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THE CONDITION OF THE TOOTH PULP IN COMBINED INFLUENCE OF EXO- AND ENDOGENIC PATHOLOGICAL FACTORS

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Pulp of the tooth is the organ, which is in unordinary conditions. It is separated from the environment by a powerful shell of hard tissues. It correlates with inner environment through tiny apical foramen of the tooth root. However, inspite of its isolation, the pulp very actively reacts on violations of hard tissues of the tooth being intact as well as on general pathologic processes which occur in the human body.

So in dental abrasion, which according to the data of many investigations oscillates from 4% to 57% in young age and reaches 91% in persons of older ages (Smith G., Robb N.D., 1996, Bartlett D.W. et el 1997), pulp does not stay intact. Depending on the degree of abrasion pathologic changes increase. In the III degree the pulp of the teeth is atrophic, decreases the number of odontoblasts. The dystrophy processes take place in it. The canals are badly permeable (Е.В. Боровский и др., 1998). Vascular changes as a rule come to the abruptly expressed hyperemia and coarsening of the vessels wall. In the nervous elements there marked the irritation phenomena, irregular intumescences, varicous inflations (М.И. Грошиков, 1995). Moreover there are indications on changes in the pulp of the tooth in endocrine pathology and the pathology of other systems of the body. Not seldom abrasion of the teeth, especially in older people, occurs on the background of the diseases of other systems and organs (Е.В. Ковалев и др., 1998).

In the accessible literature we failed to find information on this problem.

Materials and Methods of Investigation

The material of this investigation were the pulps of the teeth of the human being extracted according to the orthopedic indications. After extraction of them there was conducted the careful macroscopic examination of the mentioned objects. Then they were fixed in 10% solution of neutral formalin. The fixed objects were concluded into paraffine according to generally accepted histological method. There were prepared the longitudinal and diametrical sections 7-10 min in thickness. The obtained sections were painted with hemotoxilin-eosin and according to Van-Gizon. Preparations were studied under the light microscope MBI in the different enlargements.

It should be marked that the patient had the pathologic abrasion of hard tissues of the upper incisors of the III degree. She also suffered from chronical ischemia of the heart, atherosclerosis, gallstone disease, calculous cholecystitis, hypertensia.

Results and their Discussion

Under local anesthesia there were opened the pulp chambers of the upper central incisors. Visual examinations of the cavities showed the decrease of pulp volume, i.e. it filled not the whole volume of the cavity that evidently testified to its atrophy. Extraction of all the pulp was easy and without bleeding. The extracted pulp on its configuration corresponded to the form of the crown of the tooth and root canal. In macroscopic investigation there was marked its rather dense consistency which resembled gutta-percha. In some parts of the crown pulp there were revealed whiteish dense foci which resemble petrificates. Such formations may be seen locally in the pulp of the root.

Fig. 1. ***General view of pulp of the teeth***

1 – crown pulp
2 – foci of petrification
3 – root pulp
4 – foci of petrification.
(unstained preparation, enlarg. 5)

Fig. 2. Structure of the pulp in the horn of crown part

1 – intrapulpular concrement
2 – putting on homogenic dense masses on this surface of the pulp
3 – necrosis of odontoblasts
4 – layer of odontoblasts
(stained hemotoxilin-eosin, enlarg. ob. 25 Gomal 3)

Microscopic investigation of the pulp of the crown showed various changes in different parts of it. So on micropreparations of section of pulp horns there were met small concrements surrounded by the capsule. Similar on its consistency and colour masses were revealed on the surface of the pulp. These masses densely kept on its surface growing inwards the pulp tissue. Such onlayers have different thickness. The absence in such parts of the pulp any signs of odontoblasts is characteristic. In the parts of the pulp without petrificates it is possible to see the distorted cellular elements, which remotely resemble the layer of odontoblasts. They are the expressed kariopicnosis and the phenomena of the kariorrhesis.

Fig. 3. Concrement in the thickness of the crown pulp
1 – cellular infiltrate
2 – fragment of disintegrated concrement
3 – wall of concrement capsule
4 – cleftlike spaces in the thickness of concrement
(stained hemotoxilin-eosin, enlarg. ob. 25 Gomal 3)

In the deep layers of crown pulp there wear revealed big concrements, which as a rule are surrounded with the densed connective tissue capsule. Besides the concrements have a friable consistency. Disintegration of them into separate blocks of different size in producing of histological preparations testify to it. In different cases in the mentioned formations there stand aut out small-fissured spaces. The attention should be paid to such circumstance that concrements are strongly connected with the capsule. Some fragments which did not lose this tight connection testify to it.

