for men [9 – 18]. As a result: 1) some leading specialists forgot the source of the origin of such a norm, 2) many physicians only believe in the truth of these data, trusting the authoritative sources, and are not interested in theoretical substantiation thereof.

The present work was aimed at determining the reference values of the maximum volume of the thyroid gland in healthy people. The tasks included: a) analysing the representativeness of the samples of studies and validity of calculations, making it possible to define the maximum norm of the thyroid volume as 25 and 18 ml for men and women, respectively; b) searching for probable errors in the studies, resulting in a significant spread in data concerning the mean thyroid volume in healthy people in various countries, c) determining the value of the natural deviation of the thyroid volume and an optimal formula of the maximum thyroid volume for healthy adults.

OPINIONS ON THE SOURCE OF THE NORM FOR THE THYROID VOLUME

What do the authors of literature refer to when reporting volumetric indices of goitre (18 and 25 ml for women and men, respectively)? Some authors refer to the WHO as a source of such normative values, not, however, specifying the title of the publication [13, 18]. Others [19 – 22] either refer to the results of Gutekunst R. et al. [9] or absolutely do not indicate the source of the mentioned norm [12, 14 – 17] or call the normative values “internationally accepted” [11].

Such a situation is suggestive of the following. The majority of specialists in the Western Europe predominantly do remember the source of the normative standard values. Specialists in Russia are either sure that the thyroid standards equalling 18 and 25 ml were recommended by the WHO or do not know the source of such a norm at all. Almost all specialists of various countries perceive the known volumetric values of goitre above 18 and 25 ml (for all women and men, respectively) as absolute truth.

WHO AND THYROID VOLUME

What norm for the thyroid volume is proposed by the WHO? It turned out that in the WHO guidelines [1, 2] there is absolutely no mentioning of the values of 18 and 25 ml as

criteria for defying goitre of the thyroid gland for adults. In the publication of 1994 there is only a **suggestion that it is better to use the mean volume of the thyroid gland (50th percentile)** [1]. It has no numbers at all, that would indicate the volume exactly.

But what then is there in this document? There is a report on the evidence-based correlation between the thyroid volume and body mass, with a reference to the literature source of these data, i. e., publication by Hegedüs L. et al. [23]. In fact, the WHO suggests to be guided by the relationship between the body weight and thyroid volume as an additional criterion in detection of goitre, reporting nothing else regarding the thyroid volume.

Hegedüs L. et al. determined that the mean thyroid volume was 19.6±4.7 ml for men (n = 139) and 17.5±4.2 ml for women (n = 132), living in Copenhagen [23]. Their study showed that for 30-to-49-year-old women the thyroid volume amounted to 17.7±4.5 ml and for those aged 50 – 69 years to 17.9±3.2 ml. Apparently, such data pointed to the mean thyroid volume in women equalling 18 ml. For men, this value corresponded to 21 ml (amounting to 21.0±4.9 ml for 30-to-49-year-old men and 21.3±3.6 ml for those aged 50 – 69 years) according to the findings of Hegedüs L. et al. [23]. However, there is no information about 25 ml as the mean thyroid volume for men mentioned.

CONTEMPORARY STUDIES AND THE DATA OF HEGEDÜS L. ET AL. [23]

More than three decades have passed since the publication of the article by Hegedüs L. et al. [23]. Over this period, other researchers have carried out similar studies, yielding quite different results (see **Table 1**).

As follows from this review of data, the mean thyroid volume for women varies within the range from 5.78 to 12.09 ml (averagely 8.65 ml) and that for men from 6.69 to 15.87 ml (averagely 10.9 ml). Undoubtedly, these publications demonstrated the findings of the studies involving people of different countries and different nationalities, along with it different were certain circumstances (year, certain criteria of selection, correction factors of calculating the volume, etc.). Nevertheless, the criteria for selection and inclusion into these groups were close to those used in the study of Hegedüs L. et al. [23].

Pay attention to the fact that the difference between the mean values of the thyroid volume according to the findings of Hegedüs L. et al. [23] and the general population results amounts to approximately 10 ml (for men and women separately) differing by nearly 100%.

