

Morphology of Suprarenal Gland in Human Fetuses

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Research Article

Abstract: The study was conducted on 41 aborted human fetuses between 12 - 38 weeks of gestational age. Morphological details of both suprarenal glands were studied. Shape of right suprarenal gland was triangular and that of left suprarenal gland was semilunar. Mean weight of left suprarenal gland was found to be more as compared to right suprarenal gland throughout the fetal period. The weight of suprarenal gland increases at slower rate upto 28th week of gestation and shows growth spurt from 28 weeks till full term. In right suprarenal gland, growth spurt for length and breadth was observed from 12 to 14 weeks and from 34 to 36 weeks. In left suprarenal gland, growth spurt in length was observed from 20 to 22 weeks and another at 24 to 32 weeks. It was also observed that increase in breadth of left suprarenal gland was gradual and there was no growth spurt.

Keywords: suprarenal gland, Morphology.

Introduction

Suprarenal glands are a pair of flattened bodies, golden yellow in colour, situated retroperitoneally on the posterior abdominal wall on each side of the vertebral column at the level of 12th thoracic vertebra and atop the corresponding kidneys. Ontogenetically, phylogenetically, structurally and functionally cortex and medulla are distinct, despite being a single organ [1]. The development of suprarenal glands which are closely related to superior pole of kidney starts in 5th week of intrauterine life and continues to develop in extrauterine life. The gland consists of superficial cortex and deeper medulla. The cortex develops from mesoderm of coelomic epithelium and the cells of medulla are derived from neural crest (ectoderm). Gruenwald and Minh [2] found that the weight of suprarenal gland increases constantly from 24th weeks to 40th weeks of gestation. Indarjit and Banga [3] observed that the right suprarenal gland in adult was pyramidal in 56% of males and 44% of females. Anand, Choudhary, Sabharwal, *et al.* [4] found the mean length, breadth and thickness in fetuses of 9-36 weeks were found to be 1.4 cm, 1 cm and 0.45 cm respectively. In the fetuses, 80% left-sided suprarenal glands were semilunar in shape, and 20% were triangular. On the right side 50% were triangular and 50% tetrahedral or an inverted Y. Sangma, Ibochouba and Damayanti [5] found that the left suprarenal gland was

heavier than right throughout the fetal period. There is steady growth except at two spurts i.e. at 20th week and from 30th week till term. Knowledge of the normal range of the growth and size of the fetal adrenal gland is of importance for the identification of morphological changes once an anomaly is suspected. The description of development of suprarenal gland given in different text books of embryology does not include the morphological details of various stages of development of suprarenal gland. Hence the present study was undertaken to study in detail the appearance of various morphological changes of suprarenal gland in relation with gestational age in human fetuses.

Material and methods

The present study was conducted on 41 aborted human fetuses between 12 - 38 weeks of gestational age. The fetuses were obtained from the Department of Obstetrics and Gynecology of a tertiary care hospital with the prior permission of Head of Department. Consent of parents was obtained. These fetuses include the medically terminated, spontaneously aborted and the still births. The obtained fetuses were labeled appropriately. Twins and fetuses with gross anomalies are omitted from study. A detailed obstetric history was obtained in each case. The age of the fetus were calculated from the obstetrical history and crown rump lengths. The fetuses were fixed in 10% formalin before dissection.

Morphological measurements of suprarenal glands are measured as follows -

- The length was measured along the longest axis through a vertical plane.
- The breadth was measured as the widest point along a horizontal or oblique plane.
- Weight of suprarenal glands was measured by using electronic weighing machine.
- Shape of the gland was also noted

Observations and Results

The present study was carried out on 41 normal aborted human fetuses (23- Male, 18- Female) ranging from 12 to 38 weeks. Morphology of both right and left

sided suprarenal gland was studied. The shape of both right and left sided suprarenal glands was observed in this study. The shape of all right suprarenal glands was triangular or pyramidal. The shape of all left sided suprarenal glands was semilunar. From 12 weeks to 38 weeks there was increase in size of the gland. The shape of gland didn't change till the full term. There was no difference between shape of gland in males and female fetuses. The weight of suprarenal glands was recorded in each fetus. When there was more than one fetus of the given gestational age group, the mean weight represented by that age group was considered. Increase in weight of both suprarenal glands was related with increase in gestational age. Mean weight of left suprarenal gland was found to be more as compared to right suprarenal gland with the exception of 16th week where weight of right suprarenal gland was slightly more than left (Table no.1).

