THE EFFECT OF HYPERTENSION ON GRADE OF PLACENTAL MATURATION AND ITS RELATION TO NEONATAL WEIGHT

Dr. Saliha Ali Hussain
Al-Zahraa Teaching hospital, Al-Najaf

Abstract
The effect of hypertension on the maturation process of the placenta which is detected by ultrasonography and the relation of different grades of placental maturity on the weight of newborn, was studied in a group of hypertensive pregnant ladies and was compared to a group of normotensive pregnant ladies as follow:

1- 50 normotensive and 50 hypertensive women was examined by ultrasonography at three periods. First between 29-32 weeks gestation, second between 33-35 weeks, and third after 36 weeks till 40 weeks gestation.

2- The weight of the infant after delivery was measured.

We found that:
1. The hypertension not cause an acceleration of the placental maturation.
2. The grade of placental maturation after 36 weeks gestation is not correlated with newborn birth weight in hypertensive or normotensive pregnancies.
3. Early advance maturation can happen in normotensive and hypertensive pregnancies and associated with low birth weight.

Introduction
The placenta is a fetal organ so it should mature in a fashion similar to that of other fetal organ systems.

Placental phases of maturation first categorized by Grannum et al., at 1979 to four grades (G) of maturation (0, I, II, III) according to ultrasonographic variation in placental appearance occurring during gestation.

Grade 0:
The chorionic plate appears as a smooth, straight, and well defined unbroken dense line. This can be seen as early as 12 weeks gestation. The placental substance appears to be homogeneous and devoid of any outstanding echogenic areas. The basal layer also appears homogenous and of the same texture as the placental substance. This grade is seen in the first and second trimester.

Grade I:
The grade I placenta manifests the earliest ultrasonic changes of placental maturation. The chorionic plate appears as a well-defined unbroken line but assumes many subtle undulation. Few scattered echogenic areas (EGAs) appears in the placental substance resulting in a loss of homogeneity. EGAs appear as densities Measuring approximately 1 to 4 mm in length and have their long axis parallel to the basal layer. This grade is usually first noted from as early as 30 to 32 weeks and may persist until term.

Grade II:
The maturational changes in the grade II placental scans involve changes in all three zones. The chorionic plate develops more marked indentations. The placental substance appears incompletely divided by the appearance of linear or comma-like echogenic densities that are contiguous with the marked indentations of the chorionic plate. It should be noted that at this phase the linear echogenic densities do not reach the basal layer. The EGAs within the placental substance also appear to be more numerous and slightly larger than those in Grade I. The basal layer becomes punctuated with linear echoes which are arranged with their long axis parallel to the basal layer. These areas are larger and more dense than the EGAs which are randomly dispersed in the placental substance.

Grade III:
This phase represents the mature placenta. The chorionic plate appears interrupted by the indentations. Which now extend to the basal layer and probably represent the intercotyledonal septa. These are contiguous with linear echogenic densities. As a result, the placental substance become divided into compartments which presumably demarcate the cotyledons. The central portion of these compartments shows echo-spared or "fallout" areas. In addition, dense, irregularly shaped, echogenic areas appear close to the chorionic plate. They cast acoustic shadows and may measure up to 2 cm in diameter. The echogenic area at the basal layer become larger, more dense, and confluent and in some cases may cast acoustic shadows. It should be noted that a given placenta may have more than one grade if different sections are examined. In evaluating each scan in this series, the grade assigned corresponded to the most mature portion of the placenta assessed. It is obviously important to visualize as much placental tissue as possible.

Form I
Name--------- Parity---------
Age--------- Bloody RH---------
IMP--------- E.D.D---------
Gestational age by weeks --------------
History of hypertension-----------------
History of diabetes------------------
History of Antepartum hemorrhage-----------------
B.P. less than 140/90-----------------
B.P. more than 140/90-----------------

Sonographic examination
1- Date of examination------------
2- B.P.D. =cm= weeks----------
3- F.L.=cm= weeks----------
4- Amount of liquor --------
5- Grade of placental maturation ( G0, GI ,GII , GIII ).

Materials and Methods
Our study included a total of 100 pregnant women who were attending our privat clinic or Al-Zahr'aa teaching hospital at Al-Najaf between October 2006- August 2008 two groups of patients were selected.

Group A:
50 hypertensive pregnant ladies who were attended the antenatal clinic since early pregnancy, and they were developed hypertension at early third trimester, and delivered at 37-40 weeks gestation by vaginal (spontaneously or induced) or by cesarean section (elective or emergency).

