International Journal of Anatomy and Research,
Int J Anat Res 2019, Vol 7(4.3):7193-98. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2019.339

Original Research Article

MORPHOLOGY OF THYROID GLAND- A COMPARATIVE STUDY BETWEEN MALE AND FEMALE THYROID GLANDS

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ABSTRACT

Introduction: Thyroid gland surgery is one of the most common surgical interventions in the head and neck region. The gland is located low down in front of the neck. It consists of two symmetrical lobes united by an isthmus. A small portion of the gland substance often projects upwards from the isthmus, generally to the left of the midline as the Pyramidal lobe (PL). The Levator glandulae thyroidea(LGT) descends from the hyoid body to the isthmus or apex of Pyramidal lobe, innervated by branch of external laryngeal nerve. Hence this study on morphological analysis of the gland will hopefully help to minimise the complications during the surgeries.

Materials and methods: The study was done in 50 specimens which included glands dissected out of adult cadavers, specimens used for teaching in the department and rest of them were collected from fresh cadaveric workshops.statistical analysis was done between male and female thyroid glands using spss software 20 version, dependant variables were compared using chi square test.

Result: The shape of the gland was mostly normal, Isthmus was related to 2,3,4 th tracheal rings and in 6% cases it was absent. The pyramidal lobe was seen mostly to the left in 38% cases, LGT was absent in 36% cases, muscular LGT was seen on left side in 18% cases and STA was seen related to the medial border of apex in 52% cases.

Conclusion: In the present study we observed variation in the morphology between the male and female thyroid glands.

KEY WORDS: Pyramidal lobe, Levator glandulae thyroidea, Morphology.

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Access this Article online	Journal Information
Quick Response code	International Journal of Anatomy and Research
	ICV for 2016 90.30
	ISSN (E) 2321-4287 | ISSN (P) 2321-8967
	https://www.ijmhr.org/ijar.htm
	DOI-Prefix: https://dx.doi.org/10.16965/ijar
DOI: 10.16965/ijar.2019.339	

Article Information

Received: 08 Nov 2019	Accepted: 19 Nov 2019
Peer Review: 08 Nov 2019	Published (O): 05 Dec 2019
Revised: 13 Nov 2019	Published (P): 05 Dec 2019

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INTRODUCTION

Thyroid gland derives its name from its resemblance to a shield (greek:thyreos-shield; eidos- form) [1].The gland is located low down in front of the neck. It consists of two symmetrical lobes united by an isthmus.[2]. Isthmus is related to second, third and fourth tracheal rings posteriorly [1]. The gland is covered by a fibrous true capsule which is tightly adherent to the gland , pre tracheal fascia forms the false capsule. A small portion of the gland substance often projects upwards from the isthmus, generally to the left of the midline as the Pyramidal lobe (PL) [2]. It is a normal component of

thyroid gland and not a congenital anomaly, rather defined as an embryological remnant of the caudal end of the thyroglossal tract. Glandular or fibrous or fibromuscular band, the Levator glandulae thyroidea(LGT) sometimes descends from the hyoid body to the isthmus or apex of PL, innervated by branch of external laryngeal nerve [3]

Thyroid gland surgery is one of the more common surgical interventions in the head and neck region. Accurate knowledge of anatomical variations is important during tracheostomy and thyroidectomy. All thyroid diseases affect the PL. After surgical removal of thyroid gland a residual thyroid tissue in the PL may recur. Study on fleshy slips of levator glandulae thyroidea is essential to avoid iatrogenic injuries [3].

Thyroid disorder is a common health problem among large number of endocrinopathies. About 5% of world population is affected from various thyroid diseases eg.goitre, thyrotoxicosis, adenoma, carcinoma etc are usually associated with enlargement and require medical and surgical intervention. Superior thyroid artery (STA) is the main arterial supply to larynx, thyroid gland, sternocleidomastoid, sternothyroid, omohyoid, platysma and overlying skin. Head and neck surgeons deal with this artery or its branches in a variety of procedures. Cadavers are still the best means to study all the domains of anatomy. Hence this study on morphology of the gland will hopefully help to minimise the complications during the above mentioned procedures.

