



## KEYNOTES AND RESOURCES

### Episode #37 – Periodontitis & Cardiovascular Diseases May 28, 2021

#### Overview

Cardiovascular diseases (CVD) are a group of disorders of heart and blood vessels, and include:

- Hypertension
- Coronary heart disease (also known as ischemic heart disease or coronary artery disease)
- Cerebrovascular disease (e.g., ischemic stroke, hemorrhagic stroke, transient ischemic attack, aneurysms)
- Peripheral vascular disease
- Heart failure
- Rheumatic heart disease
- Congenital heart disease
- Cardiomyopathies<sup>1</sup> [1] [2]

Most CVD can be prevented by addressing behavioural risk factors, such as tobacco use, unhealthy diet, obesity, physical inactivity, and harmful use of alcohol. People with CVD or who are at elevated cardiovascular risk due to the presence of one or more risk factors (e.g., hypertension, altered glucose metabolism, dyslipidaemia, or already established disease) require early detection and management using counselling and medications, as appropriate. [2]

#### Prevalence of CVD

- CVDs are the number one cause of death globally with more people dying annually from CVDs than from any other cause.
- Coronary heart disease, stroke, hypertension (leading to heart failure), rheumatic heart disease, cardiomyopathy, and atrial fibrillation cause over 95% of CVD-related deaths.
- An estimated 17.9 million people died from CVD in 2016, representing 31% of all global deaths. Of these deaths, 85% were due to coronary heart disease and stroke.
- According to the 2016 Global Burden of Disease Study, stroke was the second largest cause of death globally, resulting in an annual mean estimate of 5.5 million

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<sup>1</sup> Cardiomyopathy is a primary disorder of the heart muscle. The main types of cardiomyopathy include dilated, hypertrophic, and restrictive cardiomyopathy. Treatment, which may include medications, surgically implanted devices, heart surgery or, in severe cases, a heart transplant, depends on the type of cardiomyopathy.

deaths. The number of global deaths due to ischemic stroke (mean 2.7 million) was slightly lower than the number due to hemorrhagic stroke (mean 2.8 million).

- Over three quarters of CVD deaths take place in low- and middle-income countries.
- Provisional US mortality data for 2020 indicate heart disease was the leading cause of death followed by cancer and COVID-19. In 2020, approximately 3,358,814 deaths occurred in the United States, with 690,882 from heart disease, 598,932 from cancer, and 345,323 from COVID-19. [2] [3] [4] [5] [6]

### **Prevalence of periodontal disease<sup>2</sup>**

Periodontal disease affects between 20% and 50% of the global population and severe periodontal disease affects 10% of the global population. Almost 47% of North American adults experience some form of periodontal disease. This prevalence is expected to increase as the population ages. The incidence and prevalence of periodontal disease have constantly increased during the past 3 decades making it the 12<sup>th</sup> most prevalent global pathology. [7] [8] [9] [10]

### **CVD and periodontal disease**

Larvin et al. (2020) examined the risk of incident CVD in individuals with periodontal disease in randomized controlled trials and longitudinal cohort studies. The results of their systematic review and meta-analysis demonstrated an increased risk of CVD in individuals with periodontal disease. Males and individuals with severe periodontal disease had the highest risk of developing CVD.

The authors proposed good oral hygiene practices and targeting interventions in individuals with periodontal disease is essential for preventing CVD outcomes. Also, dental exams could be utilized to screen for both periodontal disease and CVD. For example, incorporating blood pressure assessments during dental exams is a prime opportunity for CVD screening since many people attend dental appointments more often than medical appointments. Their research findings also indicated periodontal disease preceded CVD; thus, early diagnosis of periodontal disease along with prompt management may prevent mortality and morbidity from CVD. Part of the management of periodontal disease targets systemic risk factors, such as smoking and stress, which are also risk factors for CVD. Early interventions to target these risk factors along with periodontal disease therapy to remove causative bacterial agents may play a major role in preventing future CVD morbidity and mortality.

