

Episode 136 – Hypertension and Oral Health July 11, 2025

Introduction

Hypertension is the leading preventable risk factor for cardiovascular disease (CVD) and all-cause mortality worldwide. Hypertension affects more than 30% of the global adult population. The number of people with hypertension doubled between 1990 and 2019, from 650 million to 1.3 billion. Nearly half of individuals with hypertension are unaware of their condition. The prevalence of hypertension is rising globally due to an aging population and increases in lifestyle risk factors, such as tobacco use, unhealthy diets (e.g., high sodium and low potassium), and low physical activity. [1] [2] [3]

Although hypertension is typically asymptomatic, long-term hypertension is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia. Since hypertension is a major risk factor for morbidity and mortality associated with CVD, its prevention and treatment are essential. Many studies have reported a link between hypertension and oral health. [4] [5]

A systematic review and meta-analysis by Muñoz Aguilera et al. (2020) demonstrated a positive association between periodontitis and hypertension. The quantitative analyses indicated that participants with moderate to severe periodontitis have 20% greater odds of having hypertension compared to those without periodontitis. In addition, a positive linear association was observed, meaning the greater the severity of periodontitis, the higher the likelihood (49%) of having hypertension. [6]

Inflammation

Inflammation is recognized as a key factor in causing vascular dysfunction and plays a role in the development and progression of hypertension. Periodontitis is a chronic inflammatory disease characterized by a dysregulated host inflammatory response to dysbiotic oral biofilm. If periodontitis is not effectively treated, it can cause progressive destruction of the tooth-supporting tissues and eventual tooth loss. Several studies have shown an association between periodontitis and hypertension, suggesting potential shared inflammatory pathways. [6] [7] [8] [9] [10] [11] [12]

Dr. Glogauer and colleagues studied healthy young adults without a history of periodontal disease to determine whether lower levels of oral inflammation can be clinically relevant to cardiovascular health. Whole mouth oral inflammatory load (OIL) was measured using oral neutrophil (white blood cell) counts. Artery health was determined via flow-mediated dilation (FMD) and pulse-wave velocity. [13]

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FMD is a noninvasive test that measures how well a blood vessel widens in response to increased blood flow to assess endothelium function. The endothelium, the inner lining of blood vessels, plays a crucial role in regulating blood flow and preventing CVD. For example, the endothelium releases nitric oxide, a molecule that causes the smooth muscle in the artery wall to relax, leading to vasodilation. Vasodilation causes a decrease in systemic vascular resistance and an increase in blood flow, reducing blood pressure. [14]

During FMD, baseline artery diameter and blood flow velocity are measured using ultrasound. A cuff is placed on the arm and inflated to temporarily stop blood flow. When the cuff is released, blood flow increases dramatically, causing shear stress on the artery wall. This increased shear stress stimulates the endothelium to release vasodilators, including nitric oxide, resulting in dilation in a healthy artery. Dilation is reduced or absent in endothelial dysfunction. Endothelial dysfunction is involved in the development of atherosclerosis, hypertension, and other cardiovascular complications. [15] [16] [17] [18]

Dr. Glogauer and his team used a simple mouthrinse to determine if neutrophil levels in saliva could be linked to signs of heart disease. They found high neutrophil counts had a significant relationship to poor FMD, an early indicator of poor arterial health. This study provides evidence that oral health may impact cardiovascular health, even among young healthy individuals.[1] [13]

Muñoz Aguilera et al. (2020) analyzed the common inflammatory markers, C-reactive protein (CRP) and leukocyte counts (white blood cells), in two large representative surveys of U.S. and Korean populations to investigate the association between periodontitis and hypertension. They found periodontitis increased the odds of hypertension by up to 60% in both populations and this association was accompanied by raised levels of CRP and leukocyte counts, suggesting periodontal disease results in systemic inflammation, which may in turn lead to hypertension. [12]

Age is a common risk factor for both hypertension and periodontitis. However, the specific contribution of age and systemic inflammation to the relationship between periodontitis and hypertension has not been fully elucidated. A cross-sectional clinical study by Yang et al. (2025) explored this association and found a significant relationship between periodontitis and systolic blood pressure.[2] This association was stronger with increasing age and systemic inflammation. [8]

Yildirim et al. (2022) found periodontitis severity (stage) and progression rate (grade) may be independent risk factors for hypertension in a cohort of 7,008 clients attending a faculty of dentistry clinic in Turkey. Hypertension was diagnosed in 6% (n=435) of the clients. Both periodontal disease stage and grade differed between clients with or without hypertension. Increased periodontal disease severity was associated with a

[1] Refer to Episode 99 for discussion on this study with Ker-Yung Hong.
[2] Systolic (top number) is the measure of the pressure when the heart ventricles contract and push blood through arteries. Diastolic (bottom number) is the measure of the pressure when the heart relaxes between contractions.

