Morphometry Of Human Thyroid Gland In 12 - 40 Weeks Aborted And Stillborn Foetuses

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Abstract: Background: The thyroid gland is the first endocrine gland to get differentiated[5] and starts functioning as early as 11th week[2]. The early diagnosis of potentially treatable thyroid diseases in the foetus frequently depends on the detection of abnormal growth of the foetal thyroid gland. Material And Methods: In the present study, 30 foetuses belonging to B. J. Medical College were dissected and classified as per their gestational age in weeks 12 - 20 weeks, 21 - 30 weeks and 31 - 40 weeks. Then dimensions like (length, width, thickness), weight the foetal thyroid gland, Position of foetal thyroid gland from inferior pole to tracheal ring, position of superior pole of thyroid gland to laryngeal cartilage level and distance between superior poles to hyoid bone were measured. Result: The mean ± SD of all parameters like length, width and thickness of the lateral lobe and mean ± SD of length and width of isthmus of foetal thyroid gland were more in female foetuses than in male foetuses. The superior pole of lateral lobe of thyroid gland corresponds to upper half of thyroid cartilage in 18 out of 30 foetuses. The inferior pole of lateral lobe of thyroid gland corresponds to 3rd tracheal ring level in 17 out of 30 foetuses. Distance between superior pole and hyoid bone was more on the left side in both male and female foetuses. Conclusion: The knowledge of factors implicating gland position is very important in many specialisations from obstetricians to neonatal paediatricians, paediatric surgeons to anatomopathologists[3]. [R R Natl J Integr Res Med, 2022; 13(2): 25-30, Published on Dated: 10/02/2022]

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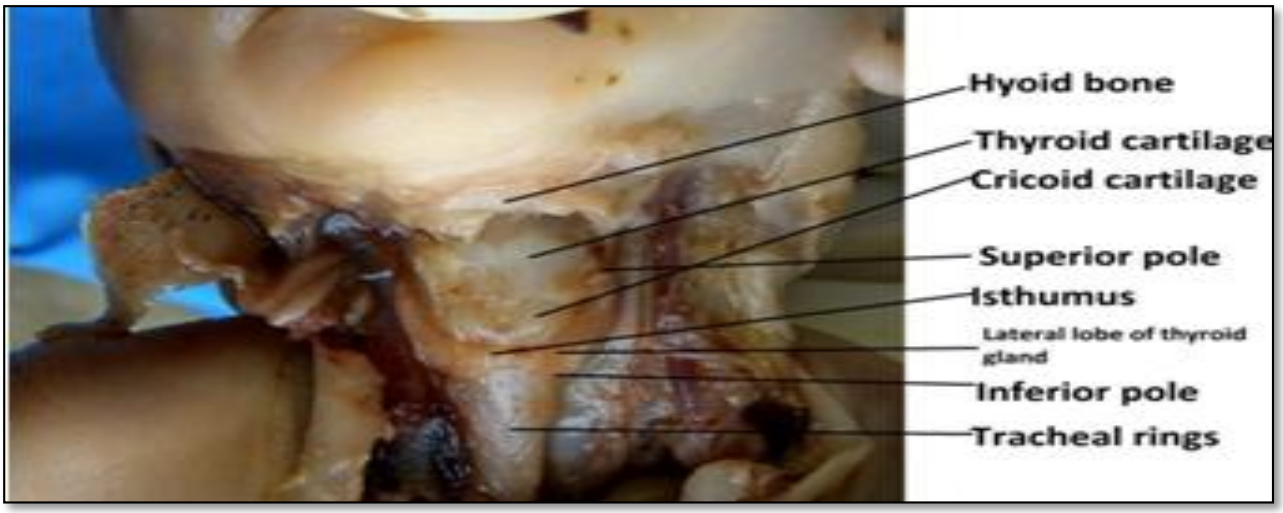
Introduction: The thyroid gland is the first endocrine gland to get differentiated 5 and starts functioning as early as 11th week[2]. The early diagnosis of potentially treatable thyroid diseases in the foetus frequently depends on the detection of abnormal growth of the foetal thyroid gland. Therefore it is very important to know the normal development of thyroid gland in foetal life[8]. Thyroid gland abnormalities are seen in approximately one in 2000 - 4000 new born infants. It regulates the basal metabolic rate, somatic growth, psychic growth, calcium metabolism and circadian rhythm[1]. It also promotes growth and development of brain during foetal life and for first 2 weeks of postnatal life. The knowledge of factors implicating gland position is very important in many specialisations from obstetricians to neonatal paediatricians, paediatric surgeons to anatomopathologists[3].

