

NUCLEAR MEMBRANE CHANGES OF HUMAN MULTIFORM GLIOBLASTOMA

(ELECTRON MICROSCOPE STUDY)

R. Koinov

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The nuclear membranes of human multiform glioblastoma undergo numerous alterations to which we would like to turn the investigators' attention. In 1972 we reported annulate lamellae as an outer nuclear membrane formation of human multiform glioblastoma (1). In the present work we demonstrate other changes established by us investigating this tumour as follows: 1) perinuclear projections of the outer nuclear membrane located in cisterns of the perinuclear reservoir; 2) reduplication of the inner nuclear membrane; 3) reduplication of both nuclear membranes resulted in formation of a cytoplasmatic complex by the membranes and the nuclear contents, and 4) chromatin-like substance in a cistern of the perinuclear reservoir.

Material and methods

The material for electron-microscopic study is taken from patients with multiform glioblastoma in the brain in the course of operation. The tissue is fixated with glutaraldehyde and osmium tetroxide. After dehydration in ethyl alcohol the material is incorporated in Durcupan. Ultrathin cuts are made by Ultramicrotom "Reichert" and after application of uranylacetate and plumbum citrate they are studied with electron microscope JEM 7 A.

Results

1. Perinuclear projections of the outer nuclear membrane. 3—4 even 10—15 projections (transversally or longitudinally cut) are found in some extensions of the perinuclear reservoir. They are round, oval or elongated ring-like; size 150—160 Å. Different number of ribosomes are placed on the membrane and in the cytoplasm. These projections contact to the inner nuclear membrane at certain places via pores. Single lumens of microtubules and vacuoles can be seen in the cytoplasm of the projections (fig. 1).

2. Reduplication of the inner nuclear membrane. They are confined invaginations of the inner nuclear membrane in shape of pockets limiting by the inner nuclear membrane itself chromatin stripes. These pockets are more than one sometimes and the chromatin is denser or coarse-granular (fig. 2).

3. Reduplication of both nuclear membranes in which chromatin stripes are surrounded by a double nuclear membrane. They form peculiar cytoplasmatic complexes of membranes chromatin stripes, nuclear regions and cytoplasm at certain places (fig. 3).

