

## Aspects of certain pulp structure modifications in senescence

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### Summary

Being known the fact that the dental pulp, as a particular form of conjunctive tissue organization, manifests great plasticity by a continuous renovation and permanent adjustment to the endured-through-life injuries, the authors undertook a clinico-hystological study, which tried to perceive its modalities of reaction to the action of certain aggressive external factors.

A sum of hystomorphological changes which succeeded in spotlighting the way the pulp reacts to the external injuries such as: decays, coronal restorations, attrition, chronic marginal periodontitis, are here revealed and analyzed. All these factors lead to slow pulp senescence process.

The modifications vary according to the general status of the organism, individual genetic specific features, the tooth type and dental pathologic history.

Due to its complex structure, the pulpo-dentinal ensemble has the capacity to deal with the numerous injuries coming from outside. The dental pulp, as a specific structure of conjunctive tissue, demonstrates great plasticity, being able to permanently adapt to the action of different aggressive external factors that influence it throughout life.

The modalities of reaction are various and reflect the defense potential, specific of each individual, having the task to permanently or temporarily hinder the evolution of morbid processes caused by external injuries.

Our survey tries to highlight the weight of certain structural changes at pulp level, under the influence of certain stress-factors.

### Material and method

Fragments of dental pulp obtained either by pulpectomy, or after teeth extraction from 30 patients aged over 60 years old, have been fixed in 4% formaldehyde solution in phosphate tampon 0.1 M, at a 7.2 pH for 12-14 hours, at 4°C. Having been thoroughly washed in running water, the fragments were treated for paraffin inclusion according to the current techniques and then sectioned in slices of 3-5 µm thickness.

After fixation on mounts and de-paraffination, the sections were stained with hemalaun-eosin (HE) and examined by trichromic technique (Masson). The examination and photographing were done on a Zeiss axioscope, using a Kodak 200 ASA pellicle.

### Results and discussions

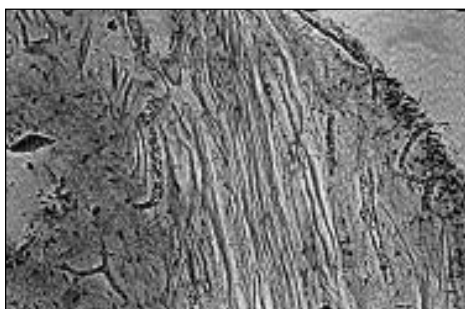
The specialty literature has approached throughout the years numerous aspects related to

the pulp tissue modifications under the influence of various aggressive external factors in elderly people. By the investigations we made, we tried to spotlight the frequency of these changes in the analyzed group and to make considerations about it.

Most of the cases, 86%, manifested pulp tissue fibrosis. It is known that there are cytokines acting as fibroblastic growth factors, which stimulate type I collagen synthesis.

As an outcome of our examinations we noticed a progressive increase of type I collagen with a longitudinal-like fascicle organization, sometimes tending to completely replace the extra-cellular matrix, which gave the aspect of a dense, fibrous conjunctive tissue through which rare fibrocytes can be observed (*Figure 1*).

Together with the fibrillar constitutive part, the progressive diminution of the fundamental substance, process that was due to its water amount increase, has also been noticed.



**Figure 1. Dental pulp fragment; collagen fibers and fascicles have a parallel organization. HE staining, 200x**

It is unanimously admitted that the extra-cellular matrix hydration is directly correlated with the amount of sulfated or non-sulfated glycosaminoglycans incorporated. The experimental data, as well as the observations regarding the evolution of the conjunctive tissue reparation process in general, have proved that the young fibroblast synthesizes larger amounts of glycosaminoglycans, glycoproteins such as fibronectin and laminin, followed by a synthesis of type III collagen and later on, of type I. This sequence was demonstrated as a part of the differentiation and maturation process of the mesenchyme, as well. By means of the radio-isotope marked precursors of collagen, it has been proven *in vivo* that the fibrocytes keep their capacity to incorporate small amounts of these precursors and to further exclusively synthesize small amounts of type I collagen.

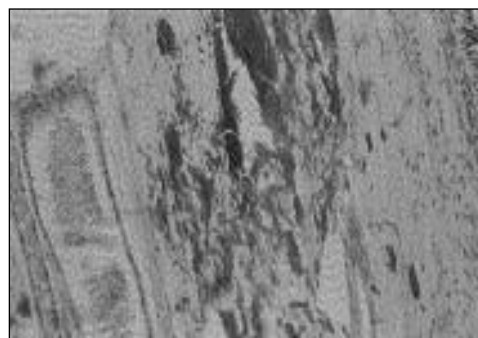
Therefore, the following hypothesis can be emitted: the evolution in time of more and more fibroblasts to the state of fibrocytes explains the progressive fibrosis of the dental pulp as part of the

senescence process, similar otherwise to the evolution of the conjunctive tissue, especially at the dermal level.

Another appearance of the external influences, encountered in 11 of the histological exams made (representing 36.6% of cases), is that of pulp mineralization. It is acknowledged that these can take diffuse or compact forms (pulpolytes). Regarding their formation mechanism are still many unanswered questions. The latest researches (Ciftcioglu, 2001) indicate the intervention of a very small bacteria (*Nanobacterium sanguineum*) which apparently causes the construction of pulpolytes, as well as of the biliary or kidney stones.

The presence of calcium-octophosphate deposits can be observed along the collagen fibers (Figure 2), or sometimes in the blood vessels walls, or even in the sheaths of the pulp nerves.

Far less frequent adipose cells can appear, too, at pulp level, deriving either from fibrocytes or from macrophages, an occurrence facilitated by the chronic inflammatory processes.



**Figure 2. Pulp mineralization zone, along the collagen fibers. HE staining, 200x**

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