

A COMPARATIVE STUDY OF THYROID GLAND IN SOME MAMMALS

Annie Doley¹, Monjushree Chakravorty²

¹Assistant Professor, Department of Anatomy, Tezpur Medical College, Tezpur.

²Associate Professor, Department of Anatomy, Tezpur Medical College, Tezpur.

ABSTRACT

BACKGROUND

Goitre or swelling of thyroid gland is very common in North-East region and is encountered frequently in clinical practice. Goitre is a compensatory hypertrophy of thyroid gland and it has been recognised for centuries even back to the times of Ebers Papyrus (1500 BC) (LE McDonald.) The thyroid is the largest endocrine gland present in all mammals. In some disease conditions, an individual has to undergo a complete thyroidectomy and live on thyroid supplements for life. Is there a possibility of xenograft and xenotransplant? With this view a comparative study of the thyroid gland was under taken in the Dept. of Anatomy, Gauhati Medical College, Guwahati. The main purpose of the study was to see if thyroid gland of human was in any way similar to thyroid gland of other mammals. Xenograft and Xenotransplantation are the latest research studies going on these days. By these techniques, tissues and organs of one species can be transplanted or grafted into another species.

MATERIALS AND METHODS

The study of thyroid gland was conducted in Dept. of Anatomy, Gauhati Medical College. The various species included for studies were of human, pig and goat. They were divided into three groups I, II, and III. The specimen of human was collected from morgue of Gauhati Medical College. The specimen of pig and goat were collected from College of Veterinary Sciences, Gauhati. In all animals, the size, shape, length, breadth, thickness was recorded.

RESULT

The length, breadth, thickness of thyroid gland in group I, II and III were taken with the help of Vernier callipers. Weight was measured with the help of electronic weighing machine. The results were statistically analysed.

DISCUSSION

The findings of this study were compared with the findings of work done by other authors previously.

CONCLUSION

In this study, it was observed that biometrical values were different in all the mammals but morphological characters were almost similar.

KEYWORDS

Thyroid Gland, Pig, Goat, Human.

HOW TO CITE THIS ARTICLE: Doley A, Chakravorty M. A comparative study of thyroid gland in some mammals.

J. Evid. Based Med. Healthc. 2016; 3(63), 3448-3451. DOI: 10.18410/jebmh/2016/742

INTRODUCTION: Thyroid gland is a reddish brown, highly vascular ductless endocrine gland. It is situated in the lower part of the neck. It is present in all mammals and performs many physiological functions. Thyroid gland varies greatly in different mammals. In dogs and cats, the gland consists of separate masses connected by an isthmus. In horse, paired lobes are highly dissociated but connected by an insubstantial isthmus. In yet other species, the thyroid has a more compact form and exhibits relatively large median (pyramidal) lobe in addition to lateral lobes. This arrangement is found in pigs and human (Dyce, Sac and Wensing).¹

Financial or Other, Competing Interest: None.
Submission 15-07-2016, Peer Review 26-07-2016,
Acceptance 05-08-2016, Published 08-08-2016.

Corresponding Author:

Dr. Annie Doley,

Assistant Professor, Department of Anatomy,

Tezpur Medical College & Hospital,

Tezpur, Bihaguri-784010.

E-mail: annie2nov@gmail.com

DOI: 10.18410/jebmh/2016/742

The reason why thyroid gland has attracted so much attention over the years is due to wide spread and vital effect of thyroid hormones on physiology of body mediated at cellular level to produce heat and energy by regulating the rate of oxygen consumption. The thyroid gland secretes two important hormones- thyroxine (T4) and triiodothyronine (T3). A normal level of thyroid hormone is necessary for several functions: - Brain Development, Growth, Puberty, Fuel Metabolism, Gastrointestinal Function, Reproduction and Circulation. Theodor Kocher, who is considered as the father of thyroid surgeries, performed thyroidectomy in the early 1800s. But he noticed that post thyroidectomy, the patient suffered from myxoedema. Can animal tissue be replaced for the lost human tissue? Xenograft and xenotransplant is a process by which tissue or organs from an individual of one species is transplanted or grafted onto another species. Common example is use of pig valves in humans. In view of the wide spectrum of function of thyroid gland, a comparative study of it has been undertaken in Gauhati Medical College in the Dept. of Anatomy.

