

Ultrasonographic Study of Foetal Craniometry in the First Trimester of Pregnancy to Rule out Any Congenital Anomalies in East Singhbhum

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Abstract

Aim: The aim of the study is to review the first trimester normal anatomy of the fetal skull and diagnosis of cranial defects.

Material and Method: A total no. of 50 cases were studied in the department of anatomy, Mahatma Gandhi Memorial (M.G.M.) Medical college Jamshedpur. All cases were selected in the gestational age group of 10–14 weeks referred to Radiology department for Ultrasonographic evaluation of fetal wellbeing from the department of Obstetrics and Gynecology, M.G.M. Medical College and Hospital Jamshedpur.

Result: Out of 50 cases, 41 (82% of cases) had normal Biometric parameters, while 6 (12% of cases) had small for gestational age and 3 (6% of cases) had large for gestational age.

Key words: Biparietal diameter, Cephalic index, Foetal skull, Ultrasonography, Congenital anomalies

INTRODUCTION

Ultrasound can demonstrate fetal head by the 8th week of Gestation, but intracranial anatomy becomes visible only after the 12th week. The fetal head is the most prominent part of the Foetus and as such it is easily accessible for examination during the first trimester anatomy scan. Examination of the fetal head should include the skull shape and the membranous gap between the cranial bones such as Fontanelles and sutures for the assessment of Intracranial development and also various parameter and indices such as Biparietal diameter (B.P.D), Fronto-occipital diameter (F.O.D), Head Circumference (H.C), Cephalic index (C.I) and Head: Body ratio for the assessment of gestational age of and monitoring of normal growth of the fetus. Conventionally, most of congenital anomalies have been diagnosed in the second trimester of pregnancy. However,

with the increasing incorporation of the 10th–14th week scan into clinical practice, this examination is progressively used for performing an early anatomy scan.^[1-10]

The Foetal Craniometry

The B.P.D is the distance between the parietal eminences on either side of the skull and is, therefore, the widest diameter of the skull from side to side. Measurements of B.P.D made from the outer table of the proximal skull (the part nearest to the transducer) to the inner table of the distal skull (the part farthest away from the transducer).

The Biparietal diameter of the Head was the first measurement of Foetus growth described (Willocks *et al.*, 1967). Among all the parameters B.P.D remains the simplest. As the fetus grows, the B.P.D of the fetal head also increases throughout pregnancy. Fetal skull is well defined ultrasonically from 11 to 12 weeks onwards the B.P.D is the most discussed and documented Obstetric ultrasound measurement.

The FOD is measured along the longest axis of the skull at the level of the BPD from outer edge to outer edge.

CI is the ratio of B.P.D to FOD which is reported as percentage.

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Normal range (± 2 standard deviations) of CI = 70–86. Head: body ratio is calculated by dividing the HC by the abdominal circumference. With normal anatomy, the head: body ratio can be considered normal if it lies between the 57th and 95th percentiles for the gestational age.^[10-17]

Congenital Anomalies of Foetal Head, that May be Diagnose During the 1st Trimester Ultrasonographic Scan

Acrania/Anencephaly

Open neural tube defects are severe congenital anomalies occurring with a prevalence of one in 1000–2000 pregnancy. Among them, the anencephaly sequence is the most severe central nervous system (CNS) malformation, which is characterized by complete absence of the calvarium.

Microcephaly

An abnormally small head can be diagnosed when BPD is more than 3 standard deviations below the normal.

Cephalocele

Cephalocele is serious CNS malformation characterized by partial protrusion of the brain through a cranial defect.

Hydrocephalus

Although it can be recognized by the 18th week of gestation when there will be dilatation of the lateral ventricles, however, it can be suspected in the 1st trimester scan when biometric diameter and HC are more than of its normal range, showing abnormally large head size.^[17-25]

