



FETAL TRANSCEREBELLAR DIAMETER/ABDOMINAL CIRCUMFERENCE RATIO IN IUGR

Radiodiagnosis

Dr. R Hari Kiran Reddy	Associate Professor, Department Of Radiology , J.J.M.Medical College, Davangere, Karnataka India.
Dr. Anusha B K*	Junior Resident, Department Of Radiology , J.J.M.Medical College, Davangere, Karnataka India. *Corresponding Author
Dr. Sagar S	Junior Resident, Department Of Radiology , J.J.M.Medical College, Davangere, Karnataka India.
Dr Meghana S	Junior Resident, Department Of Radiology , J.J.M.Medical College, Davangere, Karnataka India.
Dr. Bhagya Shree Sajjan	Junior Resident, Department Of Radiology , J.J.M.Medical College, Davangere, Karnataka India.

ABSTRACT

Background: In an Indian set up, which ranks 12th amongst 52 lower middle income nations with National Mortality Rate (NMR) - 25.4/1000 live birth [1]- 24% is contributed by SGA infant. Hence accurate knowledge of gestational age, is needed to differentiate true Intrauterine Growth Retardation (IUGR) from incorrect gestational parameters. With Transcerebellar Diameter (TCD) being an emerging new sonographic parameter and having an advantage, as its resistant to external pressure and growth deviations[2].Whereas fetal abdominal circumference (AC) is earliest impaired in fetal insult. Thus TCD/AC is very useful in predicting IUGR.

Method: A case control study with total of 100 patients was done, with 50 normal and 50 sonologically proven IUGR. All of Gestational Age (GA) between 20-38 weeks within a duration of one year. Mean TCD/AC ratio of study was compared with mean TCD/AC ratio of control in accordance to gestation age. Sonologically IUGR was -2SD above the mean ratio and true IUGR was taken as <10th percentile birth weight [3].

Results: The Cut off value obtained for predicting IUGR was 15.99% (TCD/AC), with the sensitivity and specificity of 78.9% and 58.3% respectively.

Conclusion: TCD/AC ratio was greater than 90th percentile for that gestational age in IUGR fetuses. Thus TCD/AC ratio acts as age independent parameter to assess fetal IUGR. Hence it should form a routine radiological parameter in order to diagnose IUGR at the earliest.

KEYWORDS

Transcerebellar Diameter; Abdominal Circumference; IUGR; Ultrasonography.

INTRODUCTION:

Since the Mortality rate in India is very high estimated to be about 25.4/1000 live birth [1]. There is common problem of incorrect gestational age given by the mother, due to which calculating the true Intrauterine Growth Retardation (IUGR) becomes difficult. Therefore a parameter which is Gestational Age (GA) independent would serve the purpose and become more reliable. Hence Transcerebellar Diameter (TCD) being GA independent and having an advantage, as its resistant to external pressure and growth deviations [2], and this when corresponded to Abdominal Circumference (AC) i.e. TCA/AC ratio is very useful in predicting IUGR.

MATERIALS AND METHODS:

This is a case control study design which was conducted in the Department of Radiology in JJM Medical College, Davangere, Karnataka for a period of 6 months from September 2019 to march 2020 on 100 pregnant women who were divided into two groups.

Group A was the control group consisting of 50 women and Group B consisting of another 50 who were sonologically proven of IUGR between GA of 20 to 38 weeks.

Inclusion Criteria

- Pregnant women who gave consent
- Pregnant women of 18 to 35 yr age group.
- Regular menstrual history
- Known Last Menstrual Period date
- No OCP for atleast 3 months prior to pregnancy
- Singleton pregnancy
- Gestational age between 20 to 38 weeks
- Early onset of prenatal care with early dating scan (<20 weeks) consistent with LMP

Exclusion Criteria

- Irregular menses
- Wrong last menstrual period date
- Multiple gestations and Polyhydramnios
- Pregnant females with anomalous fetus

All the Measurements was performed using GE LOGIQ S7 EXPERT - low frequency 3-5 MHz probe. Routine parameters like Biparietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference(AC) and Fetal Length(FL) were measured and recorded.

Ultrasonography

- Transcerebellar Diameter - Cerebellar View: In Axial plane centered on thalamus cerebellar hemispheres are focussed. TCD is measured by placing callipers on the outer margins of cerebellum, **Figure 1.**
- Abdominal Circumference – In Axial plane at the level of fetal stomach bubble, umbilical vein and portal sinus, the callipers should be on skin surface to measure abdominal circumference. **Figure 2.**

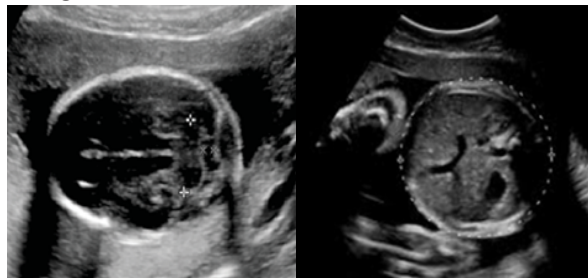


Figure 1-TCD plane

Figure 2 – AC plane

TCD/AC x 100 ratio was then calculated for all the cases and both groups were compared, which was then correlated with the GA of the patients. When the ratio was above two standard deviation (2SD) of the mean it was considered significant.

