ORIGINAL RESEARCH PAPER

Anatomy

KEY WORDS: Abdominal Circumference , Head Circumference, foetal G.A , Ultrasonography.

CORRELATION OF HEAD CIRCUMFERENCE AND ABDOMINAL CIRCUMFERENCE IN SECOND TRIMESTER ONWARDS BY ULTRASONOGRAPHY

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ABSTRACT

Ultrasonography is an ultrasound based diagnostic imaging technique used to visualize internal structures and soft tissues. Ultrasound is non ionizing , non invasive , safe , accurate, cost effective method of objectively assessing pregnancy. It is an ideal diagnostic technique and provide clinical information regarding growing foetus. Both the head and abdominal circumference are unimportant growth parameters during the foetal life. MATERIAL & METHOD-500 normal pregnant women were observed in radiodiagnosis department of Zenana Hospital, Ajmer. Patient of 2nd and 3rd trimester were considered and ultrasonographic measurements with consent form were recorded. RESULT-The range of variation of observed value of head and abdominal circumference with+ 2SDwere taken to eradicate error.CONCLUSION-The mean abdominal circumference increased from 237.61 mmat 28 weeks to 348.22 mm at 40 weeks while the head circumference comparable increased from 28 to 40 weeks but at a lower variations.

Introduction

Existence of the ultrasound was first demonstrated on bats, dolphins and other animals. In medical field the use of ultrasound started for the detection and visualization of cerebral ventricles by Dvosik in 1930s. Clinical application of ultrasound in obstetrics was introduced and popularized by Donald of Glassgow (1958). The advantage being that the ultrasound is a noninvasive technique causing minimum discomfort to patient and no side effects on foetus.

Head circumference is less accurate than biparietal diameter as a predictor of foetal age prior to 26 weeks gestation but accuracy in 3rd trimester is comparable to accuracy of biparietal diameter.
The abdominal circumference increases progressively from 2nd and 3rd trimester. The rationale of employing multiple predictors for dating can be addressed by Bayer' s theorem. This indicate that when two circumference are compared the accuracy of end point is increased. In symmetrical IVG retardation all foetal parameters are reduced in size and averaging the gestational age will not improve accuracy of dating. In asymmetrical IVG retardation only the head circumference remains to near normal while abdominal circumference is variable.

MATERIAL & METHOD

The study on the estimation of head and abdominal circumference in 2nd trimester and 3rd trimester in normal pregnant women by real time ultrasound measurement has been conducted in Radiodiagnosis department of Zenana Hospital Ajmer. Total of 500 cases were taken. The patients included in this study were of gestational age of 2nd and 3rd trimester. The ultra sound measurement of foetal head circumference and foetal abdominal circumference were made in millimeters.

(a) Head Circumference (HC)- was measured considering both transverse (BPD) biparietal diameter and front to back (APD) anteroposterior diameter.
(b) Abdominal Circumference (AC)- was measured from an axial image of foetal abdomen at the level of liver or on a transverse image of foetus at level of umbilical vein and by tracing around the outer edge of image.

OBSERVATION:-

500 cases were studied from 28 weeks of gestation age to 40 weeks excluding twins and any congenital anomalies.

Table 1

S.NO.	F.G. Age	No. of cases
1	28	34
2	29	30
3	30	60
4	31	52
5	32	49
6	33	65
7	34	52
8	35	39
9	36	41
10	37	32
11	38	19
12	39	12
13	40	05

Table 2:- Observed distribution of Fetal Abdominal and Fetal Head Circumference

Fetal Gestational Age	No. of cases	Mean Fetal Abdominal Circumference	Mean Fetal Head Circumference
28	32	237.61	252.1
29	30	240.43	257.93
30	54	244.36	258.65
31	55	257.12	276.52
32	48	273.61	284.56
33	65	285.80	298.66
34	60	292.79	304.26
35	42	302.51	313.55
36	44	306.40	314.18
37	30	330.34	337.2
38	19	339.85	344.87
39	7	342.72	348.88
40	4	348.22	353.75

Table 3:- Calculated equation to estimate the fetal Abdominal and Fetal Head Circumferences by fetal gestational Age:-

Sr. No	Parameters	Versus Fetal Abdominal Circumference	Versus Fetal head Circumference
1	No. of Cases	500	500
2	Covariance	143	128.13
3	Correlation	0.99	0.99
4	Intercept	-54.84	-7.70
5	Slope	10.21	9.15
6	Std. error of prediction	5.22	4.69

Table 4:- Calculated equation to estimate the fetal gestational age from the fetal Abdominal and Fetal Head Circumferences

Sr. No	Parameters	Versus Fetal Abdominal Circumference	Versus Fetal head Circumference
1	No. of Cases	500	500
2	Covariance	143	128.13
3	Correlation	0.99	0.99
4	Intercept	5.81	1.36
5	Slope	0.09	0.10
6	Std. error of prediction	0.50	0.50

RESULT

From the present study the data observed was put into the software and the following resultant equation can be generated From table no 3; the Fetal Abdominal and Fetal Head circumference can be generated by fetal gestational age-

Y= -54.84+10.21*G.A(x) where X = Fetal Abdominal circumference

Y= Fetal Gestational Age

Y= -7.70+9.15* G.A(x) where X = Fetal Head circumference
Y= Fetal Gestational Age

From table no 4; the Fetal gestational age can be generated by fetal Abdominal and Fetal Head circumference -

Y= 5.81+0.09*X where X = Fetal Abdominal circumference
Y= Fetal Gestational Age

Y= 1.36+0.10*X where X= Fetal Head circumference
Y= Fetal Gestational Age

DISCUSSION

An important for the sonographers to understand is that no sonographic method can precisely decide gestational age in every case. Properly constructed studies of the relationship between gestational age and sonographic parameters in the fetus should indicate the range of error that may be associated with the prediction of age by ultrasonography. The range of error usually reported $\pm$ 2SD which should be applicable to approximate to 95% of a normal foetal population. Thus it assign a gestational age based on the sonographic measurement of the foetus and the variability is$\pm$ 1 week , than we are in effect stating that a 95% of time age estimate should be within 1 week of the true menstrual age. It should be noted that approximately 50% of the time the magnitude of the error in age prediction will be more than $\pm$ 2SD variability range. Several sonographic foetal measurements have been in use for assessing gestational age.

F.P. Hadlock et al (1983) studied in 361 normal pregnancies between 15 and 42 weeks, the relation between ultrasonographical measured fetal femur length, fetal abdominal circumference expressed as FL/ACx100. It was clear from their results that detection of fetal IUGR possible with the use of standard measurements such as fetal abdominal circumference, head circumference, HC/AC and estimated fetal weight in patients whose data have been established early in pregnancy.

Summary and Conclusion – It is concluded that data and results are predictive of foetal gestational age, and it can guide and give the correct foetal gestational age to radiologists as well as the obstetricians to make the right decision regarding the management of the patients. In present study the mean of the foetal head circumference estimated from real time ultrasound, was similar to study done by R.Rajan. observed mean of the Abdominal and Head Circumference for each week of third trimester shows least variations from the data presented by Hadlock et.al.

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