

# Comparative Accuracy of Trans Cerebellar Diameter and Crown Rump Length for Estimation of Gestational Age

Richa Sharma<sup>1,\*</sup>, Natasha Gupta<sup>2</sup>

<sup>1</sup>Department of Obstetrics & Gynecology, University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi, India

<sup>2</sup>Department of Radiology, University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi, India

## Email address:

[gautamdrrichal@gmail.com](mailto:gautamdrrichal@gmail.com) (R. Sharma)

\*Corresponding author

## To cite this article:

Richa Sharma, Natasha Gupta. Comparative Accuracy of Trans Cerebellar Diameter and Crown Rump Length for Estimation of Gestational Age. *International Journal of Medical Imaging*. Vol. 5, No. 3, 2017, pp. 38-41. doi: 10.11648/j.ijmi.20170503.12

Received: April 10, 2017; Accepted: July 13, 2017; Published: August 10, 2017

---

**Abstract:** Many Indian women present for the first antenatal check up in third trimester and most of them have unreliable LMP with no early scans. To compare the predicted accuracy of third trimester transcerebellar diameter and first trimester crown rump length for estimation of gestational age. A cross sectional study was conducted on 198 eligible antenatal women in 3<sup>rd</sup> trimester, having early scans showing CRL. Transcerebellar diameter (TCD) was measured and compared with 1<sup>st</sup> trimester CRL for accurately estimating the gestational age based on LMP. It was found that there is linear rise in TCD along with gestational age and TCD in mm corresponded to the gestational age in weeks. TCD was accurate in 90.6% women between 29 to 31 weeks and then accuracy was increased reaching 94.7% (33+1 to 35 wks) and 93.8% (37+ to 40 wks). The efficacy of 3<sup>rd</sup> trimester TCD is comparable to 1<sup>st</sup> trimester CRL for estimation of gestational age.

**Keywords:** Crown Rump Length, Gestational Age, Transcerebellar Diameter

---

## 1. Introduction

The accurate estimation of gestational age is of great clinical importance to the obstetricians. Some women are not sure of their dates or their LMP cannot be taken into consideration as they may not have regular cycles or had spotting in early weeks or recent usage of hormonal contraceptives. Clinical examination may be incorrect and can be affected by amount of liquor, fetal growth restriction or macrosomia, maternal obesity etc. [1] All women may not have first trimester scan which has good gestational accuracy and fetal biometry in second & third trimester have significant discrepancy.

Wrong estimation of gestational age can lead to unnecessary induction of labour, dysfunctional labour, caesarean section, increased maternal and neonatal morbidity. Unnecessary preterm inductions can also cause neonatal mortality due to consequences of prematurity.

So there is a need of ultrasonographic parameter that can reliably estimate the gestational age at any period and is not altered by any factors. The transcerebellar diameter (TCD)

has been found to be a reliable ultrasound parameter for gestational age estimation by the end of second trimester [2]. Cerebellar growth is not altered in fetal growth restriction and its rate of growth is similar in both singleton or multiple gestation [3]. Fetal cerebellum can be visualized sonographically at 9-10 week, it grows rapidly in second trimester having linear relationship with gestational age. Gestational age in weeks corresponds to TCD in mm [4]. Chavez MR devised TCD normograms and reported that it has 94% predictive accuracy for gestational age in third trimester [5]. Predicted gestational age by TCD is within 5 days for GA 29 – 36 weeks and at 37 weeks is  $\pm 9$  days.

A study was conducted to explore if third trimester TCD is as accurate as first trimester CRL?

## 2. Aim

To compare the predicted accuracy of third trimester transcerebellar diameter and first trimester crown rump length for estimation of gestational age.

### 3. Material and Methods

A cross sectional study was conducted on antenatal women of any age and parity in third trimester (29 - 40 weeks) attending OPD for regular check up and satisfying inclusion criteria. Prior ethical clearance was taken from Institutional ethical committee. Gestational age was calculated from confirmed LMP and CRL, those having discrepancy of more than 2 weeks were excluded.

