Original Research Article

Efficacy of fetaltranscerebellar diameter in gestational age estimation in singleton gestations by ultrasonography in second and third trimester of pregnancy

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Abstract

Background: In present era of nuclear family, everyone expects to have a healthy normal baby. Accurate gestational age estimation is important in proper obstetrics case management. As commonly used sonographicfetal parameters are less reliable, there is need for more reliable parameter for accurate gestational age estimation. TCD is an emerging alternative marker for gestational age estimation. **Objective:** This study was conducted to ascertain the efficacy of fetaltranscerebellar diameter in gestational age estimation in singleton gestations by ultrasonography in second and third trimester of pregnancy. **Materials and Methods:** This is a prospective cross sectionalstudy carried out in 102 normal singleton gestations in theperiod of 15 to 35 weeks. Fetal transverse cerebellar diameter (TCD) was measured in millimetres. Gestational age in weeks based on LMP is considered for comparison with TCD. **Results:** We observed a linear correlation between transversecerebellar diameter and gestational age. **Conclusion:** TCD can be used as a reliable and accurate biometric parameter for fetal gestational ageestimation in second and third trimesters.TCD alone can also be the strong predictor of gestational age.

Key Words: Gestational age, transversecerebellar, fetal, preterm delivery, weight

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INTRODUCTION

Accurate gestational age estimation is important in obstetrics as an error in estimation of gestational age is associated with preterm delivery, low birth weight and post maturity and higher perinatal mortality/ perinatal morbidity. So, precise determination of gestational age antenatally and objective knowledge of the expected date of delivery (EDD) is necessary for management of pregnancies. In contemporary obstetric practice the most effective way for assessment of gestational age is by sonography, especially during the first half of pregnancy and also detailed assessment of foetal anatomy, detection of major congenital anomalies, fetal growth and wellbeing, all have become possible due to the availability of ultrasound.[1,2,3] One of the most common indications for obstetric sonography is related to uncertain gestational age. Several sonographicbiometric parameters are used for gestational age estimation, commonly used sonographicfetal parameters includes, crown - rump length (CRL), biparietal diameter (BPD), head circumference (HC), femur length (FL), and abdominal circumference (AC)[4]. Sonographicfetal biometry is reliable in first two trimesters. However, in third trimester, no single parameter is reliable in estimating accurate gestational age, as each of them got a discrepancy of more than 3 weeks and its reliability diminishes as the gestation advances. Other parameters

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which may be used are, length of humerus, binocular distance and trans-cerebellar diameter (TCD). TCD is an emerging alternative marker for gestational age estimation. The present study was undertaken to evaluate the usefulness of transcerebellar diameter by ultrasonography in gestational age estimation in second and third trimester of normal pregnancy with gestational age of 15-35 weeks.

MATERIAL AND METHODS

Study design: The design of this study was to hospital based prospective cohort study over a period of 6 months.

Source of data: To study 102 antenatal cases of gestational age 15-35 weeks as assessed clinically and by conventional ultrasound parameters. The study was done after approval by the ethical committee of our institution and consent was taken from all the patients before USG examination.

Data collection method: Study was conducted in the Department of Radiodiagnosis, Kannur Medical College, Kerala after obtaining Institutional Human Ethical Committee approval.102 pregnant women of gestational age 15-35 weeks referred to the department were included in the study. The method of study consists of sonographic estimation of gestational age by transcerebellar diameter (TCD) measurement. TCD was measured with 3.5 MHz convex array transducer using GE S8 ultrasound system. Best view of cerebellum is obtained by rotating the transducer in the axial plane centered on the thalamus to show the cerebellum, the cistern magna and the cavum septum pellucidi. The cerebellum characteristically appears as two lobules on either side of the midline in the posterior cranial fossa. The widest diameter of the cerebellum was measured by placing caliperfrom outer to outer margin. All the TCD were recorded in millimetres. Trans-cerebellar diameter was correlated with gestational age calculated based on LMP.

Inclusion Criteria

- Singleton pregnancies of 15 and 35 weeks gestation.
- Women with optimal menstrual history-Known last menstrual period (LMP).

