Morphological and morphometrical study of placenta in normal and hypertensive pregnancies.

Pushpa Gowda 1Jayanthi KS

1Assistant Professor of Anatomy, Kempe Gowda Institute of Medical Sciences, Bangalore
2Professor of Anatomy, Vidyai Institute of Medical Sciences, Bangalore

Abstract

**Background and Aim**: Placenta is the main channel in utero, through which the fetus receives its nutrition from the mother. Hypertensive disorders of pregnancy are fairly common and affect the growth and development of the placenta and fetus in many ways. Knowledge of these changes in placenta due to hypertension in pregnancy is essential as many of these changes can be diagnosed prenatally by available techniques to improve the fetal outcome and reduce perinatal morbidity and mortality. **Materials and Methods**: The present study was conducted to note the morphometrical and morphological parameters in the placenta of normal and hypertensive pregnancies and to correlate them with fetal outcome. The study was done on 30 placentae as control group, obtained after delivery of normotensive women and 30 placentae as study group, which were obtained after delivery of hypertensive mothers which included chronic hypertension, pre eclampsia and eclampsia. The placental specimens were collected from the department of obstetrics and gynecology, KIMS, Bangalore and new born parameters were taken from their records. **Results**: The placental morphometrical parameters were significantly less in hypertensive group as compared to the control group. The mean placental weight was 458.33 ± 70.47gms; mean placental surface area was 215.82±27.83 sqcms, the mean placental volume was 583.67±66.21cc and mean decidual thickness was 2.50 ±0.24 cms in hypertensive group while in the control group the values were 561.67±77.33 gms, 241.91±37.23 sqcms, 674.00±88.50 cc and 2.83±0.34 cms respectively. The mean birth weight (kg) of newborn was 2.92 ± 0.45 in control group and it was and 2.47 ±0.40 in hypertensive group. **Conclusion**: Thus hypertensive disorders of pregnancy affects the placenta in a major way by decreasing its weight, surface area, thickness and volume and by increasing pathological changes like placental infarcts and calcified areas which adversely affect fetal parameters like weight and APGAR score.

**Key Words**: infarction, calcification, newborn, maternal

Introduction

The Human placenta is a discoid choriodeciduate organ, which connects the fetus with the uterine wall of the mother. The umbilical cord is attached near the center of the fetal surface of the placenta and branches of umbilical vessels radiate from this point to vascularize the chorion. Thus the maternal blood in intervillous space and fetal blood in chorionic villi flow side by side but in opposite direction and help in exchange of gases and metabolic products. The principal factors affecting the delivery of the nutrients includes - the maternal blood concentration, flow of blood in intervillous space, area of placental diffusion membrane, its diffusion, resistance and the fetal hemodynamic factors. Any disruption in these will affect the fetal nutrition and growth.

Hypertensive disorders are common complications of pregnancy and diagnosed if maternal blood pressure is more than 140/90mm Hg. Hypertension in pregnancy may be chronic hypertension or may be induced due to pregnancy like gestational hypertension, pre eclampsia and eclampsia. These hypertensive disorders causes compromised placental perfusion due to vasospasm of maternal blood vessels. The placental ageing changes
like thinning of syncytiun with gradual thickening of
diagnosis of blood vessels in villi, progressive conversion of fetal
type of mesoderm into fibrous tissue are also
tissue. These placental changes interfere with oxygenation, nutrition and thus the growth and
development of the fetus. The child born under such
circumstances undergoes intrauterine growth retardation
and there can be increased incidence of perinatal
morbidity and mortality.3

Hypertension in pregnancy is reflected in the placenta
in a significant way. Examination of placenta after
delivery gives an accurate record of the infant’s prenatal
experience and provides information that may be important to the care of both mother and infant.4
Examination of placenta shows ageing changes with more
infarcts and fibrin deposits and it appears thinner than
normal. Umbilical cord edema and marginal insertions
are more common.5 All these findings can be diagnosed
during antenatal checkup by available techniques like
ultrasonography and colour Doppler.

Materials And Methods

The present study was done on 30 placentaes of
normotensive women obtained after delivery and 30
placentaes of hypertensive deliveries. The placentaes were
collected from Kempe Gowda Medical Collage and Hospital, Bangalore after ethical clearance from the same
institution. Both groups included para 1, 2, 3. Normal or
LSCS delivery after 38 weeks, Age group (18-38), control
group with normal BP and study group with BP 140/90
excluding those with diabetes mellitus, cardiac ailment,
severe anemia or any other major medical or surgical
illness. Morphological and Morphometrical findings of
all placentaes were recorded under following headings
and correlated with the outcome of infant in terms of
birth weight and APGAR score.

1. Placental Morphometry

Weight in grams, Area in sq.cm, Volume in cc,
Decidual thickness in cms.

2. Placental Morphology

Number of cotyledons, Number of infarcted areas,
Number of calcified areas.

3. Newborn parameters

APGAR score, Weight in Kgs, Congenital anomalies
if any.

4. Fetoplacental weight ratio

The placental weight was recorded by weighing them
on weighing scale immediately after delivery. The
surface area was taken by placing the placenta on plastic
sheath, its circumference traced and area calculated
from the radius thus obtained using the formula- \( A = \pi r^2 \).
Volume of placenta was found out by displacement
method. A graduated jar was taken and water was poured
in it till one lit. mark, placenta was immersed into it and
the amount of water displaced was taken as its volume.
Average thickness of the placenta was found out by using
the formula - Thickness = Volume/Area. Number of
cotyledons, Infarcts, Calcified areas were counted by
naked eye examination. New born parameters were
taken from the birth records and fetoplacental weight
ratios were calculated. Mean values of all the parameters
were obtained and studied.

