ORIGINAL RESEARCH PAPER

Anatomy

KEY WORDS: Foetal Thyroid Gland, Agenesis, Pyramidal Lobe, Levator glandulae thyroideae.

MORPHOLOGICAL AND MORPHOMETRIC STUDY OF FOETAL THYROID GLAND AT DIFFERENT GESTATIONAL AGE.

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ABSTRACT

Introduction: The thyroid gland is the largest endocrine gland and is one of the earliest to start differentiating and functioning. Different variations like persistence of pyramidal lobe, thyroglossal cyst, agenesis of isthmus and aberrant thyroid tissue are common findings and need to be taken care of especially in emergency thyroid related surgeries.

Material & Methods: 50 intact foetuses of different gestational ages ranging from 10-36 weeks were studied in the Department of Anatomy, Government Medical College and Hospital -32 Chandigarh. After preserving in 10% formalin, midline incision was given and the thyroid gland was exposed. Accordingly different morphological and morphometric measurements were taken and evaluated.

Results: The thyroid glands were found to be related with 1st – 6th tracheal rings in all the foetuses. They were butterfly shape in most of the cases except in three foetuses where there was absent isthmus. The foetuses were divided into 3 groups based on their gestational age as 10-18 weeks, 19- 27 weeks and 28-36 weeks. The mean dimensions of length, breadth and width of both right and left lobes were noted accordingly. In 14 % cases, pyramidal lobe along with levator glandulae thyroidea (LGT) was noted whereas in 12% cases there was agenesis of isthmus.

Conclusion: The variations of thyroid gland and its morphometric measurements are important in foetuses specially with increasing gestational age. The incidence of certain developmental anomalies like agenesis of isthmus, persistent pyramidal lobes and presence of LGT are important from both surgical and radiological point of view.

INTRODUCTION:

The thyroid gland is the first endocrine gland to get differentiated and starts functioning as early as 11th week [1] The word "Thyroid" is Greek and is loosely translated to mean shield gland.[2] The organogenesis of thyroid gland begins when the median endodermal cells starts getting thick and forms a diverticulum in the primitive pharynx floor which ultimately descends at 7 weeks of pregnancy at the level of cervical spine.[3]A pyramidal lobe which is mostly conical often ascends towards the hyoid bone from isthmus or adjacent part of either lobe. A fibromuscular tissue often connects this pyramidal lobe to the hyoid bone and is called levator glandulae thyroideae. [4,5] Accessory thyroid glands are sometimes found as small detached masses of thyroid tissue in the vicinity of the lobes or above the isthmus [6] The important function of thyroid hormones are that they maintain the level of metabolism in almost all the body cells that is optimal for their normal function. The importance of thyroid gland is to promote growth and development of the brain during foetal life and for the first few years of postnatal life. Iodine deficiency is the single most common cause of preventable mental retardation and brain damage in the world [7]

Many authors have described the existence of variations of thyroid gland like the pyramidal lobe, levator glandulae thyroideae, accessory thyroid and the agenesis of isthmus in adult thyroid gland but the incidence of development of such unusual thyroid variations in foetuses should be as well known to all interventionists irrespective of whether they are surgeons, radiologists or pathologists.

AIMS & OBJECTIVE

The study was conducted with the following aims and objectives.

1. To measure the different dimensions of foetal thyroid gland.
2. To study the morphology of foetal thyroid gland and its variations, if any.

MATERIAL & METHODS

Fifty intact foetuses of different gestational ages ranging from 10-36 weeks procured from the Department of Anatomy, Government Medical College and Hospital, Chandigarh - 32 formed the material for this study. The foetuses were labelled from 1-50 and were grouped as 10-18 weeks, 19-27 weeks and 28-36 weeks. The foetuses with gross developmental anomaly as well as with any abnormality in the neck such as any scar or any swelling were excluded from the study. The thyroid gland was exposed according to the incision as given in **ROMANES J** (Reprinted 2016) and certain findings like the level of thyroid gland, presence or absence of isthmus in relation to the tracheal rings were noted in situ. For taking different morphometric measurements, the gland was taken out and after preserving in 10% formalin, was studied in detail.

The length of the isthmus was measured between two horizontal planes, one passing along the upper border and the other along the lower border of the isthmus. Distance between these two planes was measured. The breadth of the isthmus was measured between two vertical points each passing along the medial surfaces of right and left lobes where the isthmus was connected with them. For measuring the length, breadth and thickness of each lobe, the measurements were taken from the highest point as shown in figure no.1. Any other variations in the morphology of the thyroid gland like presence of pyramidal lobe, Levator glandulae thyroideae or absent isthmus was noted accordingly. The distance between these two planes was measured with the help of a digital vernier calliper.

