



# Analysis on the relevance between periodontal inflammation and macrophage polarization and function in gingival tissue



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**Background:** Activated macrophages play a central role in the development progress of chronic periodontitis. Polarized macrophages M1- and M2-type macrophages have distinct effects on periodontal inflammation through secreting various cytokines. Our study aims to observe the M1/M2 ratios and expression of macrophage-related cytokines in different periodontal status, then investigate the relevance between periodontal inflammation and macrophage polarization and function.

**Methods:** Forty-three gingival samples were collected from patients with chronic periodontitis (n=13), gingivitis (n=19) and periodontal health individual (n=11). Periodontal index probing depth (PD), clinical attachment level (CAL) and gingival index (GI) were recorded before collection. M1/M2 ratios were detected through immunofluorescence staining, while the expression levels of macrophage-related cytokines TNF- $\alpha$ , IFN- $\gamma$ , IL-6, IL-12, IL-4 and IL-10 were observed through immunohistochemistry staining. The relevance between them was analysed by statistical software.

**Results:** Compared with periodontal health group, chronic periodontitis group has a significant increase in M1/M2 ratio accompanied by enhanced TNF- $\alpha$ , IFN- $\gamma$ , IL-6 and IL-12 expression (p<0.05), while gingivitis group only has enhancements in TNF- $\alpha$ , IL-12 and IL-4 expression (p<0.05), without any difference of M1/M2 ratio. Both M1/M2 ratio, IFN- $\gamma$  and IL-6 expression levels in chronic periodontitis group were significant higher than gingivitis group (p<0.05). Meanwhile, M1/M2 ratios were positively correlated with PD, IFN- $\gamma$  and IL-6 (p<0.01), PD was positively correlated with IL-6 and IFN- $\gamma$  and negatively correlated with IL-4 (p<0.05).

**Conclusion:** Transformation of M1 and M2 has a crucial impact on periodontal inflammation. Predominance of M1-type macrophages and M1-related cytokines associates with the pathogenesis of chronic periodontitis. Regulation of macrophages polarization may be a potential therapeutic target for immunomodulatory therapy of chronic periodontitis.