Observation And Results

The following are the observation and results:

The placental morphometric parameters were
significantly less in hypertensive group as compared to
control group. The difference in the mean number of
cotyledons was statistically insignificant, while the number
of infarcted areas and calcified areas were significantly
more in hypertensive group. The mean birth weight of
newborns was significantly decreased while the newborns
with lower APGAR score were more in hypertensive
group than in control group (Table 1-5, Fig. 1-3).
Table 1: Placental morphometry

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Study (hypertensive)</th>
<th>Significance (p &gt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight in gms.</td>
<td>561.67±77.33</td>
<td>458±70.47</td>
<td>Significant</td>
</tr>
<tr>
<td>Surface area in sq.cms</td>
<td>241.91±37.23</td>
<td>215.82±27.83</td>
<td>Significant</td>
</tr>
<tr>
<td>Volume in cc</td>
<td>674.00±88.50</td>
<td>583.67±66.21</td>
<td>Significant</td>
</tr>
<tr>
<td>Decidual thickness in cms</td>
<td>2.83±0.34</td>
<td>2.50±0.24</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Table 2: Placental morphology

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Study (hypertensive)</th>
<th>Significance (p &gt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cotyledons</td>
<td>17.30±1.09</td>
<td>17.03±1.45</td>
<td>Insignificant</td>
</tr>
<tr>
<td>No. of infarcted areas</td>
<td>3.67±1.12</td>
<td>10.13±2.80</td>
<td>Significant</td>
</tr>
<tr>
<td>No. of calcified areas</td>
<td>3.57±0.97</td>
<td>16.83±2.61</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Table 3: Newborn parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Study (hypertensive)</th>
<th>Significance (p &gt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight in Kgs</td>
<td>2.92±0.45</td>
<td>2.47±0.40</td>
<td>Significant</td>
</tr>
<tr>
<td>APGAR Score-Still born 7/10 and 8/10</td>
<td>0</td>
<td>1</td>
<td>Significant</td>
</tr>
<tr>
<td>7/10 and 9/19</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8/10 and 9/10</td>
<td>29</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Congenital anomalies if any</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Fetoplacental weight ratio

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Study (hypertensive)</th>
<th>Significance (p &gt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetoplacental weight ratio</td>
<td>5.19</td>
<td>5.38</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

Table 5: Morphometric parameters in previous studies

<table>
<thead>
<tr>
<th>Name of study</th>
<th>Weight in gms (mean ± SD)</th>
<th>Surface area in sq.mm (mean ± SD)</th>
<th>Volume in cc (mean ± SD)</th>
<th>Thickness in mm (mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Study</td>
<td>Control</td>
<td>Study</td>
</tr>
<tr>
<td>Mijumdar. et al (2005)</td>
<td>485±47.31</td>
<td>399.10±90.31</td>
<td>265±65.24</td>
<td>202.59±58.37</td>
</tr>
<tr>
<td>Udainia et al (2001)</td>
<td>495</td>
<td>405.67</td>
<td>245.56</td>
<td>195.98</td>
</tr>
<tr>
<td>Palaskar et al</td>
<td>475</td>
<td>329</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rath (2000)</td>
<td>382.14±52.32</td>
<td>351.30±64.04</td>
<td>254.63</td>
<td>251.73</td>
</tr>
<tr>
<td>Present Study</td>
<td>561.67±77.33</td>
<td>458.33±70.47</td>
<td>241.91±37.23</td>
<td>215.82±27.83</td>
</tr>
</tbody>
</table>

Discussion

Placenta being a fetal organ shares the same stress and strain to which the fetus is exposed during pregnancy. Thus any disease affecting the mother and fetus has full impact on the placenta. Studies carried out by earlier workers have shown a significant decrease in placental morphometric values in hypertensive pregnancies which correlates with the present study (Table 5).

The study by Mijumdar et al shows a significant decrease in weight, surface area, volume and thickness of the placenta in study group as compared to the control group which corresponds with the present study. Study by Udainia shows significant decrease in weight and surface area of hypertensive placentae. The study carried out by Palaskar et al also quotes significantly lower weights of placentae because of hypertension in pregnancy. Rath et al reported similar results.
more in hypertensive placentae which corresponds with the findings of Mujumdar et al and Udainia et al. Morphological abnormalities were not found in any of the placentae except one the placenta in control group which showed presence of accessory lobe.

The mean birth weights of new born as well as the APGAR scores were significantly less in hypertensive group as compared to control group as per the present as well as earlier studies by Mujumdar et al, Palaskar et al and Udainia et al. The fetoplacental weight ratio showed an insignificant increase in hypertensive group as compared to study group in the present study. Similar results were observed in the study by Palaskar et al while study by Rath et al showed a decrease in fetoplacental weight ratio in hypertensive pregnancies.

Thus the present as well as earlier studies show that the hypertensive disorders of pregnancy affect the placenta in a significant way by decreasing placental parameters like weight, volume and surface area and also by increasing pathological lesions like infarction and calcification. These adverse effects of maternal hypertension on placenta affect the growth and development in a significant way by decreasing the birth weight and APGAR score.

**Conclusion**

The results of the present study clearly show that hypertensive disorders of pregnancy affect placenta in a major way. The effects are seen in form of decreased placental weight, surface area, thickness and volume apart from pathological changes like increased number of placental infarcts and calcified areas. These regressive changes in placenta affect the growth and development of the fetus reducing parameters like weight and APGAR score in newborn.

**References**


Address for communication:
Dr. Pushpa Gowda
Assistant Professor of Anatomy,
Kempe Gowda Institute of Medical Sciences, Bangalore.
e-mail ID : pushpa.anilk@gmail.com
Mobile: 09844230460