

Ultrasound Determination Of Thyroid Gland Volume Among Adult Nigerians

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Abstract

The study has determined the normal thyroid volume using ultrasound in Maiduguri, North-Eastern Nigeria. One hundred and forty three subjects were studied consisting of 72 (50.30%) females and 71 (49.70%) males. The mean age of the subjects was 38.60 13.10 years.

The overall mean volume of the thyroid gland for both lobes in all the patients studied was $8.55\text{cm}^3 \pm 1.82$. The mean volume for both lobes in females and males were 7.58cm^3 and 9.72cm^3 respectively. The males thyroid volume was higher than the females ($p = 0.000$).

The mean volume of the right and left lobes of the thyroid gland in males and females were 4.48cm^3 and 4.07cm^3 respectively. The right thyroid lobe volume was higher than the left ($p = 0.000$). The values obtained in our study were lower than those reported from previous studies among Caucasians.

INTRODUCTION

Ultrasound has become one of the primary imaging modalities for the assessment of the major glands of internal secretion within the cervical region.¹ The thyroid gland is among the most commonly imaged glands using ultrasound due to the limitation of clinical examination.¹ Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) provide structural information of the thyroid gland just like ultrasound, but are relatively more expensive. Thyroid ultrasound appears suitable in tropical Africa^{2,3} where more sophisticated modern imaging techniques may not be readily available or are very expensive.

Anatomically, the normal thyroid gland consists of two lobes which lie on the anterolateral surface of the trachea extending from the thyroid cartilage superiorly to the sixth tracheal ring inferiorly. They are asymmetrical with the right lobe being larger than the left and the thyroid gland is larger in males.^{4,5}

Anele, 2001 has studied the thyroid volume of 327 Nigerians using 3.5MHz transducer with a water bath, but according to him, the 7.5MHz transducer would have been the most ideal.³ Other workers have also documented the superiority of the 7.5MHz transducer for thyroid ultrasound.⁶ It is easy

and causes less discomfort to both the patient and the Sonologist and does not require a water bath. This necessitates the present study to determine the actual thyroid volume among Nigerians using the 7.5MHz transducer.

PATIENTS AND METHODS

One hundred and forty three adults resident in Maiduguri, consisting of 71 males and 72 females were randomly selected, with informed consent, for the study. The age of the subjects ranged from 23-69 years. The study was prospective and extended from September 2002 to September 2004.

Ultramark 9 ATL, a grey scale real-time ultrasound machine, fitted with a 7.5MHz transducer was used for the study. The patients were examined in supine position, with pillow placed under their shoulders to hyperextend the neck. Ultrasound gel was applied over the thyroid area. The transducer was directly placed on the skin over the thyroid gland and images of each lobe were obtained in transverse and longitudinal planes. The craniocaudal and the sagittal dimensions of both lobes were measured on the longitudinal image. The transverse dimension was measured on the transverse image. The thyroid gland volume was calculated using the formula below:

Volume = length x width x thickness x 0.479 (conversion factor)

Where: length = craniocaudal dimension

Width = transverse dimension

Thickness = sagittal dimension

Subjects with anterior neck swelling or clinical evidence of thyroid disease were excluded from the study. Also excluded from the study were women during menstruation, pregnant women or women who have delivered within the last 12 months.

The data were collected and analyzed using SPSS for windows version 11 and a $p < 0.05$ was taken as significant. The results were presented in form of tables.

RESULTS

The 143 subjects studied consist of 72 (50.30%) females and 71 (49.70%) males. The mean age of the subjects was 38.60 13.10 years with a range of 23-69 years.

The overall mean volume of the thyroid gland for both lobes in all the patients studied was $8.55\text{cm}^3 \pm 1.82$. The mean volume for both lobes in females and males were 7.58cm^3 and 9.72cm^3 respectively.

The mean volume of the right and left lobes of the thyroid gland in all the patients studied were 4.48cm^3 and 4.07cm^3 respectively (Table 1). The right thyroid lobe volume was higher than the left ($p = 0.000$).

The mean thyroid volume of the right lobe among the females studied was 4.04cm^3 and the left was 3.54cm^3 (Table 2). The values were higher for the right than the left lobe ($p = 0.000$).

In males, the right and left lobes of the thyroid gland volumes were 5.12cm^3 and 4.60cm^3 respectively (Table 3). The values were higher for the right than the left lobe ($p = 0.000$) and more than that of the females ($p=0.000$).

