Volume : 5 | Issue : 11 | November 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Original Research Paper

"Sonological Evaluation of Placental Thickness with Respect to the Gestational Age"

Radiology

KEYWORDS : Placental thickness, gestational age, ultrasonography.

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ABSTRACT

Objectives: Present study is aimed to assess the association between placental thickness with the gestational age of the fetus. Materials and methods: Study group consists of 100 normal, singleton pregnant women of gestational age 11- 40 weeks referred to department of Radiodiagnosis, from department Obstetrics and Gynecology,MIMS,Nellimarla,Vizianagaram. Results: In our observations, placental thickness increases gradually from 11.51mm at 11 weeks to 37.13mm at 40weeks of pregnancy. Conclusion: Placental thickness in millimeters almost matches to gestational age in weeks especially from 11-35 weeks, which can also be used as additional tool for estimating gestational age. Normal placental thickness nomograms have been established in the present study to determine whether a given placental thickness is normal or abnormal for a particular gestational age.

INTRODUCTION

Placenta is an organ of significance in pregnancy, which provides vital support to the fetus. It has significant role in nutritive, endocrine, metabolic and immunological functions. Placenta is directly responsible for modulating the maternal environment necessary for normal fetal development. It provides important physiological relation between a pregnant woman and the fetus [1]

The development of placenta starts by 5th week of gestation, from chorionic villi at the site of implantation and attains diffuse granular echotexture by 10th week. [2, 3]

The role of antenatal sonography in the evaluation of placental abnormalities in entities like gestational diabetes, IUGR and non immune hydrops has been illustrated in various studies. Measurement of thickness of placenta can differentiate normal physiological pregnancy from pregnancies complicated by various pathological processes. [4]

Various studies have shown that intra uterine growth retardation(IUGR) is mostly associated with reduced placental thickness as growth retardation is almost always accompanies with maldevelopment of chorionic villi and impaired feto-placental angiogenesis.[5,6] Thus measurement of placental thickness can contribute in diagnosing the fetuses at risk.

Various aspects of placental growth including weight, volume and plate area were investigated in different researches in order to find their correlation with gestational age and fetal well being. In this setting it was proposed that the thickness of placenta is directly proportional to the gestational age of the fetus. For estimating placental size even though placental volume is more accurate than placental thickness, we consider only measurement of placental thickness, as it is simple, rapid and easily reproducible. [7]

Materials and methods:

Present study includes 100 normal antenatal subjects of gestational age ranging from 11 weeks to 40 weeks, referred to department of Radiodiagnosis, MIMS,Nellimarla,Vizianagaram.

Exclusion criteria are a) subjects with multifetal gestation, fetal hydrops, fetal growth retardation and congenital malformations.

b) Systemic diseases complicating the pregnancy like diabetes mellitus, hypertension and also the liquor abnormalities like poly/oligohydromnios.

c) Morphological variants of placenta like succenturiate lobe and circumvallate placenta.

d) Abnormal insertions of cord like velamentous cord insertions(i.e. cord inserts on the chorioamniotic membranes) and marginal/battledore placentas.

d) Placentas where cord insertion site is not clearly appreciated.

The transabdominal sonography was performed on each subject using Philips Envisor equipment, which has a multifrequency convex transducer with frequency range of 2 to 5MHz.

Thickness of placenta was measured from the echogenic chorionic plate to placental myometrial interphase(excluding myometrium and subplacental veins). All these measurements are taken when uterine myometrium is in relaxed phase. Sonologically site of umbilical cord insertion was identified as a 'V' shaped hypo echoic areas close to the chorionic plate, where placental thickness was maximum.

Calculation of gestational age in 1st trimester was done by measuring CRL(crown-rump length) using hadlock tables[8,9] and for 2nd & 3rd trimesters composite of fetal measurements like biparietal diameter, circumference of head and abdomen taken at appropriate levels and femur length are used. [10, 11, 12]

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Statistical software SPSS 10.0 and SYSTAT 8.0 were used for analysis of data and for generation of graphs and tables Microsoft word and Excel was used.

Results:

Age distribution of antenatal women studied: A total of 100 normal antenatal subjects of age between 18-39 years were included and represented in table-1.

-Table-1

AGE IN YEARS	NO. OF CASES	PERCENTAGE
<20	8	8
20-25	73	73
26-30	14	14
>30	5	5
Total	100	100

Distribution of placental position.

-Table-2

PLACENTAL POSITION	NO CASES	PERCENTAGE
Fundal anterior	33	33
Fundal posterior	29	29
Anterior wall	12	12
Posterior wall	13	13
Lateral wall	13	13
Total	100	100%

Out of 100 cases studies, anterior wall was the most common location of placenta, seen in 45 cases, followed by posterior location in 42 cases. Lateral location is relatively rare, accounting for 13% of cases as given in table-2

It is observed that placental thickness increases with each week of gestation from 11.51mm at 11 weeks to 37.13mm at 40 weeks of gestational age as given in table-3.

-Table-3

Gestational age in wks	No. of cases	Mean placental thickness
11	2	11.51
12	1	11.86
13	3	12.62
14	2	13.53
15	1	14.98
16	2	15.59
17	3	16.66
18	1	17.53
19	2	18.53
20	3	19.11
21	2	20.66
22	1	21.17
23	4	22.59
24	4	23.61
25	2	24.13
26	3	26.02
27	2	26.53
28	3	26.66
29	4	28.61
30	3	30.33
31	4	31.27
32	9	31.33
33	8	32.39
34	3	32.79
35	8	34.54
36	11	35.46
37	4	36.75
38	3	36.23
39	1	37
40	1	37.13

In table-4 comparison between **gestational age** from 11-35 weeks and **placental thickness**(mm) measured by sonography was documented clearly.

