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Histological changes in placenta villi in some types of pathological pregnancy

Variability of placenta pathological characteristics and their influence on occurrence of fetal developmental anomaly do not exhibit homologous dependence. Rodriquez et al. (10) suggest that the extent of this fetal membrane damage and the extent of fetal developent disturbance are interrelated.

Therefore, the aim of our study was to compare histological structure of placenta villi with the placentas derived from pathological pregnancies in which gestation, cholestasis, pregnant type A diabetes and premature outflow of amniotic fluids were observed.

MATERIAL AND METHODS

Fragments of 12 mature placentas from pathological pregnancies (gestosis, cholestasis, type A diabetes of pregnancies and premature outflow of amniotic fluids) and 3 placentas from normal pregnancies were fixed in glutaraldehyde and OsO_4 and subsequently embedded in Epon 812. Semithin sections 1μ thick were stained with methylene blue and azur.

The smallest embranchments of villi trunks across which the exchange between the mother's and fetal blood is most effective, were estimated using the light microscope. The photographs were taken using the camera produced by the Carl Zeiss Jena firm.

RESULTS

CONTROL GROUP

On the circumference of the smallest villi there were observed the concentrations of syncytiotrophoblast nuclei beyond which the villi were surrounded by a thin border. In the stroma of villi the sections of some capillary vessels with erythrocytes in lumen and single cells with clear cytoplasm

were found. In the nuclei of these cells the nucleoli were found and the chromatin was strongly dispersed. However, in the syncytiotrophoblast nuclei the chromatin formed distinct, dark lumps.

GESTOSIS

In comparison with the control the syncytiotrophoblast surrounding the villi was very thin. Trophoblastic nodules were also very small and poorly visible. In the stroma of villi light, without colouring vesicles and large single cells with clear nuclei were observed. A number of blood vessels was greater than in the control. Their lumen was extended and filled with the erythrocyte mass. Single blood corpuscles in the intervillous spaces were sickleshaped (Fig. 1). The body mass in one of these pregnancies was 5,050 g.

CHOLESTASIS

The terminal villi were surrounded by a very thin syncytiotrophoblast invisible in some places. The trophoblastic nodules were almost invisible. In the villous stroma a great number of membranes surrounding colouring-resistant vesicles of various sizes was present. Therefore the structure of stroma had the frothy texture. Large, clear cells with low chromatin nuclei were found among vesicles. In some nuclei a small nucleolus was present. The number of these cells was considerably greater than in the normal placenta. The blood vessels of a typical diameter were crammed with the blood corpuscle mass.

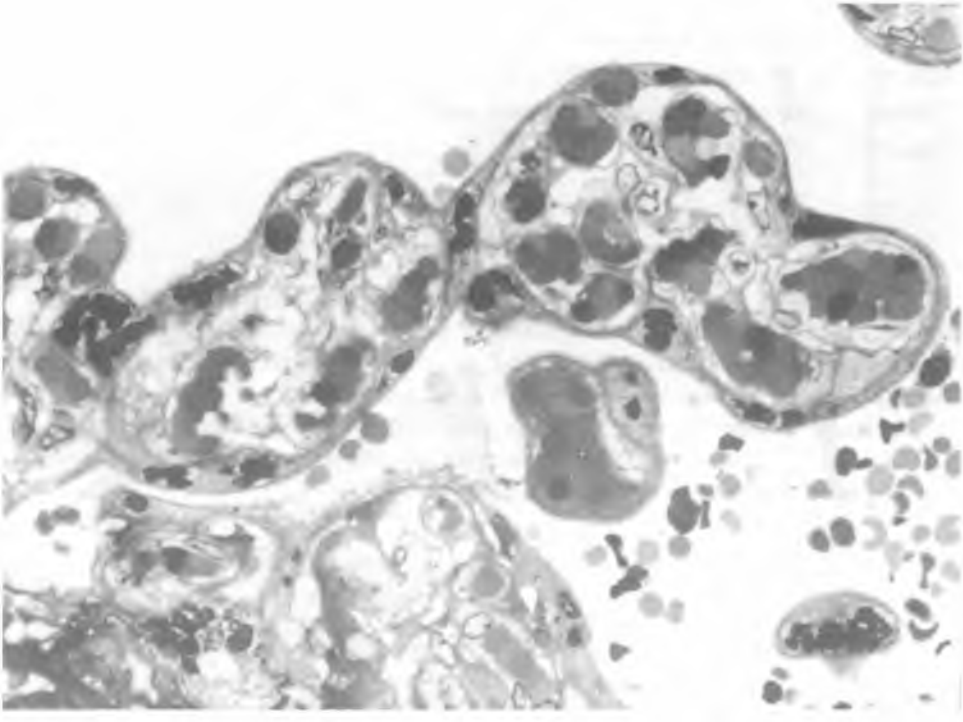

Fig. 1. Gestosis. A very thin syncytiotrophoblast surrounding terminal villi. In the morphologically modified stroma a great number of capillaries filled with erythrocytes mass is present. Magn. approx. 400x

TYPE A DIABETES PREGNANCIES

The predominant number of the smallest villi was surrounded by a thick syncytiotrophoblast with a large number of cell nuclei. In their stroma with very poor affinity for pigments single, large, clear cells were present like in the control. The sections of blood vessels were crammed with the blood corpuscles resembling a dense mass. The trombocytes present in the intervillous space formed numerous, small concentrations. Some erythrocytes were sickleshaped (Fig. 2).

