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Ultrasound Measurement of Placental Thickness in Normal Singleton Pregnancy.

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ABSTRACT

Objective To establish a normative data of placental thickness in normal fetus across gestation.

Methods A prospective longitudinal study of 134 pregnant women recruited from the antenatal clinic was performed. They were randomized into 4 groups (A, B, C and D). Each group had first transabdominal ultrasound examination done at 18, 19, 20 and 21 weeks, respectively. The follow-up scan was then performed at 4-week interval until term. The estimation of gestational age has confined to the used of BPD, HC, AC and FL. Placental thickness was obtained by scanning perpendicularly through the thickest part of placenta. All newborns were proved to be normal at birth. The data was analyzed for mean, standard deviation, the 5^{th}, 50^{th} and 95^{th} percentile. The best fit mathematical model was derived using SPSS computer program.

Results The total number of measurements were 683. The number of measurements at each gestational week ranged from 2 to 44. The best regression model between gestational age and placental thickness obtaining from random sampling of single measurement in each patient was observed to be linear : Placental thickness (mm) = 14.5927 + 0.719 Gestational age (weeks), r = 0.483.

Conclusion The nomogram for placental thickness of our population was established. This may be a useful aid in the prenatal diagnosis of fetal growth restriction and hydrops fetalis.

Key words : ultrasound, placental thickness, pregnancy

Since the placenta is considered a fetal organ, the evaluation of the placenta has become an essential part of "fetal anatomical survey". In the past, placental morphology and function could only be studied postpartum, in vitro, or by the placental pathologist. Ultrasound has enabled us to evaluate placental abnormalities that can have a significant impact on pregnancy management and outcome. The initial aim of placental examination by ultrasound was the determination of placental position,[1,2] this now becomes a part of routine prenatal assessment. Improvements in imaging resolution allow more detailed examination of placental morphologic characteristics.

Total placental volume is probably the most accurate estimate of placental mass, but the difficulty in obtaining three-dimensional measurements with real-time sonography is usually beyond practical capabilities. Abnormal growth of placenta has been shown to precede abnormal growth of the biparietal diameter and abdominal circumference with 90% sensitivity and specificity in the 20- to 25-week range, but the major drawback is the time-consuming method of measuring the placenta.[3] Besides, in some studies, and accurate measurement requires computerized equipment which is not yet widely available.[4,5] The easiest and most widely applied measurement is placental thickness.

Hoddick et al reported that the placental thickness in millimetres was equivalent to the gestational age in menstrual weeks.[6] Jauniaux et al have shown that the best regression model between gestational age and placental thickness during the second trimester of pregnancy was linear.[7] However, Grannum et al have reported that the thickness of the placenta gradually decreases after 32 weeks' gestation.[8] Similarly, Dombrowski et al have also found that there was a gradual increase of the placental thickness before 32 weeks of gestation and a slow progressive decrease thereafter.[9]

The purpose of this study was to establish a normative data of placental thickness in our population across gestational age.

Materials and Methods

One hundred and thirty-four pregnant women were recruited into the study from our antenatal clinic. Inclusion criteria were (1) regular menstrual cycle with certain last menstrual period, (2) gestational age less than 12 completed weeks, (3) informed consent was obtained. Gestational age was determined by last menstrual period and confirmed by crown-rump length through transvaginal ultrasound in every case. Exclusion criteria were (1) women with datesize discrepancy of more than 7 days, (2) multifetal pregnancy, (3) non-viable pregnancy. They were randomized into 4 groups (A, B, C and D). Each group had first transabdominal ultrasound examination done at 18, 19, 20 and 21 weeks, respectively. The follow-up scan was then performed at 4-week interval until term.

Ultrasonograms were performed in all cases with real-time equipment using 3.5- or 5.0- MHz curvilinear transducers ; Aloka-SSD 2000 (Japan). In our institution, the estimation of gestational age has confined to the used of BPD, HC AC and FL, In the measurement of placental thickness, perpendicular scanning through the thickest part of placenta was used.