Why did the results regarding the thyroid volume obtained by Hegedüs L. et al. [23] turn out be excessive as compared with the present-day data? It may be supposed that they failed to take into consideration the initial compensatory overstrain of the thyroid gland, accompanied and followed by adaptive

First author, year (source)	Number of people (M/F)	Country	Mean thyroid volume in men (ml)	Mean thyroid volume in women (ml)
Berghout et al., 1987 [24]	50 (25/25)	Nether-lands	12.7±4.4	8.7±3.9
Hsiao et al., 1994 [25]	163 (115/48)	China	8.3±3.3	7.7±3.3
Tsyb et al., 1997 [26]	3848 (1771/2077)	Russia	14	12
Barreare et al., 1999 [27]	2987 (1274/1713)	France	13.3	8.9
Gomez et al., 2000 [28]	268 (134/134)	Spain	9.19	6.19
Ivanac et al., 2003 [21]	51 (0/51)	Serbia	-	10.68±2.8
Ahidjo et al., 2005 [29]	143 (71/72)	Nigeria	9.72	7.58
Adibi et al., 2008 [8]	200 (123/77)	Iran	10.73 ± 3.44	7.71 ± 2.63
Şeker, et al. 2010 [3]	251 (105/146)	Turkey	15.87±7.18	10.94±4.53
Moghadam et al., 2011 [30]	314 (106/208)	Iran	9.08±2.49	7.93±3.2
Yousef et al., 2011 [4]	103 (75/25)	Sudan	6.69±2.56	5.78±1.96
Turcios et al., 2015 [5]	100 (21/79)	Cuba	7.3±0.3	6.4±0.3
Şahin et al., 2015 [6]	461 (292/169)	Turkey	14.53±2.55	12.09±2.05

Table 1. Volume of the thyroid gland (TG) in adults.

alterations (including hypertrophy) in order to provide optimal hormonal metabolism. One may think that Hegedüs L. et al. [23] in 1983 due to peculiarities of ultrasound equipment of that period failed to evaluate the signs of compensatory overstrain (enhanced blood circulation, diffuse hypogenecity of tissue, vascular contouring of the lobes, hypoechogenic inclusions in the lobular segments, etc.).

This circumstance in the study by Hegedüs L. et al. is also favoured by the mean value of TSH, amounting, for example, in 30-to-49-year-old women to 1.8±0.9 μIU/mL (normal range 0 – 3.0 μIU/mL) [23]. In this case, the value of TSH of 1.8 μIU/mL corresponds to the 60th percentile of the norm, similar to TSH of 2.5 mIU/L representing the 58th percentile (with the norm of 0.4 – 4.0 mIU/L). The value of 2.5 mIU/L is the border between the optimal and excessive part of the reference interval for TSH, at which there is high risk for the development of hypothyroidism [31 – 33]. The interval from 2.2 (50th percentile) to 4.0 mIU/L for TSH (normal range 0.4-4.0 mIU/L) according to the proposal of our Clinic, is called “euthyroiditis of strain”, since it points to the initially excessive compensatory overstrain of the thyroid gland and serves as a sign of increased requirements of the body in thyroid hormones [34].

In my opinion, these arguments seem more probable than assumption on iodine deficit, having possibly influenced the result [6]. This is also convincingly favoured by: 1) mild iodine deficiency in the locality of Copenhagen, 2) the findings of B. Rasmussen et al. [20] and A. Carlé et al. [22] having

determined in healthy adult citizens of Copenhagen the mean thyroid volume in women and men amounting to 11.9 ml and 13.5 ml, respectively (with analogous values of urinary excretion of iodine from the 1970s to 2001 [20, 35, 36]).

CONCLUSIONS OF GUTEKUNST R. ET AL. [9]

Present-day researchers refer to the publication of Gutekunst R. et al. [9] as a source of reference values for the thyroid volume [19 – 22]. In their article, Gutekunst R. et al. provide neither substantiations nor calculations which allowed them to draw the exact conclusion that the upper limit of the norm of the thyroid volume is 18 ml for women and 25 ml for men (**Figure 1**), with the exception that these values are the sum of the mean and three standard deviations [9]. As a proof of their conclusion the authors refer to the data of previous studies [23, 24, 37 – 40]. Do these works contain the initial calculations and conclusions leading to the recommended norm of the thyroid volume?

