

TO COMPARE ESTIMATION OF GESTATIONAL AGE BY FOETAL TRANSCEREBELLAR DIAMETER WITH BIPARIETAL DIAMETER, FEMUR LENGTH, ABDOMINAL CIRCUMFERENCE, HEAD CIRCUMFERENCE AT DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY AT SMS MEDICAL COLLEGE, JAIPUR

Dr. Samta Solanki¹, Dr. Anusha S², Dr. B S Meena³

¹⁻²Resident Doctor, ³Senior Professor and Head

Department of Obstetrics & Gynaecology, SMS Medical College & Attached Group of Hospitals, Jaipur, Rajasthan

Article Info: Received 04 June 2020; Accepted 28 June 2020

DOI: <https://doi.org/10.32553/ijmbs.v4i6.1255>

Corresponding author: Dr. Anusha S

Conflict of interest: No conflict of interest.

Abstract

Background: Ultrasonographic assessment of gestational age by using different foetal parameter such as BPD, FL, AC are highly reliable in first and second trimester in pregnancy. In third trimester reliability of any single parameter has limitations.

Methods: This was a hospital based comparative cross-sectional study done in the Department of Obstetrics and Gynaecology, S.M.S. Medical College and attached hospitals, Jaipur, Rajasthan. The period of study was from June 2018 to October 2019.

Results: The mean TCD at 15 weeks and 40 weeks was 15.00 ± 0.00 mm and 53.33 ± 1.155 mm respectively. The mean BPD at 16 weeks and 40 weeks was 33.50 ± 0.70 mm and 93 ± 1.528 mm respectively. The mean HC at 15 weeks and 40 weeks was 111.00 ± 1.41 mm and 340 ± 2.00 mm respectively. The mean FL at 15 weeks and 40 weeks was 18.50 ± 0.70 mm and 77.67 ± 1.528 mm respectively. The mean AC at 15 weeks and 40 weeks was 99.00 ± 1.41 mm and 365.33 ± 8.32 mm respectively.

Conclusion: We conclude that foetal transcerebellar diameter can thus be used as an alternative foetal parameter to assess gestational age and can be used in cases of wrong dates or when other routine parameters are not conclusive or did not accurately predict gestational age for e.g. in cases of hydrocephalus, brachycephaly, dolicocephaly, intrauterine growth restriction, achondroplasia or short limb dwarfism.

Keywords: Gestational age, Linear regression, BPD

Introduction

Ultrasonographic assessment of gestational age by using different foetal parameter such as BPD, FL, AC are highly reliable in first and second trimester in pregnancy. In third trimester reliability of any single parameter has limitations.^{1,2}

Many women who come irregularly for their antenatal check up, and are not sure of LMP and also do not possess early dating scan, poses difficulties in accurate calculation of gestational age.³

Recently the evaluation of posterior fossa of the fetal cranium has been accepted as part of routine obstetrics ultrasonographic examination and therefore, can predict fetal gestational age.

Transcerebellar diameter (TCD) is the maximum transverse diameter of the fetal cerebellum. The fetal cerebellar hemispheres are located in the posterior cranial fossa surrounded by dense petrous ridges making it resistant to extent pressure and growth deviations.⁴

It has been well documented and demonstrated that in pathological alteration in foetal growth pathway due to macrosomia or IUGR, there is no alteration in the cerebellar blood flow making the TCD well preserved. Even changes in vault development due to external pressure did not alter TCD. Therefore TCD appears to be the most reliable age independent biometric parameter in the evaluation of true gestational age.⁵

Materials and Methods

Study Design:

This was a hospital based comparative cross-sectional study done in the Department of Obstetrics and Gynaecology, S.M.S. Medical College and attached hospitals, Jaipur, Rajasthan.

Study period:

The period of study was from June 2018 to October 2019, (after taking the approval from Institutional Review Board and Ethical committee).

Study Population

100 pregnant women between 15 weeks to 40 weeks of gestation and who were willing to be enrolled in the study were included in the study after applying inclusion and exclusion criteria and obtaining written informed consent. As the study was cross sectional in design, only one measurement was considered for women having multiple visits.

Inclusion Criteria

- All women with singleton viable pregnancy in the Second & third trimester (15 to 40 weeks) and willing to participate in study.
- Patient who are sure of their LMP with H/o regular menstrual cycles.

Exclusion Criteria

- Suspected IUGR fetus.
- Anomalous fetus.
- Multiple gestations.
- Pregnant woman with medical disorders.
- Use of contraception in last 3 months
- History of abortion in last 3 months
- History of lactational amenorrhea

The study would comprise of pregnant women attending ANC clinic in Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur in second and third trimester of pregnancy.

After taking written and informed consent they were clinically evaluated.

Detailed clinical history and examination was done.

Routine blood investigations was done.

By detailed history and examination, foetal gestational age was estimated separately from LMP.

All patients were subjected to USG for estimation of GA by FL, BPD, AC and TCD (TCD measure on USG in suboccipitobragmatic plane).

