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Assessment of collagenase activity and MMP levels in GCF and in peri- implant sulcular fluid in healthy, chronic periodontitis and peri-implantitis patients

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ABSTRACT: Background: The present study was conducted to assess collagenase activity and MMP levels in GCF and in peri- implant sulcular fluid in healthy, chronic periodontitis and peri- implantitis patients.

Materials & Methods:40 patients of both genders were divided into 4 groups. Group I patients were healthy, group II had healthy dental implants, group III patients had periodontitis and group IV had peri-implantitis. Collagenase activity wasmeasured using a DNP-synthetic octapeptide.

Results: The mean gingival index was 0.6 in group I, 1.1 in group II, 2.2 in group III and 2.3 in group IV. Probing depth was 3.2 in group I, 2.5 in group II, 5.7 in group III and 5.1 in group IV. Collagenase activity per site was 1.7, 0.5, 15.2 and 14.7 in all groups respectively. Collagenase activity per ml was 9.2, 2.2, 16.4 and 21.6 in all groups respectively.

Conclusion: Peri-implantitis PISF contained higher collagenase-2 levels. GCF and PISF from severeCP and PI exhibited the highest activation of MMP-8 isoenzymes species.

Key words: Peri-implantitis, GCF, MMP

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1. INTRODUCTION

The causes of the peri-implantitis development and progression of inflammation are very different. Factors such as oral cavity health, proper hygiene, smoking, and stress are certainly important. Without a doubt, anatomical factors and proper attachment of connective tissue and epithelium to the implant surface affect the maintenance of the implant and the development of possible inflammatory processes. The implant-bone interaction depends on many factors, including properties of the material from which the implant is made. Another important factor is the quality of the implant surface—its chemical, physical, and mechanical features.

Recently, an increased level of MMP-8, especially in activated/active form (aMMP-8), in oral fluids is associated with and reflects periodontal and peri-implant inflammation/diseases especially in clinical active phases. Periodontal and peri-implant degeneration (APD) is caused by interstitial collagenase MMP-8 and not by bacterial enzymes. MMP-8 is released from neutrophils by selective degranulation triggered by potent periodontopathogenic bacteria and their virulence factors together with host-derived proinflammatory mediators.

Increasing evidence indicates that pathologically excessive collagenase activity plays a major role in periodontal destruction. This is not surprising, since collagen is the major structural protein of all periodontal tissues, and collagenolytic MMP-1, -8, and -13 are the only neutral proteinases that have the ability to initiate the digestion of type I collagen, the most dominant collagen in these periodontal and PI tissue compartments. The present study was conducted to assess collagenase activity and MMP levels in GCF and in peri- implant sulcular fluid in healthy, chronic periodontitis and peri- implantitis patients.

2. MATERIALS & METHODS

The present study comprised of 40 patients of both genders. All patients were informed regarding the study and their consent was obtained.
Data such as name, age, gender etc. was recorded. Patients were divided into 4 groups. Group I patients were healthy, group II had healthy dental implants, group III patients had periodontitis and group IV had peri-implantitis. Gingival crevicularfluid (GCF) and in peri-implant sulcular fluidwere collected on filter paper strips, volume was determinedand samples were extracted in buffer containing general proteinase. Collagenase activity wasmeasured using a DNP-synthetic octapeptide, and molecular and activation forms of collagenase-2 by Westernimmunoblotting.Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

3. RESULTS

Table I Distribution of patients

Groups	**Group I**	**Group II**	**Group III**	**Group IV**
Status	Healthy	Healthy implants	Periodontitis	Peri-implantitis
Number	10	10	10	10

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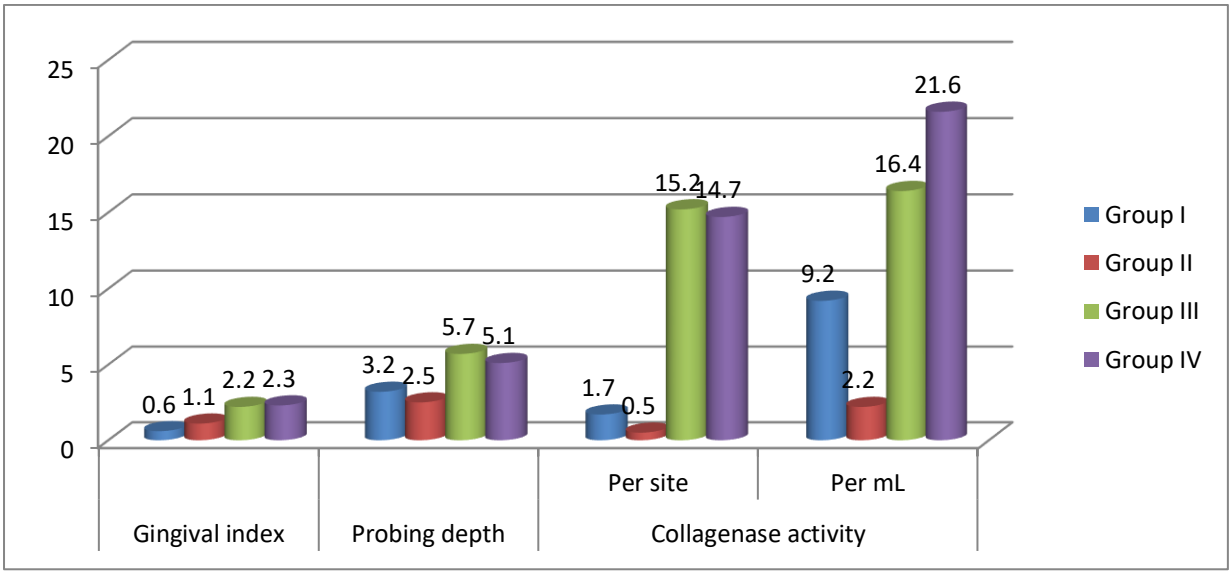
Table I shows distribution of patients in various groups.

