RETHINKING MMP-8 AS A BIOMARKER IN PERIODONTITIS: EVIDENCE FROM GENETIC AND PROTEIN EXPRESSION ANALYSIS

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INTRODUCTION

The periodontium is a dynamic structure whose main role is to support the tooth and the oral mucosa, and is influenced by local, environmental, and systemic factors (1,2). Periodontitis is a chronic, multifactorial inflammatory disease affecting the soft and hard tissues of the periodontium, which can lead to irreversible damage (2). Clinical diagnosis is often made at an advanced stage, by which time the destruction of the supporting tissues has already begun (1).
According to the latest WHO global report on the state of oral health, severe periodontal disease is a public health issue affects nearly 19% of the population that is, one billion people (3).
Genetic polymorphisms in matrix metalloproteinases (MMPs), particularly MMP-8, may influence the progression of the periodontal disease. Single nucleotide polymorphisms in promoter regions can alter gene expression. Several studies have explored the link between MMP-8 polymorphisms (-799C>T, +17C>G), enzyme levels, and periodontitis risk, findings remain inconclusive (4,5,6).

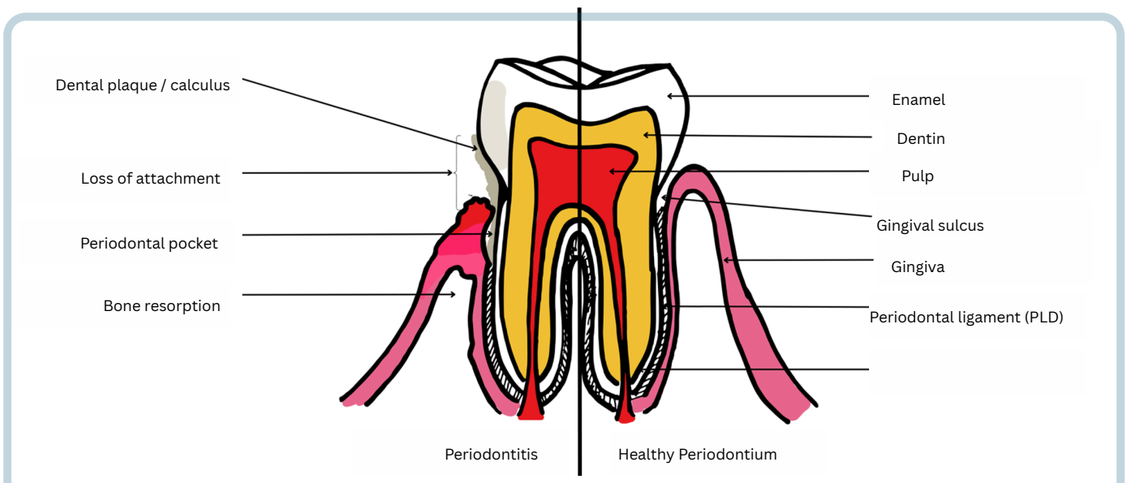

Figure 1 – Comparison between healthy periodontium and periodontium affected by periodontitis. Own illustration.

