

## **The signification of collagen fibers proportion and the cellular type inflammation in chronic periodontal diseases**

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### **Summary**

The fibroblast represents the predominant cellular type into the conjunctive periodontal tissue and it is considered to be a cellular component of the periodontal disease. The gingival fibroblasts as the otherwise localized fibroblasts synthesize and secrete the collagen fibers, elastin, non collagen proteins, glyco proteins and glycosaminoglicans.

The cytokines and metalloproteinases matrix, by a massive secretion of inflammatory mediators, participates into the inflammatory process of the periodontal area during the periodontal disease. It is known that during the periodontal disease the formation of a cellular infiltrate and the destruction of collagen fibers in lamina propria take place.

We will study the proportion between the collagen fibers from the cellular inflammatory infiltrate in chronic periodontal disease to establish the degree of periodontal damage and some prognosis criteria.

**Key words:** periodontal disease, fibroblast, collagen, cytokine.

### **Introduction**

The term periodontal disease is used to describe inflammatory type reaction modifications of gingival and the surrounding collagen tissue due to the action of bacteria or bacterial plaque

The periodontal disease is one of the most frequent and destructive, at the same time, inflammatory disease affecting the soft tissues and the alveolar bone that sustains the tooth.

Gingivitis becomes periodontitis if the bacteria persist and move towards the apex area. At the same time, the inflammation extends, producing the destruction of conjunctive tissue and alveolar bone.

In the disease antecedents the host defense mechanisms probably trough formation of free oxygen radicals and the for-

mation of inflammatory cytokines and proteolytic enzymes are incriminated. The evolution and the risk degree of the disease depends how the host responds.

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tion of collagen fibers in lamina propria take place.

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### Material and methods

The study was realized on 26 gingival biopsies taken from chronic periodontal disease, III degree, and active type; with gingival recess. The lesions join metallic crowns (9 lesions), composite (11 lesions) and ceramics (6 lesions). The metal present into the crowns is a classic alloy of chrome-cobalt and the composite from total physiognomic crowns is composite. Also the ceramics crowns are totally physiognomic, vita ceram. The cases selection criteria and the periodontal classification start from the lesions clinical aspect (color, bleeding, dental probing that indicates the depth of the pocket) and the X-ray exam that shows the bone resorption. The chronic periodontitis were diagnosed based on clinical and radiological criteria, all patients heaving more than a periodontal recess e 4-5 mm attachment loss. The patients included in this study had neither oral nor systemic diseases nor any other immune abnormalities and did not take any medication.

Fragments from periodontal tissue were surgically excised during surgical periodontal intervention. Biopsies were fixed in formal 10% and they were included in paraffin. The coloration was made with hematoxylin, eosin, Trichrome Gömöri and PAS reaction.

The fibroblast was colored and the image was analyzed by immunohistochemistry for the antibody anti Vimentin (Vg). The antibody was visualized by DACO system, LSAB utilizing DAB chromogen.

The evaluation of the area fraction of collagen fibers in the upper connective tissue was determined in sections. Histological

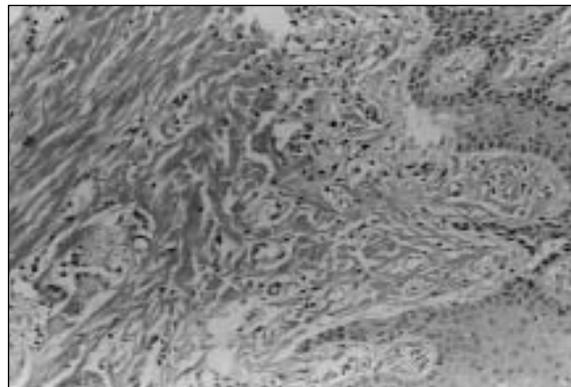
sections were observed in a microscope using a 40 objective X equipment, representing 0.159 mm<sup>2</sup> and the numbering of 30 fields of this kind of section for each field.

### Results

All examined fragments corresponded to the clinical stage of the disease. The periodontal tissue on the majority of cases presented ulcerations zones into the periodontal recess with the existence of isles of different sizes of epithelial regeneration. The ulceration zone continues with a very rich lymphocyte, plasmocyte, histiocytes, macrophages, granulocytar, fibrocytar, and fibroblastic infiltrate and some spots were found. At the edges of the cellular infiltrate zone, fibroblasts and newly formed capillaries appear in great number. Here isolate collagen fibers that become bends in fascicula were found. The proportion of the two cellular infiltrate components are represented in Table 1. The cellular infiltrate is low represented in the periodontal tissue area surrounding the ceramic crowns. (Figure 1).

