MORPHOLOGICAL AND MORPHOMETRIC STUDIES ON HUMAN FETAL THYROID GLAND

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ABSTRACT

Thyroid glands of 22 aborted fetuses (9 males, 13 females) were observed by dissection method for morphological features and measured for morphometric parameters by using vernier calipers. The gestational age of fetuses varied from 16-40 weeks. The ratio of thyroid gland weight to fetal body weight has increased with gestational age. The morpometric parameters of thyroid glands are greater in male than female fetuses. The fetal thyroid increased in size much faster after 32 weeks suggesting that evaluation of possible fetal goiter should be taken into account and helps to correlate with nomogram. The present study also helps to establish the normal dimension of the thyroid gland in euthyroid neonates.

KEY WORDS

Thyroid gland, Isthmus, Levator glandulae thyroidae.

I. Introduction: The thyroid gland is the first endocrine gland to develop in the embryo and the largest endocrine gland in the body. It is the only endocrine gland that depends on the external environment for the raw materials of its hormones. The thyroid hormones are necessary for regulating the basal metabolic rate, somatic growth, psychic growth and calcium metabolism and also to regulate circadian rthythm. Dysfunction and anatomical abnormalities of the thyroid are among the most common diseases of the endocrine glands.

II. a. Collection of specimens:

A Total of 22 formalin preserved dead embryos and fetuses with relevant obstetric records available in dept. of anatomy, S.V.M.C Tirupati were utilized for this study.

The fetuses are of both the sexus and 16-40 weeks of gestational age. The fetuses were preserved by injecting 10% formalin solution into the pleural, peritoneal and cranial cavities. The Crown-rump and Crown-heel lengths and weights of the fetuses were recorded. External features of the fetuses and visible anomalies if any were recorded. The extremities were preserved by multiple injecting techniques described by Ajmani (1996)

II. b. Isolation of the thyroid glands:

A vertical incision is given from symphysis

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menti to suprasternal notch. A horizontal incision is given on both sides along the inferior border of the mandible from the angle of the mandible to Symphysis menti. The skin, fascia, and sternocleidomastoid and sternothyroid muscles were retracted. Trachea and the isthumus of the thyroid gland lying over the 2nd, 3rd, 4th tracheal rings and lateral lobes of the gland on each side were cleaned and identified. In some specimens pyramidal lobe was seen extending from the upper border of isthmus was traced. Blood vessels of thyroid gland were cleaned. Recurrent laryngeal nerve in the trachea-esophageal groove was identified. The physical measurements of the thyroid gland i.e. Length, Width, Thickness and weight were recorded

III. Results and Observation:

In the present study a total of 22 aborted embryos and fetuses were observed for age related morphological features and morphometric parameters of the thyroid gland during prenatal period.

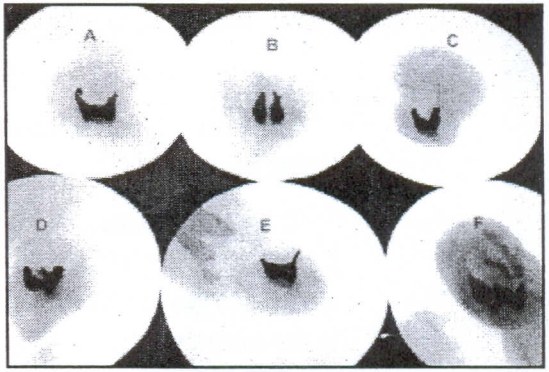
The specimens were categorized in to gestational age group 0-12 weeks, 12-24 weeks, 24-36 weeks, and more than 36 weeks. The gestational age of fetuses ranged from 16-40 weeks and the C.R. length varied from 14-32 cm and the weight of the fetuses ranged from 110-2300 grams.

I. Morphological features:

i. Position of the gland: The Thyroid glands were located in the anterior lower neck in all the specimens observed in the present study.

ii. Shape of the gland: In 22 fetuses thyroid glands are butterfly shaped. In three fetuses of gestational ages of 38-40 weeks the thyroid glands are 'H' shaped. Levator glandulae thyroidae was present in 5 fetuses of 20-36 weeks of gestational age. Variations in the size of lobes were observed in 8 fetuses the right lobe is larger than left lobe and in 3 specimens the left love is broader than right lobe.

iii. Colour of the gland: In four fetuses of 16-36 weeks of gestational age the thyroid glands are pale brown in Colour. In rest of the specimens thyroid glands are brownish- red to dark brown in Colour.