Table II Assessment of parameters

Groups	Gingival index	Probing depth	Collagenase activity	
			Per site	Per mL
Group I	0.6	3.2	1.7	9.2
Group II	1.1	2.5	0.5	2.2
Group III	2.2	5.7	15.2	16.4
Group IV	2.3	5.1	14.7	21.6

Table II shows that mean gingival index was 0.6 in group I, 1.1 in group II, 2.2 in group III and 2.3 in group IV. Probing depth was 3.2 in group I, 2.5 in group II, 5.7 in group III and 5.1 in group IV. Collagenase activity per site was 1.7, 0.5, 15.2 and 14.7 in all groups respectively. Collagenase activity per ml was 9.2, 2.2, 16.4 and 21.6 in all groups respectively.

Graph I Assessment of parameters



4. DISCUSSION

Periodontitis and peri-implantitis, globally common infection-induced oral inflammatory disorders of teeth and dental implants supporting soft and hard tissue, i.e., periodontium and peri-implatium, involve destruction of both soft and hard tissues, as active periodontal and peri-implant degradation (APD). Periodontal/peri-implant tissues are mainly made up of type I collagen. The proteolytic enzyme mainly responsible for the active periodontal/peri-implant soft and hard tissue degeneration (APD) is matrix metalloproteinase (MMP-8), also known as collagenase-2 or neutrophil collagenase. MMP-8 is a member of the MMP family. Structurally related but genetically distinct MMPs are Ca^{2+}- and Zn^{2+}-dependent endopeptidases capable of degradation of almost all extracellular matrix and basement membrane protein components both in physiologic repair and pathologic destruction of

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tissues, such as a breakdown of extracellular matrix in embryonic development, wound healing, and tissue remodeling. The present study was conducted to assess collagenase activity and MMP levels in GCF and in peri- implant sulcular fluid in healthy, chronic periodontitis and peri- implantitis patients.

In present study, mean gingival index was 0.6 in group I, 1.1 in group II, 2.2 in group III and 2.3 in group IV. Probing depth was 3.2 in group I, 2.5 in group II, 5.7 in group III and 5.1 in group IV. Collagenase activity per site was 1.7, 0.5, 15.2 and 14.7 in all groups respectively. Collagenase activity per ml was 9.2, 2.2, 16.4 and 21.6 in all groups respectively.

Xu et al in their study GCF from CP and G sites exhibited elevated collagenase activity and flow, but collagenase concentrations expressed per ml were not significantly different between the healthy and G sites. Minimal fluid was obtained from healthy PISF, and collagenase concentration was the same or lower than in healthy GCF. Although PISF flow was 34% lower than GCF flow in CP subjects, collagenase concentration in CP and in PI sites was 78% and 971% greater, respectively, than in the appropriate healthy sites. Western immunoblot revealed MMP-8 in both PISF and GCF; fibroblasttype MMP-8 was not detected in healthy GCF and PISF. Immunoreactivity level and inactive and activated forms of PMNtype MMP-8 in GCF and PISF increased with the severity of periodontitis and peri-implantitis. Enhanced levels of fibroblast-type MMP-8 in active form were detected only in severe CP GCF and PI PISF.

Aleksandrowiczet al[12]evaluated the level of MMP-8 in PISF obtained from patients without clinical symptoms of mucositis or peri-implantitis and compare it with MMP-8 level in gingival crevicular fluid (GCF) obtained from patients with healthy periodontium and those with varying severity of periodontitis. A total of 189 subjects were included in the study, and GCF/PISF samples were analysed for MMP-8 level by ELISA test. MMP-8 level in PISF obtained from patients without symptoms of mucositis or peri-implantitis was significantly higher not only than in GCF of periodontally healthy patients but also, which seems to be very interesting, than in GCF of patients with varying degrees of periodontal inflammation, consistent with earlier studies.

The shortcoming of the study is small sample size.

5. CONCLUSION

Authors found that Peri-implantitis PISF contained higher collagenase-2 levels. GCF and PISF from severeCP and PI exhibited the highest activation of MMP-8 isoenzymes species.

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