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Transcerebellar diameter in the second and third trimesters could be one of the ideal methods for predicting gestational age in pregnant women by using ultrasonography

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Abstract:

Introduction: The use of ultrasonography (USG) for the determination of the gestational age (GA) becoming more common in to the practice globally. During the complete pregnancy cycle, the fetal central nervous system experiences amazing evolution. This convoluted but well-organized neurodevelopmental process, which is seen in the brain cortex and in cerebellum. Neurodevelopmental changes one can easily detect them during gestational period by the use of ultrasonography. The cerebellum, located in the hind brain, which is lies in the posterior cranial fossa i.e. dorsal to the pons and medulla which is separated by the fourth ventricle. Cerebellum is less susceptible to deformation probably due to this, so the cerebellar development is hardly influenced even in case in placental insufficiency due to the 'brain-sparing' phenomenon. Furthermore, none of the fetal studies have reviewed neurodevelopment into whole gestational life, which can be the logical tool proposed to evaluate fetal rationality. Many of the literature that provide this information, as a result while assessing the transcerebellar diameter (TCD) and creating a normogram for it will aid in determination of gestational age. **Aims and objectives:** To establish the accuracy of mean transcerebellar diameter (TCD) ranges in different gestational Age in the second and third trimester of pregnancy. **Material and method:** A cross-sectional study was conducted on pregnant women in their second and third trimesters at the department of radio-diagnosis, datta meghe medical college, Nagpur, Maharashtra, India with the approval from the Institutional Ethical Committee. The study included 232 pregnant women with whose gestational age was confirmed by last menstrual period (LMP). Transcerebellar diameter (TCD) was identified in the suboccipitobregmatic view. The maximum length of each transcerebellar diameter was measured. **Observation and result:** All of the patients were distributed across the different gestational Age. In total 232 patients, 73 were between the ages of 18 and 20 weeks, 55 were between the ages of 21 and 24 weeks, 40 were between the ages of 25 and 28 weeks and the remaining 64 were between the ages of 29 and 36 weeks. We were measuring the Transcerebellar diameter and correlating them one by one with the gestational age calculated using LMP and got the range of the Transcerebellar diameter length in mm nearly correspond with the gestational age in weeks of the fetus. **Conclusion:** Transcerebellar diameter (TCD) length in millimetres corresponds to fetal gestation age in weeks as the pregnancy progresses could be one of reliable parameter to establish the gestation age in pregnant women.

Keywords: *transcerebellar diameter, TCD, gestational age determination*

Introduction:

The use of ultrasonography (USG) for the determination of the gestational age (GA) becoming more common in to the practice globally.[1] During the complete pregnancy cycle, the fetal central nervous system experiences amazing evolution. This convoluted but well-organized neurodevelopmental process, which is seen in the brain cortex and in cerebellum. Neurodevelopmental changes one can

easily detect them during gestational period by the use of ultrasonography. Ultrasonography is now a days used in clinical practise to assess the anatomical cohesion of the fetal cerebellum as well as the linear growth of the transcerebellar diameter (TCD).[2-6]

Approximation of the transcerebellar diameter (TCD) also allows the estimation of gestational age in cases where there is uncertain dates in the second and third trimester gestation. It may be more appropriate, even though in cases where there are intrauterine growth disturbances. It can be due to the dense petrous ridges and occipital bones. The cerebellum, located in the hind brain, which is lies in the posterior cranial fossa i.e. dorsal to the pons and medulla which is separated by the fourth ventricle. Cerebellum is less susceptible to deformation probably due to this, so the cerebellar development is hardly influenced even in case in placental insufficiency due to the 'brain-sparing' phenomenon.[7-10] Furthermore, none of the fetal studies have reviewed neurodevelopment into whole gestational life, which can be the logical tool proposed to evaluate fetal rationality.[11] Many of the literature that provide this information, as a result while assessing the transcerebellar diameter (TCD) and creating a normogram for it will aid in determination of gestational age. [12, 13]

Aims and objectives:

To establish the accuracy of mean transcerebellar diameter (TCD) ranges in different gestational Age in the second and third trimester of pregnancy.

Material and method:

A cross-sectional study was conducted on pregnant women in their second and third trimesters at the department of radio-diagnosis, datta meghe medical college, Nagpur, Maharashtra, India with the approval from the Institutional Ethical Committee. The study included 232 pregnant women with whose gestational age was confirmed by last menstrual period (LMP). Transcerebellar diameter (TCD) was identified in the suboccipitobregmatic view. The maximum length of each transcerebellar diameter was measured. Data were tabulated and all the statistical analyses were done using SPSS software.

Observation and result:

All of the patients were distributed across the different gestational Age. In total 232 patients, 73 were between the ages of 18 and 20 weeks, 55 were between the ages of 21 and 24 weeks, 40 were between the ages of 25 and 28 weeks and the remaining 64 were between the ages of 29 and 36 weeks. We were measuring the transcerebellar diameter and correlating them one by one with the gestational age calculated using LMP and got the range of the transcerebellar diameter length in mm nearly correspond with the gestational age in weeks of the fetus.

S. No.	Gestational Age in weeks	No. of Patients	Fetal Transcerebellar diameter length Mean[mm]	Standard Deviation[mm]	Variance	Range[mm]
1	18-20	73	18.97	0.8971	0.8048	18.9 ± 0.89

2	**21-24**	**55**	**22.21**	**0.8754**	**0.7663**	**22.2 ± 0.87**
3	**25-28**	**40**	**26.4**	**1.0077**	**1.0155**	**26.4 ± 1.0**
4	**29-36**	**64**	**32.64**	**2.3324**	**5.4401**	**32.6 ± 2.33**

Discussion:

In the absence of a menstruation history, there is no other accurate means of determining the estimated gestational age. With the introduction of high resolution real time ultrasonography, the opportunity to see multiple organs in utero throughout the second and third trimesters has dramatically improved.[14] Bansal M et al., Anirban Das Gupta et al., Hill LM et al., Goldstein I et al. and Ahmad et al. in their study found transcerebellar diameter in (mm) almost equivalent to gestational age of fetus.[15-19] study also revealed that The TCD measurement of the fetus is resistant fetal head shape alteration that means it does not affect this parameter.[20] We also realised in our study for second and third trimester of pregnancy that the transcerebellar diameter length range in mm accuracy is almost same with the fetal gestational age in weeks.

Conclusion:

Transcerebellar diameter (TCD) length in millimetres corresponds to fetal gestation age in weeks as the pregnancy progresses could be one of reliable parameter to establish the gestation age in pregnant women.

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