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 aetiological theory of caries development and the non-specific plaque hypothesis based on Loe’s work in the 1960s allow us to diagnose and treat other conditions. Un fortunately, the concept of plaque leading to periodontal breakdown is largely fiction rather than evidence-based. Miller’s concept of the pivotal role of plaque in causing periodontal disease is largely ignorant of the potential contributory factors. Unfortunately, the modern dental profession is largely ignorant of the potential contributory factors involved in these interrelationships.

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 90 minutes of scaling and polishing by a student dental hygienist. He had no active caries and no more than 10 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 (ischaemic heart disease and diabetic nephropathy combined) is three times higher in diabetics with severe periodontitis than in diabetics without severe periodontitis.1 Javed et al. showed that scaling and root planing in prediabetes reduced glycaated haemoglobin (Hba1c) by 1 per cent at three months, and reductions in Hba1c of 0.3 to 1 per cent have been confirmed in several other studies in both Type 1 and Type 2 diabetics. There are estimated to be 245,940 diabetics in the United Arab Emirates. In 304,000 of these cases, the condition has not been diagnosed, and 934,300 people have impaired glucose tolerance, a prediabetic state of hyperglycaemia, or elevated levels of blood sugar.2

In the UK Prospective Diabetes Study, it was shown that Type 2 diabetics who reduce their Hba1c level by 1 per cent are 19 per cent less likely to suffer cardiovascular disease in comparison to controls.16 Smoking and alcohol consumption also contribute significantly to the development of periodontal disease.3

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Sugar
Traditionally, teaching on caries prevention has focused on the number of sugar exposures per day, especially between meals. Academic paedodontists suggest that providing children with four sugar exposures a day is unlikely to lead to significant enamel decalcification.4 However, a large study conducted in 2005 by Bernabé et al. in children aged 12 to 17 years showed 20 per cent of them had evidence of active caries and no more than 14,000 additional cases. It is likely that comprehensive periodontal treatment of all obese/prediabetic patients would significantly less costly and, hopefully, 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 profession 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.

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Left: Patient at presentation (he requested extraction of all mandibular teeth).—Right: The same patient one month after scaling and polishing (he asked how he could maintain the teeth in this condition).

group made up of 30 members. These included physicians, endocrinologists, nurses, oral pathologists, dieticians, periodontists and lay people, but no dentists. Its 255 pages make no mention of dentistry or periodontal disease. The National Institute for Health and Care Excellence document on Type 2 diabetes, also updated in 2014, 100 fails to mention dentistry or periodontal disease.

Smoking
We have known for over 20 years that smoking increases the risk of periodontal breakdown. Odds ratios for developing periodontal disease as a result of smoking constitute a range: 2.5 to 5.77 for current smokers and 1.68 for former smokers,4 and 3.25 for light smokers to 7.28 for heavy smokers.5 A smoker 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 15 per cent risk of progressing to destructive periodontitis. Why then do we refer to hygiene phase therapy when smokers are a much greater risk factor than poor oral hygiene? How many dentists spend as much time on smoking cessation consulting as on oral hygiene instruction?

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 pre-diabetics, it is presently unclear if poor 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 it is part of the dental profession’s role to inform patients of these interrelationships.

Recent research in England has suggested that 0.4 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 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 £30,000 to £60,000 in England according to NHS England. Assuming £30,000 per procedure, this would total around an additional £7 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 assume a mortality rate between 0.5 to 1.0 per cent and 14,000 additional deaths. It is likely that comprehensive periodontal treatment of all obese/prediabetic patients would be significantly less costly and, hopefully, result in few if any fatalities.