Moreover, there is evidence periodontal disease, as well as CVD, are associated with other systemic disease such as diabetes and rheumatoid arthritis. Therefore, treatment of periodontal disease may improve not only CVD but other systemic outcomes. If periodontal disease causes systemic disease through shared inflammatory pathways, then this could be a potential cost-effective treatment in preventing and/or reversing CVD and other systemic diseases simultaneously. [11]

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<sup>2</sup> Refer to Episode #5 – The global epidemic of periodontal disease for more information on the prevalence of periodontal disease.

## Hypertension and periodontitis

Muñoz Aguilera et al. (2020) conducted a systematic review revealing people with periodontitis were more likely to have hypertension. The researchers examined 81 studies and found moderate-to-severe periodontitis was associated with a 22% raised risk for hypertension, while severe periodontitis was linked with 49% higher odds.

The authors offered a number of plausible mechanisms to explain why periodontitis might be a risk factor for hypertension. Firstly, periodontitis is associated with systemic inflammation, mediators of which, including C-reactive protein (CRP), interleukin 6 (IL-6); tumour necrosis factor alpha (TNF- $\alpha$ ) can all affect endothelial function.<sup>3</sup> Clinical evidence suggests periodontitis affects systemic endothelial function and in turn this could impact hypertension. Previous research has demonstrated treatment of severe periodontitis improved endothelial function by reducing systemic inflammation in individuals with and without other comorbidities, such as diabetes.

Secondly, some reports suggest possible direct effects of oral microbiota related bacteraemia in mediating vascular dysfunction as well. Emerging experimental animal evidence indicates that an immune response to a common periodontal pathogen *Porphyromonas gingivalis* (*Pg*) results in the elevation of blood pressure, vascular inflammation, and endothelial dysfunction.

Another possibility may be cells, including T cells, B cells, and monocyte/macrophages, primed in inflamed periodontium, may be more prone to chemotactic recruitment to perivascular adipose tissue<sup>4</sup> and adventitia,<sup>5</sup> a step that has been shown to precede development of vascular dysfunction, hypertension, and atherosclerosis.

The authors concluded that periodontitis could be associated with increased risk of hypertension in a linear fashion. Further, management of periodontitis could impact the management of hypertension. Their findings highlight the potential to improve cardiovascular outcomes by addressing poor oral health in the general population. However, longer and larger studies are needed to determine whether periodontal treatment will benefit patients in terms of cardiovascular health, ultimately resulting in reduced morbidity and mortality. [12]

An additional study by Muñoz Aguilera et al. (2020) investigated the association between periodontitis and hypertension using two representative surveys of the US and Korean populations. They also examined the role of systemic inflammation in mediating this association. The study analyzed common inflammatory markers (e.g., CRP and

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<sup>3</sup> Endothelial cells are important constituents of blood vessels that play critical roles in cardiovascular homeostasis by regulating blood fluidity and fibrinolysis, vascular tone, angiogenesis, monocyte/leukocyte adhesion, and platelet aggregation. Normal vascular endothelium is considered a gatekeeper of cardiovascular health, whereas abnormality of vascular endothelium is a major contributor to many cardiovascular ailments, such as atherosclerosis, aging, hypertension, obesity, and diabetes. <https://www.frontiersin.org/articles/10.3389/fphar.2019.01568/full>

<sup>4</sup> Perivascular adipose tissue is a unique adipose tissue involved in all the aspects of vascular physiology and pathophysiology.

<sup>5</sup> Adventitia is the outermost layer of a blood vessel wall.

white blood cell [WBC] counts), blood pressure measurements, and periodontal status in 7,999 individuals.

The study found periodontitis increased the odds of having hypertension by 20-60% and increased the chance of having a systolic blood pressure  $\geq 140$  mmHg pressure by up to 2.5 times. This association was accompanied by raised levels of CRP and WBC. These associations were independent of age, gender, body mass index (BMI), education level, smoking, alcohol consumption, creatinine, physical activity, presence of other comorbidities and confirmed in participants not taking antihypertensive medications.