#### 3.1. Inclusion Criteria

(1) All Women with Confirmed Last Menstrual Period, Regular Cycles and not Used Hormonal Pills 3 Months Prior to Conception

(2) Women Having First Trimester Ultrasound

(3) Low Risk Antenatal Women

(4) Singleton Pregnancy

(5) Women Consenting to Participate in the Study

#### 3.2. Exclusion Criteria

(1) High Risk Pregnancies are Excluded- Hypertensive Disorders, Diabetes, Fetal Growth Restriction, Hydrocephalus, Congenital Anomalies Etc.

(2) Multiple Gestation / Malpresentation / Previous Caesarean Section

Transcerebellar diameter was measured and compared with CRL (measured in first trimester) for estimation of gestational age. TCD was measured by transverse view of fetal intracranium through the posterior fossa that included visualization of midline thalamus, cerebellar hemisphere and cistern magna (Figure. 1, 2, 3). Measurements were taken in mm at 90 degree to the long axis of the cerebellum across its widest point using outer to outer method [5]. TCD and CRL were considered accurate if the discrepancy between them and LMP was within 5 days.

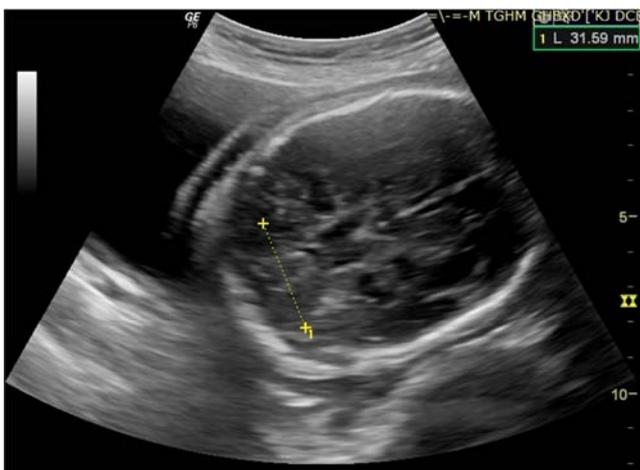


Figure 1. Transcerebellar diameter measurement of a Primigravida at 31 weeks gestation.

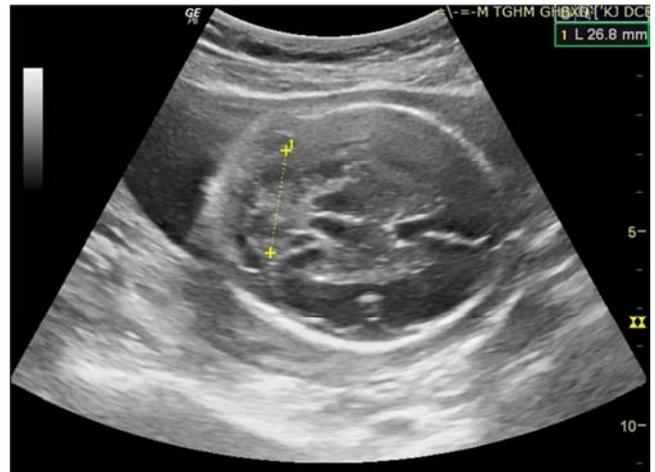


Figure 2. Transcerebellar diameter measurement in another woman at 27 weeks gestation.

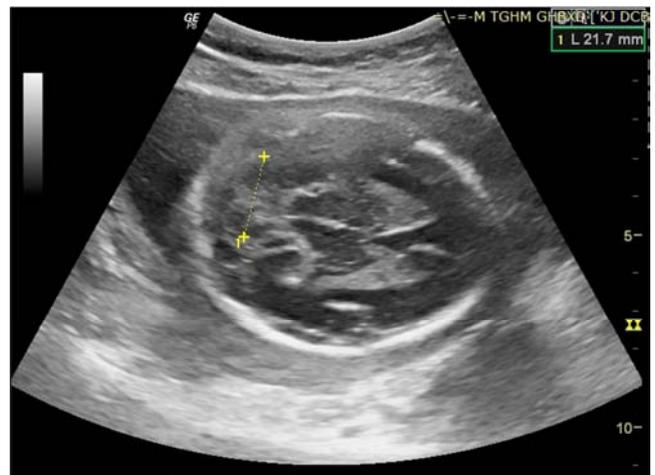


Figure 3. Transcerebellar diameter measurement in G3P2L2 women at 21+5 weeks gestation.

