

## Association between periodontal disease and systemic diseases

Periodontal disease consists of a series of disease stages of infectious/inflammatory aetiology that affect the tooth supporting tissues. It is very prevalent throughout society, with numbers of up to **85%** for **gingivitis** and **35%** for **periodontitis** (*Study by Ibermutuamur Prevention Society-SEPA on oral health of the working population in Spain 2012*).

It has been observed that having periodontitis can lead to an increased risk for the onset and/or progression of certain **systemic conditions**, such as cardiovascular diseases, diabetes, certain respiratory diseases, rheumatoid arthritis, obesity and metabolic syndrome, as well as pregnancy disorders including as pre-term births or low birth weight babies. To explain the relationship between such diverse systemic diseases and oral infection, different possible mechanisms of interaction have been suggested. The main ones include:

- 1) **Bacteraemias**, which involve the passage of oral bacteria directly into the bloodstream, and that can occur after routine procedures such as toothbrushing or therapies like, for example, scaling and root planing (Kinane *et al.* 2005).
- 2) **Systemic inflammation**, which is characterised by the presence of elevated levels of inflammatory markers such as C-reactive protein (CRP). This state of systemic inflammation may be due to a generalized condition such as obesity, or to a local infection, such as periodontitis. Systematic reviews have established an association between periodontitis and CRP levels (*Paraskevas et al.* 2008), which, in turn, have been shown to decrease following periodontal treatment (D'Aiuto *et al* 2005).

Also, recent studies by the University of Birmingham have suggested the existence of a new channel that may contribute to the systemic impact of periodontitis. A research team led by Prof. Ian Chapple has proven that circulating polymorphonuclear neutrophils (PMNs) in patients with periodontitis are found in a hyperactive state, leading to a greater release of free radicals, and in turn, greater oxidative stress, potentially causing progressive damage to the walls of the blood vessels (*Matthews et al. 2007*).

### **Cardiovascular Diseases**

As Dr. Fernández-Avilés recently pointed out in the *El Escorial Summer Course* organised by the Universidad Complutense, cardiovascular diseases (CVD) make up 31% of all deaths and 7% of the health expenditure in Spain (2009). Because classic risk factors did not fully explain the development of cardiovascular diseases, in the late 1990's, a newfound interest arose for infections as players in the physiopathological processes of CVD (*Nieto et al 1998*). Systemic inflammation as a consequence of chronic infectious processes (such as periodontitis) promotes vascular endothelial activation, favouring the formation of atherosclerotic plaques, the main trigger of heart failure.

Statistically significant epidemiological evidence has linked periodontitis to a two-fold risk of CVD occurrence including stroke or heart diseases (*Janket et al. 2003, Bahekar et al. 2007*). Similarly, there is evidence that treating periodontitis could have a beneficial effect on vascular function. The results of a randomised clinical trial (RCT) published in the *New England Journal of Medicine* are particularly interesting, where an association was observed between scaling and root planing and an improvement in endothelial function 6 months following treatment (*Tonetti et al. 2007*).

### **Diabetes Mellitus**

Diabetes Mellitus (DM) is the most common metabolic disorder; approximately **14%** of the population has DM, of which **87%** has its type II form. This disease causes major associated complications: microangiopathy, neuropathy, nephropathy, retinopathy and diabetic foot. Recently, it was suggested that periodontitis be considered as the sixth complication of DM.

The relationship between these two diseases is bidirectional, so that having DM has been associated with greater periodontitis incidence, severity and progression, while periodontitis patients have worse glycaemic control (whether diabetic or not) and a higher risk for complications (in patients with diagnosed DM).

Recent evidence has also determined that patients with advanced periodontitis are at greater risk for developing diabetes (*Borgnakke et al. 2013*). And, treating periodontitis has been proven to have beneficial effects on glycaemic control in diabetics, with a 0.36% average reduction of glycosylated haemoglobin levels (*Engelbrektson & Kocher JCP 2013*).

Given the strong association between both diseases, periodontists have acquired a key role in early diagnosis and dental management of patients affected by DM. It is estimated that **17%** of the Spanish population has DM but has not been diagnosed, and that approximately **34%** are in a pre-diabetic stage, one step prior to disease onset. Regular visits to the periodontist are an excellent opportunity for early detection of this disease.

### **Obesity and Metabolic Syndrome**

As mentioned by Dr. Antonio Zapatero in the most recent Summer Course held by the Universidad Complutense, obesity could be considered the epidemic of the 21<sup>st</sup> century. The last annual report of the Sistema Nacional de Salud [*National Health*

*System]* concludes that **16%** of the Spanish population is obese and that **37%** are overweight. Metabolic syndrome was described by Reaven in 1988, and many different diagnostic profiles have been proposed, all coinciding on obesity and insulin resistance.

In recent years there has been a growing interest in the study of this syndrome, due to significant associated comorbidities (hypertension, type II DM, cardiovascular disease, dyslipidemia, etc...), most of which derive from the ability of adipose tissue to produce cytokines and inflammatory mediators (this tissue acting as much more than a simple storage tissue). Periodontitis, as a chronic infectious/inflammatory disease, may contribute to the systemic inflammatory state of these patients, and its treatment might even reduce associated comorbidities, as is being studied jointly by the Hospital de Fuenlabrada and the School of Dentistry at the Universidad Complutense.

### **Rheumatoid Arthritis**

Rheumatoid Arthritis (RA) is a chronic disease that causes inflammation in multiple joints of the body, and whose pathogenesis is very similar to periodontitis. Both diseases are associated with systemic inflammatory states, while *Porphyromonas gingivalis*, one of the main periodontal pathogens, can generate citrullinated host peptides, with anti-CCP antibodies being the main markers of RA severity and activity.

Epidemiological data show a strong association between both diseases (Pischon *et al.* 2008). However, longitudinal studies have not yet established a causal relationship between the two, or whether periodontal treatment could lead to a beneficial effect in these patients.

## Conclusions

Research in the field of Periodontal Medicine is currently booming, which can be evidenced by the joint Workshop on this subject recently held by the American Association of Periodontology (AAP) and the European Federation of Periodontology (EFP) in La Granja (Segovia). In the future we hope to clearly understand the mechanisms that link periodontitis with systemic diseases. The effect of periodontal treatment on the overall health of our patients also remains to be determined.

## References

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