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ASSESSMENT OF GESTATIONAL AGE;

COMPARISON BETWEEN TRANSCEREBELLAR DIAMETER VERSUS FEMUR LENGTH ON ULTRASOUND IN THIRD TRIMESTER OF PREGNANCY

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ABSTRACT... Objective: To compare correct assessment of gestational age between Transcerebeller diameter versus femur length in third trimester (28-40) using first day of last menstrual period for actual period of gestation. **Study Design:** Cross-sectional descriptive study. **Place and Duration of Study:** Department of Obstetrics and Gynecology, Bahawal Victoria Hospital, Bahawalpur from Jun 2012 to Dec 2012. **Methodology:** This study was performed on 327 patients in third trimester of pregnancy from 28-40 weeks fulfilling the inclusion criteria. Ultrasound measurements of transcerebellar diameter (TCD) and femur (FL) were made with commercially available real time ultrasound equipment Toshiba Nemio-10 model 2009, Transducer frequency 50/60 Hz. Collected data was analyzed by SPSS version 10. **Results:** Out of 327 patients, TCD was found to give correct assessment corresponding to the gestational age by LMP in 262 (80.1%) patients, while in 232 (70.9%) patients FL was found to give correct assessment corresponding to the gestational age by LMP. **Conclusions:** Transcerebellar diameter is more reliable method of gestational age determination in third trimester of pregnancy than femur length. TCD can be used as a tool to assist in the assessment of gestational age in third trimester.

Key words: Cerebellum, Transcerebellar diameter, Gestational age, Femur length, Third trimester of pregnancy

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INTRODUCTION

The provision of obstetric and neonatal care, as well as the public health monitoring of pregnancy outcomes, relies upon the accurate determination of gestational age[1]. Uncertain gestational age has been associated with adverse pregnancy outcomes including low birth weight, spontaneous preterm delivery and perinatal mortality, independent of maternal characteristics.

Ultrasonographic fetal biometry is highly reliable in first and second trimester of pregnancy but reliability of any ultrasound method greatly diminishes as gestation advances[2]. In third trimester, reliability of any single ultrasound parameter is poor which is shown in many studies[3,4].

Many patients in our setup due to socio-economic reasons come for their first antenatal visits in third trimester. Most of them are uneducated come from remote areas. Many being lactating mothers unsure of LMP or having irregular cycles. Because of non-availability of any dating scan or earlier ultrasound and uncertainty in LMP, it becomes very difficult to calculate their due dates. Many pregnancies considered to be preterm or post term are wrongly classified.

Unnecessary testing such as fetal monitoring and unwarranted interventions including induction for supposed post-term pregnancies in these patients may lead to an increased risk of maternal and neonatal morbidity. In third trimester various ultrasound parameters including FL which is most commonly used shows margin of error of 2.1 to 3.5

weeks from actual gestation[3-5]. Even the composite gestational age prediction in the third trimester does not give great accuracy of actual gestational age, taking into consideration the discrepancies of late trimester scan and possibility of growth retardation.

Newly introduced ultrasound parameter Transcerebellar diameter (TCD) is a reliable predictor for gestational age in third trimester[6]. Size of cerebellum is less affected by deviation in fetal growth restriction or growth acceleration[6,7]. TCD normogram predicts gestational age with accuracy of 94% in the third trimester[8].

This parameter is particularly useful in prediction of gestational age in patients who are unsure of dates or suspected of having IUGR and it is a standard against which other parameters can be compared.

METHODOLOGY

This study was conducted at Department of Obstetrics and Gynecology, Bahawal Victoria Hospital, Bahawalpur over a period of 6 months from Jun 2012 to Dec 2012. Approval from the Hospital Ethics Committee was taken prior to conducting the study. Non-probability consecutive sampling was employed to select 327 patients.

Pregnant women of age 20-30 years, parity up to 02 with singleton uncomplicated pregnancy who were sure of dates from 28-40 weeks calculated by first day of last menstrual periods were included. Patients who were unsure of dates, with Anamolous fetuses & intrauterine death (IUD), multiple pregnancies & medical disorders like diabetes, hypertension were excluded.

Ultrasound measurements were made with commercially available real time ultrasound equipment (Toshiba Nemio-10 model 2009, Transducer frequency 50/60 Hz W/VA 1350W/1500VA).

