



ROLE OF ULTRASONOGRAPHY IN EVALUATION OF GESTATIONAL AGE BY TRANSVERSE CEREBELLAR DIAMETER AND ITS RELATION TO INTRAUTERINE GROWTH RETARDATION

Radiology

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ABSTRACT

Background: Fetal gestational age (GA) measurement is a crucial aspect of obstetric USG. A successful pregnancy outcome and the best prenatal care depend on an understanding of fetal GA. TCD is an additional measure for estimating GA in fetuses with growth restriction. **Methods:** This study was conducted at SAIMS Medical College, Indore, over a period of one year from September 2022 to February 2024. Eighty pregnant women in the third trimester of a singleton pregnancy were examined in order to measure TCD. Of these, 40 had known cases of IUGR and 40 had fetus that were appropriate for their gestational age. **Results:** There was no discernible difference in the TCD of IUGR and AGA fetuses, and the correlation coefficient between TCD and gestational age was found to be statistically significant. **Conclusions:** TCD measurement can be used as a more reliable parameter for more accurate gestational age estimation in the third trimester of IUGR fetuses.

KEYWORDS

Gestational age, Ultrasonography, Intrauterine growth restriction, pregnancy, Transverse cerebellar diameter

INTRODUCTION

Many clinical decisions during pregnancy are based on gestational age, so accurate dating of pregnancy is crucial to the management of the obstetric patient. An integral component of obstetric ultrasound (USG) is the measurement of the fetal gestational age (GA). Proper understanding of fetal GA is essential for the best prenatal care and a fruitful pregnancy outcome. [1]

TCD, or transverse cerebellar diameter, is a novel measurement for gestational age. Because the occipital bone in the posterior cranial fossa and dense petrous ridges surround it, the cerebellum is resistant to deformation brought on by external pressure. [2,3]

When assessing GA, TCD measurement is very accurate, particularly when the last menstrual period (LMP) is unknown. [4]

Transcerebellar diameter (TCD) is a useful parameter for the estimation of GA in growth restricted fetuses, as all these parameters are influenced by fetal growth disorders and fetal position. The fifth week of prenatal life marks the beginning of the fetal cerebellum's development, which continues throughout the gestational period. [5]

At every developmental stage, USG can precisely measure the maximum diameter of this transverse organ. Because it is situated in a thick bony fossa, it is less susceptible to deformation from external compression.

Changes in fetal growth, such as those caused by IUGR and macrosomia, have no effect on it. [6] TCD is a recent sonographic parameter that is said to be more accurate in specific scenarios, such as extreme growth abnormalities and variations in the shape of the fetal head, such as brachycephaly and dolicocephaly. [7]

The purpose of the current study was to evaluate TCD as a predictor for GA assessment in third trimester IUGR fetus. The objective of this study was to evaluate the utility of ultrasonography in assessing the relationship between intrauterine growth retardation and gestational age as determined by transverse cerebellar diameter.

MATERIAL & METHODS

This cross-sectional analytical study was conducted at SAIMS Medical College, Indore over a period of one year from September 2022 to February 2024. For the purpose of measuring TCD, a total of 80 pregnant women in the third trimester of a singleton pregnancy were examined. Of these, 40 had fetuses that were adequate for their gestational age and 40 had known cases of IUGR.

The last menstrual period (LMP) was used to determine the gestational period. A 4 week difference between the clinical examination and

gestational age was considered IUGR evidence. Exclusions from the study included multiple gestations, polyhydramnios, transverse and oblique lies, and incorrect or unclear dates. Every patient had their fundal height measured in centimeters before undergoing ultrasonography.

In the third trimester, between 32 and 40 weeks of gestation, both groups had USG scans with a confirmed date of LMP. In addition to other conventional parameters for GA estimation, TCD was measured. Using thalami and cavum septum pellucidum, the fetal cerebellum was identified in the transverse view of the posterior cranial fossa. The cerebellum, which resembles a butterfly, was then viewed by rotating the transducer beneath the thalamic plane.

From outer-to-outer margin in widest transverse diameter, the TCD was measured in millimeters. By using an expanded new Ballard score in the post-natal newborn assessment, the actual gestational age was verified. Ethical clearance was taken from Institute's Ethical committee before the commencement of study and written informed consent was obtained from all the study.

Statistical Analysis

The mean was used to summarize continuous variables, and the t test was used to analyze the standard deviation. The Pearson correlation coefficient was used to determine the correlation between two variables. We considered a p-value of less than 0.05 to be statistically significant. The statistical program Epi info version 7.2.1.0 was used for all of the analysis.

RESULTS

In all, 40 cases of IUGR and 40 cases that were appropriate for gestational age were included in the study. In every instance, USG measured TCD in millimeters in addition to other variables.

