

# **Periodontal medicine: Past, Present and Future**

**Bruno G. Loos**<sup>1</sup>

<sup>1</sup>Department of Periodontology, Academic Center for Dentistry Amsterdam (ACTA), University of Amsterdam and Vrije Universiteit Amsterdam, The Netherlands.

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**The Past.**

Several Scandinavian research reports from the late 1980's and early 1990's have appeared on the possible connection between dental health and atherosclerotic cardiovascular diseases [1]. In a landmark symposium in 1997 in Chapel Hill, North Carolina, USA, Steven Offenbacher, James Beck and many of their colleagues proposed that there is more than just circumstantial evidence that periodontitis is associated with some systemic diseases and/or conditions, and the term "periodontal medicine" was introduced into the periodontal arena [2]. Today we can look back at more than 100 years recognition that oral infectious and inflammatory conditions can have systemic consequences [1].

**The present.**

Currently, the number of medical conditions being researched in relation to periodontal diseases and/or poor oral health continues to grow. A search through trial registries with clinical research *in progress* reported a total of 57 different systemic conditions now being investigated to be linked with periodontitis [3]. This suggests that many medical conditions, including periodontitis, are part of certain inflammatory biotypes [4]. The traditional thought was that periodontitis could be part of the causal chain of another disease; for example the biological events and pathways that periodontitis is part of the causal chain of cardiovascular diseases has been made plausible [5]. However, perhaps periodontitis is linked to a multitude of systemic diseases because these (including periodontitis) diseases have common inflammatory mechanisms and aberrant host immune responses that manifest in multiple organs, including in the oral cavity and in the cardiovascular system. This concept describes pleiotropic effects of host immune responses with different manifestations depending on the complex interactions between genes, environment, lifestyle and epigenetic changes [4, 6]. To further elaborate, the relationships between periodontitis and cardiovascular diseases appear to be increasingly evident [7]. The associations have been studied in many countries over the last two decades and continue to be present. Various forms of cardiovascular disease phenotypes are linked with periodontal disease; these include major cardiovascular disease events (myocardial infarction, cerebrovascular accidents and sudden death) and chronic cardiovascular disease conditions (such as high blood pressure, angina pectoris, claudicatio intermittens, vasculogenic erectile dysfunction). However, reports have found similar genetic risk variants between periodontitis and cardiovascular diseases; the impairment of the

regulatory pathways by genetic factors may be a common pathogenic denominator of at least coronary artery disease and periodontitis [6]. Thus, the shared genes could suggest that both conditions are sequelae of similar (the same?) aberrant inflammatory pathways. Nevertheless, and highly intriguing, the treatment of periodontitis gives positive effects on the cardiovascular system: periodontal therapy not only results in improvement of the periodontal status, but also results in significant improvements of important and relevant clinical and molecular biomarkers of the cardiovascular system. These include – after successful periodontal treatment – lower levels of C-reactive protein, reduced blood pressure, reduced intima media thickness of carotid arteries, the increased flow mediated dilatation of the brachial arteries, and even decreased symptoms of the vasculogenic type of erectile dysfunction. Especially for patients who already have cardiovascular diseases and in addition periodontitis, for them periodontal treatment is an added value for their general condition [8].

The two-way relationship between periodontitis, on the one hand, and diabetes, on the other hand, is extensively researched and has strong epidemiological and biological strengths. Diabetes mellitus, particular type 2, can have several oral co-morbidities including periodontitis, but also candida infections, dry mouth and mouth burning sensations, caries and even oral cancer [9]. Diabetes type 2 is often not diagnosed by physicians until patients have systemic complaints or symptoms like reduction of vision. Periodontitis may be one the first symptoms of diabetes and as such it has been hypothesized that the periodontal office could be a place for screening on diabetes. In a recent study it was found that among referred patients with severe periodontitis, one in four were suspected to have (pre)diabetes, based on a validated HbA1c measurement in a drop of blood through finger stick analysis [10]. Importantly, it is now well established that the treatment of periodontitis improves the metabolic state in the diabetic patient; a recent landmark randomized trial it has once more been demonstrated that blood levels of HbA1c are reduced in patients with diabetes when periodontitis is treated [11].

### **The future.**

We see that the medical profession is more and more aware of the importance of oral health: subjects with diabetes in the medical offices will be screened for periodontitis, by the use of a simple questionnaire in an App, without an oral examination which is for physicians and nurse

practioners too cumbersome in daily general practice [12]. Those with the risk of periodontitis are encouraged by their physicians to seek regular dental care, dental prophylaxis or periodontitis treatment. Next to additional improvements of the metabolic state, new data showed improved quality of life among diabetes patients when special attention was paid to oral health by the physicians or nurse practioners.

The future will bring increasingly close collaborations between dentists and physicians. The dental offices – where we already work in a preventative manner and of which the population is used to visit at least once a year – can expand to become “health check offices” where each individual will come for his/her yearly oral and body health check. Dentists and dental nurses take a simple blood pressure and they will screen for common chronic diseases with simple questionnaires, finger stick blood droplets and/or oral rinses for salivary diagnostics and point of care read out machines, as well as with the aid of computer applications and calculators, that are constantly being fed through artificial intelligence algorithms. All of this will help for a better quality of life and a longer healthier life for the population.

## References.

1. Beck, J.D., et al., *Periodontal Medicine: 100 Years of Progress*. J Dent Res, 2019. **98**(10): p. 1053-1062.
2. Stamm, J.W., *Periodontal diseases and human health: new directions in periodontal medicine*. Ann Periodontol, 1998. **3**(1): p. 1-2.
3. Monsarrat, P., et al., *Clinical research activity in periodontal medicine: a systematic mapping of trial registers*. J Clin Periodontol, 2016. **43**(5): p. 390-400.
4. Loos, B.G., *Periodontal medicine: work in progress!* J Clin Periodontol, 2016. **43**(6): p. 470-1.
5. Schenkein, H.A. and B.G. Loos, *Inflammatory mechanisms linking periodontal diseases to cardiovascular diseases*. J Clin Periodontol, 2013. **40 Suppl 14**: p. S51-69.
6. Loos, B.G. and T.E. Van Dyck, *The role of inflammation and genetics in periodontal disease*. Periodontology2000, 2020. <https://www.researchgate.net/publication/336741529>.
7. Sanz, M., et al., *Periodontitis and cardiovascular diseases: Consensus report*. J Clin Periodontol, 2020. **47**(3): p. 268-288.
8. Teeuw, W.J., et al., *Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis*. J Clin Periodontol, 2014. **41**(1): p. 70-9.

9. Verhulst, M.J.L., et al., *Evaluating all potential oral complications of diabetes mellitus*. Front Endocrinol (Lausanne), 2019. **10**: p. 56.
10. Teeuw, W.J., et al., *Periodontitis as a possible early sign of diabetes mellitus*. BMJ Open Diabetes Res Care, 2017. **5**(1): p. e000326.
11. D'Aiuto, F., et al., *Systemic effects of periodontitis treatment in patients with type 2 diabetes: a 12 month, single-centre, investigator-masked, randomised trial*. Lancet Diabetes Endocrinol, 2018. **6**(12): p. 954-965.
12. Verhulst, M.J.L., et al., *A rapid, non-invasive tool for periodontitis screening in a medical care setting*. BMC Oral Health, 2019. **19**(1): p. 87.