Exclusion Criteria

- Women who are unsure about their LMP.
- Women whose gestational age estimation was not done before 12 weeks by ultrasonography using CRL.
- Women who are showing discrepancy of more than 1 week between gestational age based on LMP and based on first trimester USG.
- IUGR fetus and fetus with anomalies.
- Women with systemic disorders or obstetric disorders

Statistical analysis: The data was expressed in number and percentage. Microsoft excel 2007 used to calculate percentage. Non parametric test applied to find the significant difference between the groups.

RESULTS

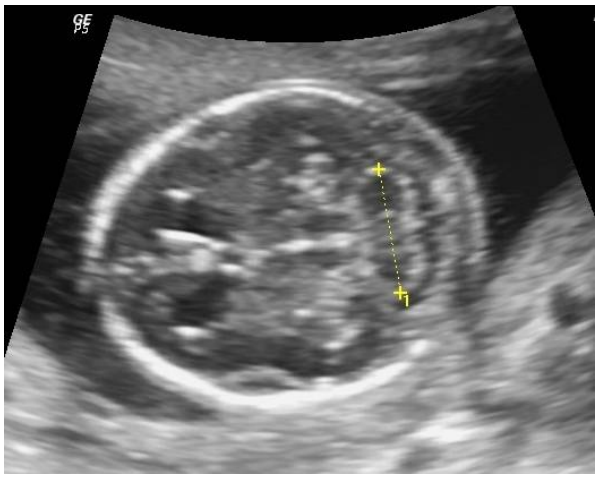

Figure 1: Image depicting sonographic measurement of fetal trans-cerebellar diameter

Table 1: Distribution of patients based on the gestational age

Gestational age (Weeks)	Number	Percentage (%)
15	4	3.92
16	3	2.94
17	4	3.92
18	5	4.90
19	4	3.92
20	6	5.88
21	7	6.86
22	7	6.86
23	5	4.90
24	3	2.94
25	3	2.94
26	4	3.92
27	4	3.92
28	5	4.90
29	4	3.92
30	5	4.90
31	4	3.92
32	6	5.88
33	5	4.90
34	7	6.86
35	7	6.86
Total	**102**	**100.00**

Table 2: Correlation of gestational age with Fetal trans-cerebellar diameter

Gestational age (Weeks)	Fetal trans-cerebellar diameter (mm) (MEAN±SD)
15	14.45±0.85
16	15.12±0.34
17	16.78±1.34
18	18.03±0.92
19	19.34±1.45
20	20.56±0.34
21	20.89±1.45
22	21.45±0.95
23	22.78±0.34
24	23.94±1.12
25	24.02±0.18
26	26.18±1.01
27	28.43±0.45
28	29.01±1.34
29	30.45±0.92
30	32.84±1.34
31	33.97±0.19
32	35.78±1.43
33	36.18±0.12
34	37.56±0.56
35	38.93±1.45

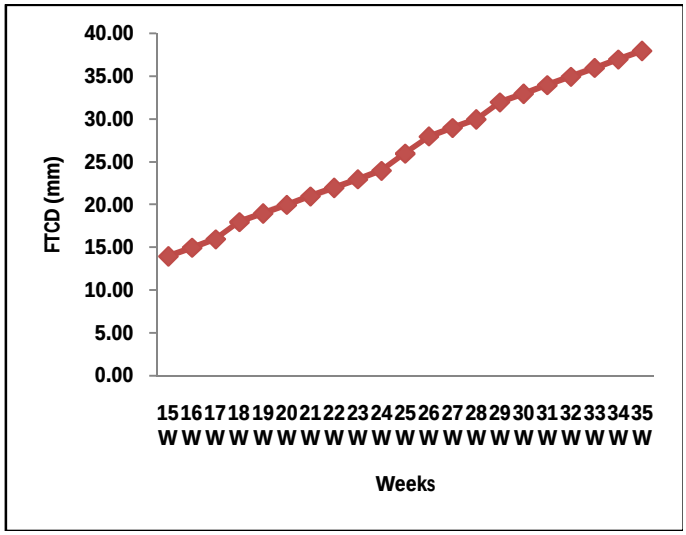

Figure 2: Leaner relationship between the gestational age with FTCD

Total 102 patients were included in the study. 21, 34 and 35 weeks of gestational age had 7 patients each (Table-1). Positive correlation was observed with correlation of gestational age with FTCD. The study results showed as weeks increases the diameter of FTCD also increased (Table-2 and Graph-1).

