

THE SIGNIFICANCE OF MATRIX METALLOPROTEINASES IN THE DEVELOPMENT OF PERIODONTITIS

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Abstract:

In recent decades, there has been a growing interest in non-invasive diagnostic methods. Saliva is one of the safe biomaterials for studying the human body. The correlational increase in salivary composition and its metabolic products, particularly the product of connective tissue degradation and metalloproteases gives the possibility of its widespread use in diagnosis.

Research purpose: Evaluation of the diagnostic effectiveness of bone-specific molecule and oral fluid matrix metalloproteinase in periodontal diseases.

Research materials and methods: Sixty-eight individuals were under observation, divided into groups of somatically healthy subjects and patients with moderate chronic generalized periodontitis (CGP). The control group consisted of 14 somatically healthy individuals aged 30.3 ± 2.1 years, without any nosological forms of acute periodontal diseases or exacerbations of chronic periodontal conditions, including oral diseases. These individuals hadn't harmful habits and were not taking any medications. It was determined using biochemical and immunological methods.

The obtained results and their discussion: The increased production of pro-inflammatory cytokines in response to microbial products induces a cascade of reactions, one of which is the stimulation of proteolytic enzyme activation (markers of connective tissue breakdown). Among these, metalloproteinases (MMPs) occupy an important place. We examined MMPs related to collagenases. Taking into account that our research showed increased expression of MMP-9 and MMP-8 activity in patients with periodontal diseases, they were proposed as valid indicators



of the disease. An important biological function of MMP-8 in the periodontium is to facilitate the migration of leukocytes, especially neutrophil granulocytes, from blood circulation to the periodontal arch by cleaving the collagen and other components of the extracellular matrix. MMP activity is inhibited and regulated by endogenous or natural tissue inhibitors of tissue inhibitors MMP (TIMP) and α 2-macroglobulin. The imbalance between MMP and TIMP often leads to irreversible periodontal destructive pathology. Therefore, for effective differentiation between clinically healthy areas and gingivitis from chronic periodontitis, as well as for efficient monitoring of treatment in patients with chronic periodontitis, it would be advisable to conduct the MMP-8 test.

Table 1 The average level of MMP-8 and ICTP in oral fluid in patients with gingivitis and periodontitis

Indicator	Healthy group n =14	Gingivitis group n =26	Periodontitis group n =28
MMP-8 (ng/dl)	4,23 ± 0,41 *	21,74 ± 3,04 *	40,62 ± 2,98*
ICTP (ng/ml)	13,58±1,54 *	19,24±1,87 *	48,63±3,91*

Note: *- significantly differs from the healthy group (P<0.05)

As can be seen from the presented research results, the content of MMP-8 in patients with gingivitis is 5.1 times higher than in healthy patients. The table above also shows that patients with periodontitis have a 9.6-fold increase in MMP-8 levels compared to healthy individuals. The observed dynamics of MMP-8 in the oral fluid of the examined patients induce inflammation associated with tissue destruction in periodontal diseases. Therefore, a better understanding of the main pathophysiological mechanisms of metalloproteinase in combination with the presence of periodontal lesions can lead to new diagnostic and therapeutic methods of prevention, as well as the management and treatment of this category of patients with periodontal diseases.

Pyridinoline induced carboxiconcentric telopeptide is a product degradation type of collagen I, which is the main component of the alveolar bone. In progressive periodontitis, this degrades and is released under the influence of bacterial collagenase or pro-inflammatory mediators. Therefore, Pyridinoline induced carboxiconcentric telopeptide is considered specific for alveolar bone loss and consequently is of particular interest for the timely diagnosis of periodontitis. As can be seen from the presented research results, the content of Pyridinoline induced



carboxiconcentric telopeptide in the blood of individuals examined with gingivitis exceeded the baseline level of individuals with healthy periodontitis by 14%, while in patients with periodontitis, the studied indicator exceeded the values of healthy individuals by 3.6 times and gingivitis patients by 2.5 times. ICTP, being a biomarker specific for bone degradation, can be clinically used to differentiate gingival inflammation from progressive periodontitis. This study is consistent with the results of the aforementioned studies.

Conclusion:

1. In the context of molecular-destructive disorders in chronic generalized periodontitis and gingivitis, oral fluid levels of metalloprotease-MMP-8 increased by an average of 5.1 times compared to healthy individuals.
2. Level of pyridinoline induced carboxiconcentric telopeptide in patients with periodontitis individuals 14%, the studied indicator exceeded the values of healthy individuals by 3.6 times and gingivitis patients by 2.5 times.

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