Original Research Article

A Morphometric Study of Development of Fetus Suprarenal Gland, Kidney and their Comparison

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Abstract

The suprarenal gland plays a vital role in maintenance of internal milieu. Over the past years, the evaluation of foetal morphometrical growth parameters have been subject of increased awareness for the assessment of foetal growth. In some studies foetal organs were also measured to see their gross development at various gestational ages. So, the aim of our study was to determine the growth rate of foetal suprarenal gland and kidney in increasing gestational age. The present study was carried out in the Department of Anatomy, Kasturba Medical College, Manipal. The material for the study consisted of 30 human foetal specimens from 12^{th} to 28^{th} weeks of gestational ages. The suprarenal glands and kidney were taken from fetal specimens for various measurements. The measurements were done by using calibrated beaker for volume and vernier caliper for linear parameters. Statistical analysis for the measurements was done. At 1-12 weeks there was no significant correlation between kidney and suprarenal gland. At 13-24 weeks there was significant correlation ($p < 0.05$) between weight and length of suprarenal and kidney. At 25- 40 weeks there was significant correlation (as $p < 0.05$) between weight and breadth of suprarenal and kidney. The knowledge of morphometery of the suprarenal gland and kidney is important in cases of anencephaly, hirsutism and hypertension in association with suprarenal cortical and medullary tumors and these measurements may be helpful for the obstetrician because these can give us an indication for finding the gestational age of the fetuses.

Keywords: Adrenal gland, kidney, fetuses, measurements, comparison

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Date of submission: 18 Jan, 2014 Date of acceptance: 16 Dec, 2014

Introduction

The most common abdominal masses in newborn infants are of renal origin. Ureteropelvic junction blockage and subsequent hydronephrosis, multicystic dysplastic kidneys, renal vein thrombosis and renal tumours comprise the majority of these masses (1).

Suprarenal glands play a vital role in maintenance of internal environment. The minor alteration in its function may lead to an exponential change which can result in mortality. The significant reasons of such a disturbance are occurrence of trauma and tumours of suprarenal gland (2).

Precise gestational age assessment is key to quality maternity care, e.g. diagnosis of growth ailments and timing of delivery. Failure may lead to iatrogenic prematurity or postmaturity, both of which are related to increased perinatal morbidity and mortality. Kidney length is an important technique of determining gestational age than the foetal biometric indices of biparietal diameter, head circumference, femur length and abdominal circumference between 24 and 38 weeks gestation (3).

Hence, normal morphometric measurements of suprarenal gland as well as kidney are helpful to rule out all these diseases of kidney and suprarenal gland in the human foetuses.

Hence, this study was performed to measure the normal dimensions of kidney and suprarenal gland in various age groups of the human foetuses and the

relation between the dimensions of kidney with suprarenal gland in different trimesters of pregnancy.

Materials and Methods

The present study was carried on 25 formalin embalmed fetal specimens from 10th to 40th weeks of gestational ages in the Department of Anatomy which were obtained from the Department of Obstetrics and Gynecology Kasturba Medical College, Manipal. Ethical approval was taken for the study from the local ethical committee.

The foetuses were divided into 3 groups. Group-1 (1-12 weeks), Group-2 (13-24 weeks), and Group-3 (25-40 weeks). The suprarenal glands and kidney were taken out from foetal specimens for measuring the following parameters- weight, length, breadth, thickness and volume. The measurements were done by using calibrated beaker for volume by water displacement technique. Vernier caliper for linear parameters and weight by electronic weighing machine (Fig. 1 and 2). Statistical analysis for the measurements was done.

Results

The mean and range of all parameters of suprarenal gland and kidney measured at various gestational ages were shown in Table 1 and 2.

At 1-12 weeks there was no significant correlation between kidney and suprarenal gland. At 13-24 weeks there was significant correlation (as $p < 0.05$) between - weight, breadth and thickness of right and left suprarenal gland, weight, length and volume of right and left kidney. We also found that there was significant correlation between weight and length of suprarenal and kidney. At 25- 40 weeks there was significant correlation (as $p < 0.05$) between –Weight, length, breadth, volume and thickness of right and left kidney, weight, length, breadth and volume of right and left suprarenal gland. And there was significant correlation between weight and breadth of suprarenal and kidney. At 1-12 weeks weight of suprarenal gland was almost half to that of weight of kidney and at 25-40 weeks weight was almost 1/3rd of the weight of kidney.

Discussion

Anand et al. in their study found that the mean length, breadth and thickness in fetuses of 9-36 weeks as 1.4 cm, 1 cm and 0.45 cm, respectively but in our study we observed the values to be 1.74, 1.81 and 0.72cm.