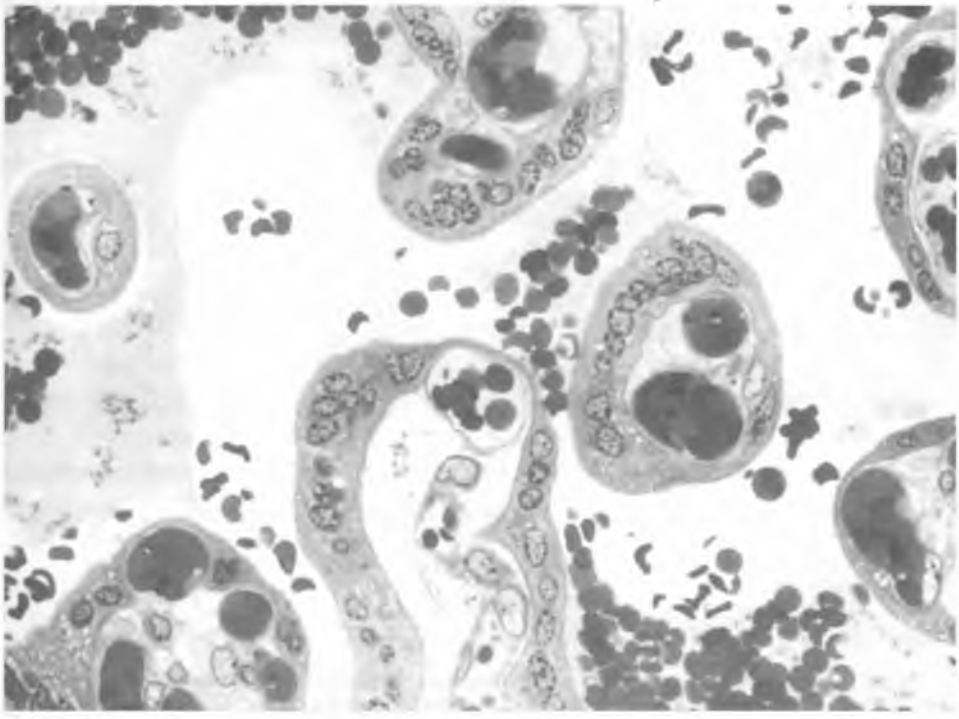

Fig. 2. Type A diabetes pregnancies. Terminal villi surrounded by a very thick syncytiotrophoblast. Masses of erythrocytes can be seen in capillaries, and concentrations of thrombocytes in the intravillous space. Magn. approx. 400x

PREMATURE OUTFLOW OF AMNIOTIC FLUIDS

Apart from the typical villi, their large number exhibited the advanced pathology. The damaged villous stroma did not show the affinity for dyes and blood vessels were not relatively small in relation to the surface of the villi section. The trophoblastic nodules were also small, not numerous and mostly contained 1-2 cell nuclei. Besides, the nodules of the syncytiotrophoblast was thinner in comparison with the control. Many erythrocytes in the intervillous space were sickleshaped (Fig. 3).