## Results

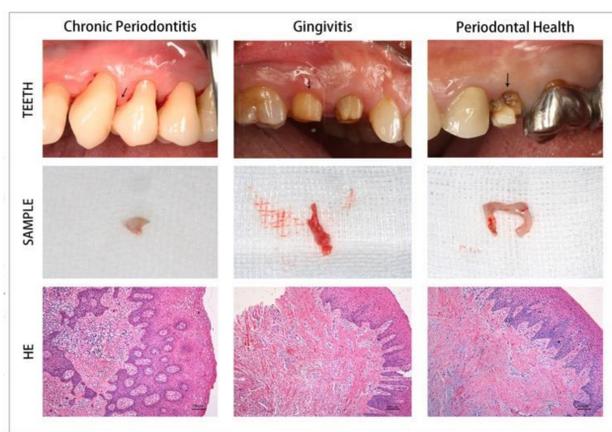


Fig.1 Samples collection and HE staining of gingival tissues

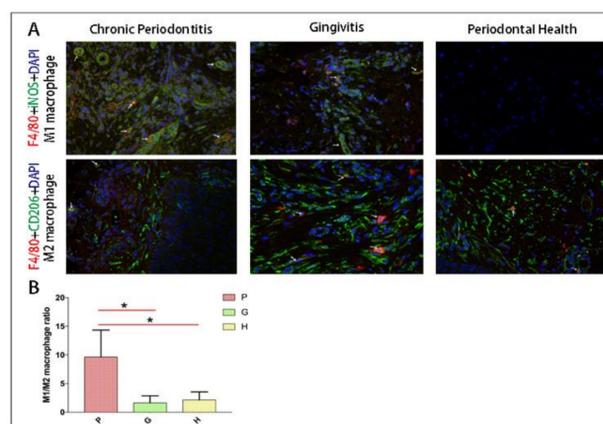


Fig. 2 Expression of M1- and M2-type macrophages in gingival tissues

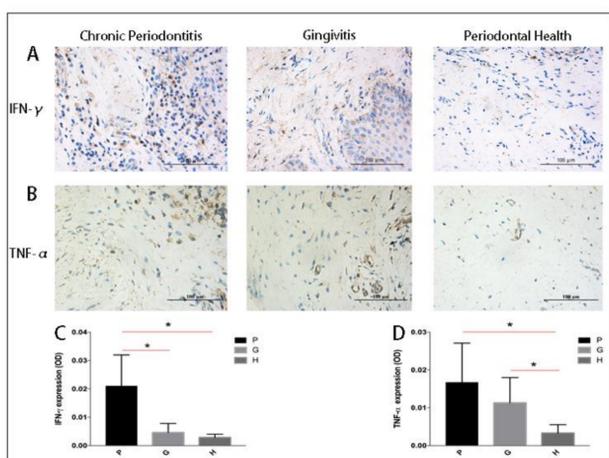


Fig. 3 Expression of cytokines IFN- $\gamma$  and TNF- $\alpha$  in gingival tissues

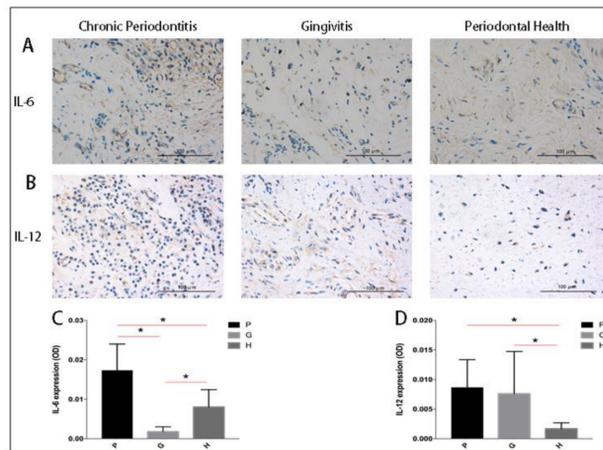


Fig. 4 Expression of cytokines IL-6 and IL-12 in gingival tissues

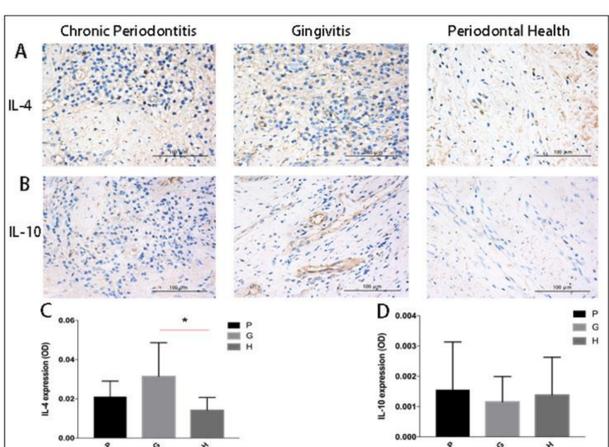


Fig. 5 Expression of cytokines IL-4 and IL-10 in gingival tissues

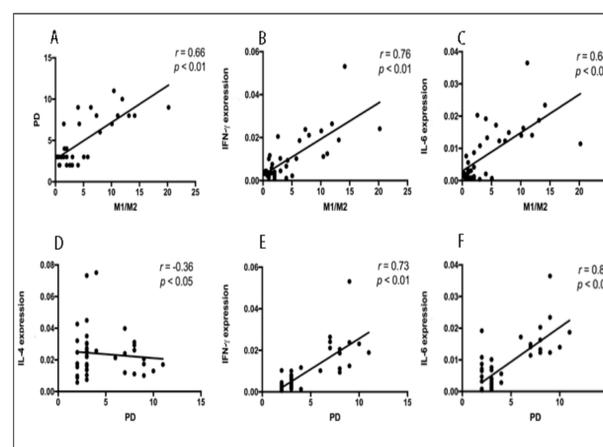


Fig. 6 Correlation between periodontal index and M1/M2 ratios and macrophage-related cytokines