Figure 1: Humans foetal thyroid gland



Material & Methods: After getting approval of Ethical Committee of B. J. Medical College, Ahmedabad, 30 foetuses of gestational age 12-40 weeks were collected from the Department of Obstetrics and Gynaecology, Civil hospital, Ahmedabad and dissection of foetuses was conducted in the Department of Anatomy, B. J. Medical College, Ahmedabad for 3 Years duration. Out of 30 foetuses, 17 were females and 13 were male foetuses. All the foetuses were preserved in glass specimen jars having 10% formalin. The dissection of 30 foetuses of gestational age 12 – 40 weeks was carried out according to cunningham's manual under good ventilation and bright light. Then the dimensions like (length, width, thickness), weight the foetal thyroid gland were measured. Position of foetal thyroid gland from inferior pole to tracheal ring, position of superior pole of thyroid gland to laryngeal cartilage level and distance between superior poles to hyoid bone were also measured as per figure 2-7.

Figure 2: Showing All The Foetal Thyroid Glands Along With Laryngeal Cartilages And Tracheal Rings

Figure 3: Showing The Width And Length Of Thyroid Gland

Figure 4: Showing The Total Transverse Width Of Thyroid Gland

Figure 5: Showing Weight Of Thyroid Gland Using Digital Weighing Machine

Figure 6: Showing Position Of Thyroid Gland From Superior Pole To Laryngeal Cartilage Level

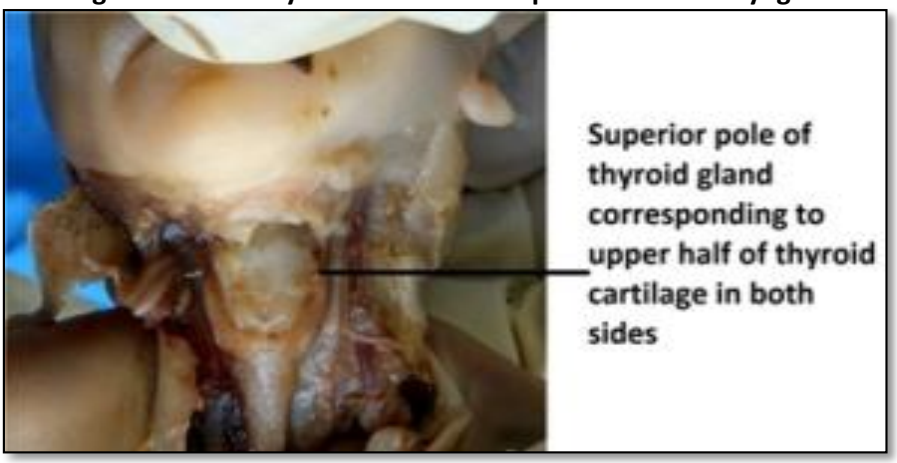
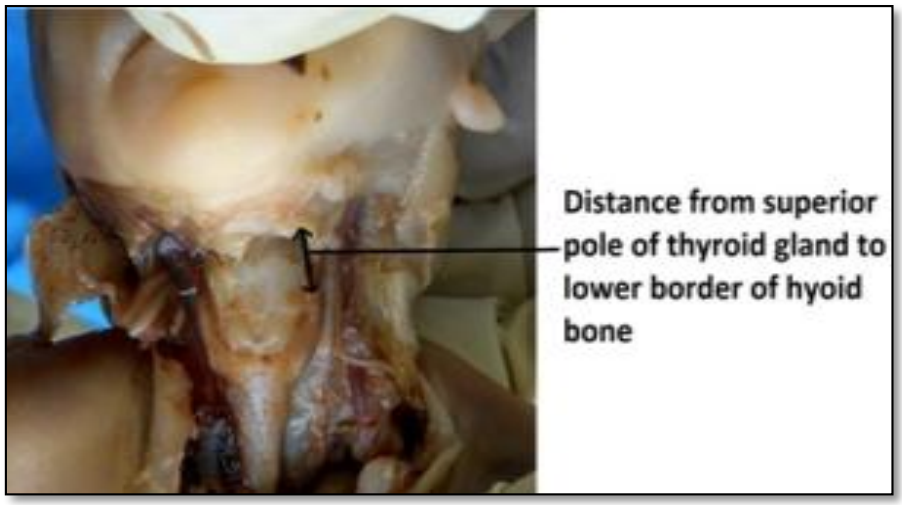