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20% increased risk for hypertension in stage IV periodontitis. Increasing periodontitis progression rate was associated with a 35% increased risk for hypertension in grade C periodontitis.[3] [19]

Larvin et al. (2022) conducted a longitudinal cohort study in the UK examining the effect of hypertension and periodontitis on the risk of subsequent systemic disease. The study included 244,393 participants free of systemic disease, other than hypertension at baseline. Self-reported responses of painful gums or loose teeth were surrogates for periodontitis.

The findings demonstrate both periodontitis and hypertension were associated with an increased risk of several subsequent systemic diseases. In particular, hypertension had an additive effect with periodontitis on the risks of CVD and respiratory disease. The findings showed participants with loose teeth (clinically indicative of severe periodontitis) had the highest incidence of subsequent systemic diseases compared to the other oral health indicators. The results also suggest periodontitis may independently increase the risk of CVD. Shared inflammatory pathways and endothelial dysfunction are the probable cause in this association. However, further research is required to understand the biological mechanism underpinning the associations between periodontitis, hypertension, and subsequent systemic disease. [20]

Tooth loss

Gordon et al. (2018) conducted a cross-sectional study of postmenopausal females and found the number of missing teeth was associated with prevalent hypertension. [21]

A nationwide longitudinal population-based cohort study in Korea by Woo et al. (2021) of 19,680 participants investigated the link between tooth loss and the risk of hypertension. A total of 1,853 participants developed hypertension during the 7.4-year follow-up period. The study demonstrated a loss of eight or more teeth was associated with an almost two times higher risk of developing hypertension. Accordingly, a higher number of lost teeth may be associated with an increased risk of new-onset hypertension, emphasizing the need to be aware of this risk and monitor for the development of hypertension in clients with tooth loss. [5]

Tada et al. (2022) conducted a systematic review and meta-analysis on the association between tooth loss and hypertension. Meta-analyses revealed a statistically significant association between tooth loss and hypertension. The authors found individuals with fewer remaining teeth exhibited higher prevalence and incidence of hypertension. Those with more tooth loss had significantly higher systolic blood pressure, but not diastolic blood pressure. In general, tooth loss was associated with higher risk of hypertension and higher systolic blood pressure. [4]

A systematic review and meta-analysis by Xu et al. (2022) examined the association between tooth loss and hypertension. The authors analyzed 26 studies from 16 different countries involving 1,224,821 participants. They found tooth loss was associated with

[3] Refer to Episodes 49 and 50 for discussion on staging and grading periodontal disease.

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hypertension. However, the association appeared to be less in the older population, suggesting there may be an initial association between tooth loss and developing hypertension. The authors recommend oral health clinicians should screen all clients' blood pressure and provide appropriate referrals if hypertension is suspected. [22]

Probable mechanisms

Probable mechanisms for the association between periodontitis, tooth loss, and hypertension include:

- Periodontitis may elicit vascular inflammation, leading to endothelial dysfunction.
- Periodontopathogens may stimulate local and systemic host immune responses, resulting in atherosclerosis development and endothelial cell activation.
- Production of reactive oxygen species (ROS) increases in response to periodontal inflammation; subsequently ROS enter the systemic circulation. ROS are oxygen radicals and key signaling molecules that play a vital role in inflammatory disorder progression.
- Tooth loss can result from cumulative exposure to oral diseases, such as periodontitis and dental caries. The release of proinflammatory cytokines during the progression of these diseases may trigger hypertension.
- Severe tooth loss may alter dietary habits due to insufficient masticatory function. Reduced intake of vitamins and vegetable fibres increases hypertension risk.
- Systemic inflammation associated with hypertension may activate local inflammation, resulting in release of periodontal inflammatory mediators increasing tooth loss susceptibility.
- Hypertension may lead to malfunction of small arterioles, which affects local nutrition supply, aggravates periodontal diseases, and increases risk of tooth loss. [4] [22]

Oral microbiome[4]

LaMonte et al. (2022) examined associations between oral microbiota, blood pressure, and incident hypertension in 1,215 postmenopausal participants, with a mean follow-up of 10 years. In the prospective analysis, ten oral bacterial species were significantly associated with higher risk of developing incident hypertension (e.g., *Streptococcus anginosus, Streptococcus salivarius,* certain *Prevotella sp.*) and five were significantly associated with lower risk of incident hypertension (e.g., *Neisseria subflava, Aggregatibacter segnis*). Only one of the five bacteria (*N. subflava*) is a known nitrate reducer.