MATERIALS AND METHODS

A midline neck incision was put from the chin downwards upto the supra sternal notch with a scalpel. A horizontal incision was made along the posterior border of the base of the mandible till the mastoid process and the skin flaps were raised and reflected laterally. Another horizontal incision was given along the upper border of clavicle, platysma was removed, supra and infra hyoid muscles were retracted laterally. The thyroid gland was exposed with the capsule. The shape of the gland, whether normal, irregular, horse shoe shape or any abnormal shapes were noted. Lateral lobe features were noted down. Position of isthmus, its relation to the tracheal rings, absence of isthmus were noted . Position of PL whether right sided, left sided, midline, its absence were noted. The position of levator glandulae thyroidea, its texture whether muscular, fibromuscular, fibrous, its absence were noted. The superior thyroid arteries were dissected on both sides and traced from the apex of the lobes, their branching pattern was noted whether branches are given at the middle of apex or at medial border of the apex of the gland. The gland in – situ was photographed. Sex of the cadaver was noted. All the above morphological observations were noted down and tabulated under appropriate headings.They were analysed using SPSS Software 20.0 version and the results were tabulated, Pearson Chi-Square Test, Independant T Test, Mann-Whitney Test were used for Comparison of the data among the genders. p value of less than 0.05 was considered significant.

Fig. 1: Normal thyroid gland with Isthmus(A) and Pyramidal lobe (PL).

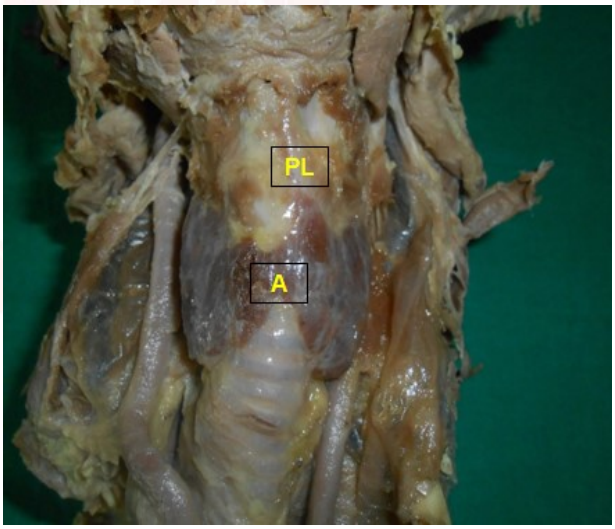


Fig. 2: Showing Levator glandulae thyroideae (LGT).

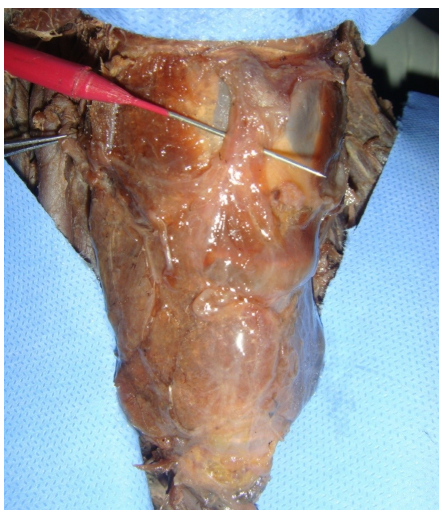
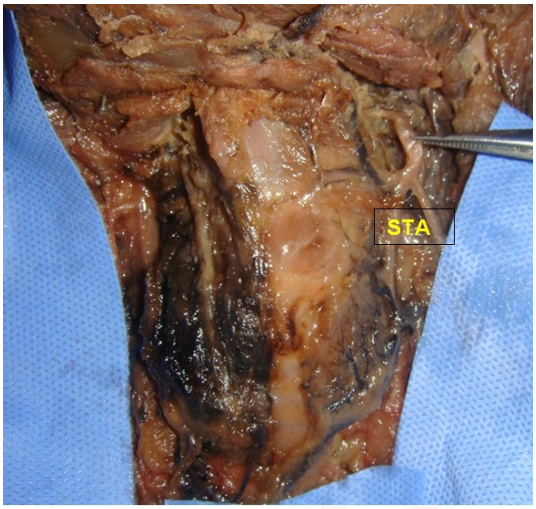


Fig. 3: Showing superior thyroid artery (STA).



RESULTS

The shapes were compared between male and female glands and the results are tabulated below in table 1

Table 1: Comparison between the sex.

Shape	Male	Female	Total
Horse shoe	27.80%	42.90%	32%
Normal	17.20%	57.10%	50%
Irregular	16.70%	0%	12%
Separate lobes irregular	5.60%	0%	4.00%
Separate lobes conical	2.80%	0%	2.00%
Total	100%	100%	100%

The chi-square test between male and female shows p value of 0.353 which is not significant.