Of the six references just mentioned above, only four are dedicated to ultrasonographic estimation of the thyroid volume in vivo [23, 24, 37, 39], with a further two references being the studies of the weight of the thyroid gland [38, 40]. Irrespective of the fact that the weight of the thyroid gland closely correlates with its volume [41, 42], it is incorrect to use the mass of the gland in order to determine its normal volume in case of “ex vivo”, without assessment of the

Tab. 2. Obere Grenzwerte des normalen Schilddrüsenvolumens

Geschlecht/Alter	Volumen (ml)
– Frauen	18
– Männer	25
– 13jährige	8
– 6jährige	4

Die Referenzvolumina der Tabelle 2 wurden aus sonographischen Untersuchungen und Autopsiedaten ausreichend mit Jod versorgter Bevölkerungsgruppen errechnet. Die obere Normgrenze wurde als Mittelwert plus drei Standardabweichungen definiert (3, 7–9, 12, 16, 17, 26).

Die korrekte Einstellung des Längs- und Querschnittbildes kann mit der Bestimmung der Tiefenausdehnung im Längs- und Querschnitt überprüft werden. Bei Differenzen von mehr als 2 mm muß die Untersuchung wiederholt werden. Bei sehr großen Schilddrüsen mit bizarrer Oberfläche, einer Isthmusdicke über 1 cm und (oder) retrosternal nicht abgrenzbaren Anteilen kann das Volumen nicht genau berechnet werden. Die Volumenangabe muß sich dann auf »größer als . . .« beschränken (5, 10, 11).

Punktion

Klinisch verdächtige und (oder) sonographisch echoarme oder echokomplexe Areale oder Knoten müssen zytologisch untersucht werden (1, 21, 24). Echoreiche Knoten müssen nur bei klinischem Malignitätsverdacht oder besonderer Fragestellung punktiert werden. Veränderungen, die nicht eindeutig palpabel sind, sollten unter sonographischer Sicht punktiert werden (25). Ein Punktionsschallkopf ist nicht erforderlich und erschwert eher die notwendige fächerförmige Aspiration. Die Nadelspitze wird parallel zum Schallkopf am Schallkopfrand in den Punktionsort vorgeschoben. Vor der Punktion müssen der Schallkopf und der Hals des Patienten vom Schallgel gereinigt werden. Das Desinfektionsmittel ermöglicht als Kontaktgelersatz eine ausreichende Bildqualität. Die Spitze der Nadel ist während der Punktion als weißer Kegel gut zu erkennen und festzuhalten.

Zusammenfassung

Die Sonographie gehört nach der körperlichen Untersuchung an die erste Stelle zur Beurteilung oder zum Ausschluß von Strukturveränderungen der Schilddrüse. Für die Bestimmung der Schilddrüsengröße und damit zum Ausschluß oder Nachweis einer Struma ist die sonographische Volumetrie maßgebend. Einige sonographische Veränderungen sind so charakteristisch, daß sie im klinischen Zusammenhang Diagnosen ermöglichen: Struma diffusa, Zysten, Morbus Basedow und Schilddrüsenentzündungen. Bei Struma nodosa mit multiplen oder solitären Knoten ist die Sonographie für die weitere Diagnostik richtungweisend.

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Figure 1. A copy of the page from the article Gutekunst R. et al. [9] table maximum norm thyroid volume for women, men and children.

anthropometric parameters, instrumental and laboratory findings, as well as conditions contributing to thyroid hypertrophy (iodide sufficiency, hormonal metabolism state, ultrasonographic signs of pathology, pernicious habits, life style, menstrual cycle, etc.).

Based on what particular data did Gutekunst R. et al. [9] draw a conclusion that the sought-for volume was 18 ml for women and 25 ml for men? What mean value of the volume was summed with three standard deviations? Four references of Gutekunst R. et al. [9] with five different variants of the mean thyroid volume are shown in **Table 2**.

The study carried out by Gutekunst R. et al. revealed the effect of iodide deficiency in citizens of various cities of Germany on enlargement of the volume of their thyroid gland as compared to Swedish citizens with optimal iodide exchange [9]. The mean values of the thyroid volume in the sample from Sweden (Stockholm) [37] are close to the data obtained in the Netherlands (Amsterdam) [40], but considerably differ from the analogous values determined by other researchers in Denmark (Copenhagen) and Germany (Darmstadt) [23, 39]. Dispersion of these data amounts to about 80-90%. What was then the mean volume chosen for calculations by Gutekunst R. et al. [9]? Nothing is reported by the author.

