Assessment of Gestational Age in the Third Trimester of Pregnancy: Comparison of Symphysio-Fundal Height Measurements with Ultrasonic Methods.

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Abstract

Context: Despite its cost and loss of accuracy, ultrasound is still employed by most obstetricians when faced with the problem of uncertain dates in the third trimester of pregnancy. There are, however, cheaper methods of estimating gestational age in the third trimester.

Objective: To compare the accuracy of symphysio-fundal height measurement (SFH) with ultrasonic measurement of biparietal diameter (BPD) and femur length (FL) in assessing gestational age in the third trimester of pregnancy.

Subjects and Methods: Women carrying singleton uncomplicated pregnancies in the third trimester who were attending antenatal clinic at the University College Hospital (UCH), Ibadan between January 1991 and May 1991 had SFH measurements, and ultrasonic BPD and FL determination. The measurements were used to obtain the corresponding estimated gestational ages from local growth charts. The gestational age of each patient on the day measurements were taken was calculated retrospectively from the Dubowitz Gestational Age Assessment at birth. This was used to determine the accuracy of the estimated gestational ages.

Results: Of the 105 patients studied, SFH correctly assessed gestational age in 59.1% compared to 62.5% for BPD ($p = 0.71$), 62.8% for FL ($p = 0.72$) and 69.8% for BPD combined with FL ($p = 0.14$). Among the patients who delivered at term, 70% delivered within two weeks of the date predicted by SFH compared to 69.6% for BPD ($p = 0.916$), 72.8% for FL ($p = 0.77$) and 78% for BPD combined with FL ($p = 0.26$).

Conclusion: There was no significant difference between SFH measurement and ultrasound parameters in determining gestational age in the third trimester of pregnancy.

Key Words: Ultrasonography, Gestational Age, Biparietal Diameter, Femur Length, Symphysio-Fundal Height. [Trop J Obstet Gynaecol, 2003, 20: 123-126]

Introduction

In up to 45% of pregnant women, the menstrual history is unreliable in calculating gestational age due to irregular cycles or inability to remember the date of onset of the menstrual period [1]. In this group of women, ultrasound has been found to be very useful in dating the pregnancy if they present in the first or second trimester [2]. Unfortunately, many of our patients present late in pregnancy, by which time the accuracy of ultrasound has dropped from an error-margin of 6-10 days before 26 weeks to 3 weeks in the third trimester.

When faced with the problem of uncertain dates in the third trimester many obstetricians still request for ultrasound despite its cost and poor accuracy at this period. Studies are therefore required to define more carefully the relative accuracy of ultrasound and cheaper clinical methods of dating pregnancy. Of all the clinical parameters, symphysio-fundal height (SFH) measurement has been found to give the best correlation with fetal growth and it is the most reliable [3]. Hence, the objective of this study was to compare the reliability of symphysio-fundal height measurements with ultrasonic parameters in the assessment of gestational age in the third trimester of pregnancy.

Patients and Methods

The subjects for this study were patients attending the Antenatal Clinic, University College Hospital, Ibadan between January 1991 and May 1991. To be eligible for the study, patients had uncomplicated singleton pregnancy with gestational ages between 28 and 40 weeks. Patients were however recruited whether or not they were certain of their date of last menstrual period.

After obtaining their informed consent, patients had both SFH and ultrasound BPD and Fl measurements performed on the day of recruitment. The observed measurements were used to obtain the estimated gestational ages from local nomograms for the same population.

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All measurements were made by one of us (OK). In order to avoid bias, measurements were made without prior knowledge of the patients' menstrual age.

Patients were subsequently managed routinely until delivery. None of the measurements were repeated for the purpose of this study. At delivery each baby was examined within 48 hours and gestational age at birth was assigned using the Dubowitz method [4]. Combined external and neurological scores were used and single assessment was performed on each baby. The true gestational age at birth of each baby on the day of recruitment was deduced from the Dubowitz gestational age at birth. This was used to determine the accuracy of all the estimated gestational ages. All gestational ages were recorded to the nearest week. The Dubowitz method for assessing gestational age has an inherent error of one week when a single assessment is performed [4]. Hence for the purpose of this study any estimated gestational age within one-week of the true age obtained by the Dubowitz assessment was taken as correct.