Sl. No	Age (Weeks)	sex	CR Length (cm)	CH Length (cm)	Fetal Weight (gms)	Shape	Colour	THYROID LOBES			Weight of Thyroid
								Length	Width	Thickness	
1.	16	Female	20	34	140	Butterfly	Pale Brown	0.5	1.2	0.2	2.0
2.	16-22	Male	22	34	290	Br.Lt.Lobe	Dark Brown	0.7/1.0	1.6	0.2	2.0
3.	18	Female	12	21	110	Butterfly	Brownish Red	0.7	1.1	0.1	2.1
4.	18-20	Male	23	36	250	Butterfly	Brownish	0.8	1.2	0.1	2.0
5.	20	Female	17	33	470	Butterfly	Brownish Red	0.8	1.8	0.2	2.0
6.	22-23	Male	19	29	450	Br.Lt.Lobe	Brownish	1.2/0.9	1.8	0.3	4.0
7.	22-24	Male	17	32	520	Br.Lt.Lobe	Red Brownish Red	1.0/1.3	2.2	0.3	3.0
8.	26	Male	20	37	500	Butterfly	Brownish	1.0	1.6	0.2	2.0
9.	28	Female	23	41	900	Br.Lt.Lobe	Brownish Red	1.3/0.8	1.9	0.3	3.5
10.	28	Female	17	26	750	Butterfly	Brownish Red	1.1/0.8	2.1	0.4	3.0
11.	32	Female	16	30	500	Br.Lt.Lobe	Pale Brownish	1.1/1.3	22	0.3	3.0
12.	34-36	Male	28	45	1150	Br.Lt.Lobe	Brownish Red	1.2	2.2	0.3	3.5
13.	36	Female	23	38	550	Isthmus Absent	Brownish Red	2.2/1.2	0.7/0.8	0.5/0.4	4.0

Sl. No	Age (Weeks)	sex	CR Length (cm)	CH Length (cm)	Fetal Weight (gms)	Shape	Colour	THYROID LOBES			Weight of Thyroid
								Length	Width	Thickness	
14.	36	Female	25	41	750	Br.Lt.Lobe	Brownish Red	1.2	2.3	0.5	3.8
15.	36	Female	25	41	1250	Br.Lt.Lobe	Brownish Red	1.2/1.6	2.6	0.4	3.8
16.	36	Male	26	44	1500	Butterfly	Brownish Red	1.9	1.8	0.6	4.0
17.	36	Female	27	43	2000	Butterfly	Brownish Red	1.2	2.2	0.6	3.5
18.	36	Female	29	44	2200	Butterfly	Brownish Red	1.5	2.9	0.5	4.0
19.	36	Male	31	48	2100	Butterfly	Brownish Red	1.9	3.1	0.6	3.8
20.	36	Male	31	35	2200	Butterfly	Brownish Red	2.0	3.1	0.6	4.0
21.	38	Female	31	46	2300	Br.Lt.Lobe	Brownish Red	1.3/1.6	2.9	0.5	4.0
22.	38-40	Female	30	46	2200	Br.Lt.Lobe	Brownish Red	1.7	2.9	0.4	4.1

II. Morphometric Parameters:

a. Weight of the thyroid glands: The average weight of the thyroid gland varied from 2.0 -4.0 grams in 16-40 weeks of gestational age. There is a gradual increase in average weight of the thyroid glands with increase in the gestational ages. There is an increase in the average weight of the male thyroid glands compared to female thyroid glands at 12 - 24 weeks of gestational age and it is reverse at 24-36 weeks of gestational age. But in specimens of more than 36 weeks of gestational age both male and female thyroid glands average weights are more or less equal. The ratio between the fetal weight and the thyroid gland weight in the present study was 318.5: 2.375; 760: 3.08; 1705: 3.90 at 12-24 weeks, 24-36 weeks and > 36 weeks of gestational age receptively.

