Ultramicroscopic study of hair follicles in healthy people and patients with cerebrovascular disease

There are several layers in histological sections of human hair follicles: connective bag, outer root sheath, Henle zone, Huxley zone, inner root sheath, cortical substance medulla. The cells of the inner root sheath containing red granules trihohyalinum or karatogan that forms a soft keratin hair further. The inner layers of the hair bulb with the structure closest to the interneuron brain tissue. This enables us to studying histochemical features of the inner layers of the hair bulb to draw a conclusion about the state of brain tissue in cerebral vascular disease.

Methods of the research. Electron microscopic studies were performed in the laboratory of Lviv National Medical University. The ultrastructure of the hair follicle and its cuts in health and disease was being studied by the following method. A man after shampooing in the occipital area hair removed together with the inside of the hair follicle, which immediately placed in a large drop of 2 % osmium tetroxide solution of phosphate buffer on (pH=7,36). Then defatted in acetone razor cut hair of keratinized and hair follicle quickly transferred to another drop of fixative solution of the same composition, placed on dental wax on an ice plate. Then block of tissue (hair follicle) was fixed by 2 % osmium tetroxide solution of phosphate buffer on (pH=7,36) with sucrose for 2 hours on the ice bath. Then it was washed with buffer solution of the same composition. To prepare for salt water-insoluble resin the tissue blocks washed from the remnants of retainers were carried through alcohols of increasing strength (wiring diagram in a solution of ethanol: 40 % – three fresh portions of 10 min.; 70 % – three fresh portions 10 min.; 96 % two fresh portions 20 min). And (acetone (wiring diagram in acetone, acetone of „especially pure” – six fresh portions (duration 15 min. each)). Then dehydrated slices were placed in Epone-araldyt. The composition of water-insoluble resin pouring containing

Epone 812 and araldyt for A. Hanert (1975):
Epone 812 ml of 5
araldyt M 3 ml
DDSA 11 ml
Dybutylftalat 0,4 ml
DMP-30 15 drops

Accommodation units tissues in Epone-araldyt carried through because of the increasing concentration of resin solutions (it looked like this: a mixture of acetone and resin in a ratio of 3: 1 – a fresh portion of two hours; mixture of acetone and resin in 1: 1 ratio – a fresh portion of two hours; pure resin – a fresh portion of twelve hours at room temperature). For better impregnation material with a mixture of acetone resin placed in the slot blender of 10 rotations per minute. Then the tissue blocks were placed by the same dive in Epone-araldyt, located in gelatin capsules. The polymerization was carried out stepwise material at a temperature of 36, 45 and 60° C for 24 h. each.

Ultrathin sections were prepared on ultramicrotome using special glass knives. To study selected sections of silver or pale lemon color. Sections were contrasted already in 2 % uranyl acetate solution (J. Stempac,
R. Warol, 1964), and then – lead citrate (E. Reynolds, 1963). Study and photographic material performed using microscopes UEMV-100K while accelerating voltage of 75 kV and magnification on the screen microscope 2000s – 124000H.

We conducted a study of very small sections of hair follicles by the method described above in 30 healthy subjects and 44 patients after suffering a cerebral ischemic stroke. After systematization received microphotographs we present the most typical picture, showing all sample ultramicroscopic picture of the hair follicle in normal and pathological conditions.

Fig. 1. A normal section of the hair follicle tissue.

The photo shows a normal lipid and protein inclusion between collagen and elastic fibers. The Golgi apparatus is in the normal range. Membranes not dissolved. Number pinocytosis vesicles and granules trihohliatilinum not increased, indicating lack of stagnation in cells and intercellular substance.

Fig. 2. A section of the hair follicle tissue with pathology.

