UNIVERSITY of WASHINGTON TACOMA

The Physiological Mechanisms that Drive the Comorbidity of Diabetes Mellitus and Periodontitis

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BACKGROUND

MOTIVATION:
Periodontitis and diabetes mellitus are chronic inflammatory diseases with a multi-systemic nature. The disorders have reached epidemic proportions and are considered a public health issue, affecting individuals of all ages and race (CDC 2021).

- In the US, diabetes is the 7th leading cause of death.
- CDC labels periodontal disease as one of the largest threats to dental health, with one in two adults with mild to severe periodontitis (CDC 2021).

DESCRIPTION:
In the United States, periodontitis and diabetes mellitus are two of the leading inflammatory diseases. The bidirectional association between the diseases have been confirmed; however, the mechanisms linking the two diseases are still unknown. Through a critical review, the physiological mechanisms of diabetes mellitus and periodontal disease was discussed. Summarizing the findings of the articles, the three main mechanisms that drive the comorbidity of diabetes and periodontitis are pro-inflammatory mediators, insulin-signaling, and dysglycemia.

SYNTHESIS:
Inflammation adversely affects the severity of periodontitis and diabetes.

- Elevated levels of pro-inflammatory mediators are present in individuals with periodontitis and diabetes: tumor necrosis factor (TNF), developmental endothelial (Del), and interleukin (IL).
  - Patients are seen reporting with worsened oral health, exhibiting symptoms of periodontal breakdown: receding gum lines, tooth loss, and tooth motility (Mesia et al. 2016).

TNF- a, an inflammatory cytokine, is associated with insulin resistance.

- Patients with diabetes and periodontitis often present with higher individual variability in their glucose profiles (Dicembrini et al. 2021).
- High levels of TNF- a have been associated with increased reports of periodontal-related lesions and serum insulin levels (Ekuni et al. 2010)

Diabetes and periodontitis, as standalone diseases, can disrupt glucose homeostasis, especially when left untreated. When blood glucose levels are not maintained, this can manifest into a series of systemic complications (CDC 2021).

- Poor glycemic control is linked to `poor periodontal and diabetic health.
  - No significant association made until researchers took into consideration of the different diabetic statuses: poor, moderate and severe (D'Aiuto et al. 2018)

CLINICAL FEATURES: GUM DISEASE AND DIABETES MELLITUS

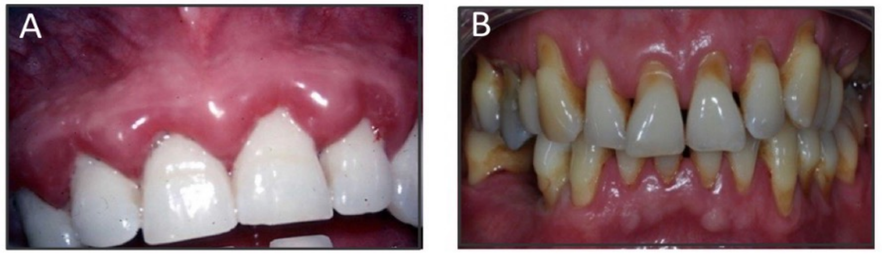

Figure 1. Clinical features of plaque-induced gingivitis associated with diabetes-mellitus (A), alongside clinical features of chronic periodontitis in a diabetic patient (B) (Llambés et al. 2015).

Gingivitis – preventable and reversible
Periodontal disease – preventable and irreversible
Diabetes – type 2 – preventable

Untreated Gingivitis ↑
Patient's susceptibility to developing periodontitis

Oral Health ⇋ Diabetic Health ⇋ Overall Health

PERIODONTAL TREAMTMENT: OUTCOMES

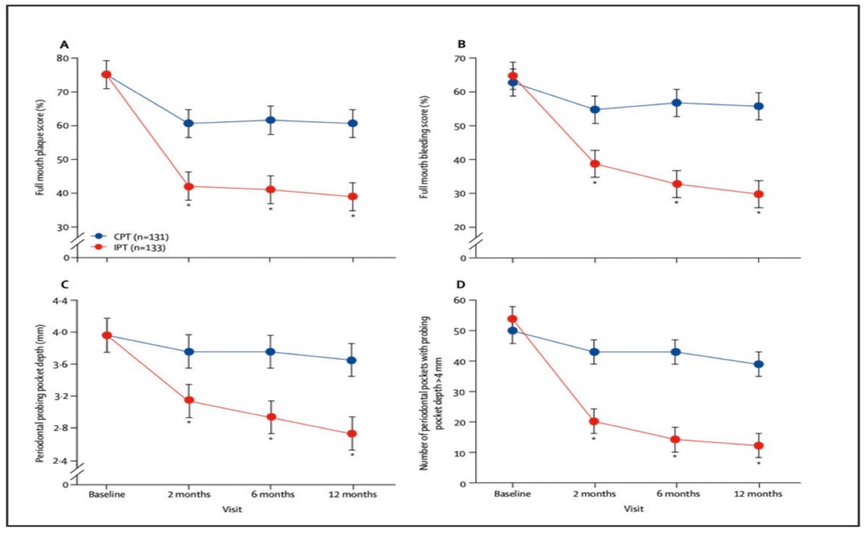

Figure 2. Periodontal measures of baseline and follow-up visits at 2,6, and 12 months. Data has been calculated with a 95% confidence interval (D'Aiuto et al. 2018). CPT = control periodontal treatment. IPT = intense periodontal treatment.

IPT vs CPT

- IPT – whole mouth scaling, periodontal surgery therapy: pocket reduction, gum/bone/tissue graft
- CPT – gingival scaling, root planning, antibiotics

DIABETES AND PERIODONTITIS

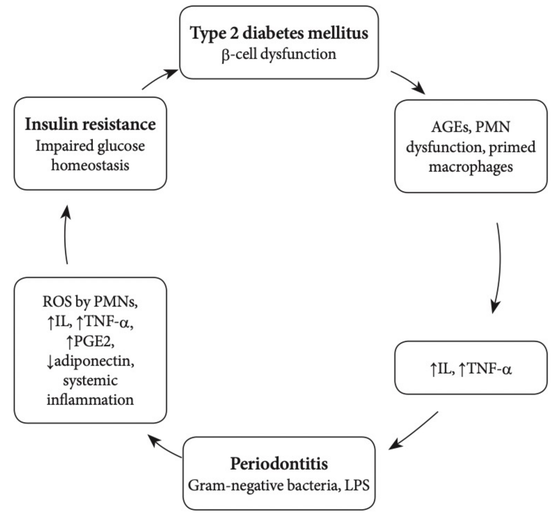

Figure 3. Bidirectional relationship between diabetes mellitus and periodontitis (Gurav 2012).

- ↑ of IL and TNF ⟶ Facilitate and amplify inflammatory response; for example, inflammation of the connective tissue ⟶ loss of connective tissue and alveolar bone loss ⟶ periodontitis
- ↑ TNF and IL, increases a patient's susceptibility to developing diabetes
  - Anti-TNF treatments have been shown to promote increased insulin response and glucose uptake (Grauballe et al. 2015).

FUTURE DIRECTIONS:

- Educational interventions should be implemented in healthcare and community settings.
- Oral findings may offer an advantage for the early detection and intervention of diseases (Gay et al. 2014).
- The findings shed light on the previous unknowns and bring attention to the importance of preventative measures concerning oral and overall health.

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