Let us suppose that chosen were the lowest values obtained by Gutekunst R. et al. in the citizens of Sweden [37]. According to these data, the sum of the mean and three standard deviations amounts to 20.6 ml for women and

First author, year (source)	Country	Number of people (M/F)	Mean thyroid volume in men (mean±SD, ml)	Mean thyroid volume in women (mean±SD, ml)	Range of thyroid volume in men (ml)	Range of thyroid volume in women (ml)	Iodine excretion (mean±SD, µg I/g creatinine)
Gutenkunst R., 1986 [37]	Sweden	303	11.1±4.7	7.7±4.3	3.3-27.4	2.5-34.0	170.2±93.3
	Germany	1397	26.9±17.0	16.5±12.2	3.8-105.0	2.6-124.1	83.7±94.4
Berghout A., 1987 [24]	Nether-lands	50 (25/25)	12.7±4.4	8.7±3.9	2.7-20.4		147.2±68.2
Hegedüs L., 1983 [23]	Denmark	271 (139/132)	19.6±4.7	17.5±4.2	8-33		?
Olbriht T., 1983 [39]	Germany	542 (217/325)	18.4±6.5	14.0±5	9-38	6-25	?

Table 2. Thyroid volume in adults according to gender and findings of studies.

25.2 ml for men. If we round off these values we will obtain 21 and 25 ml for women and men, respectively. What made then the authors to alter the calculated volume for women? Why instead of 21 ml (or even 20 ml if rounding off to the lesser side) were 18 ml chosen? Why did not they treat the value for men in the same manner?

An analogous calculation based on the data of Berghout A. et al. [24] would yield a similar norm: 20.4 ml for women and 25.9 ml for men (rounded – 20 and 26 ml). The same calculation of the data of Olbriht T. et al. [39] will give us substantially greater reference ranges: 29 ml for women and 33.7 ml for men. Even a greater norm of the thyroid volume will be shown by the sum from the data of the study by Hegedüs L. et al. [23]: 30.1 ml for women and 33.7 ml for men.

As is seen Apparently, Gutekunst R. et al. referred to all the six studies but with no appropriate criticism of the results of Olbriht T. et al. [39] and Hegedüs L. et al. [23] accepted only their own data as the norm and without explanations diminished the normal value of the thyroid volume for women by 2.6 ml. [9]. The decision of Gutekunst R. et al. [9] about the extra 2.6 ml for women is unclear not clear (probably, it was made under the influence of the data of Hegedüs L. et al. [23]) but neither is it a matter of principle. What is more important is the lack of substantiation of the upper limit of the norm as the sum of the mean and three standard deviations (mean+3SD).

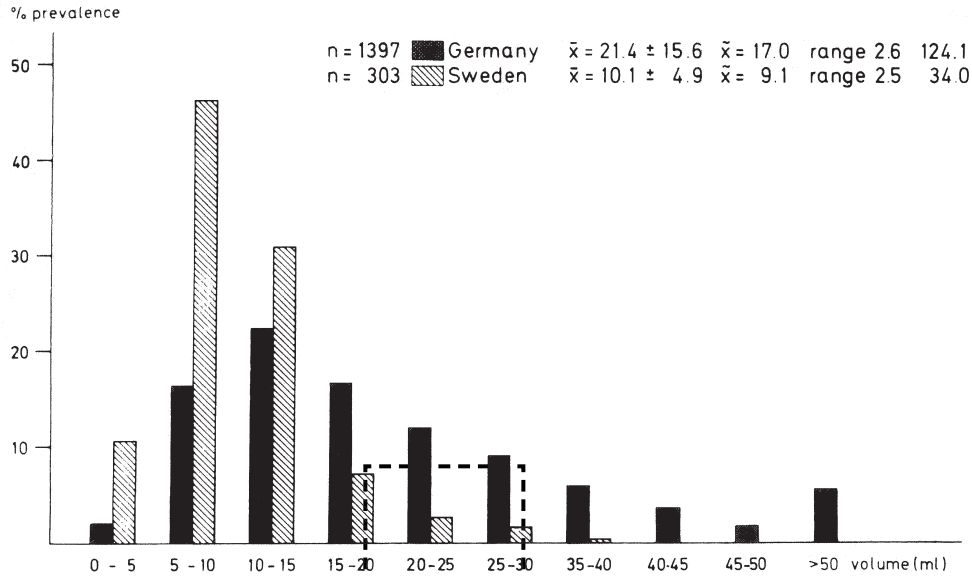

Figure 2. Excerpt from the article Gutekunst R. et al. [37], frequency distribution chart of volume of the thyroid of both sexes in samples from Sweden and Germany. The dashed line circled area of the chart, including the third and second standard deviation, respectively, 3% + 7%) in the sample from Sweden, in which Gutekunst R. et al. [9] propose to estimate the volume of the thyroid in the remaining 87% of people.