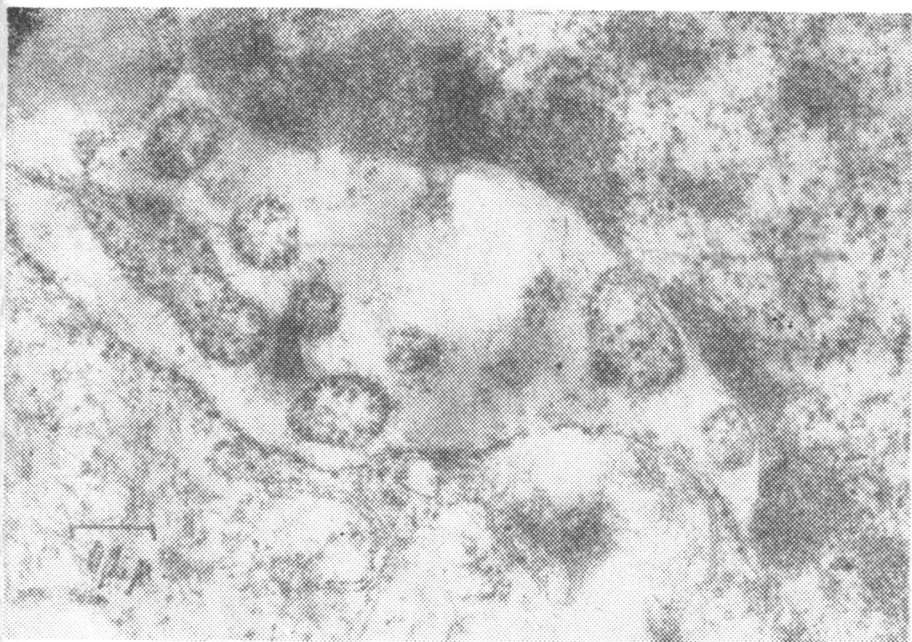


Fig. 1

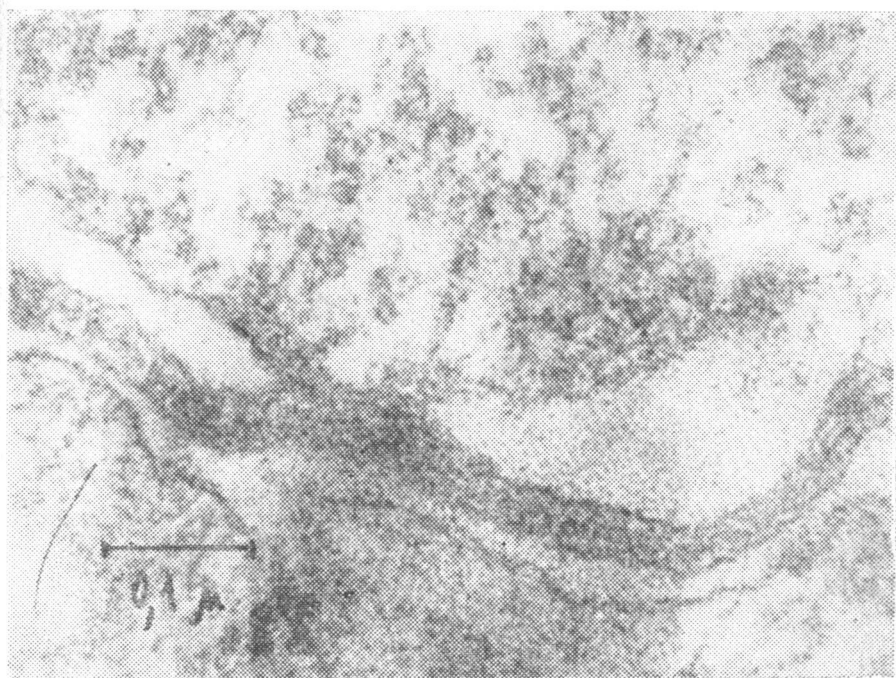


Fig. 2

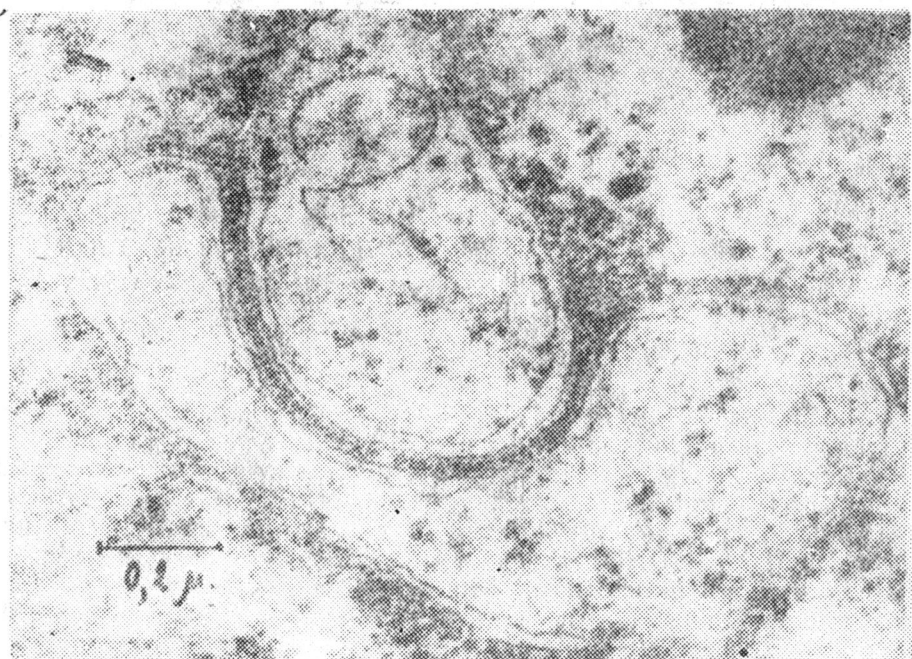


Fig. 3

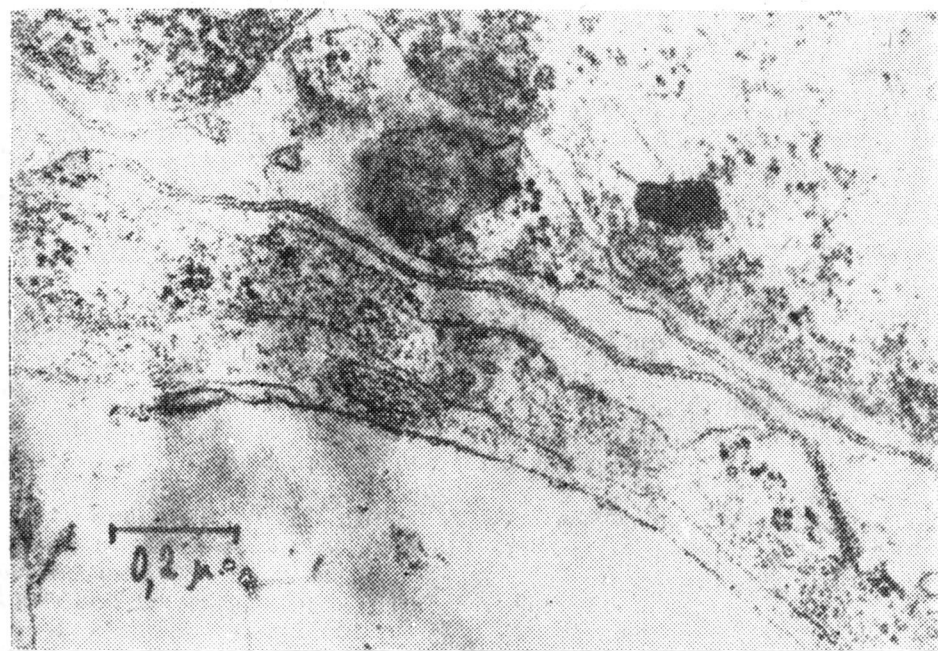


Fig. 4

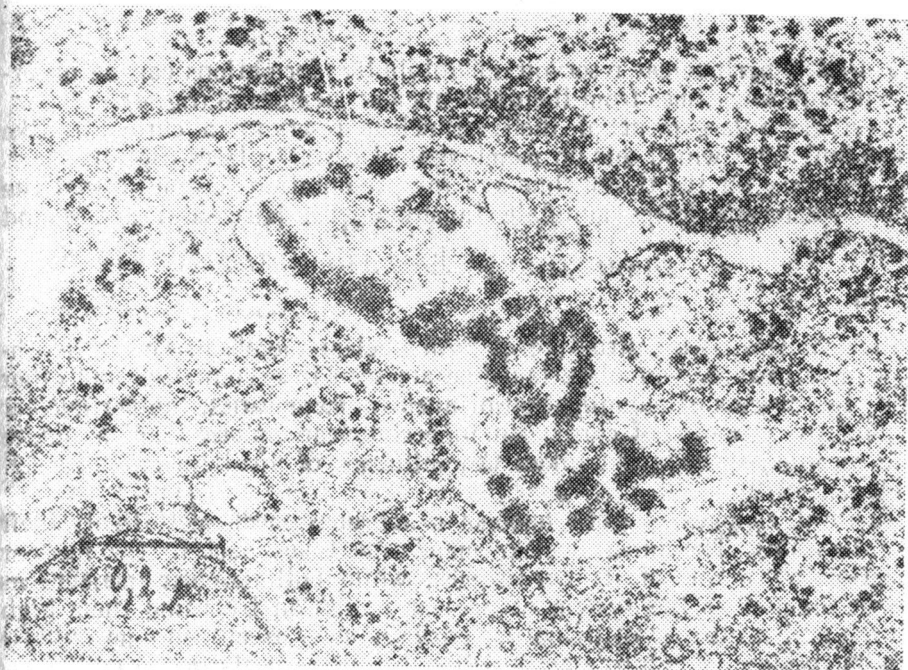


Fig. 5

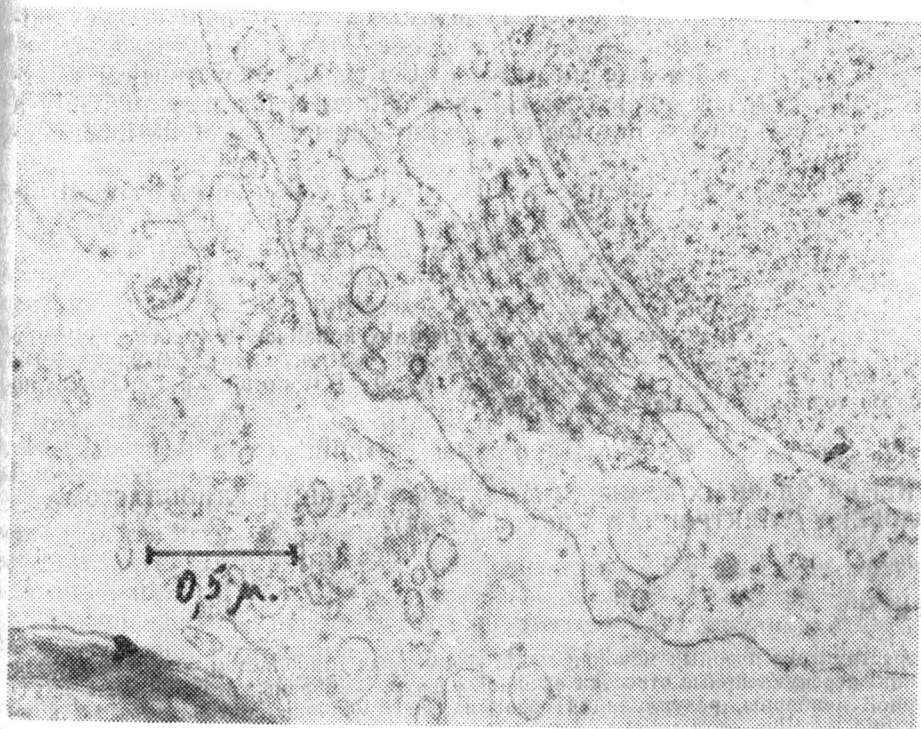


Fig. 6

4. In a dilated perinuclear reservoir microtubular formations can be observed which originate sometimes from the outer nuclear membrane (fig. 4).

5. In a single enlargement of the perinuclear reservoir a chromatin-like substance was found out which sets up membranes at certain places (fig. 5).

6. It is necessary for the thoroughness of the presentation to remind that the outer nuclear membrane forms annulate lamellae with horizontal and round structure (fig. 6).

Discussion

The noted changes in the structure of both nuclear membranes occur in other cells, too. For instance, annulate lamellae are seen in germinative