Table 1: Showing mean weight of suprarenal gland (in gram) against the gestational age (in weeks).

Gestational Age (in weeks)	Mean weight of right suprarenal gland (in gram)	Mean weight of left suprarenal gland (in gram)	Number of fetuses
12	0.09	0.11	1
14	0.21	0.25	3
16	0.47	0.45	5
18	0.57	0.64	4
20	0.78	0.87	8
22	1.10	1.18	10
24	1.31	1.42	3
28	1.78	1.91	1
30	1.89	2.10	1
32	2.29	2.67	2
34	2.31	3.12	1
36	2.60	3.20	1
38	3.20	3.46	1

The combined mean weight of both right and left suprarenal glands for the given week of gestation was also studied. The combined mean weight of suprarenal gland with the Standard Deviation for different weeks of gestation was calculated. If only one fetus was present in the group, weight of that fetal suprarenal gland represents the group. Standard Deviation of such group is "0" (Table 2). The mean length and breadth of suprarenal glands were recorded in each fetus. When there were more than one fetus at the given gestational age group, the mean length and breadth represented by that age group was considered (Table 3).

Table 2: showing the combined mean weight of both suprarenal glands with the Standard Deviation compared with the gestational age.

Gestational Age (in weeks)	Combined mean weight (in grams) with Standard Deviation	Number of fetuses in the group
12	0.2 ± 0.00	1
14	0.46 ± 0.11	3
15	0.83 ± 0.11	2
16	0.99 ± 0.21	3
17	0.96 ± 0.04	2
18	1.45 ± 0.20	2
19	1.56 ± 0.29	4
20	1.75 ± 0.15	4
21	2.23 ± 0.27	2
22	2.29 ± 0.15	8
23	2.73 ± 0.45	3
28	3.69 ± 0.00	1
30	3.99 ± 0.00	1
32	4.96 ± 0.27	2
34	5.43 ± 0.00	1
36	5.54 ± 0.00	1
38	6.66 ± 0.00	1

Table 3: Showing mean length and breadth of suprarenal glands (in cm) against the gestational age (in weeks).

Gestational age (in weeks)	Right suprarenal gland		Left suprarenal gland	
	Length (in cm)	Breadth (in cm)	Length (in cm)	Breadth (in cm)
12	0.9	0.8	1.0	0.8
14	1.47	1.2	1.33	1.20
16	1.52	1.18	1.42	1.24
18	1.68	1.35	1.45	1.27
20	1.74	1.40	1.49	1.35
22	1.75	1.51	1.87	1.42
24	1.77	1.57	1.90	1.63
28	1.8	1.50	2.60	1.90
30	1.9	1.6	3.10	1.98
32	1.85	1.6	3.25	2.2
34	2.1	1.6	3.0	2.1
36	2.6	2.4	3.21	2.2
38	2.8	2.6	3.34	2.5

The mean length and breadth was taken as combined length and breadth of both right and left suprarenal gland for the given weeks of gestation. For more than one fetus of particular age group, the mean length and breadth of suprarenal gland with the Standard Deviation for different weeks of gestation was calculated. If one fetus present in the group, average length and breadth of that fetal suprarenal gland represents the group. Standard Deviation of such group is "0" (Table 4).