The authors concluded specific oral bacteria were associated with risk of hypertension development among postmenopausal females. Nonnitrate reduction mechanisms, such as inflammation and atherosclerosis, may be involved. Research to confirm these observations and determine mechanisms is required. [23]

Periodontal therapy[5]

A Cochrane review by Luo et al. (2021) assessed the effect of different periodontal therapies on blood pressure in individuals with chronic periodontitis. The authors stated

[4] Refer to Episodes 32 and 63 for discussions on the oral microbiome.
[5] Refer to Episodes 128 and 129 for additional information on periodontal therapy.

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conclusions could not be drawn about the effect of periodontal therapy on blood pressure in individuals with chronic periodontitis due to low certainty of evidence and lack of relevant studies. Only one study was found that suggested periodontal therapy may reduce systolic and diastolic blood pressure over a short period in individuals with hypertension and chronic periodontitis, but the certainty of evidence was moderate. [24]

A systematic review and meta-analysis by Sharma et al. (2021) showed intensive periodontal therapy (IPT) consisting of supra and subgingival instrumentation, improved endothelial function, which was measured by FMD. Although the overall analysis showed no significant effect of IPT on lowering blood pressure, subgroup analysis demonstrated a significant decrease in blood pressure in participants with hypertension and prehypertension.

Additionally, a significant decrease in CRP levels in successfully treated participants was observed. However, other inflammatory markers (e.g., interleukin-6 [IL-6], I interferon gamma [IFN-γ]) and cardiometabolic markers (e.g., high-density lipoprotein [HDL], low-density lipoprotein [LDL], triglycerides) did not change significantly following IPT. Overall, the results suggest successful periodontal therapy could support antihypertensive therapy in individuals with hypertension and prehypertension. [25]

A systematic review and meta-analysis of randomized clinical trials by Luthra et al. (2022) showed when individuals received nonsurgical periodontal therapy versus no therapy, there was a significant decrease in their CRP, up to six months follow-up. The reduction was to a degree equivalent to that observed after traditional lifestyle or drug interventions. Secondary outcomes included changes in levels of other inflammatory biomarkers (IL-6, IL-8, IL-10, tumor necrosis factor alpha [TNF-α]); along with changes in periodontal measures of inflammation (bleeding on probing, probing depths, clinical attachment levels). [26]

A systematic review and meta-analysis by Lyu et al. (2024) showed periodontal therapy enhances endothelial function. After subgroup analysis of long-term and short-term follow-up, periodontal therapy was shown to increase FMD levels in participants with severe periodontitis. [27]

A review by Angjelova et al. (2024) suggests periodontal therapy effectively improves established CVD risk factors and serves as an effective strategy for endothelial dysfunction management. The primary outcome following periodontal therapy was a decrease in serum levels of CRP, indicative of systemic inflammation stabilization, alongside enhancements in endothelial dysfunction measures, representing markers of CVD. Based on the reviewed evidence, periodontal therapy demonstrates beneficial effects on blood inflammatory markers and improves the lipid profile. [28]

Oral self-care[6]

Kim et al. (2022) investigated whether oral hygiene indicators were linked to major CVD development in 52,677 participants with hypertension in a longitudinal study in Korea.

[6] Refer to Episode 89 for additional information on oral self-care.

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The study found participants with hypertension who had poor oral hygiene indicators (e.g., dental caries) had a higher risk of major cardiovascular events. In contrast, better oral hygiene behaviour (e.g., tooth brushing) was negatively related to the risk of major cardiovascular events. The authors concluded dental caries were related to the risk of CVD in individuals with hypertension. Further, better oral hygiene may attenuate the risk of cardiovascular events in these individuals. [29]

Del Pinto et al. (2022) investigated the association of oral self-care habits and hypertension. Among the 4,506 participants, 48% reported brushing ≥3 times/day, and 23% used a power toothbrush. Brushing ≥3 times/day and using a power toothbrush were associated with 19% and 28% lower odds of hypertension, respectively, compared to those reporting less frequent brushing and manual toothbrushing.

Possible mechanisms behind the systemic benefit of oral self-care include their modulating effects on the local microbiota and the immune system. Previous research has shown:

- Periodontal bacteria appear to elicit a hypertension-specific immune host response;
- Periodontal therapy has a significant modulatory effect on adaptive immunity;[7] and
- Periodontopathogens were positively associated with both blood pressure and prevalent hypertension.

