Plaque, sugar, obesity, diabetes and smoking

Reassessing risk factors for periodontal disease

By Prof. Crawford Bain, United Arab Emirates

Traditionally, dentists have been taught that both dental caries and periodontal disease develop and progress as a direct result of patients’ over-frequent consumption of refined sugars and patients’ failure to remove bacterial plaque effectively. Miller’s acidogenic theory of caries development and the non-specific plaque hypothesis based on Lee’s work in the 1960s allow dentists to present a simple cause-and-effect explanation to patients.

Since then, the dental profession has blamed patients’ poor oral hygiene for periodontal breakdown and dental caries while often failing to diagnose and treat other contributing causative factors. Unfortunately, while plaque is generally a necessary ingredient of common dental diseases, the explanation contained in these theories of its pivotal role is simplistic given current knowledge. This brief article will attempt to put the more significant risk factors in context.

Plaque

Gingivitis is a natural bodily response to bacterial accumulation and as such is non-specific. Effective plaque removal will generally reverse gingivitis. The concept of inevitable progression from gingivitis to destructive periodontitis if oral hygiene is not good is, however, flawed. Figure 1 shows a 46-year-old patient with non-existent oral hygiene over several years. Figure 2 shows the same patient one month later after around 90 minutes of scaling and polishing by a student dental hygienist. He had no active caries and no more than ten per cent bone loss.

It has become increasingly evident that while some patients are “susceptible” to periodontal breakdown, others are more “resistant”. Common among these host-based factors leading to greater breakdown are the presence of diabetes and a smoking habit.

Diabetes

Several authors have demonstrated a clear relationship between degree of hyperglycaemia and severity of periodontitis, and the risk of cardio-renal mortality (specifically type 2 diabetes and diabetic nephropathy) combined is 600 per cent more likely to lose 60 per cent bone.

In the UK Prospective Diabetes Study, it was shown that Type 2 diabetes who reduce their HbA1c level by 1 per cent are 19 per cent less likely to suffer caries, 16 per cent less likely to suffer heart failure and 43 per cent less likely to suffer amputation or death due to peripheral vascular disease.

Clearly, not only will control of diabetes facilitate management of periodontitis, but also, probably more importantly, effective management of periodontitis is likely to have major beneficial effects on the serious sequel of diabetes. Unfortunately, the medical profession is largely ignorant of the potential benefits of establishing and maintaining periodontal health.

The publication Type 1 Diabetes in Adults. National Clinical Guideline for Diagnosis and Management in Primary and Secondary Care (updated in July 2014) was compiled by a consensus reference group made up of 50 members with 20 pack years (20 cigarettes per day for 20 years) is up to 600 per cent more likely to lose teeth owing to periodontal disease, whereas a patient with poor plaque control has around a 5 per cent risk of progressing to destructive periodontitis. Why then do we refer to hygiene phase therapy when smoking is a much greater risk factor than poor oral hygiene? How many dentists spend as much time on smoking cessation counselling as on oral hygiene instruction?

Sugar

Traditionally, teaching on caries prevention has focused on the number of sugar exposures per day, especially between meals. Academic paedodontists suggest that provided there are two daily exposures to fluoride in toothpaste, a maximum of six sugar exposures a day is unlikely to lead to significant enamel decalcification in children.

However, a large study conducted in 2005 by Bernabé et al. evaluated 1,702 adults over 11 years and concluded that “the amount of, but not the frequency of, sugars intake was significantly associated with DMFT [decayed, missing and filled teeth] throughout the follow-up period.”

It thus appears that, at least in adults, “how much” is more important than “how often” with regard to sugar consumption. This is all the more significant since DMFT measures real outcomes over significant time spans, while many studies on both caries and gingivitis are very short term and use surrogate outcomes, such as de-calcification on an enamel sample, or plaque and gingivitis indices as the basis of their conclusions. Patients are only really interested in real outcomes.

Obesity

The third National Health and Nutrition Examination Survey showed that body mass index was significantly associated with periodontal disease. Other studies have indicated a less strong association, and with the compounding variable of blood sugar levels in prediabetes, it is presently unclear whether obesity is in fact an independent risk factor or is associated with the established role of diabetes. Regardless, obesity is a known risk factor for Type 2 diabetes and cardiovascular problems, and is of part of the dentist professional’s role to inform patients of these interrelationships.

Recent research in England has suggested that 1.4 million obese patients would benefit from gastric band or bypass (bariatric) surgery. Currently, around 8,000 people a year receive the treatment on the National Health Service (NHS). If all 1.4 million were offered surgery, the researchers estimate it would aver 5,000,000 heart attacks and 40,000 cases of Type 2 diabetes over four years.

They don’t, however, discuss potential costs of this surgery, which can vary from £5,000 to £35,000 according to NHS England. Assuming £3,000 per procedure, this would total £4.45 billion in health costs. Nor is there much discussion on death rates (0.5 to 1 per cent with the present skill level of surgeons). Even if surgical skills do not diminish, we should anticipate between 7,000 and 14,000 additional deaths. It is likely that comprehensive periodontal treatment of all obese/prediabetic patients would be significantly less costly and, hopelessly, result in few if any fatalities.

Conclusion

It is clear that the simple story of plaque control preventing progression of common dental diseases is largely fiction rather than evidence-based fact. While effective oral hygiene will always be a significant part of the management of dental diseases, the modern dental professional must be equally aware of the other common risk factors outlined in this article.

Editorial note: A complete list of references is available from the publisher.

Crawford Bain, a UK-certified specialist in periodontics, endodontics and restorative dentistry, is currently Professor of Periodontology and Director of Post-Graduate Periodontics at the Hamdan bin Mohammed College of Dental Medicine in Dubai in the United Arab Emirates. He can be contacted at Crawford.Bain@hbcs.dubai.ae.