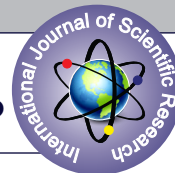


EFFICACY OF FETAL TRANSCEREBELLAR DIAMETER/ ABDOMINAL CIRCUMFERENCE RATIO AND HEAD CIRCUMFERENCE /ABDOMINAL CIRCUMFERENCE RATIO IN PREDICTING ASYMMETRICAL IUGR AS COMPARED TO WEIGHT AFTER BIRTH



Radio-Diagnosis

Dr. Amrita Gupta* Resident, Department Of Radiodiagnosis, Sri Aurobindo Medical College And Post Graduate Institute, Indore, M.P, India *Corresponding Author

Dr. Manish Bhagat Professor And Head Of Department, Department Of Radiodiagnosis, Sri Aurobindo Medical College And Post Graduate Institute, Indore, M.P, India

ABSTRACT

The high incidence of intrauterine growth retardation (IUGR) in general obstetric population and its low recognition together leads to increasing perinatal morbidity and mortality. Regular surveillance and timely management decisions can alter the outcome of IUGR pregnancy. TCD/AC and HC/AC ratio remains constant throughout the gestational age. TCD is least affected in the process of growth restriction, while HC is affected less frequently. However, AC is the most affected parameter. Hence, TCD/AC and HC/AC ratio is increased in the cases of IUGR. This study is planned to compare the efficacy of gestational age independent parameters, Trans cerebellar Diameter/Abdominal Circumference and Head Circumference/Abdominal Circumference in predicting asymmetrical IUGR, after 20 weeks of gestation as compared with weight after birth. It was concluded both methods can be used to screen the cases of IUGR, however, TCD/AC is better parameter.

KEYWORDS

Asymmetrical IUGR, Transcerebellar diameter, Head circumference, Abdominal circumference, growth restriction, perinatal mortality.

INTRODUCTION:

The high incidence of intrauterine growth retardation (IUGR) in general obstetric population and its low recognition together lead to increasing perinatal morbidity and mortality. Regular surveillance and timely management decisions is cornerstone for optimum outcome in these cases, which rely mainly on accurate determination of gestational age.[1]

Trans Cerebellar Diameter (TCD): The maximum transverse diameter of the fetal cerebellum.[1] **Abdominal circumference (AC)** reflects the size of the liver (which correlates with the degree of fetal malnutrition) as well as the volume of subcutaneous plane, predicting growth restriction more accurately than either BPD or FL.[2] Of the four basic ultrasound measurements, the AC generally had the largest reported variability. This is partly attributed to the fact that AC is more acutely affected by growth disturbances than the other basic parameters.[3]

TCD/AC Ratio: The cerebellum is located in the posterior cranial fossa well protected within the strong bones (petrous temporal and occipital bones) forming it, thus withstanding the extrinsic pressure better than the parietal bones.[4] It is relatively resistant to hypoxia due to brain sparing phenomenon leading to maintained blood supply to brain at the cost of systemic supply[5] Thus, a ratio of TCD/AC which is gestational age independent is very useful in predicting IUGR.

HC/AC Ratio: This ratio compares the preserved organ in the malnourished fetus, the brain, with the most compromised, the liver and is of significant value in identifying asymmetric IUGR fetuses. So the study was planned to compare both the parameters.

Aims And Objectives:

To compare the accuracy of Trans cerebellar Diameter/Abdominal Circumference and Head Circumference/Abdominal Circumference in predicting asymmetrical IUGR, after 20 weeks of gestation as compared with weight after birth.

MATERIALS AND METHODS:

A hospital based prospective observational study was conducted at Sri Aurobindo Medical College and Postgraduate institute, Indore for a period of 1 year (From 1st January 2023 to 31st December 2023).

50 clinically suspected cases of IUGR, after 20 weeks of gestation, from Department of Obstetrics and Gynecology, referred to our Department of Radiodiagnosis for ANC scan (Based on no relative increase in abdominal girth / fundal height and/or insufficient weight gain) were included in the study.

Inclusion Criteria: Any gravid women suspected with fetal IUGR after 20 weeks of gestation with non-anomalous, singleton live intra uterine pregnancy (According to the ACOG guidelines)

Exclusion criteria: 1) Symmetrical IUGR, <18 and >35 years, Multiple gestation, Anomalous pregnancies, Unsure of LMP/ Patients with irregular cycle, Denied consent

Machine: LOQIC E9 Ultrasound and Color Doppler system with a curvilinear probe of frequency 2-6 MHZ.