AIM AND OBJECTIVE:

1. To study the biometry and morphological characteristic of thyroid gland in pig, goat and human.
2. To compare the thyroid gland in the following mammals and see if there exists any similarity.

MATERIAL AND METHODS: The various species included for studies of thyroid gland were of human, pig and goat. The species were divided into three groups consisting of 20 mammals in each group as follows:

Sl. No.	Name of the Mammal	Group	No. of Animals
1.	Human	I	20
2.	Pig	II	20
3.	Goat	III	20

Group I:

- The thyroid glands were obtained from autopsies done in Dept. of Forensic and State Medicine, Gauhati Medical College.
- Specimens of adult human thyroid gland were collected from cadavers following all legal formalities, when autopsies were done within six hours of death after excluding all histories of possible abnormalities.

Group II and III:

Specimens were collected after taking ethical clearance,

- From the Dept. of Anatomy, College of Veterinary Science, Khanapara, Guwahati.
- Thyroid gland of pig and goat were taken from animals used for dissection.
- Some specimens were obtained from local abattoirs.

In all animals, the gland was properly dissected out and their positions were noted. After removal of the gland, their length, breadth, thickness were measured with the help of Vernier callipers and measuring scale. Weight was measured with the help of electronic weighing machine.

The length, breadth and thickness were recorded as follows:

- **Length:** Craniocaudal distance of thyroid gland.
- **Breadth:** Anterior-posterior diameter at the middle of thyroid gland.
- **Thickness:** Mediolateral distance at the middle of thyroid gland.
- **Weight:** Was taken in a precision balance.

Note: Weight was taken as whole i.e. combined weight of right and left lobe and isthmus.

Biometrical values were statistically analysed according to (Snedecor and Cochran).² Significant difference of length, breadth, thickness and weight was noted.

Paired t-test was done and t was taken as significant if the value of t was greater than 2.447.

RESULTS AND OBSERVATION: The average length (in cm) of right and left thyroid gland of mammals belonging to group I, II, III, were found to be 5.35, 5.13; 5.49, 5.59; and 1.46, 1.41 respectively.

The average breadth (in cm) of right and left lobe of thyroid gland of mammals belonging to group I, II, III, were found to be 2.96, 2.95; 1.01, 1.03; and 0.53, 0.52. Respectively. The average thickness (in cm) of right and left lobe of thyroid gland of mammals belonging to group I, II, III, were found to be 1.95, 1.95; 0.56, 0.54; and 0.42, 0.41 respectively. The average weight of thyroid gland in mammals belonging to group I, II, III were found to be 25.72 g, and 5.24 g and 6.93 g respectively. The shape of thyroid gland of mammals belonging to group I was found to be shield shaped consisting of right and left lobes and connected by a distinct isthmus.

A median pyramidal process was found in the mammals of this group. The shape of thyroid gland of mammal of group II was not very distinct. It was more or less triangular in shape and showed 2 lobes. The isthmus was not distinct. The shape of thyroid gland of group III was found to be elliptical and elongated in shape and consisted of right and left lobes. Isthmus was indistinct. The colour of thyroid gland of all mammals was found to be reddish brown in colour. Also in all the mammals, the thyroid gland was located in the lower part of the neck region.