The authors concluded that periodontitis was closely linked to hypertension and low-grade systemic inflammation could be a key mediator in this association. Further interventional studies are needed to ascertain whether the treatment of periodontitis, leading to a decrease in systemic inflammation, may represent a novel nonpharmacologic intervention in hypertension management similar to other lifestyles strategies (e.g., weight loss, increasing physical activity, salt or alcohol intake reduction, smoking cessation). [13]

Lanau et al. (2021) conducted a systematic review to determine whether there is a decrease in or better control of blood pressure after performing nonsurgical periodontal treatment in individuals with periodontitis. The authors evaluated changes in blood pressure associated with different periodontal treatment modalities, with a follow-up ranging from 1 to 12 months. A total of eight clinical studies matched the inclusion criteria describing the effect of dental prophylaxis with scaling and root planing with or without adjunctive antimicrobial therapy.

The data indicated a reduction in blood pressure, in particular systolic, after periodontal treatment. However, the results should be interpreted with caution since the studies had different designs and a limited number of participants. Further research with larger and longer-term clinical trials are needed to demonstrate the association between nonsurgical periodontal treatment and the reduction of systolic blood pressure values. The authors concluded that periodontitis could influence the prevalence of hypertension and periodontal interventions could play an important role in the prevention of CVDs. [14]

In a more recent study by Muñoz Aguilera et al. (2021) periodontitis was linked to higher blood pressure in otherwise healthy individuals. The case-control study aimed to investigate the relationship between periodontitis and mean arterial blood pressure in a sample of otherwise systemically healthy individuals. The study included 250 adults with generalized, severe periodontitis (i.e.,  $\geq 50\%$  of teeth measured with periodontitis) and a control group of 250 adults without severe periodontitis, all of whom were otherwise healthy and had no other chronic health conditions. The median age of the participants was 35 years, and 52.6% were female.

All participants underwent comprehensive periodontal examinations (e.g., full-mouth plaque assessment, periodontal pocket depths, bleeding on probing). Arterial blood pressure was assessed and fasting blood samples were also collected and analyzed for

high levels of WBCs and high-sensitivity C-reactive protein (hs-CRP),<sup>6</sup> markers of increased systemic inflammation. Additional information analyzed as confounders included family history of CVD, age, BMI, gender, ethnicity, smoking, and physical activity levels.

The study found a diagnosis of periodontitis was associated with higher odds of hypertension, independent of common cardiovascular risk factors. Individuals with periodontitis were twice as likely to have high systolic blood pressure values  $\geq 140$  mm Hg, compared to individuals with healthy gingival tissues (14% and 7%, respectively). Also, the presence of active periodontal inflammation (identified by bleeding upon probing) was associated with higher systolic blood pressure. Participants with periodontitis exhibited increased glucose, low-density lipoproteins (LDL), hs-CRP, and WBC levels; and lower high-density lipoproteins (HDL) levels compared to those in the control group. Nearly 50% of the participants with periodontitis and 42% of the control group had blood pressure values for a diagnosis of hypertension, defined as  $\geq 130/80$  mmHg. [15]

### **Endothelial function and periodontitis**

Fujitani et al. (2020) assessed the relationship between periodontitis and endothelial function in 33 adult participants. The study found an association between increased tooth mobility and endothelial dysfunction. Increased tooth mobility, a major periodontal parameter, appeared related to endothelial dysfunction. Further investigations are required to assess whether periodontal treatment can improve endothelial function and prevent negative cardiovascular outcomes. [16]

### **Take home messages**

Prevention and management of periodontitis improves oral health, overall health, and quality of life, and may prevent and improve hypertension. Evidence indicates periodontal bacteria cause damage to the periodontal tissues and also trigger inflammatory responses that can impact the development of systemic diseases including hypertension. Promotion of good oral health could help reduce periodontal disease and the risk of high blood pressure and its complications.