THREE STANDARD DEVIATIONS FROM THE MEAN – A LIMIT OF THE NORM?

Gutekunst R. et al. [37] obtained nonparametric samples in Sweden and Germany (**Figure 2**). Similar deviations from the correct distribution in a sample are also observed in other, more recent studies [4, 5]. Since the majority of the authors provide no data on distribution of the thyroid volume in the sample [3, 8, 21, 29, 30 and others] this circumstance limits a full-valued analysis of their data.

As is known, for the normal distribution 95% of the values lie within the limits of two standard deviations from the mean [43]. Due to abnormal distribution of the thyroid volume in the sample from Sweden, Gutekunst R. et al. seemingly made a decision to embrace a maximally possible number not by two but by three standard deviations [9, 37]. Probably, this is the only reasonable explanation of the motivation of Gutekunst R. et al. to apply the sum of the mean with three standard deviations for designation of the upper limit of the norm [9, 37].

The group of the third standard deviation of the cohort from Sweden included only 3% (9 people) between the 94th and 97th percentiles [37] (**Table 3**). According to these data there arises a question: **is it correct to evaluate the volume of the gland in 94% of people by the values found for other 3% of people**, if the volume of the gland in this (substantially less numerically) group amounts to 24.2% (in both genders) in relation to the volume of the

Part of the sample	Thyroid volume in women		Thyroid volume in men		Thyroid volume in women and men	
	ml	% of people (approximately)	ml	% of people (approximately)	ml	% of people (exactly)
mean	7.7	56%	11.1	56%	10.1	56%
mean + SD	12	31%	15.8	31%	15.3	31%
mean + 2SD	16.3	7%	20.5	7%	20.2	7%
mean + 3SD	20.6	3%	25.2	3%	25.1	3%

Table 3. Distribution of the thyroid volume in the sample from Sweden according to the findings of Gutekunst R. et al. [37].

gland of the rest (considerably greater) part of the sample (or 19.5% in “mean+3SD”)? Undoubtedly not! **The value of the third standard deviation in such a case distorts the assessment of the norm for a considerably greater (94%) part of the sample.**

The same refers to the second standard deviation of the sample from Sweden [37] (**Table 3**). It embraces 7% (21 people) representing 32% (in both sexes) from the volume “mean+SD” (and 24.2% in “mean+2SD”), distorting the norm for 87% of persons.

In contrast to 3SD and 2SD, the first standard deviation included 31% of persons and accounted in both sexes for 48.5% from the mean (and 32% in “mean+2SD”), more fully characterizing a meaningful part of the sample from Sweden [37].

NATURAL CHANGES OF THE THYROID VOLUME

The results of the studies of the thyroid volume, contained in **Table 1** demonstrably show a very considerable rather a wide spread between the lowest and highest values of the volume. The difference between them reaches nearly 100%. This is a sign of unreliability of some part of the results.

All groups shown in **Table 1** have almost similar key criteria for selection aimed at involving healthy people only. Deviations of the mean thyroid volume between these groups, according to the opinion of some researchers,

may be associated with difference of the anthropometric parameters (for example, height) between citizens of the Western Europe, Asia, Africa and America and are related to the ethnic factor influenced by genetic prerequisites and geographic environmental factors [5, 6, 8, 29].

Such hypotheses give rise to doubts, since the mentioned circumstances are unable to exert a leading effect on the thyroid volume. The summarised data in the Table show a substantially greater thyroid volume in citizens of Turkey. This circumstance is unlikely to be associated with the length of the body of the population, since the average height in this region does not exceed the average height of citizens of the neighbouring country Iran, with its ethnically close population, as well as those of the majority of European countries [44, 45], wherein substantially lower values of the mean volume of the thyroid gland were revealed.