Patients who developed complications that could compromise fetal growth such as pre-eclampsia, those who deliver infants with birth weights below two standard deviations, using the growth chart of Olowe [5] and those who delivered stillbirths were excluded from the study. Patients were however not excluded for preterm delivery.

Symphysio-fundal height was measured as described by Belizan et al [6], the same method that was used by Otolorin et al [7] to produce a standard symphysio-fundal growth chart for the same population. A metric tape of non-elastic material was used to measure the distance from the uterine fundus to the top of the pubic symphysis. All measurements were recorded to the nearest centimeter. To avoid observer bias, the reverse side of the tape was used before turning the tape to the centimeter side to take the actual reading. Fetal presentation and the degree of descent of the presenting part were not taken into consideration during measurement, as these have not been found to affect the distribution of SFH measurements [6].

All ultrasonic measurements were made with a SONOLINE SX mechanical real time scanner equipped with a 3.5MHz transducer and electronic calipers for measurement, which was calibrated at a sound velocity of 1540m/sec. The BPD was measured as described by Silverman and Tailor [8]. The fetal skull was displayed at the plane of the thalamus and the septum pelucidum, and the skull outline was ensured to be oval before measurements were taken. Measurements were made from the outer edge of the proximal skull to the inner edge of the distal skull (outer to inner). The same method had been used earlier by Osinusi and Bamgboye to produce a BPD nomogram for this population [9]. Femur length was measured by the method described by O'Brien et al [10], which is similar to the method used by Osinusi [11] to produce a femur length nomogram for the same population.

To determine the accuracy of the methods in predicting onset of spontaneous labour at term, the estimated gestational age was used to prospectively predict a delivery date assuming that the normal duration of pregnancy is 280 days [3].

Data analysis was by SPSS statistical package. Proportions were compared with the χ^2 test and the level of significance was set at 0.05.

Results

A total of 134 women were recruited for the study. Twenty-two of these did not deliver at UCH, Ibadan and were lost to follow up while seven patients were excluded for other reasons, including 2 with stillbirths, leaving 105 patients for analysis. Two of these 105 patients had pre-term deliveries at 35 and 36 weeks respectively. Of the 105 patients, 32 (30.5%) were uncertain of their dates of last menstrual period. Correlation analysis among the 73 patients who were certain of their dates revealed that gestational age determined by Dubowitz postnatal assessment correlated highly with that calculated from the date of last menstrual period using Naegele's rule ($r = 0.91\ p < 0.01$).

Table 1

Distribution of the Patients According to Gestational Age at Time of Measurements

Gestational Age (weeks)	Total No. of Patients	*Number of Measurements Made*		
		SFH	BPD	FL
28	7	7	7	6
29	10	10	10	9
30	11	11	11	8
31	6	6	6	6
32	8	8	7	6
33	8	8	8	8
34	7	7	7	7
35	8	8	8	7
36	7	7	7	7
37	7	7	7	7
38	10	10	10	9
39	7	7	7	6
40	9	9	9	8
Total	*105*	*105*	*104*	*94*

Table 1 shows the distribution of the patients according to their gestational ages on the day of recruitment. The mean height of the mothers was 1.60 m (range: 1.48 - 1.71 m) and the mean birth weight of the babies was 3.25 kg (range: 2.5 - 4.25 kg). Table 2 shows the details of the demographic characteristics of the patients.

Table 2

Demographic Characteristics of the Patients

Variable	Number of Patients	Proportion (%)
Maternal Age		
20 - 24	15	14.3
25 - 29	43	40.9
30 - 34	36	34.3
35 - 39	11	10.5
Parity		
0	23	21.9
1 – 4	71	67.6
5 and above	11	10.5
Babies' Gender		
Male	49	46.7
Female	56	53.3
Birth Weight		
2.5 – 2.9	28	26.7
3.0 – 3.4	41	39.0
3.5 – 3.9	29	27.6
4.0 – 4.4	7	6.7
Total	***105***	***100***

All the 105 patients had their SFH measured but the BPD was not obtained in one patient due to persistent direct occipito-posterior position. In 11 of the patients, a satisfactory femur image could not be obtained. SFH measurement correctly assessed gestational age in 59.1% of the patients. This was not significantly different from BPD (62.5%) and FL (62.8%) as shown in Table 3.