The photo shows enhanced lipid and protein inclusion between collagen and elastic fibers. A common area Golgi apparatus. Membranes are a little bit dissolved. The number of pinocytosis vesicles and granules of trihohliatilinum is increased.
Atherosclerosis and other destructive changes in the tissues, resulting disturbances of lipid (cholesterol) and protein metabolism (metabolic arteriosclerosis) in tissues and arteries elastyc and muscle-type elastyc developing specific changes. They reflect the dynamics of the atherosclerotic process, its morphogenesis and are represented by „prelipid changes”: lipoidosis, liposklerosis, ateromatosis, aterocalcynosis [1]. „Prelipid changes” correlate to the processes of increased permeability of cell membranes for metabolic substances (big dispersed proteins, fibrinogen, “inert” cholesterol, its esters, lipoproteyids, mucoproteids, hyaluronidase). As a result, they come from the blood into tunica intima (insudation, plasma-Atlantic impregnation, mucoid intimal edema). A number of substances impaired exchange, including lipids, cholesterol and fibrin are good at electronic microscope study. It follows that the concept of „prelipid changes” would be excluded by the results of the initial analysis of the changes in atherosclerosis. The essence of these changes in the adaptive response to intimal primary humoral-metabolic and neuro-vascular disorders. Of great importance in this reaction is the increased activity of proteolytic, fibrinolytic enzymes and lipolytic intima that „prevents” accumulation of „extra” protein and cholesterol-esters. They are loaded in the tunica intima and tissue only for exhaustion of the enzyme systems [3]. Lipoidosis reflects the stage of atherosclerosis, when intimal enzyme system can not withstand the entire increasing lipid-protein infiltration. Naturally, special cell reaction, lipofags, xantom cells and cholesterol appear.

Discussion of the results. Substances of the disturbed metabolism (lipids, cholesterol and fibrin) which are well detected in excessive amount during the electronic and microscopic study can indicate the pathological process. In the morphological study of vascular malformations the authors determine the changes in the surrounding tissues in the form of the fibrous content hypertrophy of musculo-elastic fibres [2, 5]. The following datum can prove certain correlation of histological and chemical changes in different tissues and vessels in the cerebrovascular pathology: except of the connective tissue cells which synthesize collagen and glycosaminoglycans there are the cells of haematogenic origin which perform phagocytosis in the connective tissue [5, 6]. Thus, the stromal-vascular dystroproteinosis includes the mucoid swelling, fibrinoid swelling (fibrinoid), hyalinosis, amyloidosis, which can be detected in our investigations. Mucoid swelling, fibrinoid swelling, and hyalinosis result from the increased tissue and vascular penetrability [6]. Mentioned data of the research could serve as the basis for the further investigations of the vascular pathology in general and vascular pathology of the brain in particular.

Conclusions: According to the comparative picture of ultramicroscopic cut of the hair follicles at the root (exploring people in norm and after ischemic stroke), we can say that there are certain histochemical changes in the cells of muscular elastic type and their membranes. Histochemical changes during the ultramicroscopic study of the hair bulbs in the vascular pathology of the brain could serve as the diagnostic criterion of the pathology development and the effectiveness of its treatment.

REFERENCES

УЛЬТРАМІКРОСКОПІЧНЕ ДОСЛІДЖЕННЯ ВОЛОСЯНИХ ЦИБУЛИН У ЗДОРОВИХ ЛЮДЕЙ І ХВОРІХ НА ЦЕРЕБРОВАСКУЛЯРНУ ПАТОЛОГІЮ

А.Й. ЛАБІНСЬКИЙ
Львівський національний медичний університет ім. Данила Галицького

Проведено ультрамікроскопічне дослідження волоссяних цибулин у здорових людей і хворих на цереброваскулярну патологію. Зареєстровано гістологічні зміни в корковій і мозковій речовині волоссяної цибулини при мозкових інсультах у вигляді збільшення піноцитозних включення, розпушування мембран тощо. За даними ультрамікроскопічної картини зрізу волоссяної цибулини на рівні кореня можна зробити висновок про стан тканин головного мозку при судинних церебральних захворюваннях та ефективність лікування цієї патології.

Ключові слова: ультрамікроскопія волоссяних цибулин, інсульт.

УДК 616.24–002.541:577.115.3:612.1

О.Б. ПІКАС, Т.С. БРЮЗГІНА
Національний медичний університет ім. О.О. Богомольця, м. Київ

Спектр жирних кислот ліпідів у плазмі та еритроцитах крові у хворих на казеозну пневмонію, що не постраждали від наслідків аварії на ЧАЕС.

Порівняльний аналіз показників

Як відомо, третина населення Землі інфікована мікобактерією туберкульозу. У 2011 р. у 8,7 млн людей виявлено активний туберкульоз, 1,4 млн осіб померли від нього [16]. За даними ВООЗ, сьогодні важливою проблемою в Україні є мультирезистентний туберкульоз,