Figure 7: Showing Distance Between Superior Pole To Thyroid Bone



In the present study, 30 foetuses belonging to B. J. Medical College were dissected and data were collected. All the foetuses were classified as per their gestational age in weeks ranging from 12 - 20 weeks, 21 - 30 weeks and 31 - 40 weeks. Out of 30 foetuses of gestational age 12 - 40 weeks, 12 were males and 18 were females.

The mean of all the parameters like length, width and thickness of lateral lobe and isthmus of thyroid gland were more in female foetuses than in male foetuses between 12 – 40 weeks of gestational age (Table 1). Weight of thyroid gland in grams increased as the gestational age increased in both male and female foetuses. In 8 out of 30 foetuses, the superior pole corresponds to upper half of thyroid cartilage, 18 out of 30 corresponds to lower half of thyroid cartilage and 4 out of 30 corresponds to the level of cricoid cartilage (Table 2).

It has been observed that out of 30 foetuses, the inferior pole of thyroid gland in both right and left sides, corresponds to 2nd tracheal ring in 2

foetuses, 3rd tracheal ring in 17 foetuses (most common), 4th tracheal ring in 4 foetuses, 5th tracheal ring in 4 foetuses and 6th tracheal ring in 3 foetuses (Table 3). The mean, range and standard deviation of distance between superior pole to hyoid bone. It has been observed that the mean distance between superior pole to hyoid bone was more on the left side than on right side in both male and female foetuses (Table 4).

Table 1: Mean ± SD Of Length, Width And Thickness Of Lateral Lobe Of Thyroid Gland

Sr. no	Author	Year	Sex	Mean ± SD of length, width and thickness of lateral lobe of thyroid gland.					
				Length (mm)		Width (mm)		Thickness (mm)	
				R	L	R	L	R	L
1	Aynur E. Cicekcibasi	2006	Male	11.09± 0.43	10.47± 0.45	6.05± 0.29	5.38± 0.27	3.02± 0.18	2.98 ± 0.18
			Female	10.66± 0.43	10.20± 0.45	5.16± 0.29	5.06± 0.27	2.92± 0.18	3.00± 0.18
2	Present study	2019	Male	8.57± 3.9	7.91± 4.28	4.49± 2.77	4.28± 2.78	3.79± 1.92	4.01± 2.08
			Female	11.34± 3.65	11.04± 4.05	6.56± 2.6	5.98± 2.6	5.34± 1.82	5.21± 1.97

Table 2: Laryngeal Cartilage Levels From Superior Pole Of Thyroid Gland (%)

Sr. no	Author	Year	Position of thyroid gland at neck					
			Thyroid cartilage				Cricoid cartilage	
			Upper half of thyroid cartilage		Lower half of thyroid cartilage			
			R (%)	L (%)	R (%)	L (%)	R (%)	L (%)
1	Gulner Ozguner	2013	53	49	35.5	39	11.5	12
2	Present study	2019	26.6	26.6	60	60	13.3	13.3

Table 3: Tracheal Ring Levels From Inferior Pole Of Thyroid Gland In Both Right & Left Side (%)

Sr. no	Author	Year	Tracheal ring levels											
			1st		2nd		3rd		4th		5th		6th	
			R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)
1	Aynur E. Cicekcibasi	2006	3.3	0	10	3.3	58.3	56.7	20	31.7	8.3	8.3	0	0
2	Gulner Ozguner	2013	0	0	19.5	10.5	54.5	53	23.5	24	9	9	3.5	3.5
3	Present study	2019	0	0	6.6	6.6	56.7	56.7	13.3	13.3	13.3	13.3	10	10

