Scanning Electron Microscopy of Retinoblastoma

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Transmission electron microscopic investigations resulted in a more profound knowledge of the structure of retinoblastoma, especially from the cytological point of view. The present report gives account of our scanning electron microscopic studies and of the further transmission electron microscopic investigations in retinoblastoma, respectively.

MATERIALS AND METHODS

Scanning electron microscopy has been performed in eight cases. From these, two cases are demonstrated here which belonged to the undifferentiated type of retinoblastoma. S.L. (Case 1) was a 20-month-old male infant, and F.E. (Case 2) a 15-month-old female infant. After enucleation of the eyeball, pieces of 1.0 sq.mm of the tumor were fixed in osmium tetroxide and embedded in Araldite. Specimens were sectioned by a Reichert ultramicrotome, contrasted and examined in a JEM 7A electron microscope. For scanning electron microscopy the fixed and desiccated material was coated with gold-carbon vapor and the scanning pictures were taken in a JEM 200 B electron microscope with the EM-ASIP high resolution scanning device.

OBSERVATIONS

A half-thin section of the first case is shown in Fig. 1. The round or oval cells have big nuclei, with one or two nucleoli in them. Rosettes cannot be observed. In micrographs with a higher magnification, rosette-like formations are seen, e.g., Fig. 2. Mitotic (M) and polynuclear (B) cells are also shown in the figure.

In the transmission electron micrographs, the appearance of the undifferentiated retinoblastoma cells is rather monotonous, i.e., big, moderately lobulated nuclei are found with one or two nucleoli of the reticular type in them; the cytoplasmic border of the cells is thin with a few organella.

In the scanning electron micrographs there are two remarkable phenomena: (1) the cells are mostly spherical and of different size; (2) they form garlands and are also often arranged in circles. Cells with processes occur. In Fig. 4 the shape of the cells and the intercellular

Fig. 1: (Case 1). Half-thin section. (original magnification x1700)

Fig. 2: (Case 1). Rosette-like arrangement of the cells (R). Half-thin section. (original magnification x4250)
junctons → are well visible and a lymphocyte appears in the field of examination. Lymphocytes were seen in several places in the first case. In Fig. 5 a lymphocyte is demonstrated with higher magnification. We were not able to detect connections among the processes of the lymphocytes and tumor cells.

The retinoblastoma of the second case was also undifferentiated, according to its histological appearance (Fig. 6). In pictures of greater enlargement, there were no real rosettes to be found. However, the cells exhibited rosette-like arrangements (Fig. 7). Transmission electron microscopy revealed similar features as the tumor demonstrated in the first case (Fig. 8). However, there were two more findings: a tubuloreticular structure was observed in connection with the rough-surfaced endoplasmic reticulum in the vascular endothelial cells (Fig. 9) and Lamellar processes were attached to the tumor cells in some places which resembled the outer segment of the photoreceptor processes (Fig. 8).
The scanning electron micrographs of the second case contained tumor cells which were arranged in garland-like formations or in groups (Fig. 10). The cells were generally spherical, but cells with processes also occurred. The intercellular junctions were well visible also in this case (---).

DISCUSSION

The shape and size of the tumor cells and their connections can be seen better in scanning electron micrographs than with transmission electron microscopy. The tendency of the tumor cells to arrange in circles or in garland-like formations, which was seen in our cases, has also been observed in tissue cultures.1

The lymphocytes found in these tumors are of the B type and there is no morphological evidence of their immunological activity.

Although the so-called fleurettes which were shown by T' so et al2 were absent in our second case, however, lamellar structures in connection with the cells were present in some places. These resembled the outer segment of the photoreceptor processes.3,4

In the endothelial cells of the tumor tubuloreticular inclusions were seen, which were first described by Antal and Nemeth.5

The results of scanning electron microscopy fit well into our former knowledge on the structure of retinoblastoma. In our cases it could be also shown that transitional types exist between differentiated and undifferentiated tumors thus rendering the morphological proof of the clinical observation of the same malignancy of these two types of retinoblastoma.6

SUMMARY

Two cases of the so-called undifferentiated retinoblastoma are demonstrated where typical rosettes were absent. However, cell groups resembling rosettes existed. Scanning electron microscopy revealed a tendency of the cells to arrange in circles or in garland-like formations. In one of the cases lymphocytes were found and in the other photoreceptor elements and tubuloreticular inclusions within the endothelial cells were seen.

REFERENCES


JANUARY/FEBRUARY, VOLUME 15, NUMBER 1