In both Normal and IUGR subjects, a strong positive correlation with a similar correlation coefficient at $p < 0.001$ was noted between TCD and Gestation age (Table 1).

Table 1: Correlation Between TCD And Gestational Age In Normal And IUGR Subjects.

Variable	Normal	IUGR
Correlation coefficient (r)	0.625	0.759
P-value	<0.001 (sig)	<0.001(sig)
TCD: Trans-cerebellar diameter; IUGR: Intra uterine growth retardation.		

A comparison was made between the mean TCD of IUGR and normal subjects. When all 40 subjects were analyzed in both groups, the mean TCD did not reveal any statistically significant differences between the

two groups. TCD was not significant different at the maximum gestational age when it was examined at various gestational ages in both groups (Table 2). Due to the lack of variation in TCD between IUGR and normal fetuses, it can be concluded that gestational age can be predicted using TCD regardless of fetal growth restriction. (Table 2)

Table 2: Mean TCD Comparison In Normal And IUGR New-borns.

Gestational age	Normal (n=40) Mean±SD	IUGR (n=40) Mean±SD	P-value
32 weeks	36.8±0.99	33.9±1.15	0.016* (Sig)
33 weeks	39.7±1.35	35.4±1.02	0.033* (Sig)
34 weeks	41.03±1.51	37.3±0.83	0.035* (Sig)
35 weeks	45.62		-
36 weeks	43.01±2.34	40.72±1.85	0.141
37 weeks	43.09±2.07	41.34±5.04	0.642
38 weeks	44.69±2.52	44.17±2.01	0.430
39 weeks	45.1±0	44.57±1.13	0.406
40 weeks	45.04±2.68	44.69±2.85	0.303
Overall	43.08±3.12	42.18±4.08	0.271

DISCUSSION

The use of TCD to estimate gestational age has been documented in a number of studies. TCD was examined in both IUGR and normal fetuses in the current study. Regarding the importance of TCD measurement in fetuses with unclear GA and fetal growth restrictions, conflicting results have been documented. The current study demonstrated that TCD increases linearly with gestational age in both IUGR and normal fetuses, and that TCD measurements of IUGR and normal fetuses at the same gestational age do not significantly differ from one another.

Gupta AD et al. concluded that cerebellar growth is unaffected in SGA fetuses and may therefore be useful in predicting gestational age because they found no difference in TCD between fetuses of normal and restricted growth.[8] According to Lee W. et al., TCD measurement can accurately predict GA in situations involving asymmetric growth restriction but not in situations involving symmetric growth restriction. [9] After doing a retrospective analysis on 73 growth-restricted fetuses, Vinkesteyn et al. came to the conclusion that IUGR cases have no effect on TCD. [10] According to Chavez MR et al., TCD measurement is a dependable and accurate method of determining gestational age, even in the most severe cases of growth restriction. [11]

Compared to other biometric parameters, TCD is better because it is unaffected by a wide range of conditions, including large for date fetuses, multiple pregnancies, abnormal skull shapes, and fetal growth retardation. Gestational age was found to be a significant independent predictor of TCD by Goel P et al. [12] In their investigation, Luiz et al. discovered that TCD was more consistent with GA than other biometric measures. [13] In comparison to other fetal biometric parameters, BPD and TCD were found to be superior predictors of GA by Uikey PA et al and Prasad BS et al. [14,15]

Dashottar S. et al. conducted a similar study and discovered that the difference between the estimated and actual gestational age (GA) as determined by TCD was more precise for third trimester >28 weeks as opposed to 16 to 27 weeks of pregnancy. Nevertheless, the overall estimates showed a strong correlation ($r=0.984$) with the actual gestational age, indicating that there was no statistically significant difference between the two. Consequently, this study further supports the idea that TCD in the third trimester of pregnancy was a more accurate indicator of GA in pregnancies with a mix of both normal and IUGR cases. [16] Similar to this study, a number of other investigations have also emphasized the significance of TCD in accurately predicting GA in both IUGR and normal pregnancies. [17,18]

Additionally, the current study demonstrates that there is no discernible difference between the TCD of IUGR and normal fetuses. Therefore, in third trimester IUGR cases, TCD can be used as an independent parameter for GA assessment.

The results of the current study and the studies previously mentioned indicate that TCD can be used as an independent parameter for third trimester GA assessment in IUGR fetuses.

CONCLUSION

Estimating gestational age is a crucial part of prenatal care from the

perspective of the fetus as well as the mother. The current study found no difference in TCD between IUGR and normal fetuses, and a linear relationship between transverse cerebellar diameter and gestational age in both normal and growth retarded fetuses. When there is uncertainty regarding LMP and suspicion of IUGR in the third trimester, TCD may be a useful tool for estimating gestational age.

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