Table 4: Showing The Mean, Range And Standard Deviation (SD) Of Distance Between Superior Pole To Thyroid Bone

Parameter studied	Values measured	Right		Left	
		Male	Female	Male	Female
Distance between superior pole to hyoid bone	Range (mm)	1.57 – 12.01	2.4 – 13.93	1.71 – 14.41	3.08-11.06
	Mean (mm)	4.34	4.78	5.13	4.96
	SD	2.93	2.73	2.87	2.66

Discussion: The thyroid gland is highly vascular and developmentally first endocrine gland to develop in human[6,7]. It appears at about 3rd week of embryonic development as an epithelial proliferation in the floor of the pharynx, at a point later indicated by the foramen caecum.

With further development, the gland descends in front of the hyoid bone and the laryngeal cartilages. It reaches its final position in front of the trachea in the 7th week. Then, the thyroid gland acquires a small median isthmus and 2 lateral lobes[8]. The thyroid hormone is essential for normal foetal growth and maturation of central nervous system. Foetal thyroid anomalies can cause growth restriction, cardiac insufficiency, a decrease in amniotic fluid and even intrauterine death[8].

According to Cicekcibasi (2006), mean ± SD values of all the parameters like length, width and thickness of lateral lobe of thyroid gland were greater in male foetuses except thickness of left lobe observed between 13.5 – 32.5 weeks of gestational age of foetuses. In the present study it has been observed that the mean ± SD of all the parameters like length, width and thickness of lateral lobe of thyroid gland were more in female foetuses than in male foetuses between 12 – 40 weeks of gestational age. According to Ozguner (2013), the superior pole of most of the thyroid gland corresponds to upper half of thyroid cartilage. In the present study it has been observed that the superior pole of most of the thyroid gland corresponds to lower half of thyroid cartilage. As per data mentioned in above table - 14, it has been observed that in most of the studies, inferior pole of thyroid gland corresponds to 3rd tracheal ring level.

According to Cicekcibasi (2006), the mean ± SD of length of isthmus of thyroid gland in male and female foetuses was 4.34 ± 0.26 and 3.86 ± 0.26 respectively. It has been observed that mean ± SD was greater in male foetuses than female foetuses between 13.5 – 32.5 weeks of gestational age. In the present study, the mean ± SD of length of isthmus of thyroid gland in male and female foetuses was 2.56 ± 1.84 and 4.18 ± 1.66 respectively.

It has been observed that mean ± SD was greater in female foetuses than male foetuses between 12 - 40 weeks of gestational age. In the present study, the mean ± SD of width of isthmus of thyroid gland in male and female foetuses was 5.5 ± 3.06 and 6.9 ± 2.8 respectively. It has been observed that mean ± SD was greater in female foetuses than male foetuses between 12 - 40 weeks of gestational age. According to Ozguner (2013), the distance between superior pole to hyoid bone increased throughout the foetal period. In parallel to decrease of thyroid gland with gestational age, it was far away from the hyoid bone during the foetal period. According to the present study, it has been observed that the mean distance between superior pole to hyoid bone was more on the left side than on right side in both male and female foetuses.

Conclusion: It has been observed from the present study that the mean ± SD of all parameters like length, width and thickness of the lateral lobe and mean ± SD of length and width of isthmus of foetal thyroid gland were more in female foetuses than in male foetuses. The superior pole of lateral lobe of thyroid gland corresponds to upper half of thyroid cartilage in 18 out of 30 foetuses.

The inferior pole of lateral lobe of thyroid gland corresponds to 3rd tracheal ring level in 17 out of 30 foetuses.

Distance between superior pole and hyoid bone was more on the left side in both male and female foetuses.

Interventionists and Surgeons attempting thyroidectomy need to have a thorough knowledge of embryology, surgical anatomy and variations of the thyroid gland in order to prevent inadvertent surgical and interventional complications and to perform safe and effective surgery and interventional procedures.

Present study may be helpful for early diagnosis and treatment of thyroid anomalies permitting prompt treatment and to judge the thyroid structure in preterm babies.

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