Trascerebeller diameter were measured by transverse view of fetal intracranial anatomy through the posterior fossa that included visualization of midline thalamus, cerebeller hemisphere and cisterna magna. Measurements were obtained by placing on screen calipers of ultrasound machines at the outer margins of cerebellum. Femur length was measured in transverse plane at the level of thalami from the outer table of proximal skull to the inner table of distal skull corresponding to the leading edge to edge measurement. These ultrasound parameters were directly supervised by a certified gynecologist (Professor) and radiologist (Assistant Professor of radiology Department) to exclude bias. All the reading was recorded on specially designed Proforma attached as Annexure 1.

All the data collected was entered in the SPSS version 10 and analyzed through its statistical program. Frequencies and percentages will be calculated for qualitative variables like correct assessment of gestational age by TCD and FL. Correct assessment of gestational age by TCD and FL was compared in two groups by chi square test. P value <0.05 will be taken as significant. Tables and graphs will be used to present data.

RESULTS

A total of 327 patients with singleton non-anomalous uncomplicated fetuses who were sure of dates having third trimester from 28- 40 calculated by first day of last menstrual period admitted in Gynecology/Obstetrics Unit-1, BVH, Bahawalpur were studied to compare the frequency of correct assessment by TCD versus FL for gestational age measurement in third trimester of pregnancy. Ultrasound measurements were made with commercially available real time Ultrasound equipment (Toshiba Nemio-10 model 2009, Transducer frequency 50/60 Hz W/VA1350W/1500VA).These ultrasound parameters were directly supervised by certified gynecologist and radiologist to exclude bias.

Majority of the patients belong to age group 21-25 years (33.9%) followed by age group 26-30 years (27.8%) and <20 years (23.9%). Only 14.4% had the age group >30 years (Table -I).

Regarding parity status as shown in table no. 1, 153 patients (46.8%) were primigravida and 174 patients (53.2%) were multigravida upto para 2 (G2P1, G3P2).

Table-II shows the frequency and percentage of correct assessment by TCD from 28-40 weeks of gestation. Out of 327 patients, in 263 (80.1%) patients TCD was found to give correct assessment corresponding to the gestational age by LMP. In 65 patients (19.9%) it was found to give incorrect assessment.

Age (In years)	Number (n=327)	%
<20	78	23.9
21-25	111	33.9
26-30	91	27.8
>30	47	14.4
Parity	**Number (n=327)**	**%**
Primigravida	153	46.8
Multigravida (up to p2)	174	53.2

Table-I. Distribution of cases according to maternal age/parity

Correct assessment of gestational age by TCD (Frequency and Percentages)					Correct assessment of gestational age by FL (Frequency and Percentages)				
Weeks of gestation	**Total no (n)**	**Yes**	**No**	**%**	**Total no (n)**	**Yes**	**No**	**%**	**P-value**
28	30	29	1	96.7	30	28	2	93.3	
29	21	20	1	95.2	21	19	2	90.5	
30	28	26	2	92.9	28	25	3	89.3	
31	20	18	2	90	20	17	3	85	
32	26	24	2	92.3	26	22	4	84.6	
33	15	12	3	80	15	9	6	60	
34	22	18	4	81.8	22	16	6	72.7	0.000
35	31	26	5	83.9	31	23	8	74.2	
36	35	29	6	82.9	35	26	9	74.3	
37	25	17	8	68	25	15	10	60	
38	26	17	9	65.4	26	14	12	53.8	
39	25	15	10	60	25	12	13	48	
40	23	11	12	47.8	23	10	13	43.5	

Table-II. Comparison of correct assessment of gestational age by TCD and FL

Table-II shows the frequency and percentage of correct assessment by FL from 28-40 weeks of gestation. Out of 327 patients, in 232 (70.9%) patients FL was found to give correct assessment corresponding to the gestational age by LMP. In 91 patients (27.8%) it was found to give incorrect assessment.

When we compared the correct assessment of gestational age by these two Ultrasound parameters TCD and FL by Chi-square test, P value was found to be statistically significant

(0.000) proving the hypothesis that TCD is more reliable method of gestational age estimation in third trimester.

DISCUSSION

Accurate assessment of gestational age is essential for proper management and antenatal care of every pregnancy. Fetal biometry in the third trimester is subject to much greater individual size variations than in the second trimester. Its accuracy for GA assessment is reduced considerably and estimates may have confidence intervals of plus or minus 3 weeks. Transcerebellar diameter (TCD) is emerging as a new parameter[5-7]. It represents an independent biometric parameter as shown in this study. The fetal cerebellum visualized as early as 10 to 20 post menstrual weeks. It grows in linear pattern in 2nd trimester but its curve flattens in third trimester. Measurements of the transverse diameter of the cerebellum (TCD) is independent of the gestational age and shape of the fetal head unlike the BPD (Biparietal Diameter) which is unreliable, thus TCD remains an accurate method of estimating fetal age even in cases of uncertain dates, dolicocephaly or brachycephaly[8]. It was previously suggested that the posterior cranial fossa was not affected by external pressure, therefore evaluations of the cerebellum i.e. TCD may convey more precise information regarding the fetal growth[9,10].