Those patents were selected according to form (1) as follow:-
1- They were sure about the date of the last menstrual period (LMP) and had antenatal care (before the 28 weeks gestation).
2- All the patients were not diabetic and not of Rh(-ve) blood group.
3- The age, parity, the protein urea, the use of antihypertensive drugs, all not taken in consideration.
4- Their blood pressure (which was measured on two occasions) was 140/90 or more at early third trimester.
5- Patients who delivered preterm was excluded (so from about 86 hypertensive followed patients our 50 patient included in this study reaching the 37-40 weeks gestation).

Group B:
Also 50 normotensive pregnancies with all other criterion of group A, selected from 72 pregnancies examined by ultrasonography at early third trimester (22 patient either developed complications or were not delivered under our supervision).

Several ultrasonographic examination at third trimester by experienced ultrasound doctor for grade of placental maturation, according to Grannum et al (1979) classification, in which the grade assigned is that of the most mature area of the placentavisualized, also the biparital diameter, femoral length (to confine the gestational age). First examination between 28-33 weeks second between 33-35 weeks, third after 36 weeks till 40 weeks gestation.

After the delivery the neonatal birth weight by (kg) was measured.
Difference between the groups was examined by means of student's (t) test for birth weight and (chi) square test for incidence of placental grades of maturation.

Results
1- The incidence of different grades of placental maturity, at different gestational age, after the second trimester, till delivery in 50 normotensive and 50 hypertensive patients is shown in table I and figure II

A. Between 29-32 weeks gestation, from the 50 normotensive pregnancies. The number of placenta showing grade I,II,III maturity were 17(34%), 32(64%), 1(2%) consequently, compared to 21 (42%), 27(54%), 2(4%) from the 50 hypertensive pregnancies. So no significant difference (p>0.05) by (chi square) test.

B. Between 33-35 weeks gestation, from the 50 normotensive pregnancies the incidence of G I, G II, G III, were 12 (24%), 35(70%), 3(6%) consequently compared to 15(30%) 31(62%), 4(8%) in 50 hypertensive patients. Also no significant difference (p>0.05).

C. Between (36-40) weeks gestation from the 50 normotensive pregnancies the incidence of G I, G II, G III were 0 ,21(42%), 29(58%) consequently, compared to 0 , 19(38%), 31(62%) consequently, in 50 hypertensive patients, so no significant difference (p>0.05).

2- The mean birth weight of infant from placenta of different grade illustrated in table. The mean birth weight of infants with placenta of G III changes seen before 36 weeks gestation in hypertensive pregnancies was 2.537 ± 0.98 kg which was significantly less
than the mean birth weight of those delivered to patient with placenta of G III changes seen after 36 weeks gestation in the same group.

A. The mean birth weight of infants delivered to hypertensive patient with G II and G III changes seen after the 36 weeks gestation were 3.144±0.28 and 3.176±0.24 consequently so no significant difference (p>0.05).

B. The mean birth weight of infants delivered to normotensive pregnancies with G II and G III changes seen after the 36 weeks gestation were 3.4±0.3 kg and 3.3±0.38 kg consequently also with no significant differences seen (p.0.05).

### Table I

<table>
<thead>
<tr>
<th>Gestational weeks</th>
<th>Normotensive group</th>
<th>Hypertensive group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GI</td>
<td>GII</td>
</tr>
<tr>
<td>29-32 w.g</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>33-35 w.g</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>36-40 w.g</td>
<td>0</td>
<td>21</td>
</tr>
</tbody>
</table>

Number of patients with different grades of placental maturation at different gestational weeks in 50 normotensive and 50 hypertensive pregnancies.

### Table II

<table>
<thead>
<tr>
<th>Grade of placental maturation</th>
<th>Birth weight by kg.</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normotensive</td>
<td>Hypertensive</td>
</tr>
<tr>
<td>G II after the 36 w.g</td>
<td>3.4±0.3</td>
<td>3.144±0.28</td>
</tr>
<tr>
<td>G III after the 36 w.g</td>
<td>3.3±0.38</td>
<td>3.17±0.24</td>
</tr>
<tr>
<td>G III before the 36 w.g</td>
<td>2.66±0.12</td>
<td>2.537±0.98</td>
</tr>
</tbody>
</table>

The mean birth weight by (kg) of infants delivered to normotensive and hypertensive with G II or G III maturation after the 36 weeks gestation (w.g), G III maturation before the 36 w.g.

