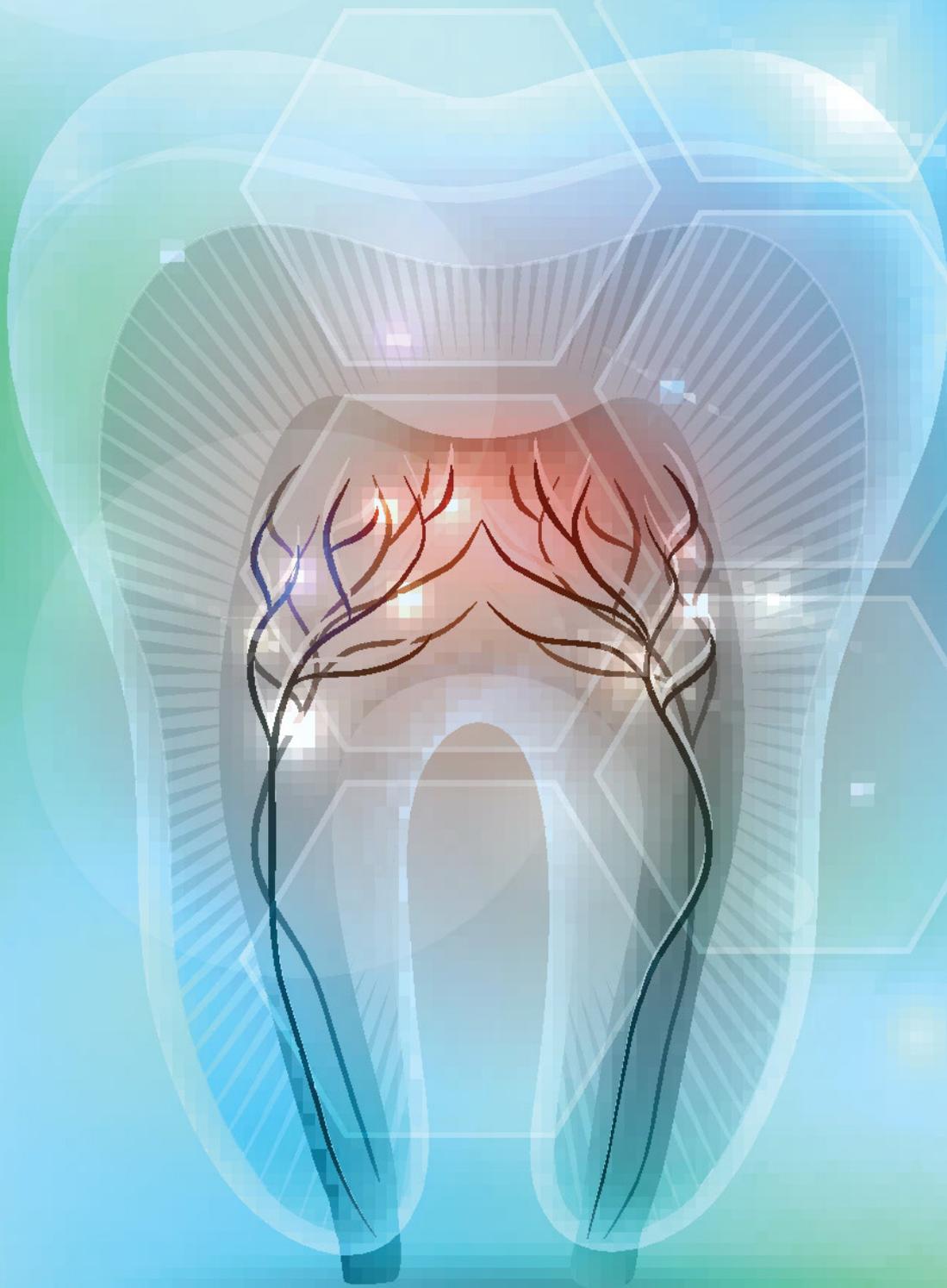


Diabetics have a three to four times greater risk of developing periodontal disease than non-diabetics



DIABETES MELLITUS AND DENTAL HEALTH: A REVIEW

Periodontal disease is the sixth complication of diabetes mellitus, but has received little recognition to date from the medical profession and is omitted from the NICE annual check list in the UK. Doctors and dentists need to work more closely for these patients and recognise the importance of cross-referrals especially for those diabetics not in receipt of regular dental care.

Christopher Turner

Retired Specialist in Restorative Dentistry, Berries, Horsecombe Grove, Bath

info@space-mark-d.com

Diabetes is an important health problem with well-documented serious complications including:

- Retinopathy
- Cardiopathy,
- Nephropathy
- Neuropathy
- Micro and macro arterial disease.