Table 3

Comparison of Symphysio-Fundal Height (SFH) with Ultrasound Biparietal Diameter (BPD) and Femur Length (FL) Measurements.

Method	No. of Measurements	Gestational Age Assessment Correct n (%)	Incorrect* n (%)	$p^{@}$
SFH	105	62 (59.1)	43 (40.9)	
BPD	104	65 (62.5)	39 (37.5)	0.71
FL	94	59 (62.8)	35 (37.2)	0.72
BPD & FL	93	65 (69.8)	28 (30.1)	0.14

*An Error of > 1 week compared to Dubowitz Estimation
$^{@}$Compared to SFH

There is no significant difference in the magnitude of the discrepancy between the true gestational age obtained by the three methods (Table 4).

Table 4

Comparison of the Magnitude of Discrepancy Between the Estimated Gestational Age and the Actual Gestational Age.

Method	No. of Measurements	Discrepancy (in weeks) ≤ 2	> 2	$p^{@}$
SFH	105	84 (80.0)	21 (20.0)	
BPD	104	88 (84.6)	16 (15.4)	0.87
FL	94	82 (87.2)	12 (12.8)	0.76
FL & BPD	93	84 (90.3)	9 (9.7)	0.64

$^{@}$Compared to SFH

Seventy percent of the patients who delivered at term delivered within two weeks of the date predicted by SFH compared to 69.6% for BPD and 72.8% for FL (Table 5). Although combined use of the two ultrasound parameters did improve the accuracy of assessing gestational age or predicting the date of delivery, it is still not significantly better than using SFH alone.

Discussion

Evaluation of the accuracy of available methods of assessing gestational age becomes necessary due to the high incidence of uncertain menstrual dates in our community. In this study an incidence 30.5% was obtained which is much higher than that reported from developed countries [12]. This high incidence of uncertain dates may be due to a high level of illiteracy and the tendency of our patients to assess age of pregnancy in lunar months [13].

Table 5

Comparison of SFH Measurements with Ultrasonic BPD and FL Measurements in the Prediction of the Date of Delivery

Method of Prediction	No. of Measurements	Patients Delivering ± 2 weeks of PDD	> ± 2 weeks of PDD	$p^{@}$
SFH	103	72 (70.0)	31 (30.0)	
BPD	102	71 (69.6)	31 (30.3)	0.92
FL	92	67 (72.8)	25 (27.2)	0.77
BPD & FL	91	71 (78.0)	20 (22.0)	0.26

$^{@}$Compared to SFH

Dubowitz gestational age assessment was used as the gold standard against which the 3 methods were compared because it is the most carefully evaluated of all postnatal estimators of gestational age [14] and has been shown to be valid for black infants in assessing gestational age [14, 15]. This is confirmed by the high degree of correlation obtained in the study between Dubowitz gestational age and menstrual ages of patients who were certain of their dates.

This study showed clearly that there is no significant difference between SFH and ultrasonic parameters in assessing gestational age or predicting date of delivery when use in the third trimester of pregnancy. In fact, there was no difference in the magnitude of the error obtainable from the two methods. This is similar to the findings of other investigators who found no significant difference between ultrasound and good clinical methods in predicting date of delivery and assessing fetal growth [16, 17]. This is probably because the variability of ultrasonic parameters approach that of the SFH measurements in the third trimester of pregnancy [18]. Since most of our patients register for antenatal care after 26 weeks when the advantage of ultrasound over SFH measurement in assessing gestational age would have been lost, the use of standard SFH chart may serve the dual purpose of assessing gestational age and fetal growth in patients who present for the first time in the third trimester.

In conclusion, ultrasound has no advantage over SFH measurement in assessing gestational age in the third trimester of pregnancy. Hence the wider use of SFH measurement for this purpose will significantly reduce the cost of antenatal care without loss of quality of care. In addition to low cost, SFH measurement can be performed even at primary health care level without special resources. It is therefore recommended that each obstetric population should have its own SFH chart for determining gestational age in the third trimester in addition to its use for monitoring fetal growth.

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