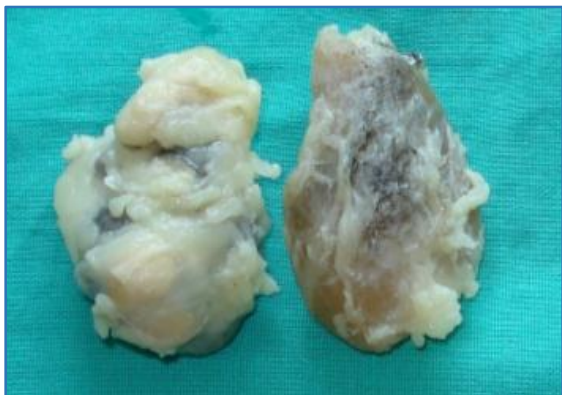
Name of Mammal	Length of Lobe (In Cm)		Breadth of Lobe (In Cm)		Thickness of Lobe (In Cm)		Weight (In grams)
	Right	Left	Right	Left	Right	Left	
Group I	5.35	5.13	2.96	2.95	1.95	1.95	25.72
Value of t	1.2467		0.1593		0.1610		
Group II	5.49	5.59	1.01	1.03	0.56	0.54	5.24
Value of t	0.7633		0.4789		-1.0812		
Group III	1.46	1.41	0.53	0.52	0.42	0.41	6.93
Value of t	-0.7633		-0.4789		1.8012		

Table 1: Average Length, Breadth, Thickness, and Weight of Thyroid Gland in Different Mammals

t is Significant if t > 2.447; Significance Level=5%; degrees of freedom (d. f.) = 6.
Group I=Human; Group II=Pig; Group III=Goat.



Photograph of Thyroid Gland in Human



Photograph of Thyroid Gland in Pig



Photograph of Thyroid Gland in Goat

DISCUSSION:

Human: The Average Length, Breadth, Thickness and Weight of Thyroid Gland in Human were as follows:

Name of Mammal	Length of Lobe (in cm)		Breadth of Lobe (in cm)		Thickness of Lobe (in cm)		Weight of gland (in grams)
	Right	Left	Right	Left	Right	Left	
Human	5.35	5.13	2.96	2.95	1.95	1.95	25.72

The above results were in conformation with the findings of A. K. Dutta,³ Inderbir Singh,⁴ Sahana,⁵ Gray,⁶ and S. Mitra.⁷ Also the thyroid gland of human was seen with two lateral lobes connected by a distinct isthmus. Such was the finding of authors like (Bloom & Fawcett),⁸ (1975), Grays (2005), (Decker and D. J. DuPlessis).⁹

Pig: The Average Length, Breadth, Thickness And Weight Of Thyroid Gland In Pig Were As Follows:

Name of mammal	Length of lobe (in cm)		Breadth of lobe (in cm)		Thickness of lobe (in cm)		Weight of gland (in grams)
	Right	Left	Right	Left	Right	Left	
Pig	5.49	5.59	1.01	1.03	0.56	0.54	5.24

The weight of the gland coincided with the findings of Robert Getty.¹⁰ (1977). The length of thyroid gland was reported to be 5-6 cm by Sisson and Grossman.¹⁰ (1970) which was similar to the finding of this study. Till the completion of this study, no data was available about the breadth and thickness of thyroid gland in pig.

Goat: The Average Length, Breadth, Thickness and Weight of Thyroid Gland in Goat were as Follows:

Name of Mammal	Length of Lobe (in cm)		Breadth of Lobe (in cm)		Thickness of Lobe (in cm)		Weight of Gland (in grams)
	Right	Left	Right	Left	Right	Left	
Goat	1.46	1.41	0.53	0.52	0.42	0.41	6.93

Statistical analysis on quantitative parameters including weight, length, breadth and thickness of thyroid gland was found to be very scarce as per available literature. However, Roy et al¹¹ (1975) stated that all parameters increase with advancing age ranging from 20 days to 5 years. The present study was not age-related. The length, breadth, thickness came close to the findings of S.R. Talukdar.(1981). The weight of gland was in confirmation with findings of Kaneko (1997) who stated the weight of adult goat to be 5-7 g.

The thyroid gland showed two lobes and the isthmus was indistinct which was similar to the findings of Roy et al(1975).

CONCLUSION: The thyroid gland of all three mammals was similar structurally. All mammals showed two lobes. In humans, the two lobes are joined by a distinct isthmus. The presence of isthmus was not very distinct in the other two mammals. However, their biometrical values were different. Xenograft and xenotransplant is a huge research subject. The present study is a small part of this huge topic. A further histological and immunological study at the molecular level is needed for a better result. Advancements in scientific technology will soon turn this distant dream into a reality.

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