Table 2: Comparison of isthmus between male and female.

Isthmus	Male	Female	Total
Absent Count	3	0	3
% within sex	8.30%	0%	6.00%
1,2,3,4 rings Count	1	0	1
% within sex	2.80%	0%	2.00%
1,2,3 rings Count	4	4	8
% within sex	11.10%	28.60%	16.00%
1,2 rings Count	4	1	5
% within sex	11.10%	7.10%	10.00%
2-6 rings Count	1	0	1
% within sex	2.80%	0%	2.00%
2,3,4 rings Count	11	3	14
% within sex	30.60%	21.40%	28%
2,3 rings Count	7	4	11
% within sex	19.40%	28.60%	22.00%
2nd ring Count	1	0	1
% within sex	2.80%	0%	2.00%
3,4rings Count	0	2	2
% within sex	0%	14.30%	4.00%
cc,1,2rings Count	4	0	4
% within sex	11.10%	0%	8.00%
Total Count	36	14	50
% within sex	100.00%	100.00%	100.00%

Chi-Square test between male and female, the p value of 0.225 which was insignificant.

Table 3: Comparison of PL between male and female.

PL	Male	Female	Total
Absent Count	13	5	18
% within sex	36.10%	35.70%	36.00%
Left Count	15	4	19
% within sex	41.70%	28.60%	38.00%
Midline Count	4	1	5
% within sex	11.10%	7.10%	10.00%
Right Count	4	4	8
% within sex	11.10%	28.60%	16.00%
Total Count	36	14	50
% within sex	100.00%	100.00%	100.00%

Chi-Square test between male and female, the p value of 0.469 which was insignificant.

Table 4: Comparison of LGT between male and female.

Levator glandulae thyroideae	Male	Female	Total
Absent Count	13	5	18
% within sex	36.10%	35.70%	36.00%
Bilateral, Fibrous, Extends Count	1	0	1
% within sex	2.80%	0%	2.00%
Upto Thyroid Cartilage			
Lt Side, Fibromuscular, Extends Count	4	0	4
% within sex	11.10%	0%	8.00%
Upto Thyroid Cartilage			
Lt Side, Fibrous, Extends Count	2	0	2
% within sex	5.60%	0%	4.00%
Upto Thyroid Cartilage			
Lt Side, Muscular, Extends Count	1	0	1
% within sex	2.80%	0%	2.00%
Upto Hyoid Bone			
Lt Side, Muscular, Extends Count	6	3	9
% within sex	16.70%	21.40%	18.00%
Upto Thyroid Cartilage			
Lt Side, Short, Fibrous Count	0	1	1
% within sex	0%	7.10%	2.00%
Midline,Fibrous,Extends Count	2	0	2
% within sex	5.60%	0%	4.00%
Upto Thyroid Cartilage			
Midline, Muscular, Extends Count	1	0	1
% within sex	2.80%	0%	2.00%
Upto Hyoid Bone			
Midline, Muscular, Extends Count	2	1	3
% within sex	5.60%	7.10%	6.00%
Upto Thyroid Cartilage			
Rt Side, Fibrous, Extends Count	1	1	2
% within sex	2.80%	7.10%	4.00%
Upto Thyroid Cartilage			
Rt Side, Muscular, Extends Count	2	3	5
% within sex	5.60%	21.40%	10.00%
Upto Thyroid Cartilage			
Rt Side, Short, Fibrous Count	1	0	1
% within sex	2.80%	0%	2.00%
Total Count	36	14	50
% within sex	100.00%	100.00%	100.00%

Chi-Square test showed a p value of 0.578 which was insignificant.

Superior thyroid artery: artery on the right was compared between male and female cases, Chi-Square test showed a p value of 0.151 it was not significant. Superior thyroid artery on left side was compared between male and female cases, Chi-Square test showed a p value of 0.278 which was not significant.

