



Age related changes in size of thyroid follicle in north Indian population: A histologic study

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ABSTRACT:

Due to increasing number of cases of thyroid gland disorders nowadays, there are rising trends of thyroid gland surgeries and interventions which requires comprehensive data regarding the gland. This study was done to find out the changes in the size of the thyroid follicle in different age groups. The age groups were Group A - upto 20 years, Group B - 21-50 years and Group C - above 50 years. The study was conducted on 60 human thyroid glands in the Department of Anatomy in collaboration with Department of Pathology, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak in North Indian population. The diameter of the thyroid follicle was measured by Image Analyzer. The study revealed that the mean size of the thyroid follicle was found to be in Group A - $56.38 \pm 14.12 \mu\text{m}$, Group B - $130.08 \pm 30.67 \mu\text{m}$ and Group C - $96.05 \pm 12.86 \mu\text{m}$. The study concluded that the mean size of the thyroid follicle was found to be higher in Group B (21-50 years) followed by Group C (above 50 years) followed by Group A (below 20 years).

Keywords: Thyroid Gland, Size of thyroid follicle.

INTRODUCTION

The thyroid gland is brownish-red and highly vascular endocrine gland. It is ensheathed by the pre-tracheal layer of deep cervical fascia forming a capsule. The capsule possesses both an outer fascial sheath and an inner thin or loose connective tissue.^[1]

Eroschenko VP (2008)^[2] explained that the inner layer of thyroid capsule is fibroelastic tissue, which sends septa into the parenchyma of the gland, dividing it into irregular lobes and lobules. These septa gradually become thinner; they reach all the follicles, separated each follicle from others by fine, irregular connective tissue composed mainly of reticular fibres^[3]

The functional units of the thyroid gland are follicles, which are spherical and cyst like, between 0.02 and 0.9 mm in diameter. Follicles consist of a central core of colloid material surrounded by a single layered epithelium resting on a basal lamina.

Follicular cells vary from squamous or low cuboidal to columnar, depending on their level of activity, which is controlled mainly by circulating hypophyseal thyroid-stimulating hormone (TSH, thyrotropin). Resting follicles are large and lined by squamous or low cuboidal epithelium with abundant luminal colloid. Apical microvilli are short in resting cells, but elongate and often branch on stimulation by TSH. Follicles showing different levels of activity may co-exist.

The study is conducted to measure and correlate age related changes in the size of the thyroid follicle in north Indian population. In biopsy specimens, the measurement of the size of the thyroid follicle can rule out the pathology if the normal size of thyroid follicle is to be known to the particular age group.

MATERIALS AND METHODS

The present study was conducted in the Department of Anatomy in collaboration with the Department of Pathology, Pt. B.D. Sharma, Postgraduate Institute of Medical Sciences, Rohtak.

This study was done on 60 human thyroid glands.

Selection of cases

Inclusion Criteria-

These samples were collected from autopsied bodies from the mortuary of Department of Forensic Medicine undergoing post-mortem in routine, after obtaining proper consent of the relatives, wherever required. Samples were collected from cases within 24 hours after death before appearance of signs of putrefaction.

Exclusion Criteria-

The following cases were excluded from the study:

- Hanging
- Poisoning
- Any cutting or crushing injury to thyroid gland
- Known case of thyroid disease
- Burnt
- Decomposed

Grouping of the Samples

Grouping of the samples were done according to age.

- ❖ Group A - ≤ 20 years
- ❖ Group B - 21 - 50 years
- ❖ Group C - above 50 years

The human thyroid gland with related structures was collected en-mass. The collected samples were washed gently with tap water. Blood and blood clots were removed. Each sample was tagged with a piece of cloth which bear an identification number along with age and sex of the victim. Then the samples were fixed and preserved in 10% formol saline solution.

Histology of the Thyroid Gland

Preparation of the Slides

Tissue blocks were fixed in 10% formol saline in a plastic container which were numbered having same number as on specimen. The tissue was washed in running tap water; dehydration was done with ascending grades of alcohol, cleared with xylene, in filterated and embedded in paraffin wax. Paraffin blocks were cut at 7 micron thickness and were stained with routine Haematoxylin and Eosin (H&E) stain.