The femur length (FL) can be measured as early as 10 weeks gestational age because of its size and echogenicity. Correlation with true gestational age is within one week prior to 20 weeks gestational age, but falls to within 2.1 to 3.5 weeks in the third trimester[11,12]. Including non-ossified portions of the femur and not visualizing the full femur (femoral head/greater trochanter to femoral condyle) are the major sources of error in gestational age assessment by FL. The former over estimates and the latter underestimates gestational age.

Many studies reported the better correlation of TCD with gestational age in 2nd and 3rd trimester, its usefulness as growth assessing parameter in comparison with other routine ultrasound parameters. In our study we used FL for comparison with TCD. The FL is most commonly used ultrasound parameter and standard method against which other parameters of gestational age assessment are compared.

Our comparative study of TCD and FL in third trimester provides validation of the performance of a retrospectively established TCD normogram regarding gestational age. No comparative study we have found which examine the relationship between FL and TCD in late third trimester. In our previous study[13] we examined the relationship between BPD and TCD in late third trimester but the limitation of that study was the lack of comparison of data with femoral length (FL). The main idea is that fetal head starts to mould as it engages and descends in preparation for birth so that both the BPD and the head circumference (HC) may measure less than they should. Since the fetal thigh does not mould, FL remains unaffected. Hence, in late gestation, FL is the standard biometric parameter to ascertain and establish fetal age, not BPD.

In our study FL was measured using Hadlock parameter[11,12]. TCD was measured as widest diameter across both hemispheres based on Chaves MR et al gestational age data for TCD done in 2004[8].

Montenegro[14] during a routine ultrasound examination of 178 normal pregnant women at 17-24 weeks performed several biometric measurements and stated that TCD seems to be good marker for gestational age calculation compared to other clinical and biometric parameters. Similar results were obtained by Strizhova. This is also proved in our study where TCD seems to be a good marker for gestational age calculation compared with BPD.

Hashimoto[15] classified the ultrasonic appearance of fetal cerebellum[16-18] and classified it as: Grade I: Hypoechoic ("eyeglass" shape), Grade II: Intermediate echogenicity, (dumbbell outline) and Grade III: Hyperechoic, ("fan" shaped) respectively. In our study the cerebella were also observed into these 3 grades.

In our study TCD was found to give correct assessment that was in accordance with gestational age by LMP between 28-40 weeks of gestation in 327 (80.1%) patients. FL was found to give correct assessment of gestational age in 232 patients out of 327 patients with diagnostic accuracy of 70.9%. P-value was 0.000 (<0.001) which is statistically significant. A study conducted by Malik R et al[19] in India between 16 to 40 weeks in100 patients. TCD was found to be an accurate parameter with accuracy of 92% and FL of 88% which also supports our study for TCD validation in third trimester.

In our previous study on TCD[13] it was found that it gave correct accuracy of 91.7% at 36 weeks of gestation. In the cross sectional study conducted by Chavez MR et al[10] TCD accuracy in third trimester was found to be 94.0% which supports our study TCD predictability.

An observational study conducted in Pakistan by Malik G, Waqar F[20]assessed the usefulness of TCD as an independent parameter for gestational age in third trimester of pregnancy in135 patients between 26 to 38 weeks. They compared the results of predicted gestational age by BPD, FL and AC (Abdominal Circumference) with actual gestation. They observed that gestational age measured by TCD was consistently correlated with that measured by FL .This correlation has also been observed in our study between TCD and FL between 28-40 weeks and we find TCD more accurate parameter then FL.

The limitation of this study is most of the studies have been done on Caucasians races considering our special population features we need to go for larger studies with larger sample sizes comparing TCD with other parameters from 20 weeks onward. We suggested that institutions performing large numbers of fetal ultrasound examinations should derive TCD nomograms to determine the measurement standards most appropriate for clinical use.

CONCLUSIONS

Transcerebellar diameter is more reliable method of gestational age determination in third trimester of pregnancy than femur length. TCD can be used as a tool to assist in the assessment of gestational age in third trimester.

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