Hypertension screening by oral health professionals with referrals to medical professionals could increase diagnosis and treatment of hypertension. Recognition of the correlation between periodontal disease and hypertension by the medical community with referrals to oral health professionals could increase detection and treatment of periodontal disease to improve oral health and reduce the burden of hypertension and its complications.

### **Stroke and periodontitis**

Patrakka et al. (2019) assessed for the presence of oral bacterial DNA in thrombus aspirates from 75 patients with acute ischemic stroke who were treated with mechanical thrombectomy. The samples were analyzed for the presence of *Streptococcus* species,

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<sup>6</sup> The hs-CRP test is different than the standard CRP test. The standard test measures high levels of the protein to find different diseases that cause inflammation. The hs-CRP test is more sensitive and measures low levels to evaluate the risk of heart disease and stroke.

mainly the *Streptococcus mitis* group, belonging to viridans streptococci as well as *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans*.

Bacterial DNA was detected in 84% (n = 63) of the aspirated thrombi, and 16% (n = 12) of the samples were considered bacterial DNA negative. DNA of *Streptococcus* species, mainly the *S mitis* group, was found in 79% (n = 59) of the samples. All thrombi were negative for both *P gingivalis* and *A actinomycetemcomitans*.

The authors concluded that Streptococcal bacteria, mostly of oral origin, may contribute to the progression and thrombotic events of cerebrovascular diseases. They hypothesized repeated transient bacteremia, caused by poor oral care or bacterial infections, may trap pathogens in atherosclerotic plaques and promote rupture of the plaques. Therefore, regular dental care should be emphasized in the primary prevention of acute ischemic stroke. [17]

Fagundes et al. (2019) conducted a systematic review and meta-analysis to investigate the association between periodontitis and stroke. The systematic review and meta-analysis suggested an increased risk of stroke in individuals with periodontitis, especially ischemic events. In addition, there was a strong association between periodontitis and stroke. However, these results should be evaluated with caution due to the need for more robust prospective studies for a more reliable conclusion, especially regarding the degree of severity of periodontitis and stroke. [18]

Alhadainy et al. (2021) conducted a cross-sectional study to determine the potential association between dental diseases and the self-reported history of stroke in the United States. The researchers analyzed retrospective data extracted from the Third National Health and Nutrition Examination Survey (NHANES III) database. The research sample taken from the NHANES III main study, after age restriction to ≥45 years, was 8,634 participants. The mean age was 65.5 years and females represented more than half of the sample (52.3%).

The study results suggested a significant association between stroke and missing teeth. Compared to those who had 0-3 missing teeth, those who had 4-10 missing teeth had approximately twice the risk of reporting a stroke and those with 11-27 missing teeth had approximately 2.5 times the risk. Those at three times the risk of reporting stroke were individuals with 28 missing teeth or who were edentulous. Associations between gingival bleeding, periodontal pockets, or caries were not significantly associated with self-reported stroke.

The authors concluded that the number of missing teeth was found to be significantly associated with the self-reported history of stroke. Additional studies were recommended to determine the nature of this association. [19]

Baniulyte et al. (2021) conducted a meta-analysis to assess the link between periodontitis and stroke. A total of ten studies were included, with the number of participants ranging from 80 to 15,792 and a follow-up duration from 0 to 15 years. The meta-analysis demonstrated three main findings: 1) individuals with periodontitis were

twice as likely to suffer stroke; 2) individuals with periodontitis were twice as likely to suffer ischemic stroke; and 3) individuals with periodontitis had a higher risk of experiencing stroke. Overall, the research found stroke events were associated with periodontitis. However, further studies are required to determine the relationship between periodontal disease severity and stroke severity; whether there is an impact of periodontal treatment; and to review whether periodontal disease impacts stroke survival. [20]

### **Atrial fibrillation, heart failure, and periodontitis**

Chang et al. (2020) examined the connection between oral hygiene and occurrence of atrial fibrillation and heart failure risk. The retrospective cohort study enrolled 161,286 participants from the Korean National Health Insurance System, aged 40 to 79 years with no history of atrial fibrillation or heart failure. Participants underwent a routine medical examination between 2003 and 2004. Data was collected on height, weight, laboratory tests, illnesses, lifestyle, oral health, and oral hygiene behaviours. During a median follow-up of 10.5 years, 4,911 (3.0%) participants developed atrial fibrillation and 7,971 (4.9%) developed heart failure.

