

Is gum disease killing your patient?

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Professor Seymour will be speaking on this subject on Saturday 6 June at the 2009 British Dental Conference and Exhibition, held at the Scottish Exhibition and Conference Centre in Glasgow.

BDA CONFERENCE

There is considerable epidemiological evidence to support the concept that poor oral health, especially the extent and severity of periodontal disease, may put patients at a significant risk for a variety of systemic conditions. This association raises the question that if patients or members of the dental profession ignore oral health, is there an increased risk of morbidity and mortality? In this presentation, the relationship between periodontal disease and many systemic conditions will be explored further. In addition, if periodontal disease does increase the risk of various systemic diseases, it raises the issue as to what the impact of treating periodontal disease is in reducing the magnitude of the risk. There is increasing evidence that reducing the inflammatory component in the periodontal tissues does have potential systemic effects. This has been shown to improve hyperglycaemic control in diabetics, reduce the prevalence of adverse pregnancy outcomes and improve surrogate markers that may be of benefit in patients suffering from coronary heart disease.

INTRODUCTION

Over the past 15 years, there has been an increasing number of papers showing an association between oral health, especially the extent and severity of periodontal disease, and a variety of systemic conditions. A list of the systemic diseases associated with poor oral health is shown in Table 1. The nature of the association is variable, but two recent systematic reviews have suggested that periodontal disease is a risk for coronary heart disease and an adverse pregnancy outcome.^{1,2}

If periodontal disease is a significant risk factor for a variety of systemic conditions, it does raise the important question of whether failure to address poor oral health increases the risk of patients succumbing to the various conditions outlined in Table 1 and their sequelae. The converse argument can also apply – that is, what impact does improving oral health have on general health? In this paper, both aspects of this paradigm will be considered.

Two retrospective studies have investigated the impact of poor oral health on the

development of further coronary events.^{3,4}

In the first of these studies 214 patients with a history of a myocardial infarction underwent a dental examination to ascertain their oral health status. No dental interventions were carried out and the patients were followed up for a period of seven years. About 25% of these patients experienced further coronary events with 32 of them proving fatal. Poor oral health left untreated was identified as a significant risk factor for future coronary events ($p = 0.007$). The second study investigated the relationship between bone loss and death from coronary heart disease (CHD). From this cohort of patients, 162 died of coronary events and the findings showed that smoking and bone loss at baseline were significant risk factors for mortality from CHD ($RR = 2.7$).

These two studies do illustrate that ignoring poor oral health can increase the risk of further coronary events, especially in those patients with a history of CHD. When this information is considered together with the conclusion from the meta-analysis, which showed that the incidence and prevalence of CHD were significantly increased in patients with periodontal disease, and other interventions to improve oral health, then periodontal

Table 1 Systemic conditions that have been reported to be associated with poor oral health

- Coronary heart disease
- Adverse pregnancy outcomes
- Hyperglycaemia control in diabetics
- Stroke
- Hyperlipidaemia
- Rheumatoid arthritis
- Left ventricular hypertrophy
- Obesity
- Pulmonary infection
- Malignant disease
- Death risk in the elderly
- Physical fitness

intervention does become an important priority in the CHD patients.

The second aspect to consider is what impact does periodontal therapy or other dental interventions have on general health? From this perspective, three areas have been studied, notably diabetes, adverse pregnancy outcomes and various aspects of coronary heart disease. The latter have included the impact of periodontal treatment on surrogate markers of CHD.

DIABETES CONTROL

Two meta-analyses have considered the efficacy of periodontal interventions on glycaemic control in diabetic patients.^{5,6} Both analyses showed that periodontal

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treatment does result in significant reduction in HbA(1c) levels, with those patients suffering from type II diabetes benefiting more than the type I patients.

ADVERSE PREGNANCY OUTCOMES

Five intervention studies have investigated the effectiveness of periodontal treatment in reducing the risk of adverse pregnancy outcomes.^{7–11} Four of these showed a significant benefit of periodontal treatment with up to a 50% reduction in the incidence of an adverse pregnancy outcome, with one study showing no benefit.^{7–10} The difference in findings may be related to the ethnicity of the population studied or the timing of the periodontal intervention.

CORONARY HEART DISEASE

A variety of so-called 'surrogate measures' have been used to evaluate whether periodontal treatment reduces the risk of CHD. Most have focused on C-reactive protein (CRP), which is a biomarker of systemic inflammation. Raised levels of CRP (>2.1 mg/l) are considered a risk for CHD. Periodontal treatment does reduce CRP levels by approximately 0.5 mg/l.¹² Similarly, removing periodontically compromised teeth also significantly reduces CRP levels.^{13,14} Although such reductions are encouraging, it has not been established whether such reductions in CRP levels are cardioprotective.

More recently the outcomes of the periodontitis and vascular events study (PAVE) have been published.¹⁵ CRP was used as the surrogate marker in this investigation and the six-month evaluation showed no reduction in CRP levels. Further analyses of the data showed that obesity nullified the periodontal treatment effects on CRP levels.