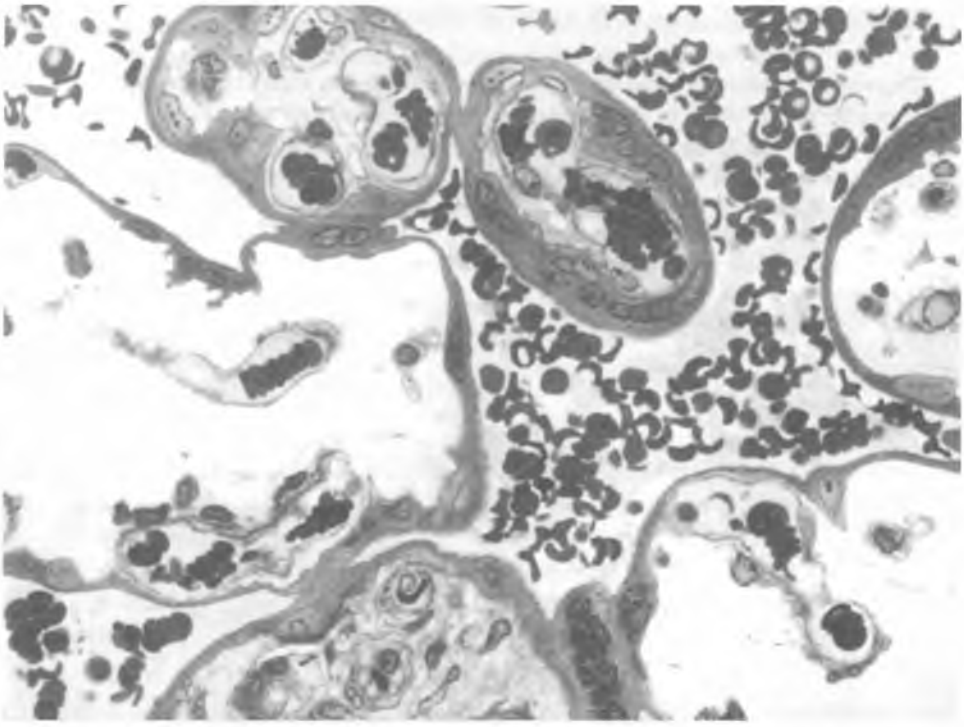

Fig. 3. Premature outflow of amniotic fluids. Besides the normal villi, the damaged ones with no colouring stroma and very poorly vascularized can be observed. Magn. approx. 400x

DISCUSSION

In the case of abnormal pregnancy a simultaneous analysis of some placenta parameters, fetal developmental anomalies and coexisting mother diseases make it possible to diagnose the cause of fetal pathology with a greater probability. Morphological changes determination in the placenta was an indispensable component of these investigations. It makes possible to distinguish the abnormalities of fetal and mother circulations which play the all-important role in fetal development (2).

In the case of gestosis differences in villi vascularization in comparison with the normal placenta were pointed out. The number of vessels was much greater and their lumen was full of blood cells. The excessive vascularization of villi may indicate bad perfusion and long lasting hypoxia (1). The big weight of a newborn may result from an abnormal exchange between the mother's and fetal blood and proneness to diabetes. A very thin syncytiotrophoblast and the presence of many no-colouring vacuoles seem to confirm it.

In the cholestasis the vessel lumen in villi was also filled with blood cells, however, a number of vessels was similar to the normal placenta. Vessels changes resembling the thrombotic ones are often present besides other changes in pathological placentas (11).

Decrease in the blood flow rate and also the physicochemical changes in the plasma discriminate the exchange between the mother's and fetal organisms.

The light cell present in a greater number in stroma than in the control placenta are probably the

Hofbauer cells and play the placenta macrophage role. It is possible that the phagocytosis processes in the placenta become more intensive in cholestasis.

The thick syncytiotrophoblast may result from abnormal villi maturation (8) or from its excessive proliferation (11). This change is included in the damage group called trophoblastic pregnancy disease (GTD) which is characterized by proliferation of trophoblastic epithelium of different types (5). Abnormal maturation of trophoblast is found in toxemiae resulting from the mother's sensitiveness to a placenta trophoblast and the tendency towards superficial implantation (8).

The presence of thrombocytes in the intervillous space is associated by some authors with the damage of vessels in the part of fetal placenta or chorioamnionitis (3, 9).

The change in villous mesenchymatic tissue structure, villi atrophy and increase in fibres number may be a result of strong and earlier reduction of blood vessels. The increase in villous fibrin is more often found in the early period of the placenta formation.

The observed lumen decrease in vessels in the villi may be caused by hyperplasia of the central membrane or by observed overgrowing of their lumen (13). Inflammations of fetal membranes may also cause contraction of vessels and perfusion decrease through the endothelia (1). It seems that vessel changes precede those in the villous stroma and affect them.

CONCLUSIONS

1. In gestosis, cholestasis, type A diabetes pregnancies and premature outflow of amniotic fluids changes in blood vessels of placenta villi are observed.

2. The changes in villous stroma and trophoblastic epithelium predominantly accompany the vessel changes.

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SUMMARY

The examinations were carried out on 3 placentas from normal pregnancies and 12 placentas from pathological pregnancies (gestosis, cholestasis, type A diabetes pregnancies and premature outflow of amniotic fluids).

Placenta sections were fixed in glutaraldehyde and subsequently embedded in Epon 812. Semithin sections 1 μ thick were stained with methylene blue and azure. Moreover, changes in terminal villi were assessed.

In comparison with the control placentas changes in blood vessels, stroma and syncytiotrophoblast were found.

Histologiczne zmiany kosmków łożyska w niektórych typach patologicznej ciąży

Badania wykonano na 3 łożyskach pochodzących z ciąż prawidłowych i 12 łożyskach pochodzących z ciąż patologicznych (gestoza, cholestaza, cukrzyca ciężarnych typu A, przedwczesne odpływanie wód płodowych). Wycinki łożysk utrwalono w zbuforowanym glutaraldehydzie i zatopiono w Eponie 812. Skrawki o grubości 1μ barwiono błękitem metylowym i azurem i oceniano zmiany w kosmkach końcowych. W porównaniu z łożyskami kontrolnymi stwierdzono zmiany w naczyniach krwionośnych, zrębie i syncytiotrofoblaście.