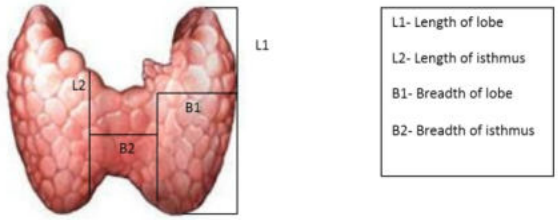

Figure No.1
Diagram showing the length and breadth of the lobes and the Isthmus and various planes

RESULTS: The thyroid gland was found to be related with 1 to 6

tracheal rings in all the foetuses. It was butterfly shaped in all the foetuses except in 6 foetuses (12%) where isthmus was absent out of which 3(50%) were male and 3(50%) were female. The mean dimensions of the length, breadth and width of each lobe are given in Table no. 1. In 8(16%) cases there was presence of pyramidal lobe along with levator glandulae thyroideae of which 5 were male and 3 were female and in all the cases it was associated with Levator Glandulae Thyroideae. In 5 out of 8 cases, the pyramidal lobe was seen arising from the left side of the isthmus. Figure 5 shows how the size of the foetal thyroid gland increases with increasing gestational age.

FIGURE:2 DIGITAL VERNIER CALLIPER

DISCUSSION:

The thyroid gland well known for its variations like agenesis of isthmus, persistent pyramidal lobe, levator glandulae thyroideae, lingual thyroid etc. are well studied by many authors. Harjeet et. al observed different shapes of thyroid gland as horse-shoe shaped (36.8%) irregular shaped (5%) and with two separate lobe (7.9%). [8]The incidence of agenesis of isthmus was reported as 2.5% according to Anupriya and Kalpana.[9] Agenesis of isthmus is often associated with absence of either of one lobe or presence of ectopic thyroid tissue and hence when such a condition is diagnosed radiologically, differential diagnosis such as autonomous thyroid nodule or thyroiditis should be kept in mind. While preparing for thyroidectomy one should be prepared to find such variations and the dissection should be precise as important nerves and vessels lie in its vicinity.[10]The reason for two separate lobes is attributed to a high division of thyroglossal duct which can be well associated with dysorganogenesis, such as absence of either lobe or presence of ectopic thyroid tissue.[11]

FIGURE 3: Showing Levator Glandulae Thyroideae (underneath forceps)

Table1. Mean Dimensions of Thyroid Gland.

Gestational Age(weeks)/No.	Right Lobe(mm)			Left Lobe(mm)			Isthmus(mm)	
	L	B	W	L	B	W	L	B
Gr1(10-18)/15	5.8	3.1	1.2	5.6	3.0	1.3	3.9	3.7
Gr2(19-27)/15	9.9	4.5	1.4	9.8	4.4	1.5	4.6	4.5
Gr3(28-36)/20	13.1	6.9	1.7	12.9	7.0	1.7	8.9	8.8

The pyramidal lobe which was found in 14% of cases mostly represents the development of glandular tissue from the caudal end of thyroglossal duct. [12]These lobes could be the source of pitfalls in surgery as their pre operative diagnosis is very difficult in schintigraphic images.[13]Incomplete removal of pyramidal lobe, also sometimes called Lolouettes lobe, during thyroid surgeries can lead to serious complications specially in carcinomas and Graves disease .[14]

FIGURE 4 Showing Pyramidal Lobe (Arrow)

Table 2. Showing incidence of agenesis of isthmus.

Sl.no	Authors	Year	% Incidence
1	Marshall	1895	10
2	Won & Chung	2002	3
3	Harjeet et al	2004	7.9
4	Ranade et al	2008	33
5	Anupriya A	2016	2.5
6	Present Study	2017	12

According to Standring, the LGT extends from the pyramidal lobe or upper border of isthmus below upto the hyoid bone above and that too usually on the left side. [15] In the present study, we encountered that all the PL to be associated with LGT which were extending upto the hyoid bone. Many authors have described this muscle to be either fibrous, muscular or fibromuscular. Godart reported such a muscle on the basis of nitric oxide test as muscular. According to Hamilton and Mossman it is fibrous or muscular replacement of the pyramidal lobe. [16]

Table 3. Showing the incidence of Pyramidal Lobe

Sl. no	Authors	Year	% Incidence
1	Marshall C.F	1895	43
2	Hamilton WJ	1976	40
3	De Groot	2001	15
4	Harjeet et al	2004	28
5	Choudhary N	2015	19.23
6	Present Study	2017	16

Conclusion: The present study tries to highlight the various developmental anomalies of thyroid gland at different gestational age. It also depicts how the dimensions increase with increase in gestational age. The knowledge of incidence of agenesis of isthmus, pyramidal lobe and levator glandulae thyroideae is important for the surgeons, radiologists and interventionists as these variations are often overlooked during these procedures and should be dealt cautiously. Thus the above study is an attempt to meet these needs and to establish a baseline data for the incidence of these variations

FIGURE 5: Showing Absent Isthmus (Arrow)

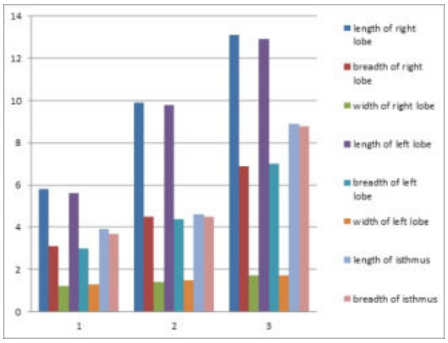

FIGURE 6 SHOWING INCREASE IN DIFFERENT MEAN DIMENSIONS (mm) OF THYROID GLAND AGAINST INCREASING GESTATIONAL AGE 1(10-18WEEKS),2(19-27WEEKS) AND 3(28-36WEEKS).

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