Informed Consent and detailed history was taken from the patients. A through systemic and obstetric examination was done in the referring department and clinically suspected cases were send for USG. The USG scans were carried out by the single trained radio-sonologist. The Head circumference (HC), Transverse cerebellar diameter (TCD), Abdominal circumference (AC), Biparietal diameter (BPD) and femur length (FL) were measured along with other routine parameters. The HC/AC ratio and TCD/AC ratio was calculated. Estimated fetal weight was calculated for all these pregnancies and percentile determined. The patients were followed up till delivery for fetal birth weight. All babies at birth were assessed by the neonatologist and grouped as appropriate for gestational age (AGA) or fetal growth restriction (FGR) according to birth weight 10- 90th percentile and <10th percentile for gestational age, respectively. The cut-off of value of TCD/AC and HC/AC ratio for diagnosing IUGR is taken according to the previous studies.

OBSERVATION AND RESULTS:

Table1: Age distribution of females undergoing ANC scan. - Maximum females were from 27-29 age groups.

Age group (year)	N (no of patients)	Percentage (%)
21-23	14	28
24-26	12	24
27-29	16	32
30-32	5	10
33-35	3	6
Total	50	100

Table2: Gravidity distribution of females undergoing ANC scan.- Maximum females were primigravida.

Gravidity	N (number of patients)	Percentage (%)
Primi	33	66
Multi	17	34
Total	50	100

Table 3: Period of gestation among IUGR pregnancies.-Maximum belonged to 32-35week 6days period of gestation

Gestational period	N (number of cases)	Percentage (%)
20- 23 wk 6d	1	2
24 -27 wk 6d	1	2
28 - 31wk 6d	7	14
32 -35 wk 6d	23	46

36 – 39 wk 6d	18	36
Total	50	100

Table 4: No of babies with IUGR acc. to birth weight category.- 45 babies had weight <10th percentile at birth.(IUGR).

Birth weight	No of babies
>10 th percentile	5
<10 th percentile	45
Total	50

Table 5: Distribution of cases with respect to TCD/AC%. - 42 cases were suspected to have IUGR according to TCD/AC criteria.

TCD/AC	No of Cases
>13.69(suspected IUGR)	42
<13.69	8

Table 6: Comparison of TCD/AC ratio % predicted IUGR with gold standard (weight after birth) -Sensitivity and PPV of TCD/AC ratio in diagnosing IUGR was 91.11% and 97.6% respectively. While specificity and NPV in diagnosing IUGR was 80% and 50% respectively.

Distribution of cases with respect to TCD/ AC	Birth weight <10 th percentile	Birth weight >10 th percentile	Total
TCD/AC >13.69	41(TP)	1(FP)	42
TCD/AC <13.69	4(FN)	4(TN)	8
Total	45	5	50

Table 7: Distribution of cases with respect to HC/ AC%. - 38 cases were suspected to have IUGR according to HC/AC criteria.

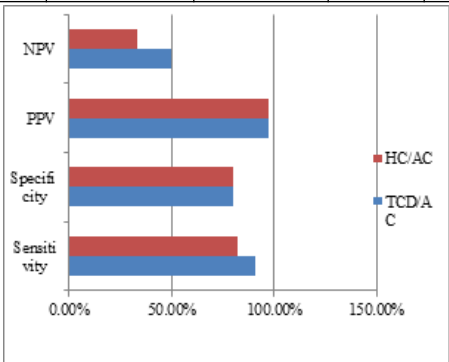
HC/AC%	No. of cases
>1.10(suspected IUGR)	38
<1.10	12

Table 8: Comparison of HC/AC ratio % predicted IUGR with gold standard (weight after birth)-Sensitivity and PPV of HC/AC ratio in diagnosing IUGR was 82.22% and 97.37% respectively. While specificity and NPV in diagnosing IUGR was 80% and 33.33% respectively.