DISCUSSION

Shape and Lateral lobes: In this study normal shaped thyroid glands accounted for 50% of the cases, in them 47.2% males and 57.1% females, this value coincides with Harjeet. A et al[4], they reported normal shape in 51% males and 48.1% females. Zuhal Ozgur et al[5], reported that lobes with isthmus accounted for 77.5%, our value is lower when compared to his.In the present study(Table 1) horse shoe shaped glands alone accounted for 32% cases, 27.8% males and 42.9% females, this value coincides with Harjeet. A et al [4], who reported horse shoe shaped glands in 35.9% males and 39.4% females. Zuhal Ozgur et al[5], also reported horse shoe shaped glands in their study. In the present study no agenesis of lobes were encountered, but separate lobes conical 2.8%, separate lobes irregular 5.6% was seen only in male cases.

Isthmus: In the present study absence of isthmus accounted for 6% of the cases, this value coincided with most of the previous authors like Marshall- 10%[6], Harjeet. A et al - 7.9%[4] , Prakash et al - 9.6% of male and 5.6% female cases[7], Hasan et al - 9.67%[8], Oya sagiroglu.A in1 case[9] ,Ranade AV rai reported it to be 33%[10], Prabhat Kumar Tiwari et al in 1 case[11], Daksha Dixit et al in 14.6%[12]. Joshi.S.D et al, in 16.66% cases[13]. Zuhal Ozgur et al in 12.5% cases[5], these values are high compared to ours and the reason may be due to different method of study and developmental variation. Tanriover.O et al in 2.22% of Turkish population[14], this value is low than ours as ours is a study on South Indian population, Lokanadham.S et al[15], Radhika Krishnan J et a[16]l, Omer Faruk Ozkan et al[17], Shailaja shetty et al[18], Eti sthapak et al reported a case of absence of isthmus in their own study[19], Veena kulkarni et al, reported in10% cases and in our study isthmus was absent in 8.3% of male cases[2].

Isthmus is related to 2-4 rings in 28% cases (Table2) in our study, this value was low compared to other authors like Marshall, Harjeet. A et al, Zuhal Ozgur et al and Nurunnabi ASM et al[20]. Joshi.S.D et al, reported isthmus related to 2nd and 3rd tracheal ring in 19% cases, 1 and 2 rings in 14% cases, 1,2,3 rings in 12% cases,1-4 rings in 4% cases, 1st ring in 2% cases, 2nd ring in 3% cases, cricoid cartilage in 3% cases[13]. Nurunnabi ASM et al, reported isthmus was present in 82.2% cases, related to 2-5 rings in 8.3% cases[20]. In the present study isthmus related to 1,2,3 rings in 16%, 1,2 rings in 10%, 2-6 rings in 2% cases, 2nd ring in 2%,cricoid cartilage, 1, 2 rings in 8% cases, these values are nearly equal to the previous values, isthmus was not fused with any of the lateral lobes as reported by some authors.

Pyramidal lobe: In the present study PL accounted for 32 (64%) specimens, 23% males and 9% females, all PL in our study (Table3)was seen along with LGT, this value of PL was more or less similar to authors like Marshall - 26 cases, Tanriover.O et al - 57.8% cases[14], Milojevic B et al - 55.2% cases[21]. Izenstark.J.L et al,reported PL in 30% of cases[22], on comparision with our study the value is low, as this was a imaging study, ours was cadaveric. Ranade A V et al, reported PL was present in 58% of male cases and absent in females in their study[10], Abu Sadat Mohammad Nurunnabi et al, found PL in 41.67% cases[3], Daksha dixit et al, reported PL along with LGT in 7.31% cases[12], Prakash et al, found PL in 43.9% of male cases and 22.9% female cases[7], Hasan et al, reported PL in 38.7% of cases in their study[8]. Hussein Muktyaz et al,reported PL in 41% cases[23], and absent in females in his study, all the above authors have reported a little lower value compared to us. In our study PL on left side was seen in 19 cases (38%) and more prevalent in males-15 cases 41.7%,females- 4 cases 28.6%, the same was reported by authors like Sreekanth et al[24], Milojevic B et al[21],Oya sagiroglu.A[9], Zuhal Ozgur et al[5] and Veena kulkarni et al[2].

Our study shows PL more common on left side as reported in literature and the above values are lesser than ours. In the present study PL on right side was seen in 8 cases (16%), 11.1% in

males, 28.6% in females, midline PL was seen in 5 cases (10%), 11.1% in males, 7.1% females. Zuhal Ozgur et al[5], Milojevic B et al[21], Hasan et al[8], Veena kulkarni et al[2], have reported the same. Absence of PL in our study is 36% it has been already reported by Harjeet.A et al[4], and Priti chaudhary et al[25].Our value of absence of PL is quite higher compared to other authors which may be because of increased number of specimens.

