THE RAPID SCREENING OF PLACENTAS BY PHASE-CONTRAST MICROSCOPE TO STUDY THE PATHOPHYSIOLOGY OF FOETAL HYPOXIA

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Inspection of the placenta is made as a routine by the obstetrician as soon as it is delivered, but it is not submitted for histopathological examination unless some abnormality is suspected, though microscopic study is desirable even if no abnormality is found. Block sectioning of the placentae is a lengthy and costly procedure. Hence a quick screening procedure for all the placentae is desirable to select cases for further investigations. Use of the phase-contrast microscope is ideal for this purpose. Placental tissue is highly transparent and permits ready observation without artefacts.

The Phase Contrast Microscope

A three dimensional image could be examined in detail with a wet smear preparation of tissue under the phase contrast microscope. The credit of this advancement goes to the Dutch Physicist, Professor Zeierneke.

With light microscope, syncytial knots are seen as nuclear clusters. They are arranged in one or two rows adjacent to the syncytiovascular membrane. With phase contrast microscope they appear as plate-like thickenings of syncytium. Syncytial knotting has been considered as a manifestation of placental maturity and the presence of increasing knotting as placental ageing.

In 1964 Alvarez for the first time studied the morphological development of foetal villi from early development to complete maturity, using the phase contrast microscope. The syncytium is easily observed with the phase contrast microscope. It has got an enormous capacity of producing pseudopodia and sprouts. The syncytial sprouts are highly immense in the immature placentas, while they are scarce or absent in the mature placenta. In the mature placentae where there is hypoxia or reduced blood flow this capacity to produce sprouts persists even at term. The placenta is considered to be the lung of the foetus and syncytium can be regarded as alveoli. In hypoxic conditions where oxygen tension is low, nature has provided this compensatory mechanism wherein proliferation of syncytial layer occurs, thus providing an additional "Respiratory Epithelium" to carry out gaseous exchange without endangering the foetus. At the moment this hypothesis of anoxaemic stimulation seems to be more appropriate but further work has to be done in this direction.

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Material and Methods

Fifty normal placentas were collected soon after expulsion. The weight of the placenta and of the baby were also recorded. Within fifteen minutes after collection, microscopic study of the placenta was undertaken according to the method described by Alvarez (1964). From each placenta a central cotyledon was studied by sectioning it into three plates parellel to the basal plate; one close to the basal plate, second intermediate and third close to the chorial plate.

From each plate further bits were taken from the different areas designated as peripheral, medial and central zones.

The placental tissue was teased in normal saline contained in a watch glass and mounted as a wet smear and examined under the phase contrast microscope, first under the low power and then under the high power.

The number of syncytial sprouts per hundred villi were counted in each placental bit and the general characteristics of the villi were studied.

Table I shows that the percentage of syncytial sprouts increased not only from the central to the peripheral zone of the foetal cotyledon, but also that the syncytial sprouts increased from the basal to the chorial plate. It is believed that hypoxia stimulates the syncytial and trophoblastic development. As the chorial plate is away from the maternal circulation, the percentage of syncytial sprouts are more.

Aldjem (1968) noticed hypoplasia of the syncytium in cases complicated by spontaneous early interruption of pregnancy, while hyperplasia of the syncytium was associated mostly in conditions like diabetes, hypertension, and pre-eclamptic toxaemia. He noted that hyperplasia of syncytium is a constant feature of placental inadequacy leading to poor pregnancy outcome.

Table II shows that the maximum number of sprouts are seen in the placentas of babies of low birth weight.

Alvarez in 1964 has shown that syncytial sprouts are more in immature placenta, but as circulation improves the number of sprouts come down in number.

Perinatal mortality was found to be related to the maturity of placenta. The maximum percentage of perinatal mor-

TABLE I

Showing the Distribution of Syncytial Sprouts in Different Areas

Zones	No. of specimens	Basal plate	Intermediate plate	Chorial plate
Central Zone	50	2.69%	6.58%	11.18%
Medial Zone	50	4.46%	7.61%	—
Peripheral Zone	50	6.02%	9.35%	11.54%

TABLE II

Correlation Between Birth Weight and Syncytial Sprouting

Weight of babies in grams	No. of cases	Average range of sprouts per 100 villi.
2000-2400	12	23.54 to 27.55
2500-2900	29	21.74 to 23.78
2900-3500	9	21.42 to 22.94

tality was related to abnormal placentae and perinatal mortality was nil in the group where the placental findings were term like. The pathology of the placenta was found to be a more reliable approach while considering the prognosis of the premature infant than the weight or gestational period.

Alvarez and co-workers have described the technique of placental biopsy in the evaluation in utero of the Rh negative pregnancy and in cases of placental insufficiency. They were able to evaluate the risk to the foetus and the possibility of foetal death.

Conclusions

Like routine screening by cytology for malignancy, the phase contrast microscope can be utilized for screening all placentas and select the suspect placentas for further block sectioning.

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