b. Length of the thyroid glands: The average length of the male thyroid glands is 0.96 cm - 1.9 cm at 16-40 weeks of gestational ages where as in female thyroid glands it is 0.6cm - 1.4cm at the same age group.

c. Width of the thyroid glands: The average Width of the male thyroid glands is 1.7 cm - 2.6 cm at 16-40 weeks of gestational ages where as in female thyroid glands the average width is 1.3cm - 2.3cm at the same age group.

d. Thickness of the thyroid glands: The average thickness of the male thyroid glands is 0.3cm - 0.6 cm at 16-40 weeks of gestational ages where as in female thyroid glands the average thickness is 0.1cm - 0.4cm at the same gestational age group.

IV DISCUSSION:

In the present study all the thyroid glands were located in anterior lower neck and the colour of the glands are pale brown in 4 fetuses and brownish red in rest of the specimens. According to Sgalitzer (1941), John Lynn & Bloom (1993), McMinn (1994), Williams (1995), Svante (1997) the thyroid gland is brownish red in colour and located in the anterior lower neck. The findings in the present study are in agreement with those reproted by McMinn (1994), Williams (1995).

In the present study all the thyroid glands are butterfly shaped in 22 foetuses and are H shaped in 3 foetuses. In one fetus of 36 weeks of gestational ages the gland presented isolated lobes with absence of isthmus. According to Williams (1995), Degroot and Jameson (2001), Lemaire (2005), Ranganathan (2006) the shape of the thyroid gland is butterfly shaped and sometimes it is like H shaped. So the findings in the present study are in agreement with those reported Williams (1995), Lemaire (2005), Larry Jameson & Weetman (2006), Ranganathan (2006). And in 5 specimens among these 8 fetuses the right lobe is larger than left lobe. According to Korenberg and Melmed (2003). But in one fetus with absence of the isthmus showing isolated lobes is an anatomical variant in human beings-Gorbman (1962), Degroot and Jameson (2001).

The thyroid gland weight ranged from 2.0 grams at 16 weeks of gestational age to 4.0 grams at term. There is a gradual increase in

average weight of the thyroid with increase in the gestational age. There is increase in average weight of the thyroid glands in male compared to female in smaller fetuses and more or less equal at term fetuses. According to Ho and Metreweli (1998) and Thomas Shepard and Andersen (2005) the ratio of the thyroid weight to body weight will be lower in smaller fetuses and shows a gradual increase and the fetal thyroid increased in size must faster after 32 weeks. The findings in the present study are in agreement with those reported by Ho and Metreweli (1998) and Thomas Shepard and Andersen (2005).

The average length, width, and thickness of the male thyroid ranged from **0.9cm - 1.9cm; 1.7 cm - 2.6cm and 0.3cm - 0.6cm** in 16-40 weeks of gestational age where as in female ranged from **0.6cm in 1.4cm; 1.3cm-2.3cm** and **0.1 cm - 0.4 cm** in the shape age group. This indicates there is a gradual increase in the length, width and thickness in relation with gestational age. According to HO and Metreweli (1998), Perry and Hollman (2002), Thomas Shepard and Andersen (2005) there is increase in the thyroid volume (length, width, thickness) in relation with the gestational age. The findings in the present study are in agreement with those reported by Ho and Metreweli (1998), Perry and Hollman (2002), Thomas Shepard and Andersen (2005).

But our study indicates that average weight, length and thickness of male thyroid glands are more than female thyroid glands in relation with increasing gestational age.

V. CONCLUSION

In present study the morphological parameters regarding position, size, shape and colour are normal but some are abnormal in shape and colour. There is a gradual increase in the average weight of the thyroid gland with increase in the gestational age and the male thyroid gland is heavier than the female thyroid gland. The ratio between the fetal weight and the thyroid gland weight in the present study was 318.5:2.375 at 12-24 weeks; 760 : 3.08 in 24-36 weeks and 1705:3.90 in more than 36 weeks group.

The average length, width and thickness of the tyroid gland was increased in relation with the gestational age and the average length, width and thickness of male thyroid glands were greater than female thyroid gland in relation with gestational age. In the literature there were no studies on morphometric and morphological parameters. But our findings provide a reference against which thyroid gland hypoplasia or goiter can be evaluated.

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