

MORPHOMETRIC ANALYSIS OF VASCULOSYNCYTIAL MEMBRANE IN PREGNANCY INDUCED HYPERTENSIVE MOTHERS

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Abstract: Placenta is the life line of the fetus. The fetus derives its nourishment through the vasculosyncytial membrane (VSM). In pregnancy induced hypertension, the VSM is seen to be thickened, causing obstruction to the passage of nutrients, leading to Intrauterine Growth Retardation. The present study is aimed at morphometric analysis of all the components of VSM of the terminal villi as seen under electron microscope in normal and in pregnancy induced hypertensive (PIH) subjects. The results reveal significant thickening of the trophoblastic basement membrane (505.86nm ± 184.96, 649.79nm ± 138.10) and VSM (3.99 nm 0.71 ±, 4.82 µm ± 10.77) in placenta of moderate and severe hypertensive cases respectively during pregnancy. The number of VSM per villi in PIH cases was significantly increased with increase of blood pressure. The significant thickening of VSM as seen in the present study may hamper the transport mechanism between mother and fetus which reflects directly on the growth of the fetus.

Key words: Placenta, Vasculosyncytial membrane, Hypertension, Morphometry

INTRODUCTION

Vasculosyncytial membrane (VSM)^{1,2} is formed as a result of sinusoidal dilation of fetal capillaries of tertiary villi, which bulge to about the trophoblastic surfaces and attenuate them to thin lamellae³. The thin syncytiotrophoblastic lamellae which was 0.5-1.4µm thick, free of nuclei and poor in organelles are directly apposed to sinusoidal fetal capillaries^{4,5}. The accumulations of nuclei which are directly lateral to VSM, are called as syncytial knots. The VSM is the most effective site for diffusion and transport of ions and metabolites between maternal and fetal blood. Kaufmann et al⁶ have reported structural changes in VSM during abnormal pregnancy. According to Becker and Bleyl⁷ there is relative lack of VSM in placenta from women with pre-eclampsia. However, most of the studies have been concentrated on gross-variations and no precise information is available regarding the measurement of each structural components of VSM. In the present study, our aim is to find out morphometric details of VSM and their significance in the development of IUGR in PIH cases.

MATERIAL AND METHODS

Patients attending ante-natal clinics of Department of Obstetrics and Gynaecology of Lady Hardinge Medical College and Smt Sucheta Kriplani Hospital, New Delhi were carefully examined for the presence of pregnancy induced hypertension (PIH). There was no history of hypertension before conceiving. Patients developing PIH after 20 weeks of gestations were classified as mild, moderate and severe hypertension according to criteria laid down by Derek⁸. Either edema or albuminuria or both were the parameters mostly associated in cases of moderate or severe hypertensive mothers. Seven (7) patients from each of the three hypertensive

groups and ten normotensive subjects were selected for the study. All the placentae were collected immediately after vaginal delivery and fixed by perfusion with 3% glutaraldehyde in cacodylate buffer at pH 7.2. Samples were collected from the central parts of the maternal surface of the placenta. Routine processing was carried out and embedding was done in Spurr's low viscosity resin. Semithin sections were cut and stained by toluidine blue. The selected areas were subjected for electron microscopy. Silver interference sections 800 Å thick were cut with Reichert Jung Ultracut-E Microtome and examined under JEOL TEMSCAN 100 CX II ELECTRON MICROSCOPE. At least 10 terminal villi were examined in each section. The VSM were identified and the measurements of thickness of basement membranes of both the trophoblast and the capillary were undertaken. In addition, the total thickness of VSM was measured and number of VSM per villi was counted in normotensive and three groups of PIH subjects with the help of a SiS 3.0 software (soft imaging system, GmbH, Germany). The data was subjected to statistical analysis.

RESULTS

A. Normotensive placenta

The toluidine blue stained semithin sections showed cross-sections of numerous placental villi of diverse sizes and shapes, separated by intervillous spaces. Each villus was lined by syncytiotrophoblast, formed by a continuous layer of varying thickness. The central core of the villus was occupied by connective tissue and fetal capillaries lined by endothelial cells. The cytotrophoblasts were occasionally seen below syncytiotrophoblast. The nuclei free area of syncytiotrophoblast and its basement membrane were seen in close apposition with the basement membrane of fetal capillaries, constituting the vasculosyncytial membrane. (Fig 1)

Under the electron microscope, syncytiotrophoblast of terminal villi showed presence of electron dense cytoplasm and multiple electron dense nuclei without any intervening cell membrane and

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