Table 2: Mean Value and SD of Biparital Diameter (BPD), Femur Length, Abdominal Circumference (AC), Head Circumference (HC), Transcerebellar Diameter (TCD) from 15-40 weeks of Gestation

GA	N	bpd (mm)	Femur Length (mm)	AC (mm)	HC (mm)	TCD (mm)	
15	Mean	2	33.50	18.50	99.00	111.00	15.00
	SD		.707	.707	1.414	1.414	0.000
16	Mean	1	36.00	20.00	108.00	125.70	16.00
	SD		0.00	0.00	0.00	0.00	0.00
17	Mean	4	38.00	25.00	114.75	135.90	16.75
	SD		2.000	1.414	6.131	5.714	.500
18	Mean	3	42.33	27.00	131.67	151.57	18.00
	SD		.577	1.000	2.082	1.986	0.000
19	Mean	8	44.63	30.88	103.38	153.45	19.38
	SD		3.662	3.907	52.216	15.843	1.598
20	Mean	5	46.40	30.80	147.60	168.06	20.40

Estimation of gestational age from LMP was considered for comparison to gestational age calculated from TCD and other sonographic parameter.

Statistical Analysis

Descriptive and Inferential statistical analysis has been carried out in the present study using computer software (SPSS Trial version 23 and primer). The qualitative data were expressed in proportion and percentages and the quantitative data expressed as mean and standard deviations. Correlation between quantitative outcomes was assessed using Pearson correlation coefficient. Significance level for tests were determined as 95% ($P < 0.05$).

Results

The present study was conducted in the Department of Obstetrics and Gynaecology, S.M.S. Medical College and attached hospitals, Jaipur. 100 pregnant women with singleton pregnancy, between 15 to 40 weeks of gestation were included in the study after obtaining informed written consent.

Foetal Transcerebellar diameter, BPD, HC, AC and FL were measured in millimeter by performing transabdominal ultrasound scan.

Table 1: Distribution of women according to Age

Age (Years)	Number	Percentage %
19 to 29	83	83
30 to 40	17	17
Total	100	100
Mean \pm SD	25.24 \pm 4.12	
Min to max	19 to 35	

Above table shows distribution of pregnant women according to their age. Majority of the women (83%) were between 19 to 29 years. 17% of the women were between 30 to 40 years. Maternal age ranged from 19 to 35 years with mean age of 25.24 \pm 4.12 years.

	SD		3.130	1.304	7.537	7.371	1.342
21	Mean	4	51.75	34.00	133.00	181.25	21.75
	SD		3.686	1.826	60.986	23.624	.957
22	Mean	3	55.00	37.67	169.67	193.07	22.33
	SD		2.646	1.155	10.017	8.891	1.528
23	Mean	3	56.33	40.67	175.00	198.80	23.67
	SD		2.082	1.528	2.000	12.179	.577
24	Mean	2	53.00	43.00	177.50	223.60	24.50
	SD		2.26	1.30	2.48	16.4	0.506
25	Mean	3	64.00	46.67	199.67	223.67	26.33
	SD		3.464	2.309	4.163	3.215	.577
26	Mean	3	66.67	48.00	206.67	235.03	30.33
	SD		2.082	2.000	1.528	12.291	2.082
27	Mean	4	69.50	49.63	217.50	255.00	31.50
	SD		1.000	.479	7.681	2.449	1.732
28	Mean	3	71.00	49.33	228.67	259.33	31.67
	SD		3.606	4.163	9.292	4.933	2.517
29	Mean	2	75.00	54.50	248.00	267.45	33.50
	SD		1.414	.707	5.657	2.758	.707
30	Mean	4	78.75	58.75	257.50	281.73	36.00
	SD		1.258	1.258	12.477	13.690	.816
31	Mean	3	79.50	62.25	272.75	293.85	38.50
	SD		1.915	3.775	2.062	10.038	3.786
32	Mean	3	83.00	62.00	277.67	299.00	39.33
	SD		1.000	3.000	32.005	2.646	1.155
33	Mean	1	81.00	67.00	312.00	341.00	44.00
	SD		0.00	0.00	0.00	0.00	0.00
34	Mean	10	84.20	65.40	293.80	317.64	46.30
	SD		2.150	2.875	11.612	15.248	5.293
35	Mean	5	87.60	68.00	301.40	330.56	43.60
	SD		2.191	1.871	14.639	11.424	2.074
36	Mean	9	88.78	66.89	319.33	332.40	48.11
	SD		3.930	5.968	21.972	29.611	6.071
37	Mean	2	89.00	72.00	299.00	319.00	54.50
	SD		1.414	0.000	29.698	5.657	4.950
38	Mean	6	88.33	72.33	311.33	320.83	48.00
	SD		3.386	2.582	44.410	11.923	1.095
39	Mean	3	86.33	71.67	319.33	319.33	48.33
	SD		6.429	5.508	35.233	27.062	4.509
40	Mean	3	93.67	77.67	365.33	340.00	53.33
	SD		1.528	1.528	8.327	2.000	1.155
Total	Mean	100	69.21	51.75	228.76	253.95	34.12
	SD		19.252	17.568	86.666	74.208	13.089

Table shows the mean values and S D of foetal transcerebellar (TCD), Biparietal diameter (BPD), Head circumference (HC), Femur length (FL), Abdominal circumference (AC) from 15-40 weeks of gestation.