Levator glandulae thyroideae: In the present study LGT accounted for 64% of cases, it was seen on left side of the gland, right and midline. Mostly all of them were seen along with PL and left sided LGT was more prevalent.LGT on left side accounted for 34% of the cases and most of them extended from PL to thyroid cartilage. It extended upto hyoid bone in 1 case, our value was similar to Marshall - 1 case[6].

In the present study LGT on left side(Table4) was seen in 13.29% males, 28.5% females. Harjeet.A et al, reported LGT in 22.9% males and 10.6% female cases. In their study LGT extended upto hyoid in 53.2% males and 52.9% females, upto lamina of thyroid cartilage in 2 specimens[4]. Ranade A V et al,reported LGT in 49.5% cases, Daksha dixit et al,reported presence of LGT in 7.36% specimens[10], Joshi S D et al, reported LGT in 30% cases, LGT was observed extendin thyroid cartilage in 14.81%,upto lower border of thyroid cartilage in 18.5% cases[13]. Zuhal Ozgur et al,reported LGT that extended upto hyoid in 17.5% cases, from left lobe in 2% cases,it bifurcated in 5% cases[5]. Prakash et al, reported LGT in 34.6% males and 27.8% females[7]. Hasan et al, found LGT in 32.25% cases[8], Priti chaudhary et al,reported LGT on left side[25].In the present study LGT on right side was seen in 11.2% males and 28.5% females, most of them extended upto thyroid cartilage. Marshall, Veena kulkarni et al, Phukon MJ et al[26], Hussein Muktyaz et al, reported LGT in 19.6% cases, In the present study midline LGT accounted for 14% males and 7.1% females, same was reported by Sreekanth et al[24]. In the present study LGT was seen mostly with PL, mostly on left side, and most of them extended upto thyroid cartilage. In our study short fibrous LGT was observed on right and left side, it was not reported by any authors. In the present study bilateral LGT it accounted for 2% of cases, authors like Marshall, Harjeet A et al, Veena kulkarni et al, have also reported it. In our study absence of LGT accounted for 36% of cases.

Superior thyroid artery: In the present study STA was observed on all specimens supplying left and right lobes. They were seen branching at medial border or middle of apex on right and left side, On the right side STA was seen branching at the medial border of the apex of the gland in 52% cases, in males it was seen in 58.3% , females 35.7% ,branching at the middle of apex in 48% cases, 41.7% in males and 64.3% in females. On the left side STA was seen branching at the medial border of the apex in 48% cases, 52.8% in males and 35.7% in females, at the middle of apex in 52% cases, 47.2% in males and 64.3% females . In our study absence of the artery was not seen, Radhika krishnan et al, reported a case in which STA was seen running down, reached upper pole of the lobe and branched out[16]. Eti sthapak et al, reported a case having rudimentary right lobe that was not supplied by STA, left lobe was supplied by both superior and inferior thyroid arteries[19]. Sreekanth et al, reported a case of STA in which the anterior branch was seen along the medial border of right lobe[24]. Priti chaudhary et al, reported a normal STA on right side and on left side it was absent[25].

CONCLUSION

To summarise the study was done in 50 thyroid specimens,the morphological features including shape, isthmus, pyramidal lobe, LGT, superior thyroid artery of both sexes were observed.

Normal shape of the gland was commonly observed in both sexes. Position of isthmus varied from cricoid cartilage to 6th ring, its absence was seen in 6% cases. Pyramidal lobe is a normal component of thyroid gland, incidence seems to have a slight tendency towards male, arises more frequently from left side and seen along with LGT. LGT extended upto thyroid cartilage in most of the cases, absent in 36%. Superior thyroid artery was present in both sexes, seen normal in its course. All the above parametres compared between male and female showed aninsignificant p value. Hence

with these features in mind, a surgeon can plan effectively for a safe and better surgery for a better outcome with minimal complications.

ABBREVIATIONS

LGT - Levator glandulae thyroidea
PL - pyramidal lobe
STA - superior thyroid artery

Conflicts of Interests: None

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How to cite this article: S Monica Diana, S Supa Devi, H A Rieyaz. MORPHOLOGY OF THYROID GLAND- A COMPARATIVE STUDY BETWEEN MALE AND FEMALE THYROID GLANDS. Int J Anat Res 2019;7(4.3):7193-7198. **DOI:** 10.16965/ijar.2019.339