Toothbrushing three or more times a day was associated with a 10% lower risk of atrial fibrillation and a 12% lower risk of heart failure during the 10.5-year follow up. Professional dental cleaning was negatively associated with risk of heart failure. The findings were independent of a number of factors including age, sex, socioeconomic status, regular exercise, alcohol consumption, BMI, and comorbidities such as hypertension.

The authors concluded that improved oral hygiene was associated with a decreased risk of atrial fibrillation and heart failure. Improved oral hygiene by frequent toothbrushing and professional dental cleaning may reduce risk of atrial fibrillation and heart failure.

While the study did not investigate the mechanisms that may explain the associations, one possibility was frequent tooth brushing reduces bacteria in the subgingival biofilm, thereby preventing translocation to the bloodstream and systemic inflammation. [21]

Sen et al. (2021) investigated the association between periodontal disease, dental care utilization, and incident atrial fibrillation, as well as atrial fibrillation as a mediator to periodontal disease-stroke association.

From the dental cohort of the Atherosclerosis Risk in Communities (ARIC) study, 5,958 participants without prior atrial fibrillation underwent full-mouth periodontal measurement exams. In addition, the researchers evaluated 9,666 participants in the ARIC main cohort who had not been diagnosed with atrial fibrillation. Those in this cohort were classified as regular (i.e., those who sought routine dental care) or episodic dental care users (i.e., those who sought dental care only when in discomfort or when something needed to be fixed, or those who never sought dental care, or did not receive regular dental care). For 17 years, the participants were followed to see if they developed atrial fibrillation.

In the dental cohort, 754 participants were diagnosed with atrial fibrillation. Severe periodontal disease was linked to atrial fibrillation on both univariable and multivariable analyses. Hazard ratio adjustments included age, race, lifestyle habits, and other conditions, such as diabetes.

In the main cohort, 1,558 participants were found to have atrial fibrillation. Those who received routine dental care had a lower risk for atrial fibrillation on univariable and multivariable analyses, compared with episodic users.

In the final analysis, the researchers concluded that regular dental care may modestly reduce the risk of atrial fibrillation by 22%. The researchers presumed periodontal care through dental scaling and root planing may decrease the burden of inflammation and prevent individuals from developing atrial fibrillation. However, a further prospective trial is necessary to confirm this finding. [22]

### **Take home messages**

Systemic inflammation, characterized by inflammatory markers including TNF- $\alpha$ , IL-6, and CRP, have been associated with a higher atrial fibrillation risk. Periodontitis is also associated with an increase in these systemic inflammatory markers. Collectively, it is plausible that systemic inflammation originating from periodontitis may increase the risk of individuals developing atrial fibrillation. Regular periodontal therapy may decrease systemic inflammation and help prevent the development of atrial fibrillation. In addition to educating clients about traditional causative factors of atherosclerosis and atherothrombotic events, such as hypertension, hypercholesterolemia, diabetes mellitus, smoking, and obesity, oral health professionals can explain the possible role of systemic inflammation caused by oral bacteria in these conditions.

### **Dyslipidemia**

Dyslipidemia is an abnormal level of lipids in the blood. The most common forms of dyslipidemia involve high levels of LDL, low levels of HDL, and/or high levels of triglycerides. Dyslipidemia is a strong risk factor for atherosclerosis and CVDs, such as stroke, coronary artery disease, and peripheral artery occlusive diseases.