The mean TCD at 15 weeks and 40 weeks was 15.00 ± 0.00 mm and 53.33 ± 1.155 mm respectively. The mean BPD at 16 weeks and 40 weeks was 33.50 ± 0.70 mm and 93 ± 1.528 mm respectively. The mean HC at 15 weeks and 40 weeks was 111.00 ± 1.41 mm and 340 ± 2.00 mm respectively. The mean FL at 15 weeks and 40 weeks was 18.50 ± 0.70 mm and 77.67 ± 1.528 mm respectively. The mean AC at 15 weeks and 40 weeks was 99.00 ± 1.41 mm and 365.33 ± 8.32 mm respectively. When plotted a graph showed linear relationship with gestational age.

Discussion

The mean sonographic transcerebellar diameter at 15 weeks is 15 ± 0.00 mm and mean sonographic transcerebellar diameter at 40 week of gestation is 53.33 ± 1.15 in our study. Mean TCD in our study (34.12 ± 13.089) was higher then (33.09 ± 12.5) observed in R Nagesh et al 2016.⁶

Mean gestational age (by LMP) in our study (28.41 ± 7.478 weeks) was higher than (27.64 ± 7.3 weeks) observed in R Nagesh et al 2016⁶

Simple linear regression analysis shows a strongly significant linear relationship between transcerebellar diameter and gestational age (graph) with high degree of correlation coefficient ($r = 0.945$ and $p < 0.001$).

Gestational age (weeks) = $1.6386 \times \text{transcerebellar diameter (mm)} - 12.1779$

The result of our study is consistent with other studies done in the past. Sumanta Kumar Mandal et al 2019⁷ in their study shows a linear relationship between transcerebellar diameter and gestational age with high degree of correlation ($r=0.990$). Y, Chauhan et al 2018⁸, had found r to be 0.989, R Nagesh et al 2016⁶, had found r to be 0.992. From our study and other studies done in past we can conclude that the ultrasonographic measurement of transcerebellar diameter is a reliable indicator of gestational age.

Conclusion

We conclude that foetal transcerebellar diameter can thus be used as an alternative foetal parameter to assess gestational age and can be used in cases of wrong dates or when other routine parameters are not conclusive or did not accurately predict gestational age for e.g. in cases of hydrocephalus, brachycephaly, dolicocephaly, intrauterine growth restriction, achondroplasia or short limb dwarfism.

References

1. Platt LD, Queenan JT, Hobbins JC, Spong CY, editors. Protocols for high risk pregnancies Assessment of gestational age. Oxford. Wiley-Blackwell; 2005 P: 64-8.
2. Chavez MR, Anath CV, SmulianJC, Yeo L, Oyelese Y, Vintzileo AM. Fetal transcerebellar diameter measurement with particular emphasis in the third trimester: a reliable predictor of gestational age. *Am J ObstetGynecol*; 2004; 191: 979-84.
3. Dewhurst CJ, Beazley JM, Campbell S. Assessment of foetal maturity and dysmaturity. *American Journal of Obstetrics and Gynaecology*. 1972; 113: 141-49.
4. White LJ, Lee SJ, Stepniewska K, Simpson JA, Dwell SL, Arunjerdja R, et al. Estimation of gestational age from fundal height: a solution for resource-poor settings. *J R Soc Interface*. 2012;9(68):503–10. 10.1098/rsif.2011.0376
5. Rebecca E. Rosenberg, A.S.M. Nawshad U. Ahmed, Saifuddin Ahmed, Samir K. Saha, M.A.K. Azad Chowdhury, Robert E. Black, Mathuram Santosham, Gary L. Darmstadt. Determining Gestational Age in a Low-resource Setting: Validity of Last Menstrual Period. *J Health Popul Nutr*. 2009 Jun; 27(3): 332–338.
6. R Nagesh, S Pramila VV, Anil Kumar Shukla. Transverse cerebellar diameter – As an ultrasonographic parameter for estimation of fetal gestational age. *International journal of contemporary medical research*, 2016; 3(4).
7. Sumanta Kumar Mandal, Sandip Kumar Ghosh, Saikat Roy, Barun Prakash. Evaluation of Fetal Transcerebellar Diameter as a Sonological Parameter for the Estimation of Fetal Gestational Age in Comparison to Biparietal Diameter and Femur Length. *IAIM*, 2019; 6(6): 41-50.
8. Y, Chauhan RD. A study of ultrasonographic transcerebellar diameter in assessment of fetal gestational age. *Int J Res Med Sci* 2018;6:3390-6