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Interleukin - 1β In Oral Fluids And Bone Loss In Periodontitis

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Abstract

Interleukin 1β (IL-1β) is pro-inflammatory cytokines that plays a key role in pathogenesis of periodontal diseases. The aim of the study is to investigate concentration of IL-1β in GCF and saliva in subjects with periodontitis in parallel with radiographic data of bone loss. 24 patients (including 11 men and 13 females), with a mean age of 49.42 (SD±10) and diagnosed with periodontitis have been involved in the study. There is significantly lower mean IL-1β concentrations in GCF in patients with mean BL < 2 mm in dentition in comparison with patients with mean BL ≥ 2 mm in dentition. There is tendency in patients with bone loss on the sites which the GCF was obtained from (BL on GCF sites) < 5 mm, the GCF concentration of IL-1β to be lower than in patients with BL on GCF sites ≥ 5 mm, but without significant difference. Our findings confirm the statement that IL-1β is an inflammatory mediator that could be associated in higher extend with the general reactivity of the host and in lower extent with local inflammation at a particular periodontal site. The results justifies the correlation of IL-1β levels in GCF with mean bone loss, i.e. severity of periodontitis and provide grounds for further research to validate this cytokine as one of the biomarkers of periodontitis.

Keywords: alveolar bone loss, interleukin-1β, gingival crevicular fluid, periodontitis

Introduction

Interleukin 1β (IL-1β) along with tumor necrosis factor (TNF) are pro-inflammatory cytokines that play a key role in initiating and maintenance of the immune and inflammatory response in the pathogenesis of periodontal diseases. They can stimulate matrix metalloproteinases, and bone resorption (1). The IL-1β

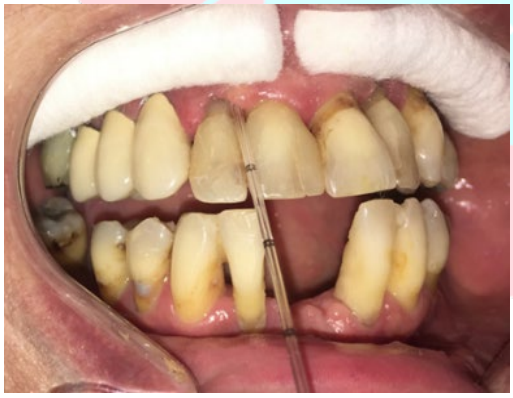
levels correlate with the presence of periodontal disease, but also depend on the severity of the disease reflected by clinical parameters at the site of collection (probing depth and attachment level), and were reduced after periodontal therapy (2). Another study suggests that IL-1β plays an important role on tissue destruction and bone resorption by stimulating matrix metalloproteinase-3 (MMP-3) and tissue type plasminogen activator (t-PA) (3). The results of a systematic review show that IL-1β is the most frequently studied biomarker in gingival crevicular fluid (GCF) and there is reliable association of IL-1β with disease progression and with outcome of periodontal therapy (4).
Recently, saliva has been considered as an alternative fluid for diagnosis by biomarkers. Saliva, in contrast to GCF, is easier to collect and may be taken in larger volume for research (5). Different type of studies show, that IL-1β levels in saliva significantly correlated with clinical parameters of periodontitis (5).

Aim

To investigate concentration of IL-1β in GCF and saliva in subjects with periodontitis in parallel with radiographic data of bone loss.

Material and methods

24 patients (including 11 men and 13 females), with a mean age of 49.42 (SD±10) have been involved in the study. The patients were admitted for treatment in the Department of Periodontology at the Faculty of Dental Medicine, Medical University - Sofia. The protocols for recording of clinical measurements and collection of GCF and saliva samples had been approved by the institutional ethics committees. All subjects signed informed consent prior to the study. All participants receive a clinical periodontal examination and orthopantomography. All patients are diagnosed with periodontitis. All they have at least 6 sites with at least 6 affected teeth in the 6 sextants of the dentition with probing pocket depth (PPD) ≥ 5 mm and clinical attachment level (CAL) ≥ 2 mm. Bleeding on probing (BOP) ≥ 20% from whole dentition (six sites per tooth were investigated). Radiological evidence for bone loss is localization of alveolar crest level's more than 2 mm apically to the cementoenamel junction. The patients were divided into two subgroups – with mean bone loss (BL) < 2 mm and with mean BL ≥ 2 mm. Additionally, we divided the patients into two groups according to the indicator bone loss on the sites which the GCF was obtained from (BL on GCF sites). The first group is with BL on GCF sites < 5 mm and the second group – with BL on GCF sites ≥ 5 mm.