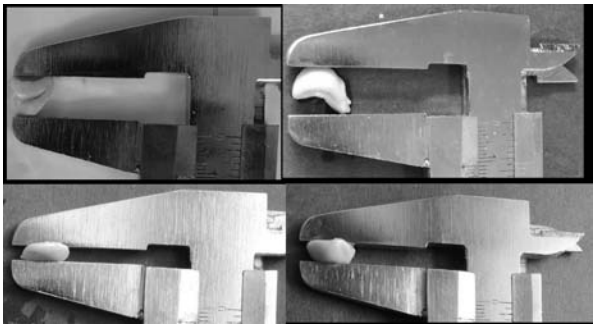

Figure 1: Measurements done on suprarenal gland

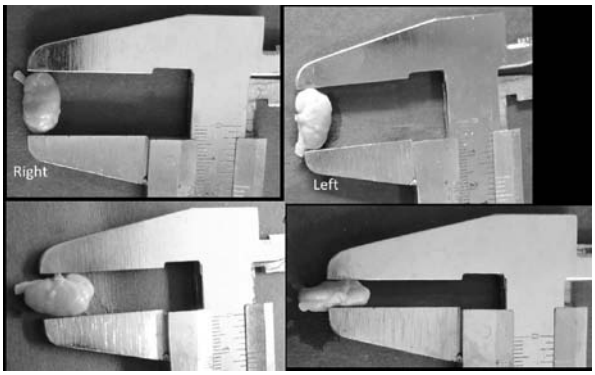

Figure 2: Measurements done on kidney

This may be due to the reason that we have measured the parameters of till term foetuses (4). Ozgüner et al. found that all parameters of suprarenal gland increases with gestational age which we also found in our study (5). Sulak et al. found that the dimensions, weight, and volume of the kidneys increased with gestational age during the foetal period which we also got in our study (6).

Elias et al. calculated the length of suprarenal gland in relation to length of the kidney. They found a strong linear correlation between length of suprarenal and kidney while in our study we found that there was significant correlation between length of suprarenal and kidney at 13-24 weeks of gestation (7).

In the present study, we also found that the length of right suprarenal was more than the length of left suprarenal gland in all trimester which was also found by KhayatiSant et al. in their study (2). Similar findings were observed by Anand et al whereas in the study done by Nowak et al. length of left suprarenal gland was more (4,8).

In the present study, the thickness was more for left suprarenal gland compared to the right one. Similar findings were observed by KhayatiSant et al. in their

Table 1: Showing mean and range of parameters measured on right and left suprarenal gland

Parameters		1-12 weeks		13-24 weeks		25- 40 (term) weeks	
		Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range
Weight (gms)	Right	0.52±0.09	0.43-0.63	0.66±0.17	0.38-0.89	1.82±1.15	0.91-4.3
	Left	0.61±0.18	0.4-0.73	0.69±0.08	0.49-0.78	2.07±1.45	0.58-5.26
Length (cm)	Right	1.5±0.36	1.20-1.91	1.53±0.18	1.31-1.85	2.14±0.46	1.45-2.83
	Left	1.4±0.28	1.10-1.64	1.28±0.24	0.98-1.68	1.94±0.72	1.1-3.19
Breadth (cm)	Right	1.36±0.2	1.22-1.60	1.57±0.26	1.16-1.95	2.05±0.48	1.46-2.93
	Left	1.27±0.43	0.84-1.70	1.5±0.25	1.17-1.78	2.17±0.46	1.50-2.98
Thickness (cm)	Right	0.5±0.1	0.4-0.6	0.60±0.13	0.46-0.87	0.74±0.36	0.3-1.64
	Left	0.96±0.68	0.46-1.74	0.66±0.22	0.15-0.92	0.83±0.34	0.34-1.55
Volume (ml)	Right	0.66±0.28	0.5-1	0.77±0.36	0.4-1.5	1.55±0.54	1.0-2.5
	Left	0.66±0.20	0.5-0.9	0.75±0.24	0.5-1.2	1.76±0.71	1.0-2.8

Table 2: Showing mean and range of parameters measured on right and left kidney**.**

Parameters		1-12 weeks		13-24 weeks		25-40 (term) weeks	
		Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range
Weight (gms)	Right	1.05±0.37	0.64-1.36	1.8±0.74	1.41-3.79	5.30±2.18	2.9-9.9
	Left	0.89±0.27	0.58-1.10	1.79±0.67	1.08-3.49	5.40±2.55	0.95-9.57
Length (cm)	Right	1.69±0.20	1.46-1.85	2.11±0.27	1.78-2.73	3.16±0.48	2.45-3.72
	Left	1.14±0.46	1.14-1.97	2.08±0.27	1.72-2.58	2.87±0.70	1.24-3.90
Breadth (cm)	Right	1.19±0.46	0.78-1.70	1.59±0.26	1.27-1.96	2.10±0.46	1.52-2.91
	Left	0.93±0.05	0.88-0.98	1.48±0.37	0.85-1.89	2.10±0.45	1.4-2.91
Thickness(cm)	Right	0.94±0.15	0.77-1.06	0.91±0.10	0.73-1.09	1.41±0.39	0.9-2.05
	Left	0.78±0.18	0.59-0.96	1.06±0.22	0.76-1.50	1.28±0.42	0.62-1.96
Volume (cm)	Right	1.0±0.5	0.5-1.5	1.80±0.56	1.5-3.2	4.34±2.19	1.50-9.0
	Left	0.93±0.40	0.50-1.30	1.77±0.97	1.0-4.0	4.63±2.25	2.0-9.0

study but Anand et al. observed more thickness on right side as compared to left side (2,4). The present study established an important and positive correlation between the length, breadth and thickness of suprarenal gland. All the parameters were correlated to one another. Even in our study we also correlate the parameters of kidney with parameters of suprarenal gland. And we found in some parameters significant correlation which can be useful.

Conclusion

For the first time, in the present study we compare the parameters of suprarenal gland with kidney. These results may be helpful in order to estimate the weight of kidney with the known weight of the suprarenal gland and vice versa.

These measurements may be helpful for obstetricians because these can give us an indication for finding the gestational age of the foetuses.

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