CHOLESTEROL

Raised levels of low density lipoprotein (LDL) cholesterol are recognised risk factors for atheroma formation. Periodontitis has been shown to be associated with

raised levels of cholesterol.^{16,17} One study has demonstrated that intensive periodontal treatment does significantly reduce cholesterol levels.¹⁸ Long-term benefits of the effects of periodontal treatment on cholesterol levels need to be determined.

VASCULAR MARKERS AND ENDOTHELIAL FUNCTION

Inflammation is the common factor linking periodontal disease with CHD. Vascular changes are essential to this shared association and several markers of vascular and endothelial functions have been evaluated in response to periodontitis and its treatment.

It has been shown recently that periodontal intervention improves vascular function as assessed by brachial artery flow mediated dilatation.¹⁹ This improvement is sustained for up to 180 days post-treatment. The improvement in brachial artery flow mediated dilatation was matched by changes in other markers of inflammation and vascular functions. Again, it needs to be established whether such benefits to the vascular system reduces the risk of coronary events.

CONCLUSION

There is increasing evidence that poor oral health, especially the extent and severity of periodontal disease, does increase the risk of a variety of systemic conditions. Studies are now focusing on establishing causality.

There is increasing evidence that treating periodontal disease does have a systematic effect and the long-term benefits of such treatment in preventing CHD remain to be determined.

Certainly patients who present with CHD should be advised of the association, but more importantly of the potential benefits that may arise if there is an improvement in their oral health.

1. Bahekar A A, Singh S, Saha S, Molnar J, Arora R. The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. *Am Heart J* 2007; **154**: 830–837.

2. Xiong X, Buekens P, Fraser W D, Beck J, Offenbacher S. Periodontal disease and adverse pregnancy outcomes: a systematic review. *BJOG* 2006; **113**: 135–143.
3. Mattila K J, Valtonen V V, Nieminen M, Huttunen J K. Dental infection and the risk of new coronary events: prospective study of patients with documented coronary artery disease. *Clin Infect Dis* 1995; **20**: 588–592.
4. Jansson L, Lavstedt S, Frithiof L, Theobald H. Relationship between oral health and mortality in cardiovascular diseases. *J Clin Periodontol* 2001; **28**: 762–768.
5. Janket S J, Wightman A, Baird A E, Van Dyke T E, Jones J A. Does periodontal treatment improve glycaemic control in diabetic patients? A meta-analysis of intervention studies. *J Dent Res* 2005; **84**: 1154–1159.
6. Darré L, Vergnes J N, Gourdy P, Sixou M. Efficacy of periodontal treatment on glycaemic control in diabetic patients: A meta-analysis of interventional studies. *Diabetes Metab* 2008; **34**: 497–506.
7. López N J, Smith P C, Gutierrez J. Periodontal therapy may reduce the risk of preterm low birth weight in women with periodontal disease: a randomized controlled trial. *J Periodontol* 2002; **73**: 911–924.
8. Jeffcoat M K, Hauth J C, Geurs N C *et al*. Periodontal disease and preterm birth: results of a pilot intervention study. *J Periodontol* 2003; **74**: 1214–1218.
9. López N J, Da Silva I, Ipinza J, Gutiérrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. *J Periodontol* 2005; **76**: 2144–2153.
10. Tarannum F, Faizuddin M. Effect of periodontal therapy on pregnancy outcome in women affected by periodontitis. *J Periodontol* 2007; **78**: 2095–2103.
11. Michalowicz B S, Hodges J S, DiAngelis A J *et al*. OPT Study. Treatment of periodontal disease and the risk of preterm birth. *N Engl J Med* 2006; **355**: 1885–1894.
12. Paraskevas S, Huizinga J D, Loos B G. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. *J Clin Periodontol* 2008; **35**: 277–290.
13. Taylor B A, Tofler G H, Carey H M *et al*. Full-mouth tooth extraction lowers systemic inflammatory and thrombotic markers of cardiovascular risk. *J Dent Res* 2006; **85**: 74–78.
14. Ellis J S, Averley P A, Preshaw P M, Steele J G, Seymour R A, Thomason J M. Change in cardiovascular risk status after dental clearance. *Br Dent J* 2007; **202**: 543–544.
15. Offenbacher S, Beck J D, Moss K *et al*. Results from the Periodontitis and Vascular Events (PAVE) study: a pilot multicentered, randomized, controlled trial to study effects of periodontal therapy in a secondary prevention model of cardiovascular disease. *J Periodontol* 2009; **80**: 190–201.
16. Iacopino A M, Cutler C W. Pathophysiological relationships between periodontitis and systemic disease: recent concepts involving serum lipids. *J Periodontol* 2000; **71**: 1375–1384.
17. Katz J, Flugelman M Y, Goldberg A, Heft M. Association between periodontal pockets and elevated cholesterol and low density lipoprotein cholesterol levels. *J Periodontol* 2002; **73**: 494–500.
18. D'Aiuto F, Nibali L, Pankar M, Suvan J, Tonetti M S. Short-term effects of intensive periodontal therapy on serum inflammatory markers and cholesterol. *J Dent Res* 2005; **84**: 269–273.
19. Tonetti M S, D'Aiuto F, Nibali L *et al*. Treatment of periodontitis and endothelial function. *N Engl J Med* 2007; **356**: 911–920.

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