RESULTS

TCD/AC ratio of all cases was compared with mean TCD/AC ratio of control group according to gestational age and where it was >2SD above the mean TCD/AC ratio of control group, it was taken as

ultrasonically IUGR case.

The Mean TCD/AC ratio in the normal foetus was found to be 14.5 (SD – 0.7) and mean TCD/AC in IUGR foetus was 15.99 (SD-1.5), **Table 1**. The result was then compared with post-delivery examination.

Out of 50 cases in study group 35 were diagnosed as IUGR by USG with 5 false positive cases, **Table 2**. Out of 50 cases in study group 38 were true IUGR postnatally and 8 were missed by USG. According to this study sensitivity of this method is 78.9% and positive predictive value is 85.7%.

Table 1: Mean TCD/AC Of Normal And IUGR Foetus

	Normal	IUGR
Mean TCD/AC	14.5	15.99
+/- SD	0.7	1.5

Table 2: Sensitivity And Positive Predictive Value Of TCD/AC For Identification Of IUGR

USG	IUGR +	IUGR-
IUGR +	True + 30	False + 5
IUGR -	False - 8	True - 7
	All test +(True IUGR) 38	All test - 12
Sensitivity = 78.9%		
Positive predictive value = 85.7%		

DISCUSSION

Prenatal diagnosis of IUGR depends on accurate gestational age and foetal size. All the biometric measurements used to demonstrate abnormal growth are also used to determine gestational age.

However there are some biometric parameters unaffected by growth abbreviation, providing standard against which growth disparities could be compared. The cerebellum last to be affected when there is decrease in blood flow in uteroplacental insufficiency and liver is the most severely and first affected organ in decrease foetal retardation^[4].

Saroj mourya et al^[5], studied eighty pregnancies with suspected IUGR. The prevalence of IUGR among the study group was 51.5%. The best cut-off value of the TCD/AC ratio for predicting IUGR was 15.8%, giving the sensitivity, specificity, positive predictive value and negative predictive value of 81.25%, 62.25%, 89.65%, and 45.45%, respectively.

Sagwan K^[6], studied 40 patients with mean value of TCD/AC ratio in study group was 14.92±1.28 and in patient with confirmed SGA babies it was 15.87±0.92 which was significantly higher than post-delivery normal cases.

William J et al^[7,8], studied 825 low risk obstetric cases and found TCD/AC ratio was gestational age independent between 14 and 42 weeks with a mean of 13.68 ±0.96. A value exceeding 2 SD of mean was significantly associated with SGA infants.

In this study the mean value of TCD /AC ratio in control group was 14.5 ±0.7 and in patient with confirmed SGA on post-delivery examination was >15.99 significantly higher (p <0.001) than in post-delivery normal cases (p <0.001). In this study, out of 38 true IUGR cases, 30 were correctly diagnosed by TCD/AC ratio, hence sensitivity was 78.9%, specificity 58.3%, the PPV was 85.7% and NPV was 46.6%. The result in this study are slightly higher than Sarojmourya et al^[5] and William J et al^[7,8].

CONCLUSIONS:

The sonographic foetal TCD/AC ratio acts as a gestational age-independent, useful, feasible and sensitive method for antenatal diagnosis of IUGR, especially in pregnancy with uncertain gestational age. Thus routine TCD/AC ratio should be performed to diagnose IUGR. TCD/AC ratio greater than 90th percentile for that gestational age is used to diagnose IUGR in foetus.

REFERENCES

1. UNICEF, 20th Feb, 2020
2. Hasimoto K, Shimizu T, Shimoya K, Kanzaki T, Clapp JF, Murata Y. Fetal cerebellum: US appearance with advancing gestational age. Radiology. 2001; 221:70-74.
3. A Manual of Essential Pediatrics: Meharban Singh (2nd ed)
4. American college of obstetrician and gynaecologist: Intrauterine growth restriction. Practice bulletin No. 12, Jan 2000.
5. Saroj Mourya, Harish K. Mourya, Mohan Makwana, Hanslata Gahlot, Suresh Verma, Seema Sharma. Evaluation of transverse cerebellar diameter to abdominal

- circumference ratio in prediction of intrauterine growth retardation. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. Int J Reprod Contracept Obstet Gynecol. 2017 Jun;6(6):2466-2470.
6. Sangwan K, Sangita G, Puspa D. Evaluation of transverse cerebellar diameter to abdominal circumference ratio in prediction of intrauterine growth retardation. Obstet Gynecol. 1999;4:5
 7. Meyer WJ, Gauthier D, Ramakrishnan V. Ultrasonographic detection of abnormal fetal growth with the gestational age independent TCD/AC ratio. Am J Obstet Gynecol. 1994;171:1057-63.
 8. Meyer WJ, Gauthier DW, Goldenberg B, Santolaya J. The fetal TCD/AC ratio: A gestational age independent method of assessing fetal size. J Ultrasound Med. 1993; 12(7):379-82.