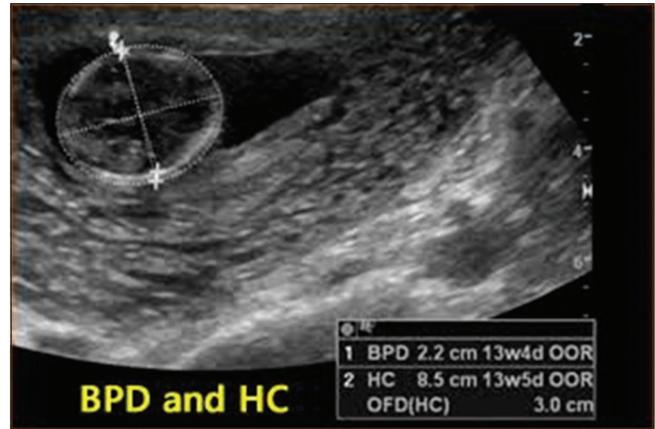


Figure 1: Normal biometric measurement



Figure 2: Lesser biometric measurement

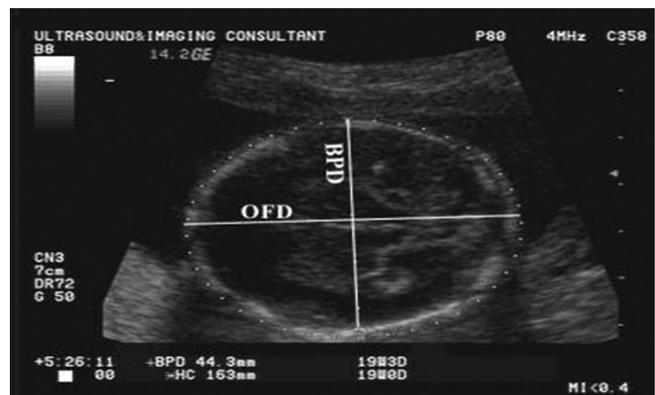


Figure 3: Greater biometric measurement

MATERIAL AND METHOD

This work “Ultrasonographic study of fetal craniometry in the first trimester of pregnancy to rule out any congenital anomalies in East Singhbhum” was carried out in the department of Anatomy, M.G.M Medical College, Jamshedpur, and ultrasonic examination was done in the ultrasound unit of the department of Radiology, M.G.M Medical College, Jamshedpur.

Cases were selected from the patient referred to the radiology department from the department of obstetrics and Gynecology for ultrasonic evaluation of fetal well being within 10-14 weeks of pregnancy or confirmation of pregnancy.

A total no. of 50 cases were studied.

Method of Study

1. History was taken with her consent.
2. Clinical study of the cases.
3. Determination of different parameter of coriometry.

Table 1: Showing distribution of cases according to gestation period in weeks

Gestation period in week	No. of cases	Percentage
10–11.5	5	10
11.6–13	15	30
13.1–14	30	60

Table 2: Showing biometric findings against different gestational age group

Gestational period in week	Mean HC (cm)	Mean BPD (cm)	Mean FOD (cm)	Mean C.I (%)
10–11.5 weeks	8.1 cm	2.1 cm	2.4 cm	87.5%
11.6–13 weeks	8.6 cm	2.4 cm	3.0 cm	80%
13.1–14 weeks	9.5 cm	2.8 cm	3.5 cm	80%

Table 3: Showing variation in the biometric finding

No. of cases	Percentage	Biometric parameter
41	82%	Normal range
6	12%	Below the normal range (small for Gestational age)
3	6%	Above the normal range (large for Gestational age)

That is BPD, HC, FOD, CI, Abdominal circumference (AC), and femur length.

- The Gestational age was computed using L.M.P
- Determination of fetal age from ultrasonic measurements mark.
- Any abnormalities or variation taken into account.

RESULTS AND DISCUSSION

The present study was designed to study the various aspect of the significance of fetal craniometry regarding fetal well-being. Fetal Biometric finding (HC, BPD, FOD, and CI) is observed and compared with a normal level of these biometric parameters and any variation taken into account – to exclude any cranial defect.

About 60% of cases were examined of Gestation period in between 13 and 14 weeks, 30% in between 11.6 and 13 weeks and rest 10% in between 10 and 11.5 weeks at Gestation.

In the Gestational age group 10–11.5 weeks, Mean HC 8.1 cm, Mean BPD 2.1 cm, mean FOD 2.4 cm, and C.I 87.5%.

In the gestational age group 11.6–13.0 weeks, mean HC 8.6 cm. Mean BPD 2.4 cm, mean FOD 3.0 cm, and Cephal index 80%.

In the gestational age group 13.1–14 weeks, Mean HC 9.5 cm, Mean B.PD 2.8 cm, Mean FOD 3.5 cm, and Cepatic index 80%.

About 82% of cases had normal biometric parameters, while 12% had small for gestational age and 6% had large for gestational age [Tables 1-3].

CONCLUSION

- BPD is a measurement that can be obtained with great consistency and accuracy.
- It has proved its efficacy in the estimation of gestational age of fetus and is expected to help the obstetrician in making obstetric decision and with refinement in technique and using other biometric parameters with BPD is likely to reduce iatrogenic prematurity which, in turn, would reduce prenatal mortality.
- The transition between first and second trimester is also the appropriate time to make the transition from CRL to BPD, FOD, HC, AC, and FL.
- Growth rate of fetal BPD decreases gradually as the fetus increases in size.
- For better results, one should also take serial measurements of BPD to evaluate the continuous fetal growth and ideal time of intervention should be guided by clinical judgment along with ultrasonographic findings, because BPD alone is not reliable in the case of IUGR, especially in symmetrical variety.
- The use of multiple parameters reduces to effect of outliers caused by biologic phenomena (i.e. congenital anomalies or growth variation) or technical error in the measurement of a single structure.