The sixth, dental complications, first described by Wilson in 1928,¹ have received much less recognition.² These complications are periodontopathy and xerostomia.

Other dental symptoms, caused by neurological changes, include burning mouth and tongue and altered taste sensations.

It is not just the diagnosis of hyperglycaemia that is important, but its severity that affects the periodontium most.^{3,4} Diabetics have a three to four times greater risk of developing periodontal disease than non-diabetics;⁵ for diabetic smokers the risk significantly greater.⁶

What is periodontal disease?

Periodontal disease is defined as the loss of bony support to the teeth, increased pocket depth and inflammation of the surrounding tissues caused by the body's reaction to plaque,⁷ while xerostomia is reduced salivary output and the associated risk of dental caries because of reduced salivary buffering capacity.⁴ High blood glucose levels are also associated with an increased incidence of oral thrush.

Periodontal disease is not a classic infectious disease because it does not meet Koch's postulates. It is a reaction to toxins produced by bacteria in dental plaque and an abnormal immune response with reduced levels of tissue healing, the severity and progression of which depend on the host response to the biofilm, although the causative organisms are still under debate.⁸

Recent research from many countries has shown a close inter-relation between diabetes and periodontitis, with one affecting the other and vice versa.^{9,10} Diabetes and periodontal disease are also thought to be biologically linked.^{11,12}

This interrelationship between diabetes and periodontal disease provides an example of systemic diseases

predisposing to oral 'infection', and once that 'infection' is established there is an exacerbation of systemic disease.¹⁴

Other examples of an interrelationship include:

- Diabetics and non-diabetics have a similar oral flora.¹³
- They have an increased susceptibility to infection and delayed wound healing.¹⁵
- There is a common pathogenesis between diabetes and periodontal disease involving an enhanced inflammatory response at both local and systemic level. This is caused by the chronic effects of hyperglycaemia and formation of advanced glycation end-products and lipids that promote the inflammatory response.^{15,16}
- Diabetics have significantly higher levels of local inflammatory mediators, especially cytokines and tissue necrosis factor when compared with systemically healthy people with periodontal disease.^{15,18} Interleukin 8 is also raised and gives a potential contribution to cross-susceptibility.¹⁹
- Diabetes enhances periodontal bone loss through enhanced resorption and diminished bone formation.²⁰
- The severity of periodontal disease in diabetics may not correspond to levels of bacterial plaque observed clinically. More aggressive treatments may be required.²¹
- C-reactive protein levels are raised in both diabetes and periodontal disease.¹⁴
- Antibiotics prescribed for periodontal disease may reduce insulin requirements.²¹ However, there is no consistent evidence that the addition of antimicrobials to scaling and root planning as part of a programme of dental care is of benefit.²²
- Periodontitis progression is associated with an increase in HbA1c levels in type 2 diabetes.²³
- Periodontitis may play a role in increasing the incidence of new cases of type 2 diabetes and possibly gestational diabetes.²⁴
- There is a significant association of periodontal disease with gestational diabetes mellitus and pre-eclampsia.²⁵

Various mechanisms for this altered immune response in the periodontal tissues of diabetics have been suggested, but none are proven. However, polysaccharides in Gram negative bacteria in dental plaque stimulate the production of cytokines and oxidative stress is critical in the development of diabetic complications.⁸

Does periodontal disease increase the risk of type 2 diabetes?

As periodontal disease and diabetes mellitus affect each other, there is some evidence to suggest that individuals with periodontal disease may be at higher risk of developing type 2 diabetes¹⁶ and pre-eclampsia.²⁵

Periodontal infection has an adverse, yet modifiable effect on glycaemic control.²⁶ When periodontal disease is brought under control and pathogens removed, the HbA1C level falls,¹⁶ there is improved glycaemic control²³ and there can be a reduced requirement for insulin dosage. The overall management of diabetes may improve²⁷ because periodontal therapy improves metabolic control.²³

Both periodontitis and dental caries are the most common diseases known to man and are both preventable. To achieve this requires thorough daily personal plaque control, to reduce the numbers of bacteria and biofilm both supra- and sub-gingivally using toothbrushes and interspace brushes first, then possibly mouthwashes.

Patients with periodontal disease may require frequent interactions with dental professionals for subgingival ultrasonic scaling to remove calculus and biofilm, in depth oral health teaching about tooth brushing and interdental brushing techniques, and consistent educational reinforcement.