GCF from 6 sites and whole saliva were collected respectively in sterile microcapillary pipette and tubes. More detailed information on GCF and saliva samples collection procedures can be found elsewhere (6). IL-1β concentration was measured using an enzyme-linked immunosorbent assay (ELISA). The collection of GCF by microcapillary pipette placed extracravicularly in contact with the tooth for 5 minutes is shown on Fig. 1. 1 μL GCF is required to be collected from each site. Around 6 ml of the whole saliva is collected.

Fig. 1 Collection of GCF with microcapillary pipette.

RESULTS

There is signifficantly lower mean IL-1β concentrations in GCF in patients with mean BL < 2 mm in dentition (41946.2 pg/ml; SD±27460.78) in comparison with patients with mean BL ≥ 2 mm in dentition (83150 pg/ml; SD±37794,19) (p=0,006) (Fig.2).

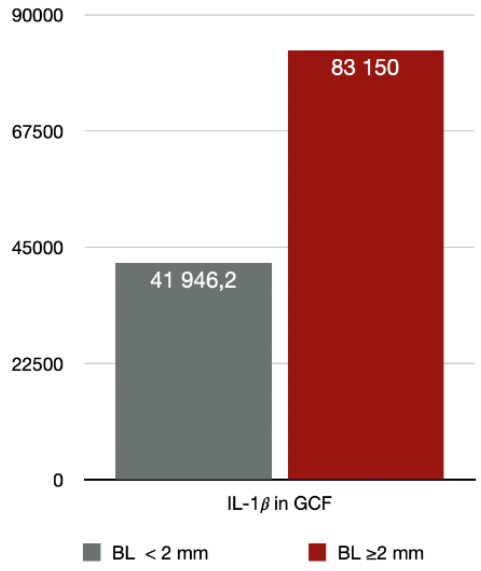


Fig.2 Mean value of IL-1β (pg/ml) in GCF in the two groups of patients divided by mean bone loss.

There is tendency in patients with periodontitis and BL on GCF sites ≥ 5 mm, the GCF concentration of IL-1β to be higher (70040 pg/ml; SD±42385.6) than in patients with BL on GCF sites < 5 mm (49642.9 pg/ml; SD±33439,4), but without significant difference (p=0,201) (Fig.3).

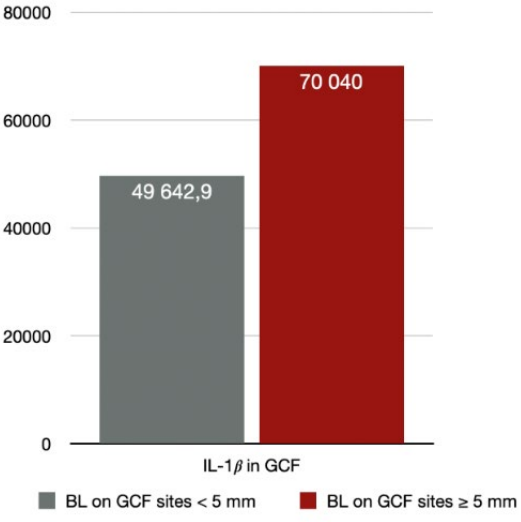


Fig. 3 Mean values of IL-1β (pg/ml) in GCF in the groups of patients divided by BL on GCF sites.

We do not ascertain significant differences in the concentrations of IL-1β in saliva in patients with different mean bone loss or BL on GCF sites.

Discussion

Our data showed a positive correlation between mean alveolar bone loss in patients with periodontitis and concentrations of IL-1β in GCF. This is consistent with reports of other authors who reported elevated GCF levels of IL-1β at active sites in periodontitis (with > 2 mm loss of attachment in 3 months) than in inactive (≤ 2 mm loss of attachment in 3 months) (7). Along with that increased GCF levels of IL-1β correlated with alveolar bone loss in active sites, which may serve him as one of possible indicators of disease activity (7). Another study discusses the possible mechanisms of action of IL-1 and TNF in pathological periodontal destruction in experimental periodontitis. At the same experiment local inhibition of IL-1 and TNF at sites with induced periodontal destruction inhibited the recruitment of inflammatory cells, reduced formation of osteoclasts and amount of bone loss (8).
The established correlation of the levels of IL-1β in GCF with the mean bone loss confirms the importance of this cytokine in the process of tissue destruction. The lack of significant correlation between IL-1β in GCF and bone loss at the same sites confirm the statement that IL-1β is an inflammatory mediator that could be associated in higher extend with the general reactivity of the host and in lower extent with local inflammation at a particular periodontal site, as claimed by other authors (2).

Conclusion

The results justifies the correlation of IL-1β levels in GCF with mean bone loss, i.e. severity of periodontitis and provide grounds for further research to validate this cytokine as one of the biomarkers of periodontitis.

Acknowledgement

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