Figure 1

Table 1 showing the range, mean volume, standard deviation, and standard error of the right and left thyroid lobes in all the subjects studied.

	Range (cm ³)	Mean Volume (cm ³)	Standard. Deviation	Standard. Error Mean
Right thyroid lobe	2.17-9.62	4.48	1.82	.152
Left thyroid lobe	1.37-9.01	4.07	1.67	.139

Figure 2

Table 2 showing the range, mean volume, and standard deviation of the right and left thyroid lobes in the 72 female subjects studied.

	Range (cm ³)	Mean Volume (cm ³)	Standard. Deviation
Right thyroid lobe	2.17-9.57	4.04	1.50
Left thyroid lobe	1.37-6.33	3.54	1.46

Figure 3

Table 3 showing the range, mean volume, and standard deviation of the right and left thyroid lobes in the 71 male subjects studied.

	Range (cm ³)	Mean Volume (cm ³)	Standard. Deviation
Right thyroid lobe	2.54-9.62	5.12	1.95
Left thyroid lobe	2.06-9.01	4.60	1.70

DISCUSSION

Thyroid ultrasound is an imaging modality to evaluate the size, shape, and abnormalities of the thyroid gland. Recent studies have used ultrasound as an accurate and precise method of measuring the thyroid size.⁷ Failure of the thyroid gland to descend from foramen caecum along the thyroglossal duct to the anterior aspect of the neck accounts for the rare ectopic location of the thyroid tissue at the base of the tongue (lingual thyroid) as well as the presence of thyroglossal duct cyst along this developmental tract.⁸ Subjects with these developmental anomalies were excluded from our study because this may affect the thyroid size. The

thyroid size was found to increase during pregnancy and decreases up to 12 months postpartum period.^{9,10} That is why women who were pregnant and one year postpartum were excluded from the study. The menstrual cycle also seems to associate with cyclical alteration of thyroid size in healthy women,¹¹ and for that reason, menstruating women were excluded from our study.

The overall mean thyroid gland volume combined for both lobes and sexes obtained from our study was 8.55 cm³. There was no previous local study for comparison. Anele,³ studied the thyroid gland volume among Nigerians, on close observation what he studied was the lobar volume, rather than the volume of the whole of the thyroid gland and moreover the side of the lobe measured was not mentioned throughout his study. The thyroid volume obtained in Iceland, Sweden, Netherlands and USA was 8ml-15ml¹² which is higher than the value obtained in our study (8.55 cm³). Our value is in agreement with a previous study by Tahir, et al, in our environment which shows the thyroid dimensions to be slightly lower than the Western values.⁵ The thyroid volume among the Chinese studied by Hsiao and Chang was 7.7ml ±3.3,¹³ this value is slightly lower than ours. This may be explained by the short height of the Chinese. It is an established fact that the height of an individual correlates well with the thyroid size.¹

Our study has shown that the right thyroid lobe volume (4.48ml) was higher than the left (4.07) with significant statistical difference between the right and left lobe volumes in both sexes ($p = 0.000$). Our finding is in agreement with previous studies done locally, and among the Caucasians, and the Chinese.^{5,12,13}

The total mean values for the females (Table 2) and males (Table 3) have shown the thyroid gland to be larger in males compared to females ($p = 0.000$). Anele (2001)³ has found no significant difference in the thyroid volume between males and females. This finding differs from our study and most of the previous studies.^{5,7,12,13} Azizi, et al (2003),⁷ while studying the thyroid volume among school children in United Arab Emirates has found a significant statistical difference in the median and upper limit of the thyroid volume between boys and girls ($p < 0.001$) in favor of boys. Langer (1989)¹² has quoted various authors in Iceland, Sweden, Netherlands and USA who found the thyroid volume to be 11-15 ml for males and 8-12 ml for females. Hsiao and Chang (1994)¹³ also found the thyroid size was

larger in males than females ($p < 0.001$) among the Chinese adults.

In conclusion, the thyroid volume obtained in our study was in the lower range of the values reported in previous studies among Caucasians. This is in agreement with a previous study conducted by the authors in the same environment while assessing thyroid dimensions (no volume measurements). The volume of the right lobe of the gland was greater than the left in both sexes. The mean thyroid volume in the males is higher than in the females.

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