The newborns were proven to be normal and weighted between the 10^{th} and 90^{th} percentile for our standard. The data was collected, the mean, standard deviation, the 5^{th}, 50^{th} and 95^{th} percentile for each gestational age were calculated and the best fit regression curve was established using SPSS computer programme.

Results

The total number of measurements was 683. The number of measurements at each gestational week ranged from 2 to 44 (28.5 ± 11.3). Only 4 and 2 measurements were done in 40 and 41 weeks' gestation, respectively because most of the patients have been delivered. The measurements of placental thickness were more difficult when the placenta was implanted at the posterior and lateral wall of uterus. No abnormality of placenta was found in this study. A normative data of placental thickness at each gestational age is demonstrated in Table 1.

The best regression model between gestational age and placental thickness obtained from random sampling of single measurement in each patient was observed to be linear : Placental thickness (mm) = 14.5927 ± 0.719 Gestational

Table 1. Normative data of placental thickness across gestational age.

GA (wk)	Number of measurement	mean ± SD	5th percentile	50th percentile	95th percentile
18	35	27.6 ± 5.7	20.0	26.0	37.0
19	41	27.2 ± 5.9	15.5	26.0	36.0
20	30	28.7 ± 6.4	17.0	28.0	39.0
21	26	28.5 ± 5.5	20.0	28.0	37.0
22	35	32.7 ± 6.7	23.0	32.5	45.0
23	44	30.2 ± 7.7	20.0	31.0	40.0
24	30	34.1 ± 5.6	24.0	34.0	43.0
25	21	30.9 ± 9.0	17.0	31.0	45.0
26	35	32.7 ± 7.5	21.0	32.0	46.0
27	42	34.8 ± 7.9	21.0	34.0	47.0
28	35	34.0 ± 6.8	25.0	35.0	46.0
29	19	35.6 ± 7.5	21.0	36.0	49.0
30	31	38.8 ± 6.3	29.0	39.0	49.0
31	44	37.5 ± 8.6	23.0	37.0	51.0
32	32	42.3 ± 9.1	33.0	40.0	58.0
33	24	41.4 ± 11.0	28.0	38.5	59.0
34	31	43.0 ± 13.7	27.0	43.0	63.0
35	39	40.7 ± 10.2	23.0	40.0	61.0
36	29	41.8 ± 7.0	34.0	39.0	53.0
37	16	37.4 ± 7.3	25.0	35.5	53.0
38	16	37.4 ± 6.9	27.0	36.5	52.0
39	22	40.6 ± 10.5	24.0	40.0	57.5
40	4	39.3 ± 9.2	30.0	39.0	49.0
41	2	36.0 ± 9.9	29.0	36.0	43.0