and other tumour cells. The process of reduplication of nuclear membranes, the perinuclear projections and the presence of chromatin in perinuclear cisterns, and annulate lamellae are recorded in cells put under the influence of viral infection (V. D. Solov'ev, et al., 1979).

The structural changes of both nuclear membranes meet most likely their functional obligations. The inner nuclear membrane takes part in the nuclear DNA replication by means of its karyosomes, while both nuclear membranes concentrate in themselves the system of nuclear oxidation by using their high active ATP-ase and a number of oxidating enzymes such as cytochrome oxidase and monoamine oxidase. The increased functional requirements in the multiform glioblastoma dictated by the basic neoplastic process of intensely DNA, RNA and protein production are most likely the main factors for the noted structural alterations in the system of both nuclear membranes of the tumour cells examined by us.

Concerning the chromatin-like substance in the cistern of perinuclear reservoir it is difficult to report on its character and nature. It has most probably a nuclear origin and has entered into the cistern through a defect of the inner nuclear membrane.

The above authors report the like of this defect in cells altered by viral invasion (2).

REFERENCES

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ИЗМЕНЕНИЯ ЯДЕРНЫХ МЕМБРАН МУЛЬТИФОРМЕННОГО ГЛИОБЛАСТОМА У ЧЕЛОВЕКА (ЭЛЕКТРОННАЯ МИКРОСКОПИЯ)

Р. Койнов

РЕЗЮМЕ

В ультраструктуре ядерных мембран мультиформных глиобластом обнаруживаются изменения как: перенуклеарные отростки внешней ядерной мембраны, редупликация внутренней ядерной мембраны, редупликация обеих ядерных мембран, цитоплазматические комплексы, annulate lamellae хроматиноподобная материя с формированием мембран в цистернах перинуклеарного резервуара.