Table 1. Demographic profile.

Age	
20-25	38 (19.1%)
25-30	118(60%)
30-35	26(13.1%)
>35	16(8%)
Parity	
Primigravida	109 (55%)
Multigravida	89(44.9%)
Gestational age (weeks)	
29-30	32 (16.1%)
30+1 -33	40 (20.2%)
33+1 - 35	38 (19.1%)
35+1 - 37	39 (19.6%)
37+1- 40	49 (24.7%)

TCD can be classified into three grades: Grade 1 - is seen up to 27 weeks, cerebellar hemisphere is rounded with absence of echogenicity and poorly developed vermis that gives eyeglass appearance to cerebellum. Grade 2 - is seen from 28 wks to 32 weeks, vermis is prominent and appears as echogenic rectangular tissue and cerebellum has “dumbbell appearance”. Grade 3 - is seen after 32 weeks gestation, hemispheres become triangular or fan shaped and cerebellum

looks more solid than cystic.

Data collected was entered in Statistical Package for social sciences (SPSS) software. Percentage was calculated and chi-square test was applied. P-value 0.005 was taken as significant.

## 4. Results

198 women were enrolled for the study, majority 118 (60%) were 25-30 years of age. Primigravida were 109

(55%) and 89 (44.9%) were multigravida. Women were classified according to their gestational age, calculated by LMP (Table-1).

There was linear rise in TCD along with gestational age and TCD in mm corresponded to the gestational age in weeks. TCD was accurate in 90.6% women and CRL was accurate in 93.7% women between 29 to 31 weeks, which is statistically not significant  $p=0.2$ . TCD accuracy was there after increased reaching 94.7% (33+1 to 35 wks) and 93.8% (37+ to 40 wks). [Table-2].

**Table 2.** Comparison of accuracy between TCD (measured in 3<sup>rd</sup> trimester) and CRL (measured in 1<sup>st</sup> trimester).

Parameters	Gestational age (weeks)				
	29-30	30+1 -33	33+1 – 35	35+1 – 37	37+1– 40
<i>TCD</i>					
Accurate	29(90.6%)	37 (92.5%)	36 (94.7%)	37 (94.8%)	46 (93.8%)
Inaccurate	3 (9.3%)	3 (7.5%)	2 (5.2%)	2 (5.4%)	3 (6.1%)
<i>CRL</i>					
Accurate	30(93.7%)	39 (97.5%)	37(97.3%)	38 (97.4%)	47 (95.9%)
Inaccurate	1 (3.1%)	1 (2.5%)	1 (2.6%)	1 (2.5%)	2 (4.9%)
Total	32	40	38	39	49

## 5. Discussion

Many antenatal women in India report for their first antenatal check up in third trimester with unreliable last menstrual period and no early scan. Decision for induction of labour for any obstetric indication becomes difficult in these women. Various studies reported the better correlation of TCD with gestational age in second and third trimester, its usefulness as growth assessing parameter in comparison with other routine ultrasound parameters. In our study, CRL was used for comparison with TCD. The CRL is most commonly used ultrasound parameter and standard method for gestational age assessment in first trimester which is accurate, and thus compared.

Transcerebellar diameter is an independent ultrasonographic parameter for estimation of gestational age, which could be as reliable as first trimester CRL as depicted in our study.

Fetal cerebellum does not change its form and size due to dense surrounding petrous ridges and occipital bone [7].