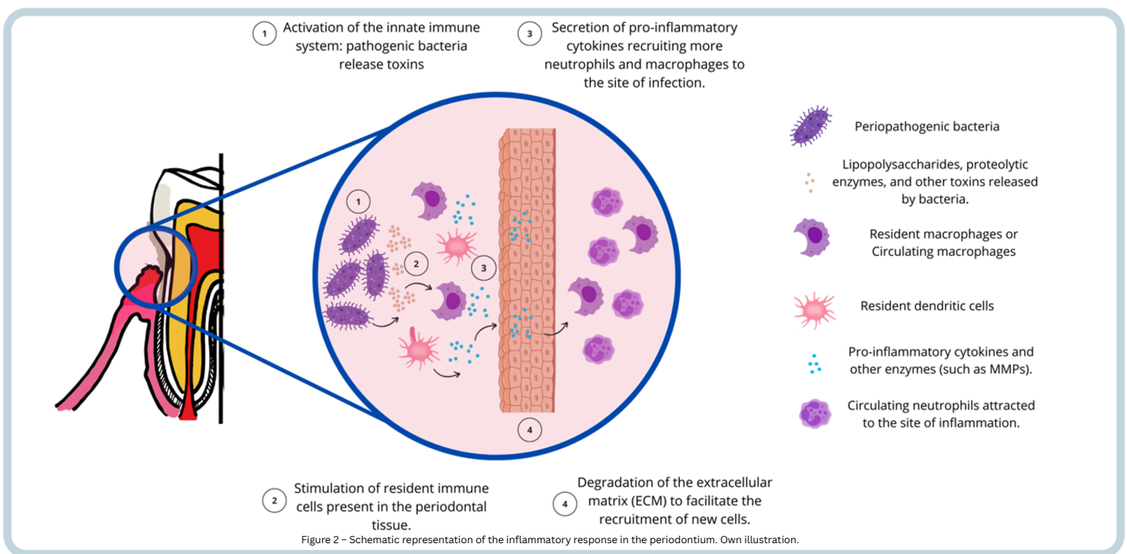

Figure 2 – Schematic representation of the inflammatory response in the periodontium. Own illustration.

AIMS

This study investigated the potential of MMP-8 as an early diagnostic biomarker for periodontitis by analysing its concentration in gingival crevicular fluid as well as the presence of two gene polymorphisms (–799C>T and +17C>G). The aim was to assess whether these molecular markers are associated with disease presence, severity, or susceptibility.

METHODOLOGY

A total of 62 individuals were included: 36 with periodontitis and 26 healthy controls. Gingival crevicular fluid samples were collected using paper strips for MMP-8 quantification via ELISA and zimography analisis. Buccal swabs were used for DNA extraction and analysis of MMP-8 gene polymorphisms by PCR-RFLP. Generalised linear models (gamma distribution, log link) were applied to assess the association between clinical and molecular variables, adjusting for age, sex, smoking, and disease stage. Model fit was evaluated using likelihood ratios, Wald tests, and AIC/BIC.

RESULTS

The results provide no evidence to suggest a significant association between the periodontitis susceptibility and each of the polymorphisms or with the genotype analysed. Furthermore, no correlation was identified between the concentration of MMP-8 or concentration of active MMP-8 and periodontitis. These findings reinforce a trend that has been observed in the recent literature, which highlights the limitations of MMP-8 as a standalone diagnostic biomarker. In the present model, age is the only factor significantly associated with a positive effect in the diagnosis of periodontitis. Age has also a slight, yet statistically significant, negative effect on active MMP-8 levels. This suggests a gradual reduction in enzyme activation with ageing. These results reflect age-related immune changes.

