



ORIGINAL RESEARCH PAPER

Radiodiagnosis

TRANSCEREBELLAR DIAMETER/ABDOMINAL CIRCUMFERENCE RATIO-A PREDICTOR OF FETAL GROWTH RESTRICTION.

KEY WORDS: Transverse Cerebellar diameter, IUGR, Abdominal circumference

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ABSTRACT
Objective: To evaluate the use of the transverse cerebellar diameter to abdominal circumference (TCD/AC) ratio in predicting intrauterine growth restriction (IUGR). **Methods:** A prospective study was conducted on 100 pregnant women attending antenatal clinic at Rajkiya Mahila Chikitsalaya, JLN Medical College, Ajmer. They were studied at 20-22 weeks and 32-34 weeks of gestational age using sonographic parameters like TCD, HC, FL, AC and their ratios. The obtained results were compared with the neonatologist's assessment of the birth weight in detecting FGR. A TCD/AC ratio above the 90th percentile was considered to indicate IUGR. **Results:** The TCD/AC at 20-22 weeks for FGR pregnancies was 14.73 ± 2.01 with p value of 0.001. The TCD/AC at 32-34 weeks for FGR pregnancies was 17.68 ± 1.84 with p value of 0.000. The value of p is significant and hence suggests that TCD/AC can be used as an independent marker for IUGR.

INTRODUCTION

The assessment of fetal growth is important to the provision of optimal prenatal care. The clinical estimation of gestational age to assess fetal growth is not reliable, prenatal ultrasonography helps overcome this problem. Ultrasound biometry of the fetus is now the gold standard for assessing the fetal growth¹.

The most commonly used parameters to evaluate fetal growth are biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur length (FL)^{2,3,4}.

Biparietal diameter, head circumference /abdominal circumference ratio and estimated fetal weight can be correlated only if gestational age is accurately known^{5,6,7} but uncertainty of the gestational age occurs frequently and makes the differentiation between the appropriate for gestational age and the small for gestational age fetus difficult⁸.

Cerebellum lies in posterior fossa of fetal brain. Measurements of the transverse diameter of the cerebellum (TCD) is independent of the gestational age and shape of the fetal head unlike the BPD which is unreliable, thus TCD remains an accurate method of estimating fetal age even in cases of uncertain dates, dolicocephaly or brachycephaly⁹. The posterior cranial fossa is not affected by external pressure, therefore evaluations of the cerebellum i.e. TCD and TCD/AC may convey more precise information regarding the fetal growth¹⁰.

AIMS AND OBJECTIVES

- To diagnose fetal growth restriction using sonological biometric ratios TCD/AC, FL/AC and HC/AC.
- To determine the efficacy of the different biometric ratios TCD/AC, FL/AC and HC/AC using Hadlock table.
- To assess comparison of the neonatologist's findings at birth of the baby with the antenatal sonological biometric ratios.

MATERIAL AND METHODS

This prospective study was conducted on 100 pregnant women antenatal clinic at Rajkiya Mahila Chikitsalaya, JLN Medical College, Ajmer during 1 year period.

An ultrasonographic biometric evaluation was done between

20-22 weeks and repeated at 32-34 weeks of gestational age and their ratios were compared, using standard formulae. All the recruited cases after birth of child were assessed by the neonatologist for gestational age and growth restriction, which were compared with the antenatal diagnosis.

Methodology: 3D/4D colour Doppler ultrasonographic machine Prosound i4 ALOKA and 3 – 5 MHz convex array transducer was used. In each patient BPD, HC, AC, FL and TCD was measured.

TCD measurement method: Transverse views of the fetal head using the landmark of thalami and cavum septum pellucidum in the midline were obtained then the transducer was slightly directed caudally to identify the cerebellum. TCD was measured as the widest diameter across both hemispheres in outer to outer fashion.



Fig1: Ultrasonographic measurement of transcellebar diameter

Inclusion Criteria

- Pregnant women attending antenatal clinic who have plans for delivery at our institute.
- Singleton pregnancy.
- First trimester - Dating scan or pelvic examination documentation.

