

# PERINUCLEAR PROJECTIONS OF THE OUTER NUCLEAR MEMBRANE IN ULTRASTRUCTURE OF MULTIFORM GLYOBLASTOMA IN HUMAN BRAIN

R. Koinov

In 1972 we reported annulate lamellae in ultrastructure of multiform glioblastoma as part of the outer nuclear membrane (1). In our present work we establish another formation of the outer nuclear membrane. Our findings concern cytoplasmic projections of the outer nuclear membrane located in perinuclear cisterns of multiform glioblastoma cells in human brain. There are no similar data in the available literature neither concerning the ultrastructure of multiform glioblastoma, nor the ultrastructure of other cells. Therefore, we presume our finding to be interesting for the cell ultrastructure and morphologic changes with tumour processes.

## Materials and methods

Materials for electron-microscopic investigation are taken from a patient 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 Ultratom Reichert and after application of uranylacetate and plumbum citrate they are studied with electron microscope JEM 7A.

## Results

3—4 even 10—15 and more projections (transversely and longitudinally cut) are found in some extensions of the perinuclear reservoir of brain tumour cells. The projections are round, oval or elongated ring-like; size 150—650 Å. Their structure is the same as that one of the outer nuclear membrane. There is an excess of ribosomes placed in the cytoplasm and under the membrane itself. Some of them have single lumens of microtubules and vacuoles. Their membranes contact to the outer nuclear membrane at certain places via little pores (fig. 1, 2, 3, 4).

## Discussion

Annulate lamellae and the present perinuclear projections are formations of the outer nuclear membrane. They are similar to endoplasmic reticulum but in comparison with it they are no canals in cytoplasm — they are bigger and different — in form and size projections located in perinuclear cisterns. It is obvious that the outer nuclear membrane has not the same outlines (contours) of the inner one, but is distant at certain parts from the latter thus forming extensions and projections which fill the cisterns' space and are connected

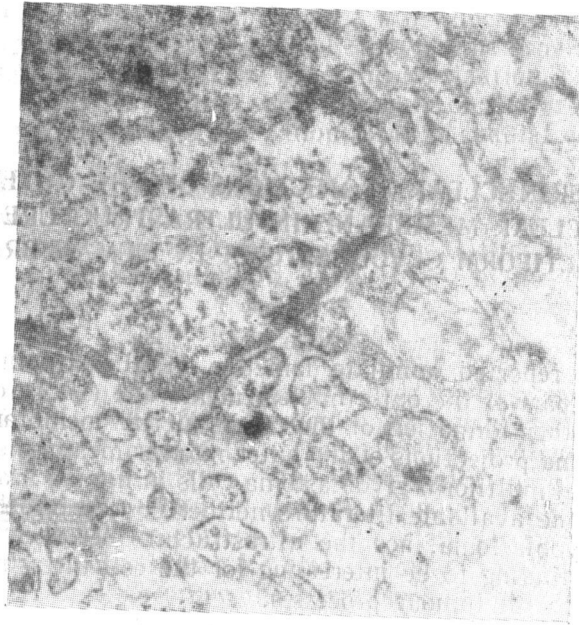


Fig. 1



Fig. 2



Fig. 3

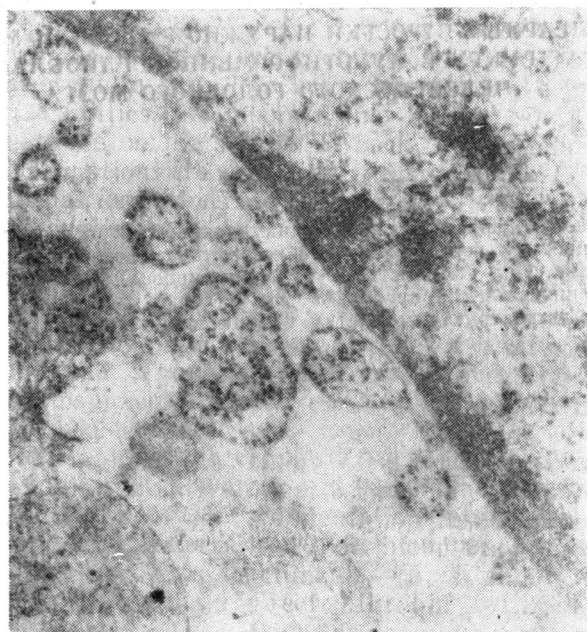


Fig. 4

to the inner nuclear membrane by means of pores. The endoplasmic reticulum as well as the perinuclear projections contain numerous ribosomes located on the membrane but the projections themselves possess also free ribosomes and microtubules. The endoplasmic reticulum is out of the inner nuclear membrane and in the cytoplasm. However, the perinuclear projections are directed to the opposite side — towards nucleus in the perinuclear reservoir.

As for their functional significance, it can be pointed out that they are formations by means of which the surface of the outer nuclear membrane is enlarged, thus providing the collection of considerable number of ribosomes on the membrane and in the inner spaces. The functions of the ribosomes are the production of protein; all aforementioned structures are found in tumour cells. Therefore, they are responsible most probably for the increased protein synthesis with any neoplastic process.

From the other hand, the analogy between endoplasmic reticulum and perinuclear projections suggests a very possible common origin of both from the outer nuclear membrane but there is a definite difference of their direction — the former point to the cytoplasm whereas the latter are directed to the nucleus.

#### REFERENCES

1. Койнов, Р. Кольчатые пластинки (annulate lamellae) в ультраструктуре мультиформенной глиобластомы головного мозга человека. — *Арх. патол.*, 12, 1972, 39

#### **ПЕРИНУКЛЕАРНЫЕ ОТРОСТКИ НАРУЖНОЙ ЯДЕРНОЙ МЕМБРАНЫ В УЛЬТРАСТРУКТУРЕ МУЛЬТИФОРМЕННОЙ ГЛИОБЛАСТОМЫ ЧЕЛОВЕЧЕСКОГО ГОЛОВНОГО МОЗГА**

*Р. Койнов*

#### РЕЗЮМЕ

Автор сообщает об обнаруженных перинуклеарных отростках наружной ядерной мембраны в расширениях перинуклеарного резервуара клеток мультиформенной глиобластомы у человека. Они имеют структуру гранулированной мембраны с рибосомами, с вакуолями и единичными микротубулами. Эта находка является оригинальным вкладом в выяснении ультраструктуры клетки и морфологии опухолевого процесса.