Measurements of the Diameter of the Thyroid Follicles

For measurement of the diameter of the thyroid follicles, 3 different fields were chosen from each slide and from each field 5 follicles of different size were observed. The diameter of follicles was measured by using an Image Analyzer. Two measurements were taken for each follicle. One measurement was taken at the maximum transverse diameter of the follicle and another at perpendicular to the first one. So the average diameter of the thyroid follicle was measured by taking the mean of the two diameters i.e.

$$\text{Maximum transverse diameter} + \text{Maximum perpendicular diameter} \quad 2$$

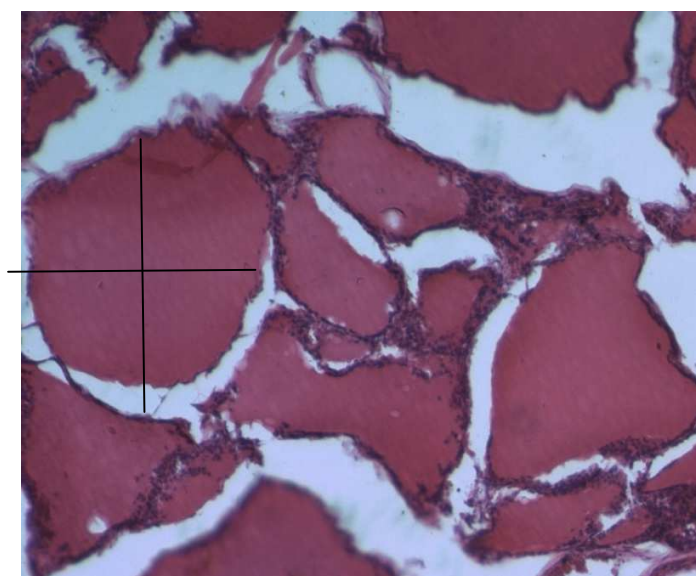


Figure: Shows Measurement of the Size of the Thyroid Follicle

Statistical Analysis:

The data obtained was analyzed using SPSS 17.1 software. The One Way Anova test was applied to compare the age related changes in the size of the thyroid follicle. The p-value ≤ 0.05 was considered as significant.

RESULTS

In the present study, the average size of the thyroid follicle in different age groups was observed to be $94.17 \pm 36.64 \mu\text{m}$.

Table: Age-wise distribution of Size of the Thyroid Follicle

Age Groups (years)	Number of specimens	Size of thyroid follicle (μm) Mean \pm SD	Significance (p-value)
A(≤ 20)	20	56.38 ± 14.12	0.00*
B(21-50)	20	130.08 ± 30.67	
C(> 50)	20	96.05 ± 12.86	
Total	60	94.17 ± 36.64	

* Significant

Size of the thyroid follicle in group A (age upto 20 years) varied from $32.7 \mu\text{m}$ to $80.8 \mu\text{m}$ (mean value $56.38 \pm 14.12 \mu\text{m}$), in group B (age 21-50 years) varied from $88.6 \mu\text{m}$ to $190.6 \mu\text{m}$ (mean value $130.08 \pm 30.67 \mu\text{m}$) and in group C (age above 50 years) varied from $72.8 \mu\text{m}$ to $115.6 \mu\text{m}$ (mean value $96.05 \pm 12.86 \mu\text{m}$). When the mean values of group A, B and C were compared with each other, the difference was found to be significant (p-value < 0.05).

DISCUSSION

The secretory follicles constitute the functional and structural units of the thyroid gland. About 30 millions of follicles are packed together to form the human thyroid gland.^[4]

The follicles which consists of spheres formed by simple cuboidal epithelium having a lumen filled with gelatinous substance called colloid.^[5] and Nayyar et al (1990)^[6] stated that aged thyroid gland as an increased number of parafollicular cells.

Thyroid gland is a very important endocrine gland which is concerned with rate of metabolism, blood calcium level and affects on growth and development in mammals^[7].

Jackson (1931)^[8] reported the size of the thyroid follicle as low as 30.6 ± 0.72 micron and as great as 62.7 ± 1.8 micron both of which are found to be lower than the present study. Saadeh et al (1978)^[9] reported the size of the thyroid follicle ranging from 178.4 to 221.5 micron, average being 198.1 micron which was found to be higher than the present study.

Berkovitz (2005)^[10] reported the size of normal thyroid follicle 0.02-0.9 mm in diameter which was found to be lower than the present study. Sultana et al (2007)^[11] reported mean follicular diameter 198.45 μ m in Group A (upto 18 years), 265.79 μ m in Group B (19-45 years) and 203.50 μ m in Group C (>45 years) which was found to be higher than the present study in Group A, Group B and Group C respectively.

Nurunnabi et al (2009)^[12] reported the average size of thyroid follicle in Group A (10-20 years) is 171.29 ± 3.95 μ m, in Group B (21-50 years) is 210.00 ± 20.02 μ m and in Group C (>50 years) is 170.55 ± 4.31 μ m which was found to be higher than the present study in Group A, Group B and Group C respectively.

CONCLUSION

In the present study, the average size of the thyroid follicle was found to be higher in Age Group B (21-50 yrs), followed by Group C (>50 yrs), followed by Group A (≤ 20 yrs) which means that most active age group is Group B. Pathologist will get benefitted by the study as they will be aware of the normal size of the thyroid follicle and help them to give an accurate diagnosis about any abnormality of the gland.

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