Sometimes side by side with concrements in its capsule different cellular infiltrates may be found. The latter may be estimated as the pulp's reaction on a foreign body, which is a concrement. On the border between the crown pulp and the root one there were discovered the foci reflecting various stages of pulp changing. Both on longitudinal and diametrical sections in preparations one can see three zones, which have different structural manifestations of pathologic process. So peripheria consists of different cellular elements scattered among collagen fibers. In the composition of the infiltrate one may identify neutrophiles, macrophages, plasmocytes, fibroblasts. There takes place the abrupt violation of regularity of odontoblastic layer. At the same time there are odontoblasts, which are at different stages of destruction. Sometimes they are mixed into homogenic conglomerates.

Fig. 4. Crown pulp on the border with a root one
1 – sclerotic part on the periphery of the pulp
2 – zone of cellular infiltration
3 – centrally disposed gravity of coagulative necrosis
4 – destruction of the vascular bed
(stained hemotoxilin-eosin, enlarg. ob. 25 Gomal 3)

In the deeper layer of the pulp one can see a zone of coagulative necrosis which consists of dry dense structureless masses, i.e. detritus. Besides, the border between the zone of cellular infiltration and necrosis is determined very clear. It has fissural emptinesses. It may be supposed that on these fissures the nutritious substances are delivered for the cell of preceding layer of the pulp.

Further to the center one can see the layer of collagenic fibers of different thickness. The thinnest of them are around concrements forming the capsule. It is characteristic that between separate bands of fibers one can find isolated fissural spaces which resemble deformed vessels with bluntly thin walls and narrow clears spaces. In some of them one can find isolated cellular elements.

In the root pulp the pathological changes are not monotonous on the whole stretch. In some zones especially closer to the part of the pulp one can find multiple cellular infiltrates. Mainly they are around relatively big intrapulpular concrements. Closer to the apical foramen, i.e. the most thin part of the pulp, there are small concrements. In this zone the cellular infiltrates are practically absent. It is characteristic the absence of odontoblastic layer. Only on the surface of

separate parts of the pulp one can find narrow strips of dense homogenic substance. Central layer of the root pulp is presented by homogenic masses of coagulative necrosis practically at all its stretch. Among these masses one can see the isolated fissural spaces without any structural elements. It may be supposed that in the mentioned spaces there is a circulation of some liquid. In some parts of the root pulp there are some bands of longitudinally oriented collagenic fibers.

Fig. 5. Histostructures of the root pulp
1 – perepheral zone with the starting petrification
2 – central part is presented by coagulative necrosis
3 – cleftlike spaces
4 – fragment of concrement
(stained accor. Van-Gison, enlarg. 25 ob. Gomal 3)

Analyzing the above described material one can come to the conclusion that in considerable abrasion of a tooth the destructive processes are developed in the pulp. The character and manifestations of these processes increases in the presence of another pathology in the human organism. The diseases of cardiovascular system and other organs in combination with expressed abrasion of tooth hard tissue result in appearance of multiple petrificates, the development of sclerosis as well as massive coagulative necrosis in the crown and root pulp.

Naturally, such a condition of the pulp is unreversible and conservative treatment becomes unuseful. The given materials may be considered as the starting point in the investigation of the combined influence of the combinations of different pathological processes taking place in hard tissues of the tooth and above its limits on the pulp.

Conclusion

1. In abrasion of the hard tissues of the tooth in persons, who suffered from the diseases of cardiovascular system, in the pulp there develop rough pathomorphological changes, which result in its mumiification.

2. In the crown pulp there take place numerous relatively large petrificates as well as applications on the surface of dilimed masses, development of sclerosis and death of odontoblasts, atrophy.

3. In the root pulp there spread out the foci of petrification, sclerosis and massive coagulative necrosis.

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Резюме

За допомогою загальноприйнятих гістологічних методів досліджена пульпа зубів із патологічним стиранням III ступеня хворої на атеросклероз, ішемічну хворобу серця, гіпертонію, калькульозний холецистит.

Виявлена атрофія та ущільнення пульпи. У коронковій частині знайдені різних розмірів конкременти та поширений склероз.

У кореневій пульпі поряд із конкрементами та склерозом спостерігались вогнища коагуляційного некрозу, які займають довгі ділянки. Окрім того, виявлена практично повна облітерація судинного русла, яка в цілому призводить до муміфікації пульпи зуба.

Резюме

С помощью общепринятых гистологических методов проведено исследование пульпы зубов с патологической стираемостью III степени больной, страдавшей атеросклерозом, ишемической болезнью сердца, гипертонией, калькулезным холециститом.

Выявлена атрофия и уплотнение пульпы. В коронковой части обнаружены разнообразные по размерам конкременты и распространенный склероз.

В корневой пульпе наряду с конкрементами и склерозом обнаружены очаги коагуляционного некроза, занимающие значительные участки по ее протяженности. Кроме этого, отмечена по существу полная облитерация сосудистого русла, что в целом приводит к мумификации пульпы зуба.