-Table-4

Parameters	Range	N	Mean	SD	T-value	P-value
Gestational Age (wks)	11-35	80	25.50	8.80	0.103	>0.921
Placental thickness	11-36	80	25.39	8.69		

T-value was obtained using student's t-test

For each week of gestational age mean placental thickness along with standard deviation (SD) was calculated.

There is no statistical difference between mean gestational age(25.50+8.80) and placental thickness (25.39+8.69) from 11-35weeks,which indicates that there is high degree of positive correlation (r=0.921) which is significant (i.e. p<0.001).

In table-5 comparison between gestational age from 36-40 weeks and placental thickness was plotted.

-Table-5

Parameters	Range	Mean	SD	T-value	p-value
Gestational age(in weeks)	36-40	38.0	1.58	8.17	<0.001
Placental thickness (in mm)	32-37	36.48	1.17		

Here difference between gestational age (38.0+/-1.58) and placental thickness (36.48+/-1.17) is high which indicates poor positive correlation (T=8.17, p<0.001) which is statistically not significant(r=0.19, p>0.247) as given in table-6.

-Table-6

Correlation between	Persons correlation	p-value
Gestational age (11-35wks) and placental thickness	0.981788	<0.001(significant)
Gestational age (>35wks) and placental thickness	0.1968	>0.247(not significant)

Sonological correlation between gestational age and placental thickness for different placental locations i.e. Group-A (anterior,fundal anterior and lateral located placentas) vs. Group-B (posterior and fundal posterior placentas) are represented in table-7.

-Table-7

	Group-A		**Group--B**	
GESTATIONAL AGE (WEEKS)	No. OF CASES	MEAN PLACENTAL THICKNESS(mm)	No. OF CASES	MEAN PLACENTAL THICKNESS(mm)
11	2	11.5	0	0
12	1	11	0	0
13	0	0	3	13
14	0	0	2	13.5
15	1	16	1	16
16	1	15	0	0
17	0	0	3	16.66
18	0	0	1	17.0
19	1	19.0	1	18.0
20	0	0	3	19.0
21	0	0	2	20.5
22	0	0	1	21.0
23	2	22	2	22
24	2	23.5	2	24.25
25	2	24	0	0
26	2	26.5	1	25
27	1	26	3	27
28	1	26	0	0
29	2	29	2	28.25
30	1	31	2	30
31	1	32	3	30.75
32	5	31.25	6	32
33	1	33	5	32.83
34	3	31.5	1	36
35	5	33.5	3	35
36	7	35.5	3	34.75
37	2	37	2	36.5
38	1	36.5	2	35.75
39	1	37	0	0
40	1	37.13	0	0

Growth patterns of placenta for different locations are almost similar as seen from above data through comparison of Group A and Group-B. Similar observations were made by hoddick et al (1985). [13]

Discussion:

Earlier placenta was evaluated purely to determine its position or to know any premature separation is present or not. Because of this its role in management of pregnancy is limited.

With advanced ultrasound equipment and more detailed examination of placenta has lead to the understanding of possible morphological changes as the placenta matures from first trimester itself.

Changes in placental thickness are an expression of normal growth of fetoplacental unit which is measurable on sonography. Altered placental thickness have been associated with a number of fetal and maternal pathological conditions and increased morbidity. So, for screening of pregnancy related complications, measurement of placental thickness has an important role.

Placental thickness must be specified for each week of gestation, so that abnormalities of fetus can be noticed by calculating the placental thickness, as thickness of placenta is altered due to pathological processes. [14]

For posteriorly located placentas, recognition of this region is done by acquiring images, where fetal accosting shadowing is least and for anteriorly placed placentas correct positioning of transducer and proper adjustment of gain settings will decrease the near field and reverberation artifacts.

Accuracy of placental measurements depends on detailed acquisition and interpretation of images. By taking accurate measurements error rate can be minimized. For e.g. imaging obliquely through the placenta leads to images showing increased placental thickening which is incorrect. All examinations were performed by using the same equipment and also by the same examiner to reduce these measurement errors.

Limitations of the study: a) Small sample size. b) Placental growth curves may differ relative to demographic characteristics of populations. Hence population specific nomograms may be required. c) Evaluation of thickness of in-situ placenta from ultrasonography in one dimension has its own limitations. d) Short placental insertion site may spuriously represent increased placental thickening in a normal placenta. e) In full term pregnancies identification of cord insertion site on placenta may be challenging, particularly for posteriorly situated placentas. [15]

Conclusion:

From the above study, it is evident that sonographic measurement of placental thickness in singleton pregnancies can be used as an additional tool in the assessment of gestational age because of its linear correlation with gestational age.

An abnormal placental thickness for the respective gestational age should raise the suspicion of any underlying pathological process at earlier stages which may affect the pregnancy outcome. This early identication of abnormalities may help the obstetrician to consider precise antenatal care.

Therefore routine antenatal ultrasound examinations should include measurement of placental thickness, as it assist in quantifying intrauterine environmental adequacy and fetal well-being.

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Volume : 5 | Issue : 11 | November 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

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