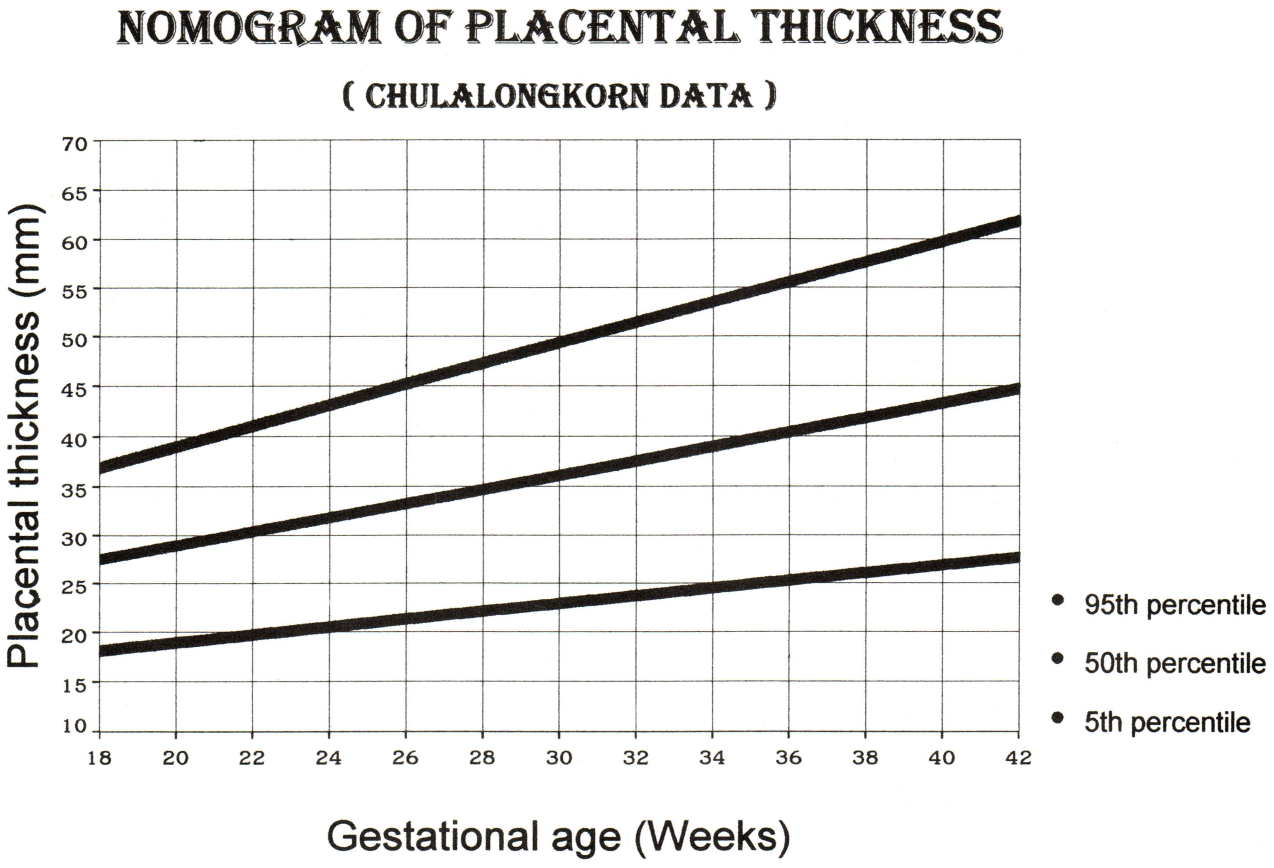

Fig. 1.

age (weeks), r = 0.483 (Figure 1).

Discussion

Ultrasonographic measurement of the placenta during pregnancy has been described for almost thirty years.[4,10] Many authors found that the placental size and the intrauterine fetal growth were closely correlated.[4,11] Hoogland et al[11] reported that ultrasonographic placental area measurement in mid-pregnancy appeared to be of prognostic value in identifying pregnancies at high risk for the subsequent occurrence of fetal growth restriction.

Besides, some recent studies showed that ultrasonographic finding of placentomegaly was an alternative effective method in prenatal diagnosis of Hb Bart's hydrops fetalis before its classic findings became apparent in the late second or third trimester.[12-14] Since the value of this parameter are useful but vary in different population, it is generally encouraged for each institution to develop a normative data used for its own population.

The gestational age of the patients enrolled in this study is highly reliable in that all patients were recruited in the first trimester and confirmed by sonographic dating using fetal crown-rump-length. The newborns were all proven to be normal and appropriate in size for gestational age. Our study showed that the placental thickness increased steadily across gestational age, which was similar to the study of Jauniaux et al,[7] who investigated the placental morphologic characteristics during second trimester of pregnancy.

However, several studies showed that the growth of human placenta ceased before the end of pregnancy.[4,9,10] This difference may be due to the difficulty of ultrasonographic measurement in the third trimester of pregnancy. Moreover, the number of subjects in the last few weeks of gestation from our study may be too small to allow definite conclusion to be drawn.

To date, the studies that have examined the ultrasonographic morphologic characteristics of the developing placenta have used highly selected groups of patients and varied considerably in their methods. Future work is needed to determine the incidence of unusual placental ultrasonographic features in a low risk population and their relationship to subsequent pregnancy outcome. We hope that our nomogram of placental thickness could be served as a basis for early detection of growth restricted fetus so that a medical intervention could be implemented early in the course of the process. Additionally, it would also be useful in differentiating normal fetuses from those with homozygous α-thalassemia-1. Further studies are needed to certify this usefulness.

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