The size of the thyroid gland is more closely correlated with the body mass and body surface area (BSA) than with the height. Such dependence was revealed in the studies demonstrating both the minimum and maximum mean volume of the gland, with the difference between them of more exceeding 100% [8, 23]. Therefore, with all other close circumstances (sufficient iodine saturation, no pernicious habits, height, body weight, etc.), one may think of other criteria contributing to compensatory hypertrophy, which were not taken into consideration while selecting and including volunteers into the groups. Moreover, the thyroid volume appears to be more dependent on the muscular

rather than adipose body mass [7], not differing by 100% in different studies.

A natural alteration in the thyroid volume is observed during pregnancy, during menstrual cycle, and in various seasons of the year [23, 46, 47]. One may think that all these conditions are united by increased requirements of the body in calories, due to activation of metabolic processes, and enhanced strain of the sympathetic-parasympathetic balance [48].

Particular emphasis is placed upon different alteration of the thyroid volume in pregnant women. According to the findings of Hegedüs L. et al. the size of the thyroid gland may increase by 50% depending on compensatory strain as determined by elevated TSH [23, 46]. On the other hand, the thyroid volume almost does not alter during gestation with sufficient compensation, as determined by the stable optimal amount of TSH and a slight decrease in free T4 and free T3 within the limits of the reference interval [47, 49].

The same relates to the dependence of the thyroid volume from the season of the year. The results of the studies by Hegedüs L. et al. demonstrated enlargement of the thyroid gland in winter by 23% as compared to that in summer, with no significant deviations of TSH [46]. This circumstance is associated with natural compensatory thyroid hypertrophy nearly independent from all other goitrogenic circumstances (iodine provision, height, body weight, place of living, ethnic peculiarities, etc.). Its main source is enhancement of metabolism during a cold season of the year. To the same

natural hypertrophy of the thyroid gland belong small in value alterations in its volume during various phases of the menstrual cycle.

By analogy with seasonal and reproductive fluctuations of thyroid metabolism it may be thought that in the comparable groups of persons (matched by gender, age, body weight, height, iodine sufficiency, season of the year, physical, mental loads, etc.) the size of the thyroid gland should not differ by more than 20-30%. This difference relates to the natural compensatory buffer providing the basal metabolism and accounts for one standard deviation from the mean. Therefore, it seems more reasonable for each gender, in accordance with its constitutional features (mainly, body weight), to consider the formula “mean+SD” as the upper limit of the norm of the thyroid gland. Excess of this value should be assessed as pathological compensatory overstrain.

CONCLUSIONS

1. The third standard deviation should not be used for defining the maximum norm of the thyroid volume. This is true for nonparametric and especially parametric samples during studies. **The common for all maximum norm of the thyroid volume of 18 ml for women and 25 ml for men should be abandoned.**
2. The mean value of the normal thyroid volume predominantly depends upon physical signs (gender, body weight, height) and cannot differ twofold and more by ethnic origin. It is erroneous to define the same maximum norm of the thyroid volume for people with different body weight.
3. **It is reasonable to define the population-specific maximum of the thyroid volume by the formula "mean+SD".** Deviation from this limit of the norm should be regarded as excessive (pathological) compensatory overstrain of the thyroid gland, manifesting itself as hyperplasia and hypertrophy.
4. It is necessary to create a common system of methodology of studying the norm of the volume of the thyroid gland, carefully choosing a list of reliable criteria for selection, rational demonstration of the data in publications and algorithms of comparing the results of studies.

AN APPEAL TO FELLOW RESEARCHERS

The author is grateful to all without exception researchers of thyroid gland volume, mentioned in the article. Without their work and effort medical science would not have an important basic knowledge for its progress.

However, a true science always requires a revision of previous knowledge based on new data, real facts and laws of nature. Without a regular analysis of past provisions and a appropriate correction it is not a science. Dogmatic attitude to the old findings detains scientific thought and its practical implementation. This is particularly important in medicine. This is why one should reasonably correct the theory, remembering previous accomplishments of colleagues.

Life of researchers, clinicians and patients is, therefore, goes by, so the improvement of the theory and its implementation in practice should be prompt. The first, researchers, will have time to manage to correct inaccuracies or to mend their mistakes, ending up by providing the current and next generations real use and conserving a good memory. The second, clinicians, will be better equipped to practice, getting a real professional satisfaction from their work. The third, patients, who are most interested in improving the possibilities of medicine, will be able … to get what are waiting for – the restoration of health.

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