Table 4: Showing combined mean length and breadth of suprarenal gland with Standard Deviation (in cm) against the gestational age

Gestational age (in weeks)	Suprarenal gland	
	Length (in cm)	Breadth (in cm)
12	0.95 ± 0.00	0.80 ± 0.00
14	1.40 ± 0.23	1.20 ± 0.30
16	1.47 ± 0.25	1.21 ± 0.15
18	1.56 ± 0.19	1.31 ± 0.13
20	1.61 ± 0.16	1.38 ± 0.13
22	1.81 ± 0.40	1.41 ± 0.10
24	1.83 ± 0.30	1.60 ± 0.00
28	2.20 ± 0.00	1.70 ± 0.00
30	2.50 ± 0.00	1.80 ± 0.00
32	2.55 ± 0.07	1.9 ± 0.07
34	2.55 ± 0.00	1.80 ± 0.00
36	2.80 ± 0.00	2.30 ± 0.00
38	3.07 ± 0.00	2.55 ± 0.00

Discussion

Three fundamental processes are involved in development; these are growth, differentiation and metabolism. Growth is increase in spatial dimensions and in weight. Differentiation is increase in complexity and organization. This differentiation may not be apparent at first, but when apparent it is known as "Histogenesis" [6]. In the present study, there was clear differentiation between the shape of right and left suprarenal gland as early as 12th week of gestation. The shape of right suprarenal gland was triangular and that of left suprarenal gland was semilunar. But according to Sangma, Ibochouba and Damayanti [5], there was no differentiation up to 18 weeks. Between 9 to 16 weeks both the suprarenal glands were tongue shaped and at 16 to 22 weeks the difference in the shape of gland was noted, the right becoming tetrahedron and left assuming crescent shape gradually. According to Anand, Choudhary, Sabharwal *et al.* [4], the shapes of right sided suprarenal glands were 50% triangular and 50% tetrahedral. On the left side 80% of suprarenal glands were semilunar and 20% were triangular. The combined mean weight of suprarenal glands in the present study at 12th week was 0.2 gm. With increase in the gestational age, the weight of the gland increases. At 38th week combined mean weight of suprarenal glands was 6.66 gm. Combined mean weight of suprarenal gland shows growth spurt from 30 to 36th week. The combined mean weight of suprarenal gland in present study at 12th week of gestation was 0.2 gms. It is more as compared to findings of Archie, Collins and Lebel [7], the weight was 0.1±0.03 at the given age. But when you compare the findings of present study at late gestational age the findings are more or less similar. At 36th week the combined weight of suprarenal of present study was 5.54

grams and that of Archie, Collins and Lebel study was 5.74±1.92 At 23th week, the mean weight of suprarenal gland of present study was 2.73 ± 0.45 gm, which was comparable with the findings of Gruenwald and Minh [2]. In their study the weight of suprarenal was 2.9 gm. In the present study the mean length of suprarenal gland was 0.95 cm and the mean breadth was 0.80 cm, at 12th week. The increase in mean length of suprarenal gland was gradual and steady except at two spurts i.e. from 12 to 14 weeks and from 28 to 30 weeks. There was steady increase in mean breadth except at two occasions; there were presence of growth spurts from 12 to 14 weeks and from 34 to 36 weeks. In the present study, the mean length and breadth of suprarenal gland at 38 weeks was 3.05 cm and 2.55 cm respectively. The observations of the present study show that there was increase in all dimensions (length and breadth) of the fetal suprarenal gland with increasing age. There is no data available in the English literature regarding dimensions (length and breadth) of fetal suprarenal gland for comparison with the data of present study.

Summary and Conclusion

The strong positive correlation was observed between length, breadth and weight of suprarenal gland with the gestational age of the fetus. So, as the gestational age increases weight, length and breadth of suprarenal gland increases. Mean weight of left suprarenal gland was found to be more as compared to right suprarenal gland throughout the fetal period, except at 16th week. The weight of suprarenal gland increases at slower rate up to 28th week of gestation and shows growth spurt from 28 weeks till full term.

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