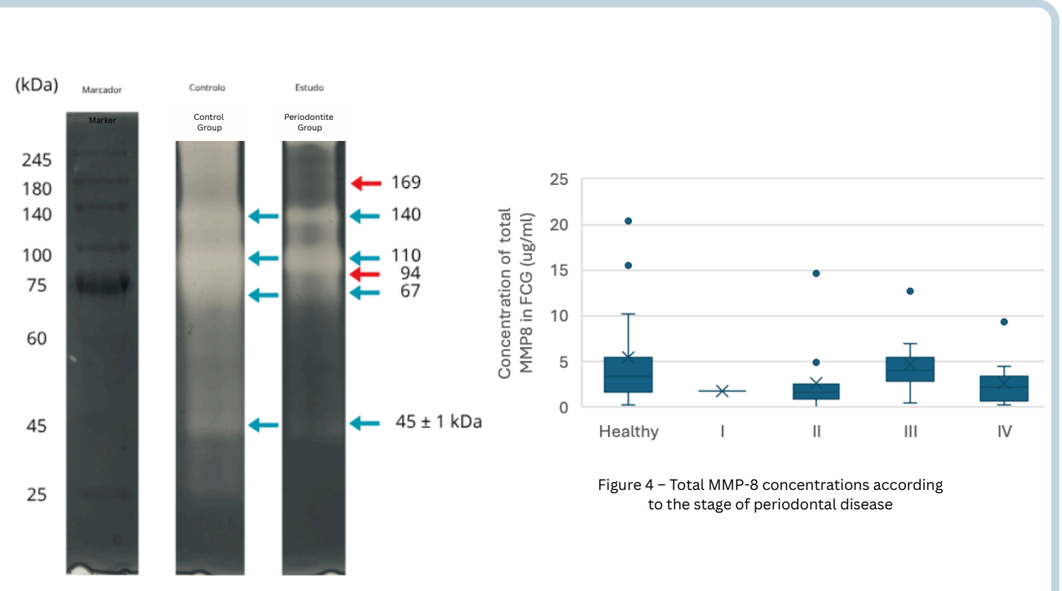

Figure 3 – Zymography results for the analysis of collagenolytic activity.

Figure 4 – Total MMP-8 concentrations according to the stage of periodontal disease

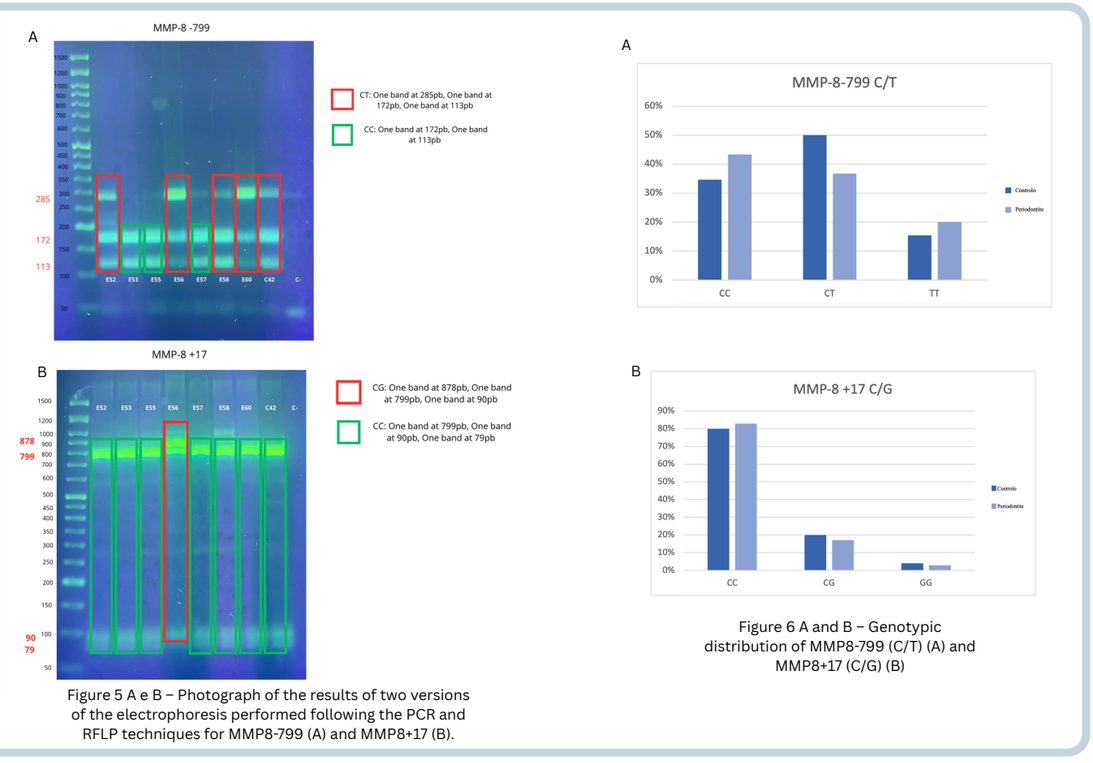

Figure 5 A e B – Photograph of the results of two versions of the electrophoresis performed following the PCR and RFLP techniques for MMP8-799 (A) and MMP8+17 (B).

Figure 6 A and B – Genotypic distribution of MMP8-799 (C/T) (A) and MMP8+17 (C/G) (B)

CONCLUSION

These results give rise to questions regarding the use of MMP-8 as a biomarker for periodontal disease, suggesting the necessity for further studies with larger samples sizes and the inclusion of other matrix metalloproteinases in the research scope.

REFERENCES

To access the bibliography, please scan this QR code.