Use of TCD between 17 to 40 weeks was studied by Reece et al, they reported it an accurate indicator of gestational age [8]. Malik et al observed TCD and BPD, FL, & AC in 135 women between 26 to 38 weeks. Reported that gestational age measured by TCD was consistently correlated with that measured by BPD, FL & AC. They also found that cerebella in 46%, 25%, 29% were grade I to III respectively, that changed progressively with advancing gestation. The median GA and TCD were 20 wks and 21mm for grade I, 31 wks and 36 mm for grade II and 36 wks and 42 mm for grade III [9]. Martin R et al studied TCD in FGR and large fetuses and reported that predicted gestational age in FGR was within 3 days in 97.5% in 2<sup>nd</sup> trimester and 93.3% in 3<sup>rd</sup> trimester and in large fetuses it was 100% within 3 days in 2<sup>nd</sup> & 3<sup>rd</sup> trimesters. Concordance between actual and predicted GA for FGR fetuses using the singleton TCD normogram was high

(Pearson's correlation,  $r = 0.98$ ;  $P < 0.001$ ). Pearson's correlation coefficient for concordance between actual and predicted GA's in large fetuses was 0.95 ( $P < 0.001$ ) [10]. Naseem et al assessed 228 women at 36 weeks and reported that the accuracy of TCD was 91.7% compared to BPD 77.2%. When they compared the proportion of correct assessment by these parameters was compared by chi-square test, value of chi-square was found to be 10.472a. P value was 0.001, and found to be statistically significant proving the hypothesis that TCD is more reliable method of gestational age estimation in third trimester [11].

To best of our knowledge, Present study is the first one to compare the accuracy of 3<sup>rd</sup> trimester TCD and 1<sup>st</sup> trimester CRL.

## 6. Conclusion

The efficacy of TCD is comparable to CRL (where there may be discrepancy of 5 day) and this knowledge can be utilized with certainty for women with unknown LMP and non availability of early dating scans.

## References

- [1] Shehzad K, Ali M, Zaid S (2006). Fetal biometry. Pak J Med Sci 22:503-508.
- [2] Pinar H, Burke SH, Huang CW, Singer DB, Sung CJ (2002). Reference values for transverse cerebellar diameter throughout gestation. *Pediatr Dev Pathol* 5(5):489-494.
- [3] Goldstein I, Tamir A, Zammer EZ, Itck-Ovitzeldor J (1998). Growth of fetal orbit and lens in normal pregnancies. *Ultrasound Obstet Gynecol* 12(3):87-91.
- [4] Bromley B, Nadel AS, Pauker S, Estroff JA, Benacerraf BR (1994). Closure of the cerebellar vermis: evaluation with second trimester US. *Radiology* 193(3):761-763.

- [5] Chavez MR, Ananth CV, Smulian JC, Yeo L, Oyelese Y, Vintzileo AM (2004). Fetal transcerebellar diameter measurement with particular emphasis in the third trimester: a reliable predictor of gestational age. *Am J Obstet Gynecol* 191:979-984.
- [6] Naseem F, Fatima N, Yasmeen S, Saleem S (2013). Comparison between transcerebellar diameter with biparietal diameter of ultrasound for gestational age measurement in third trimester of pregnancy. *J Coll Physicians Surg Pak* 23(5):322-325.
- [7] Kuklisova M, Aljabar P, Srinivasan L, Counsell SJ, Doria V, Serag A, et al (2011). A dynamic 4D probabilistic atlas of the developing brain. *Neuroimage* 54:2750-2763.
- [8] Reece EA, Goldstein I, Pilu G, Hobbins JC (1987). Fetal cerebellar growth unaffected by intrauterine growth retardation: a new parameter for prenatal diagnosis. *Am J Obstet Gynecol* 157:632-638.
- [9] Malik R, Pandya UK, Shrivastava P (2003). Gestational age estimation using transcerebellar diameter with grading of fetal cerebellum and evaluation of TCD/AC (transcerebellar diameter/abdominal circumference) ratio as a gestational age independent parameter. *Indian J Radiol Imaging* 13:95-110.
- [10] Chavez MR, Ananth CV, Smulian JC, Vintzileos AM (2007). Fetal transcerebellar diameter measurement for prediction of gestational age at the extremes of fetal growth. *J Ultrasound Med* 26 (9):1167-1171.
- [11] Naseem F, Fatima N, Yasmeen S, Saleem S (2013). Comparison between transcerebellar diameter with biparietal diameter of ultrasound for gestational age measurement in third trimester of pregnancy. *J Coll Physicians Surg Pak* 23(5):322-325.