**Table 1**

Crown types	Crowns nr.	Media CC	Media
		infiltrate cellular	CC fiber Collagen
Metallic	7	23	2
Composite	11	19	6
Ceramics	6	3	22



**Figure 1**

In the periodontitis around the composite crowns, the extension of the cellular infiltrate is beneath 4/5 of the surface of the preparation. (Figure 2)

The cellular inflammatory infiltrate becomes predominant in proportion of 2/3 in the case of metallic crown. (Figure 3)

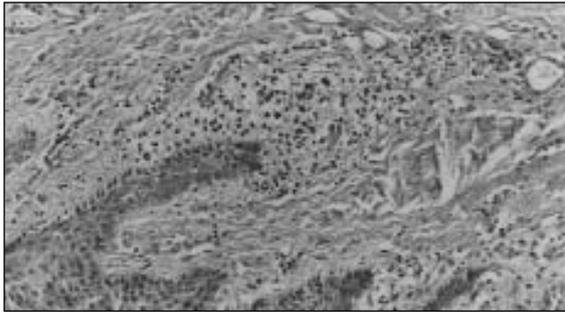


Figure 2

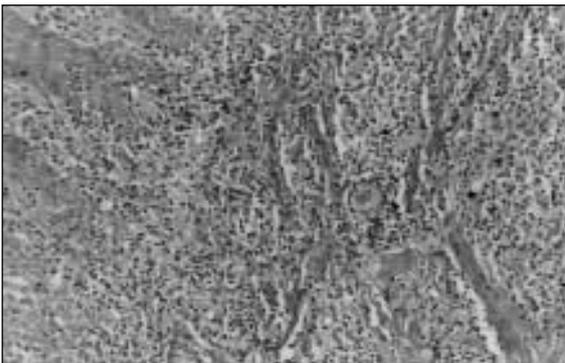


Figure 3

Knowing the fact that the process of regeneration of inflammation took place in an intermediary stage of granular tissue in the phase of vascularization, we appreciated that the relative density of neoformation capillarity and its the precursor (Table 2).

Table 2

Crown types	Crowns nr.	Fibroblasts relative density	Capillary relative density
Metallic	7	8	9
Composite	11	16	11
Ceramics	6	36	21

The differentiation of fibrocytes and fibroblasts from the rest of cellular elements was made on YHC anti Vimentin.

The relative density of fibroblasts and capillaries has reached medium values in the periodontium around composite crowns.

The highest values of the relative density in the capillarity and also of fibrocytes and fibroblast infiltrate was observed in the periodontium near ceramic crowns.

## Discussion

During inflammatory gingival disease the degradation of the gingival matrix macromolecules such as collagen or elastic fibers is partial induced by metalloproteinases, collagens, gelatinases secreted by inflammatory infiltrate cells (lymphocytes B, cytotoxic lymphocytes, macrophages bacterial elements and resident cells) the bacterial structures and resident cells (epithelial cells as well as fibroblasts) acting in concert and dependent of the local tissue Ph.

Cytokines such as interleukin or tumor necrosis factor may also lead the connective tissue of the periodontium to self-destruction trough the stimulation of metalloproteinases production. The integrity of the extracellular matrix requires a balance between the amount and activity of matrix degrading proteolytic enzymes and their associated inhibitors.

It is now recognized that during periodontitis, an imbalance between activated metal proteins and their endogenous inhibitors leads to pathologic breakdown of the extracellular matrix, and a relationship was established by Overall and co. between the tissue collagens activity and the inflammation severity. In human gingival collagens was shown to be frequently associated with inflammatory cells, but its precise cellular origin was uncertain. In the present work we reached the same conclusions but we tried to correlate the known aspects with one of the possible etiological factors meaning the material type that the crowns near periodontal defects were created.

Even though the casuistic of this study is reduced and the method used is only semi-quantitative still, we consider that we realized (by the big number of camps) an appreciation on the proportion of the two components (collagen fibers and cellular inflammatory infiltrate) done on three types of materials used near the periodontal area, which can influence the chronic periodontitis.

The cellular inflammatory infiltrate that represents the source of different enzymes and cytokines is bigger (wider) in case of periodontal area around metallic crowns where the proportion cells/collagen fibers is 27/2 and those around ceramic crowns is 3/22. The great proportion of inflammatory cells represents criteria of the periodontal disease progression and aggravation degree.

The appreciation given by fibroblasts and capillary relative density brings new information about the evolution of periodontal disease associated to different types of materials used frequently in prosthetic reconstruction of dental lesions. Around ceramics crowns the fibroblasts and capil-

lary relative density had both large values in process, contrasting the present report around metallic crowns where both values were low.

The cytokines role was demonstrated and experimented on monkeys by injecting solutions that contained specific protein receptors in the gingival zone that blocked the IL 1 and TNF, stopping the initiation and development of the inflammatory process.

The cytotoxic cells can play an important part in matrix macromolecule degradation, first of all through cellular cytotoxicity directed against fibroblastic alternation.

During the periodontal disease the intensity of the tissue reaction is correlated inversely with the collagen fibers conventional camps value, suggesting that during the disease evolution the synergic action of all implicated cell types participates to the matrix molecules destruction. It is confirmed in a certain way by the literature data that lymphocytes destruction is eased through their cytotoxic direct action or through destructive action cytokines biologic active.

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