Dyslipidemia is an important modifiable risk factor for CVDs. Several strategies have been suggested for controlling dyslipidemia, such as healthy dietary habits, physical activity, maintaining proper body weight, and taking prescribed lipid-lowering medications. However, methods for controlling dyslipidemia are frequently insufficient in clinical practice.

### **Dyslipidemia and periodontitis**

Song et al. (2020) investigated the association of periodontitis and oral hygiene indicators with changes in blood lipid parameters in a nationwide, longitudinal, population-based cohort study. The study utilized data from the Korean National Health Insurance Service-National Health Screening cohort database, which contains serial health examination data, such as data on oral health status (e.g., presence of periodontitis, dental caries, tooth loss), blood chemistry, blood pressure, BMI, and

lifestyle factors (e.g., smoking status, exercise frequency, dental scaling appointments, toothbrushing frequency).

The study involved 65,078 participants who underwent oral health examinations in 2009-2010 and had at least one follow-up examination for lipid profile without exposure to lipid-lowering agents.

The results indicated the prevalence of periodontitis was 39%. The presence of periodontitis was associated with decreased HDL cholesterol levels, while the presence of tooth loss was associated with an increased change in triglyceride levels. Compared with toothbrushing one or fewer time/day, toothbrushing three or more times/day was significantly associated with increased HDL cholesterol levels and decreased triglyceride levels.

Periodontitis may trigger systemic immune and inflammatory reactions that play an important role in the development of dyslipidemia. In this study, participants with periodontitis had lower HDL cholesterol levels and higher triglyceride levels at baseline. Longitudinally, change in triglyceride levels was positively associated with periodontitis. The authors concluded that periodontitis may be an attenuating factor for serum HDL cholesterol levels and tooth loss may be an augmenting factor for serum triglyceride levels. Improved oral hygiene may be associated with a decreased risk of dyslipidemia. [23]

### **Consensus report on periodontitis and CVDs**

Sanz et al. (2020) reported on the proceedings of a 2019 workshop jointly organized by the European Federation of Periodontology (EFP) and the World Heart Federation (WHF), which updated the existing epidemiological evidence for significant associations between periodontitis and CVD, the mechanistic links, and the impact of periodontal therapy on cardiovascular and surrogate outcomes. The group, consisting of global experts in both periodontal and cardiovascular disciplines, reviewed relevant evidence published since their 2012 workshop to answer important questions on the associations between periodontal disease and CVDs. The review also focused on the potential risk and complications of periodontal therapy in individuals on antithrombotic therapy and made recommendations for oral health and medical professionals, and for the public when visiting dental and medical practices.

The following are some of the questions addressed in the consensus report and a synopsis of the answers:

*Do individuals with periodontitis have a higher prevalence of subclinical CVD?*

There is evidence from epidemiological studies that individuals with periodontitis exhibit significant endothelial dysfunction, measured by flow-mediated dilation, arterial stiffness and a significantly greater thickness of the carotid intima-media and elevated arterial calcification scores.

*Do individuals with periodontitis have a higher prevalence of coronary artery disease and risk of myocardial infarction and other coronary events?*

There is robust evidence from epidemiological studies for a positive association between periodontitis and coronary heart disease. A systematic review by Dietrich et al. (2013) demonstrated an increased risk of a first coronary event in patients with clinically diagnosed periodontitis or more severe periodontitis compared to patients without periodontitis or less severe periodontitis. [24]

*Do individuals with periodontitis have a higher prevalence and incidence of peripheral artery disease (PAD)?*

There is limited but consistent evidence that individuals with periodontitis have a higher prevalence and incidence of PAD compared to individuals without periodontitis. Two large, population-based studies in the United States (NHANES 1999–2002) and South Korea (KoGES-CAVAS) found a positive association between the extent of clinical attachment loss (NHANES 1999-2002) and severity of radiographic bone loss (KoGES-CAVAS) with PAD, respectively.