Distribution of cases with respect to HC/ AC	Birth weight <10 th percentile	Birth weight >10 th percentile	Total
HC/AC >1.10	37(TP)	1(FP)	38
HC/AC <1.10	8(FN)	4(TN)	12
Total	45	5	50

Table 9: Comparative study between two parameters to diagnose IUGR. - The sensitivity of TCD/AC is 90.91% and HC/AC is 82.22%. Which indicate that TCD/AC carry better sensitivity than HC/AC in diagnosing IUGR.

Parameter	Sensitivity	Specificity	PPV	NPV
TCD/AC	91.11%	80.00%	97.60%	50.00%
HC/ AC	82.22%	80.00%	97.37%	33.33%



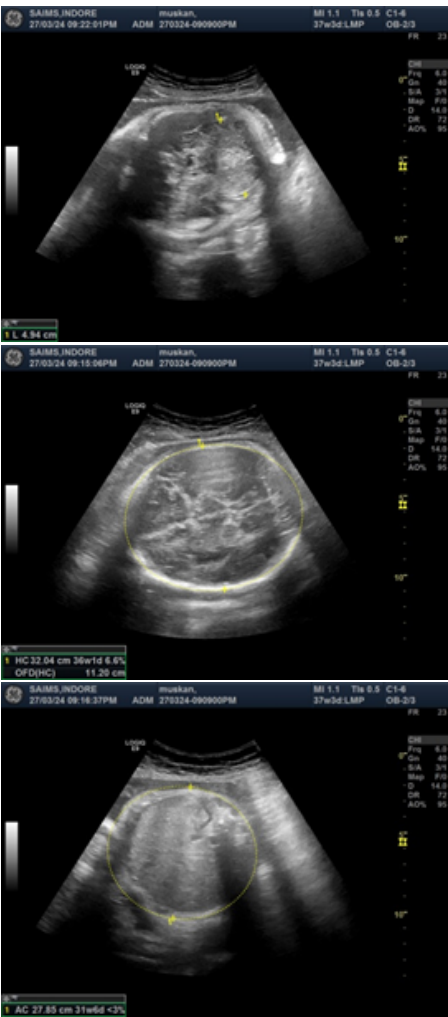
Graph 1: Bar graph showing comparison between TCD/AC and HC/AC.

Table 10: Comparing accuracy of two sets.

Parameter	Accuracy
TCD/AC	90%
HC/AC	82%

The accuracy of TCD/AC is higher (89%), than that of HC/AC (82%) in predicting IUGR in antenatally.

Images:



A 37week 3 days multigravida with IUGR, TCD/AC=4.94/27.85 *100 =17.7 , HC/AC= 32.04/27.85 *100 =1.15. TCD/AC could predict IUGR. However, HC/AC came out to be normal.

RESULT:

Sensitivity, specificity, PPV and NPV of TCD/AC in diagnosing IUGR was found to be 91.11%, 80.0%, 97.60% and 50% respectively. Sensitivity, specificity, PPV and NPV of HC/AC in diagnosing IUGR was found to be 82.22%, 80.0%, 97.37% and 33.33% respectively. Diagnostic accuracy of TCD/AC was found to be more than HC/AC, that was 90% and 82% respectively.

DISCUSSION:

The sensitivity of TCD/AC ratio in diagnosing IUGR antenatally is 91.11%, with specificity of 80.00%, PPV 97.56%, and NPV of 50.00% , which is comparable to the study conducted by the Meyer et.al.[6] According to the present study the sensitivity, specificity, PPV and NPV of the HC/AC in diagnosing IUGR was 82.22%, 80%, 97.30% and 33.33% respectively. This is quite comparable with the study of Bhimarao at el. and Benson et al. [7] In present study the efficacy of the TCD/AC ratio is proven more than HC/AC ratio in diagnosing IUGR, with diagnostic accuracy is 90% and 82%, comparable to Haller et al [8].

CONCLUSION:

TCD/AC and HC/AC ratio remains constant throughout the gestational age in normal pregnancy. TCD is least affected in the process of growth restriction, while, HC is affected less frequently (due to brain sparing effect). However, AC is the most affected parameter.

Hence, TCD/AC and HC/AC ratio is increased in the cases of IUGR. As TCD/AC and HC/AC ratio remains constant throughout in normal pregnancy, hence, they become gestational age in-dependant parameter for diagnosing IUGR. Both methods can be used to screen

the cases of IUGR, antenatally. However, among the two discussed methods, TCD/AC is better parameter for screening of IUGR cases.

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