Exclusion Criteria

- Patients with fetal anomalies.
- Unreliable gestational age

RESULTS

If TCD/AC ratio was >90th percentile, the fetus was predicted to have FGR. After birth, the babies were evaluated by the neonatologist and grouped into FGR, AGA and LGA depending on the percentile of the birth weight. The predicted growth of the fetus antenatally was compared with the neonatologist's findings.

If TCD/AC ratio was >90th percentile at 20-22 weeks of gestational age, the fetus was considered as symmetric FGR. If TCD/AC ratio was >90th percentile at 32-34 weeks of gestational age, the fetus was suspected to have asymmetric FGR.

After the birth of the baby, the neonatologist grouped the babies as FGR if the birth weight was < 10th percentile, AGA if the percentile was between 10th- 90th percentile and LGA if birth weight was > 90th percentile.

Chi-Square and Fisher Exact test have been use to find the significance of abnormal proportion of TCD1/AC1, TCD2/AC2, FL1/AC1, FL2/AC2 in relation to SGA and the Odds ratio has been used to find the strength of relationship between the parameters. Analysis of variance has been used to find the significance of mean pattern of study parameters for the estimated age.

TABLE - 1

Study Parameters (Mean±SD)	Estimated Fetal age			p value
	FGR	AGA	LGA	
TCD1	2.2±0.1	2.2±0.3	2.1±0.1	0.63
FL1	3.5±0.3	3.6±0.4	3.5±0.2	0.57
HC1	18.7±2	19.1±1.5	18.7±1.2	0.68
AC1	15.3±2	16.8±2.5	16.5±1.3	0.09

Mean pattern of study parameters according to Estimated Fetal age at 20-22 weeks

Except TCD all the other parameters are reduced in FGR when compared to AGA and LGA when measured at 20-22 weeks.

TABLE 2:
Mean pattern of study parameters according to estimated fetal age at 32-34 weeks

Study Parameters (Mean ± SD)	Estimated Fetal Age			p value
	FGR	AGA	LGA	
TCD2	3.9±0.2	3.9±0.3	3.9±0.3	0.13
FL2	6.2±0.3	6.3±0.3	6.4±0.2	0.44
HC2	29.5±3.2	30.2±1.2	30.6±1.0	0.00**
AC2	22.9±1.5	28.3±1.6	29.9±1.1	0.00**

All the parameters are reduced except TCD

TABLE 3:

Study Parameters (Mean ± SD)	Estimated Fetal age			p value
	FGR	AGA	LGA	
TCD1/AC1	14.7±2.0	13.3±1.0	12.9±1.0	0.001**
FL1/AC1	23.3±2.2	21.8±2.3	21.5±2.2	0.085
HC1/AC1	1.2±0.1	1.4±0.1	1.1±0.1	0.040*

Mean pattern of ratios of the study parameters according to estimated fetal age at 20-22 Weeks

TABLE 4:
Mean pattern of ratios of the study parameters according to estimated fetal age at 32-34 weeks

Study Parameters (Mean ± SD)	Estimated Fetal age			p value
	FGR	AGA	LGA	
TCD2/AC2	17.6±1.8	13.3±1.2	13.1±1.2	0.00**
FL2/AC2	26.5±2.2	22.1±1.1	21.6±0.9	0.00**
HC2/AC2	1.2±0.1	1.0±0.0	1.0±0.0	0.00**

In the present study we have TCD/AC with a sensitivity of 53.33%- 66.67%, specificity of 97.85%- 100%, PPV of 80%-100% and NPV 92%-94% which is comparable with the Meyer's¹¹ study with specificity of 96%, PPV of 94.5% and NPV of 88.2%. Kustagi⁸ and Song¹² have obtained a sensitivity of 62%-66% and 73%, specificity of 69%-81% and 80%-85%, PPV of 66.6%-84.2% and 79.75% and NPV of 68%-70% and 73%-88.6% respectively Krishna¹³ and Meyer¹¹ had PPV of 100% and 87% respectively which correlates well with the present study.

The potential importance of the TCD/AC ratio in the diagnosis of the fetal growth restriction (FGR) has been stated.

CONCLUSION

The potential importance of the TCD/AC ratio in the diagnosis of the fetal growth restriction (FGR) has been stated. TCD/AC can be used as an independent marker for predicting IUGR.

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