It is not unusual for these patients to require appointments at three monthly intervals, at least in the first instance. Regular reassessment at intervals determined by the severity of the periodontal disease and/or patient response are clinically indicated. Some patients may require gingival reconstructive surgery or, in extreme cases, extraction of severely periodontally involved teeth.

This means that all diabetic patients should be advised that they are at increased risk of developing periodontal disease and need regular dental care because of the positive bidirectional association between periodontal disease and diabetes mellitus.

Should we screen patients with periodontal disease?

This underlines the need for screening of patients with periodontal disease for diabetes mellitus and vice versa.²⁸ However, in the UK this is not happening because questions about dental health do not appear on the annual NICE check list for GPs and very few doctors, through no fault of their own in crowded teaching programmes, have been taught about this important inter-relation.

For example only 5.7% of doctors in Hong Kong²⁹ are aware of this inter-relation, although a recent study in Thailand found 97.5% of doctors did know, of whom 70% would refer diabetic patients to see a dentist.³⁰

The evidence is overwhelming that the alveolar bone loss associated with periodontal disease is the result of a complex inflammatory response to plaque antigens.

It follows that, if individual patients can be educated and persuaded to fully control their plaque on a daily basis, then the inflammatory reaction will subside. This requires dental appointments.

Dental professionals can also teach about the intake of sugar and how acids can be produced by oral bacteria within two to three minutes and last for about twenty minutes – the Stephan pH curve. It follows that repeated intakes of sugar are contra-indicated. Diabetics with some xerostomia may benefit from using chewing gums. They should be advised to use xylitol gums as this is not metabolised to decalcifying acids in the mouth.

Diabetics have to learn to manage their blood sugar levels following suitable education and guidance. Therefore, the vast majority should be capable of managing and controlling their plaque.

However, although doctors are not checking that diabetic patients are receiving dental care nor referring them to the dental practice, dentists are advised to refer patients to their doctors for diabetic screening if they have uncontrolled periodontal disease, xerostomia or unusual oral symptoms such as burning mouths.

The GP's target is to keep the HbA1c level at or below 6.5. If they have patients with higher levels they should associate the symptom with uncontrolled periodontal disease and seek a dental opinion, given the two-way relationship of the diseases.

Inter-professional collaboration between doctors and dentists

In addition, there is an absence of inter-professional collaboration between doctors and dentists while managing patients with diabetes mellitus.²⁸

There is an unmet need for in-depth guidance from Public and Professional Bodies to advise diabetics to seek regular dental care because the worldwide evidence is unequivocal: diabetes and periodontal disease are interrelated.

GPs could ask the following simple questions when they review their diabetic patients:

- Do you have regular dental care?
- Do you have gum disease and is it under control?
- Who is your dentist?
- Do your gums bleed when you brush your teeth?
- Are your gums receding and your teeth getting loose?

Gingivitis can develop after just seven days of missing plaque removal in an area of the mouth.³¹ Bleeding gums are never normal and recession and loosening are pathognomonic for periodontal disease. These patients should be advised to seek dental care.

At first sight question three seems unnecessary. In their medical record questionnaires dentists always ask patients who is their GP. Yet, the reverse does not happen routinely. However, in the light of the evidence, there is a greater need for co-operation and cross-referral and the sharing of test and examination results between the two professions than has generally been the case to date.³²

UK Dentists are required to examine patients and record Basic Periodontal Examination (BPE) scores

based on the World Health Organisation's Community Periodontal Index of Treatment Needs (CPITN) using a specially designed dental pocket measuring probe.

These are six numbers, three in each quadrant comprising molars and premolars on each side and incisors and canines as the central number. These numbers range from 0 to 4*. The maximum score in each sextant is recorded.³³

- 0 No periodontal problems.
- 1 Bleeding on probing (a sign of gingivitis and poor plaque control).
- 2 Calculus (indicating the need for scaling and root planning).
- 3 Pockets of 3.5 to 5.5mm (that is early periodontal breakdown).
- 4 Pockets of 5.5 to 8.5mm (that is moderately severe periodontal breakdown).
- 4* Pockets greater than 8.5mm (that is severe periodontal breakdown with an increased risk that teeth will require extraction).

By relating HbA1c levels to BPE scores doctors and dentists should be able to establish better treatment protocols for their diabetic patients.

Conclusion

In summary there is a need for:

- Doctors to be aware of the two-way relationship between diabetes and periodontal disease.
- Doctors and dentists to work together and share test results.
- An education campaign to encourage diabetics to attend for dental care.
- Publicity at national and local level about the two-way relationship between diabetes and dental disease.

Conflict of interest: none declared

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