REFERENCES

- Green JJ, Hobbins JC. Abdominal ultrasound examination of the 1st trimester fetus. *Am J Obstet Gynecol* 1988;159:165-75.
- Schmidt W, Kubli F. Early diagnosis of severe congenital malformation by ultrasonography. *J Perinat Med* 1982;10:233-41.
- Johnson A, Losure TA, Weiner S. Early diagnosis of anencephaly. *J Clin Ultrasound* 1985;13:503-5.
- Rottem S, Bronshtein M, Thaler I, Bronders JM. 1st trimester transvaginal sonographic diagnosis of fetal anomalies. *Lancet* 1989;1:444-5.
- Kennedy KA, Flick FJ, Thurmond AS. 1st trimester diagnosis of exencephaly. *Am J Obstet Gynecol* 1990;162:461-3.
- Eze CU, Ene DC, Abonyi LC, Omiyi DO. Normal value of cephalic index and craniotypes: A pilot sonographic cephalometric survey of pregnant women of Yoruba ethnic origin in Lagos, southwest Nigeria. *S Afr Radiogr* 2018;56:26-31.
- Johnson SP, Sebire NJ, Snijders RJ, Tunkel S, Nicolaides KH. Ultrasound screening for anencephaly at 10-14 weeks of gestation. *Ultrasound Obstet Gynecol* 1997;9:14-6.
- Lin Y, Chang F, Liu C. Anatomical detection of hydraencephaly at 12 weeks of menstrual age. *J Clin Ultrasound* 1992;20:62-4.
- Blaas HG, Eik-Nes SH, Kiserud T, Hellevik LR. Early development of the hindbrain: A longitudinal ultrasound study from 7 to 12 weeks of gestation. *Ultrasound Obstet Gynecol* 1994;5:151-60.
- Alexander GR, de Canus F, Husley TC, Tompkins ME, Allen M. Validity of postnatal assessment of gestational age: A comparison of the method of Ballard *et al.* and early ultrasonography. *Am J Obstet Gynecol* 1992;166:891.
- American Institute of Ultrasound in Medicine Bioeffects Committee. Bioeffects considerations for the safety of diagnostic ultrasound. *J Ultrasound Med* 1988;7 Suppl 9:S1-38.
- Barker DJ. The long-term outcome of retarded fetal growth. *Clin Obstet Gynecol* 1997;40:853-63.
- Cnattingius S, Haglund B, Kramer MS. Differences in late fetal death rates in association with determinants of small for gestational age fetuses: Population based cohort study. *BMJ* 1998;316:1483-7.

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14. Cohen B, Penning S, Major C, Ansley D, Porto M, Garite T. Sonographic prediction of shoulder dystocia in infants of diabetic mothers. *Obstet Gynecol* 1996;88:10-3.
15. Cullen MT, Green J, Whetham J, Salafia C, Gabrilli S, Hobbins JC. Transvaginal ultrasonographic detection of congenital anomalies in the 1st trimester. *Am J Obstet Gynecol* 1990;163:466-76.
16. Doubilet PM, Greens RA. Improved prediction of gestational age from fetal head measurements. *AJR Am J Roentgenol* 1984;142:797.
17. Morken NH, Kallen K, Jacobsson B. Fetal growth and onset of delivery: A nationwide population-based study of preterm infants. *Am J Obstet Gynecol* 2006;195:154-61.
18. NHS Choices. Alcohol and Pregnancy; 2008.
19. O'Connor AR, Steward CE, Singh J, Fielder AR. Do infants of birth weight less than 1500 g require additional long term ophthalmic follow up? *Br J Ophthalmol* 2006;90:451-5.
20. Ohanyido FO. Basic sonology for doctors in low income settings. *Healthquest* 2005;3:23.
21. Paspulati RM. Ultrasound pregnancy dating. *Radiol Clin North Am* 2004;42:297.
22. Pretorius DH, Nelson TR. Fetal face visualization using three-dimensional ultrasonography. *J Ultrasound Med* 1995;14:349-56.
23. Retionapathy of Prematurity UK Guideline, Royal College of Ophthalmologists; 2007.
24. Sallout B, Walker M. The fetalorigin of adult diseases. *J Obstet Gynaecol* 2003;23:555-60.
25. Salvensen KA, Bakketeig LS, Eik-Nes SH, Undheim IO, Okland O. Routine ultrasonography in utero and school performance at age 8-9 years. *Lancet* 1992;339:85-9.

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