*Is there evidence of a higher incidence of bacteremia following oral function or a professional intervention in individuals with periodontitis compared to periodontally healthy individuals?*

Overall, there is evidence oral bacteria can enter the circulation and cause bacteremia following daily activities such as toothbrushing, flossing, and chewing, and following professional interventions (e.g., tooth polishing, scaling, tooth extraction, and periodontal probing). The bacteremia is often longer in duration and involves more virulent bacteria in individuals with periodontitis.

*Is there evidence individuals with periodontitis exhibit increased production and/or levels of inflammatory mediators that are also associated with the pathophysiology of atherosclerosis?*

There is evidence of significantly higher levels of CRP in individuals with periodontitis versus healthy controls and in people with CVD and periodontitis compared with either condition alone. The effect of periodontal therapy has been shown to associate with a significant decrease in CRP levels, along with improvements in surrogate markers of cardiovascular health.

*Is there evidence those with periodontitis develop elevations in thrombotic factors that are also associated with the pathophysiology of atherothrombosis?*

There is evidence of significantly higher levels of fibrinogen in individuals with periodontitis versus healthy controls, and in individuals with CVD and periodontitis compared with either condition alone. Periodontal therapy appears to result in a significant decrease in fibrinogen levels. There is evidence from different studies of

significantly higher levels of platelet activation markers in individuals with periodontitis and that these higher levels may be reversed by periodontal therapy. [3]

### **Take home messages**

Oral health professionals can assist clients to improve their oral and systemic health by helping them understand their interrelationships and the importance of regular medical and oral health exams and periodontal maintenance appointments. Also, developing interprofessional collaborations with medical professionals provides the opportunity for oral health professionals to educate medical practitioners about the effects of oral disease on systemic health and vice versa; the importance of oral health; and the importance of referring patients with CVD to oral health professionals for early diagnosis and treatment of oral diseases.

### **Update on antibiotic prophylaxis<sup>7</sup>**

In 2007, the American Heart Association published updated evidence-based guidelines on the recommended use of antibiotic prophylaxis to prevent viridans group streptococcal infective endocarditis in cardiac patients undergoing invasive procedures. The 2007 guidelines state four categories thought to confer the highest risk of adverse outcome. A group consisting of experts in prevention and treatment of infective endocarditis, including members of the American Dental Association, the Infectious Diseases Society of America, and the American Academy of Pediatrics, in addition to the American Heart Association, reviewed the 2007 guidelines to examine evidence of the acceptance and impact of the 2007 recommendations on viridans group streptococcal infective endocarditis and, if needed, make revisions based on this evidence.

The authors concluded that on the basis of the review of the available evidence, there are no recommended changes to the 2007 guidelines. The guidelines continue to recommend viridans group streptococcal infective endocarditis prophylaxis only for categories of patients at highest risk for adverse outcome while emphasizing the critical role of good oral health and regular access to dental care for all. Randomized controlled studies to determine whether antibiotic prophylaxis is effective against viridans group streptococcal infective endocarditis are needed to further refine recommendations. [25]

The 2021 American Heart Association scientific statement highlights:

- Good oral hygiene and regular dental care are the most important ways to reduce infective endocarditis caused by bacteria in the mouth.
- There are four categories of heart patients considered to be at highest risk for adverse outcomes from infective endocarditis, and only these patients are recommended to receive preventive antibiotic treatment prior to invasive dental procedures.
- The American Heart Association guidelines issued in 2007 suggested not to use antibiotics before certain dental procedures. These recommendations resulted in a decrease in antibiotic use. [26]

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<sup>7</sup> Refer to Episode #23 for more information on antibiotic prophylaxis.

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Periodontal (Gum) Disease, ODHA Factsheet

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Canada's Food Guide

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Hypertension Canada patient resources

<https://guidelines.hypertension.ca/patient-resources/>

Health information publications

<https://www.heartandstroke.ca/what-we-do/publications>

Prevention of heart diseases and conditions

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