P value for comparison of the two groups (t) test.
Incidence of different grades of placental maturity at different gestational age after the second trimester in 50 normotensive and 50 hypertensive pregnancies.
w.g : week gestation

Discussion
Since the introduction of Grannum et al (1979) classification of placental grade of maturation, many studies were done to make use of this non-invasive technique to identified fetal maturation and fetal at risk.
With the technique and criteria of Grannum for assessment of placental morphology, this study demonstrate the incidence of different grade of placenta in normotensive and hypertensive pregnancies during the second and third trimester and its relation to birth weight.
The incidence of grade III placenta in normotensive group at 36-40 weeks gestation was 29 of 50 (58%).
A figure higher than reported by others, Grannum et al 1979 found G III placenta was 17% (23/129) of pregnancies at term Quinlan et al 1982 found G III is 7% of examination performed at this time of 174 amniocentesis procedures done for determination of fetal pulmonary maturity, Harman et al found G III placenta in only 32% of patient after 37 weeks.
In the presenting study the incidence of G I and G II at 29-32 weeks in normotensive group were 17%, 32% respectively, a result is not agreement with Destro et al study 1985 in which G I, G II demonstrated in 31.25% and 68.75% consequently.
We did not found any difference in the incidence different grades of placenta at different gestational weeks at the third trimester between normotensive and hypertensive group, which is in agreement with Montan et al 1986, and contradict those reported by Kazzi et al 1989. Kazzi et al found significant association between G III placenta and pregnancy complications including IUGR and maternal hypertension. Also it was found that placenta with G III changes had significantly increase frequencies at gestational age less than 38 week, when chronic hypertension was present compared to both repeated cesarean section and diabetes mellitus group, (Kazzi et al 1984). An accelerated placental maturation in women with pre-eclampsia also reported
by Quinlan et al (1982) , Both those studies are not in agreement with the finding of presented study.

The disparity in the general incidence of G III between different studies may be explained by the fact that, the placenta have been graded on a 0 to III basis depending on the presence of "echo genic" common like densities (Tindal et al 1965) which actually represent calcium (Grannum et al 1979) and the incidence of the this calcification increases exponentially with increasing gestational age beG Inning at about 29 weeks (Spirt et al 1982) placental calcification has also been correlated with 1- Parity (more in primigravida )(Tindal etal 1965 Spirt et al 1982) 2- Season of the year (more in summer months) Fujikura 1963 also it is related to maternal serum calcium level (Mull and Mill 1934).

In this study we found G III placenta as early as 30 weeks gestation in incidence of 1 of 50 (2%) and 2 of 50 (4%) in normotensive and hypertensive pregnancies respectively . While Grannum et al 1979 detect G III placenta first as at 33 weeks and Harman et al 31 weeks, G.ohlel found G III placenta at 29-31 weeks gestation in twins but not in singleton pregnancies of comparable gestational ages.

In this study we did not found G I placenta after 36 weeks gestation, but G I placenta reported by Grannum et al 1979, Harman et al 1982 at term.

In the present study we are found an association of early grad III changes and low birth weight in both groups . fetal weight of 276.7±0.1 kg and 213.5±0.38 kG In normotensive and hypertensive pregnancies with G III placenta started before 36 weeks gestation respectively , which significantly less than birth weight of infants when placental maturity of grade III or II were demonstrated after 36 weeks gestation .

This results is in agreement with Grannum et al 1979 ,Quinla et al 1982 ,Kazzi 1983.

We recommend that pregnancies with premature G III placenta most be followed closely by clinical examination biochemical tests ,stress test and ultrasonography in order to detect early evidence of abnormal fetal growth and /or fetal distress.

In this study no significant difference was found between birth weight of infants with G II or G III placenta after the 36 weeks of gestation in the same group.

This is not agreement with result reached by Montan et al 1986 Estel et al 1990 who found G III placenta at term associated with eutrophic infant , while G II associated with hypotrophic infant in study done on cases of reduced amniotic fluid at 38th to 40th weeks gestation.

Recommendation

From our present study we concluded that :-

1-Grade 0 placental maturity was not seen during third trimester in both hypertensive and normotensive pregnancies.
2-Grade I placental maturity was not seen after 36 weeks gestation in both groups.
3-No significant difference in the incidence of different grade of maturity at different gestational weeks at third trimester between hypertensive and normotensive pregnancies.
4-Few grade III changes detected as early as 30 weeks gestation in both groups.
5-The incidence of G III changes were significantly higher than G II after 36 weeks gestation in both groups.
6-In both groups the mean birth weight did not differed significantly when placental maturation was grade II or III demonstrated after 36 weeks gestation.
7-In both groups the birth weight was significantly lower when placental maturation of grade III was demonstrated before 36 weeks gestation. The fetus most
considered as high – risk , Therefore we recommend that ultrasonographic study of placental maturation is added to other fetal at risk , especially IUGR.

References
1- Dewhurst textbook of gynecology and obstetric , sixth ed. 1999.
2- Ganninghum , Mac Donald, Gant., Williams ,obstetric textbook ,8th ed., p53.
3- Fox H. the placental aging ; obstetric and gynecology pathology volu 2,3ed. P985.
4- Fujikura D. ; placental calcification and seasonal difference Am J obstetric and gynecology ,87;46.1963.