DISCUSSION

In present era of nuclear family, everyone expects to have a healthy normal baby. Precise knowledge of gestational age is very essential for optimal management in obstetric management of pregnancies.[1,4,5] Higher perinatal mortality has been reported in patients whose expected date of delivery is not known. Wrong assessment of gestational age can result in prematurity or post maturity. Proper assessment of fetal maturity is important for obstetrician to decide the timing and method of delivery, especially in high risk pregnancies like fetal distress, pregnancy induced hypertension, diabetes and Rh incompatibility diseases. The methods used to estimate gestational age (GA) and predict the expected date of delivery are menstrual history, clinical examination, perception of fetal movement and Nagele's rule[3],. Naegele's rule, a well accepted method for estimating date of delivery, depends only on date of LMP, i.e. EDD as 280 days or 40 weeks from the first day of the LMP. It has some problems as many patient may fail to recall exact LMP and potential error from faulty memory and many of the patients are unaware of the date of their last menstrual cycle.[1,5] And also in woman with irregular menstrual cycles and abnormal bleeding events, conception in the first ovulatory cycle after a recent delivery, substantial miscalculations may occur.[1,3,5] In such situations the clinician is in dilemma and feels the need for some simple reliable means to estimate correct gestational age. Sonographic biometric parameters are helpful in determination of gestational age where correct LMP is not known. However, these parameters have some limitations. BPD and HC are unreliable in case of moulding of foetal head in third trimester leading to distortion of skull shape.[1,5] AC is more related to growth than to gestational age.[1] Similarly, femur length is shortened in cases of achondroplasia, short femur syndrome and other dysplasias.[5] Also the variability in assessing the gestational age with these parameters goes on increasing with increasing gestational age.[3] So these parameters are limited for clinical usefulness in establishing gestational age especially in late pregnancy. So, in addition to the currently used biometric parameters, transcerebellar diameter can be used.

Transcerebellar diameter (TCD) is a more simple, accurate, independent, reliable and consistently superior predictor of gestational age in normal and as well as in IUGR foetuses.[1,5,6] From second trimester onwards, it grows with a linear correlation with gestational age.(5) TCD has strong correlation with gestational age.[1,7,8,9] TCD was found to be a reliable predictor of gestational age in the third trimester.[5,8,9]. It withstands deformation by external compression as because it is surrounded by dense petrous bone.[5] The cerebellum is the least affected parameter maintaining its size even in case of severe IUGR and macrosomia.[1,5,10] It is superior to other biometric parameters as it is not affected in many disorders like abnormal skull shapes, multiple

pregnancies and large for date foetuses[1,11]. TCD is easy to obtain even in occipito- posterior positions[1,11]. TCD better correlates with gestational age than BPD[1,12]. TCD can reliably be used in cases of achondroplasia where femur length is unreliable. Hence more accurate estimation of fetal gestational age can be done with TCD measurement, compared to other routine parameters. In the positive correlation the age showed 98% with FTCD, it was statistically significant ($p<0.05$). The present study was correlated with other studies. It was observed that most of the studies showed positive correlation compared age with FTCD. Our study also showed 95% positive correlation at 95% confidence interval. In our study we observed a linear relationship between TCD and gestational age indicating the reliability in the estimation of gestational age and monitoring fetal growth. Our findings are consistent with findings in previous studies. We recommend that TCD be used as an important sonographic biometricparameter in fetuses for accurate prediction of GA. The normal foetus transverse cerebellar diameter increases with advancing age.TCD has a predictive accuracy of 96.9% with a standard error of 0.45 at 15days.

CONCLUSION

We observed that there is a linear relationship between TCD and fetalgestational age between 15 to 35 weeks of normal singletons gestations. The relation between TCD and gestationalage based on LMP was well correlated. Transcerebellar measurements throughout pregnancy allow gestational age estimation independent of the shape of fetal head and TCD alone can also be the strong predictor of gestational age. Hence, TCD can be used as a reliable and accurate biometric parameter for fetal gestational age in second and third trimesters. We recommend the use of TCD routinely in estimating gestational age of the foetuses.

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