Vasculosyncytial Membrane - A Microanatomical analysis in Full Term Placenta of Anaemic Mothers

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ABSTRACT

Background: The structure of human placenta adapts in an uniform manner under different form of hypoxic stress. Anaemia, the common obstetric problem leading to hypoxia alters the structure of placenta. Aim: To compare the incidence of Vasculosyncytial membrane (VSM) in full term placenta of normal and anaemic mothers. Materials and Methods: Hundred (100) term placenta comprising of 50 normal and 50 anaemic placenta, were studied from the mothers delivered at Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, India. The placental tissue was collected, processed, sectioned and stained with Hematoxylin and Eosin. The incidence of VSM/100 villi was studied using trinocular microscope. The arithmetic mean of the observation was calculated. The statistical significance was evaluated by using student's unpaired t test. The number of placenta showing normal, excessive as well as deficient VSM were also analyzed. Results: The incidence of VSM was significantly increased (p < 0.05) in the placental villi of anaemic mothers when compared to the placental villi of normal mothers. The incidence of excessive VSM was higher in the anemic group. Conclusion: Anaemic placenta reveals increased formation of vasculosyncytial membrane, thereby attempting to improve diffusion of available oxygen. However, a compensated placenta cannot equate the efficiency of a normal placenta. Early diagnosis and adequate treatment is mandatory to provide adequate oxygen supply to the developing fetus.

KEYWORDS: Anaemia, Hypoxia, Placenta, Vasculosyncytial membrane, villi.

INTRODUCTION

Placenta, a vital organ of pregnancy, can provide an insight about the prenatal health of the baby and the mother [1]. Oxygen plays a vital role in the development of placenta, as it is the known key factor in regulation of cytotrophoblastic differentiation and proliferation [2]. The structure of human placenta adapts in a uniform manner in different forms of hypoxic stress [3]. Anaemia, the common obstetric problem leading to hypoxia alters the structure of placenta [4]. Vasculosyncytial membrane (VSM) is attenuated anuclear syncytiotrophoblast stretched over a sinusoidally dilated fetal vessel [5] [Figure1]. Placenta in which 6% - 30 % of the villi shows vasculosyncytial membranes are said to have a normal count [6]. Conflicting results has been reported in the incidence of VSM in hypoxia.

Shashi Munjal [7] et al and Mongia Shashi [8] et al reported increase in incidence of VSM as a compensation to hypoxia while Fox H [6] observed a deficiency of VSM due to failure of trophoblastic differentiation in hypoxia. Therefore, the above said conflicting results regarding the influence of hypoxia, has prompted the present study to compare the incidence of VSM in full term placenta of normal Vs anaemic mothers.

MATERIALS AND METHODS

After obtaining Institutional Ethical Committee clearance, this descriptive study was conducted between October2014–April2015. Hundred (100) term placenta were studied from the mothers delivering at Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry. They were divided, based on the WHO criteria [9] into Control...
group - Hemoglobin% > 11g%(50 placenta) and study group – Hemoglobin %≤11g% (50 placenta).

A detailed case history and relevant investigations done during pregnancy were collected from the subjects, after obtaining their consent. Normal and anemic mothers with single live intrauterine gestation with any gravida code (primi/multi) and delivering by any mode (vaginal/caesarean section) were included in the study. Mothers with other associated medical and obstetric complications were excluded from the study. About 1cm size of placental tissue was taken from the centre and fixed in 10 % formalin for 24 to 48 hours. The tissues were further processed by dehydration in ascending grades of alcohol, cleared in xylene, impregnated and embedded using paraffin wax, sectioned using rotary microtome and stained using routine Hematoxylin & Eosin. Complete cross-sectioned tertiary chorionic villi were analysed using trinocular research microscope (Dwinter) in 40 x magnification.

Hundred (100) villi were examined in ten randomly selected fields. The incidence of VSM/100 villi was noted among both cases and controls and the difference of the mean was evaluated using student’s unpaired t’ test. The difference is regarded statistically significant if the p value is equal to or less than 0.05. The number of placenta showing normal VSM (6-30%), excessive VSM (> 30%) and deficient VSM (<6%) were also scored.

**RESULTS**

The mean incidence of VSM in control group was 20 ± 6.4 against the mean incidence of VSM in study group which was 43.1 ± 12.36. The difference in the mean between two groups, evaluated using student’s unpaired t test, was found to be statistically significant - p<0.05. (Table 1).

The number of placenta showing normal VSM, excessive VSM and deficient VSM reveals (Table 2), Excessive VSM (presence of VSM in more than 30 out of 100 villi i.e. > 30% villi) in 80% placenta of cases , while it was exhibited only in 10% placenta of controls. Deficient VSM (< 6 %) was not found in both cases and controls.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control group (n=50)</th>
<th>Study group (n=50)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of VSM</td>
<td>20± 6.4</td>
<td>43.1± 12.36</td>
<td>p&lt; 0.05</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Percentage of placenta showing 6-30 % VSM ( Normal VSM )</th>
<th>Percentage of placenta showing &gt; 30% VSM ( Excessive VSM )</th>
<th>Percentage of placenta showing &lt; 6% VSM ( Deficient VSM )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=50)</td>
<td>45/50 (90%)</td>
<td>5/50 (10%)</td>
<td>Nil</td>
</tr>
<tr>
<td>Study group (n=50)</td>
<td>10/50 (20%)</td>
<td>40/50 (80%)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Figure 1: Tertiary chorionic villi showing Vasculosyncytial membrane
DISCUSSION

The term “Vasculosyncytial membrane” was introduced by Getzow and Sadowsky [10]. VSM is an accommodative effect to facilitate fetomaternal gas transfer. VSM converts active transport to simple diffusion [11]. Fox H [6] reported that there is a clear cut inverse relationship between the incidence of VSM and fetal hypoxia by observing a deficiency of VSM. Conversely, in the present study, none of the cases in both the groups had a deficiency of VSM (< 6%) [Table 2]. This indicates optimal maturity of the villi and hence give a good indication of the ability of the placenta to supply oxygen to the foetus.

The incidence of excessive formation of VSM (>30%) was higher in anaemic placenta in the present study [Table 2]. In contrast, Adil SAK [5] reported nil incidence of excessive VSM (> 30%) in anemic placenta. The results of present study substantiates the fact that placenta has a considerable reserve capacity and functions with optimal efficiency to overcome the hypoxia.

The mean incidence of VSM in anemic placenta was significantly higher than the normal placenta, in the present study [Table1]. The results of Shashi Munjal [7] et al and Mongia Shashi et al harmonized with the present study. The increase in the mean incidence of VSM as well as excessive formation of VSM (> 30 per 100 villi) in anaemic cases of the present study highlights the compensation of hypoxic placenta by morphological adaptation to facilitate adequate oxygen transfer to the fetus at risk.

CONCLUSION

Anaemic placenta reveals increased formation of vasculosyncytial membrane, thereby attempting to improve diffusion of available oxygen by reducing the thickness of diffusion barrier. However, a compensated placenta cannot equate the efficiency of a normal placenta. Early diagnosis and adequate treatment before the incidence of such compensatory micro-anatomical changes in placenta is mandatory to provide good oxygen supply to the developing fetus.

REFERENCES


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