Thus, regular oral self-care might represent an additional, nonpharmacological strategy for CVD prevention, possibly through dysbiosis reversal and systemic anti-inflammatory effects. Future research is required to test whether oral self-care may represent a complementary approach to manage hypertension. [30]

Mouthrinses[8]

Several reports suggest antimicrobial mouthrinses (prescription and over the counter [OTC]) may impact cardiovascular health.[9] The underlying mechanisms between mouthrinses and CVD are not yet fully elucidated. However, there is accumulating evidence it may be related to the impact of antimicrobial mouthrinses on the oral microbiome. Studies have shown antimicrobial mouthrinses may lead to adverse effects on blood pressure control in both healthy adults and those with hypertension. Chlorhexidine (CHX) use, in particular, has been found to cause a shift in the oral microbiome leading to a possibly unfavourable decline in salivary nitrite concentration. [31] [32] [33]

CHX mouthrinses reduce plaque and gingivitis, and as per the European Federation of Periodontology (EFP) clinical practice guideline on the treatment of stage I-III periodontitis,[10] CHX may be used as an adjunct to manage periodontitis for a limited time in specific cases. *In vitro* studies have shown 0.01% to 0.2% CHX has a potent bactericidal effect on single species and multispecies cultures containing periodontal

[7] Refer to Episodes 44 and 45 for discussions on the immune system.
[8] Refer to Episode 103 for additional information on the role of mouthrinses in oral care.
[9] Refer to Episodes 79, 80, and 81 for additional information on cardiovascular disease.
[10] Refer to Episodes 49 and 50 for discussions on the EFP clinical practice guideline.

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pathogens *Fusobacterium nucleatum, Porphrymonas gingivalis*, and *Aggregatibacter actinomycetemcomitans*. [34] [35] [36]

While this may be considered an advantage in reversing microbial dysbiosis. CHX also decreases bacterial diversity. Research in healthy individuals demonstrates certain bacterial species (e.g., *Veillonella*, *Actinomyces, Haemophilus, Rothia*, *Neisseria*) are also inhibited by CHX. These health-associated oral bacteria perform the vital function of reducing dietary nitrates to nitrite. Nearly 25% of ingested nitrate is transported, in a process referred to as the nitrate-nitrite-nitric oxide pathway, to the oral cavity. Once in the mouth, oral microbes reduce nitrate to nitrite. Nitrite is then swallowed and taken into the bloodstream during digestion and converted to nitric oxide. Nitric oxide is essential to cardiovascular health as it exerts vasodilation and antihypertensive effects, contributing to the maintenance of cardiovascular health. Thus, CHX mouthrinses, due to their nonspecific antimicrobial activity, may negate the beneficial effects of nitrate-rich diets[11] mediated by the oral microbiome. [34] [37] [38] [39] [40]

Public awareness

Oral health professionals typically have a high level of awareness of the association between periodontal and systemic diseases. However, limited evidence is available on the general public's awareness of this connection. Thus, Alsalleeh et al. (2023) assessed the general public's awareness of the link between periodontal disease and noncommunicable systemic diseases, namely, diabetes, coronary heart disease, atherosclerosis, hypertension, and respiratory disease.

The researchers found that the public's awareness of this association is low. Increasing their awareness may encourage individuals to seek oral healthcare, which can help prevent and treat existing oral conditions, particularly periodontal disease. In turn, this could reduce the risk of noncommunicable systemic diseases and improve existing conditions. The low level of awareness highlights the need for public health education programs on the oral-systemic link and for oral health professionals to transfer this knowledge to clients more effectively. [41]

Blood pressure screening in oral healthcare

Early detection and treatment of hypertension is crucial to reduce the risk of developing long term complications. Oral healthcare is one of few health services to which many people attend for regular check-ups, allowing for opportunistic blood pressure screening. [42]

Benefits of blood pressure screening in oral healthcare include:

- Helps to identify clients with undiagnosed hypertension, white coat hypertension, or uncontrolled hypertension, allowing for referrals for follow up and diagnosis.
- Provides important information to determine if oral care should be started, modified, or postponed.

[11] Good dietary sources of nitrates include dark green leafy vegetables (e.g., spinach, kale, romaine lettuce), beets, and celery.

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- Measuring blood pressure at the beginning of appointments, and during when indicated, can reveal how treatment may affect blood pressure. Blood pressure may change with administration of local anesthetic, general anesthesia, or even anxiety over the procedure.
- Provides an opportunity for oral health clinicians to talk about healthy lifestyles, including providing smoking cessation advice, and encourage clients with diagnosed hypertension to adhere to their medication regimen prescribed by their medical provider. [43] [44] [45] [46] [47]

Andersson et al. (2022) surveyed client experiences with blood pressure screening in oral healthcare. Participants found the blood pressure screening was a convenient and easy way to have blood pressure measured, it was "no big deal," and it increased their health awareness. [48]

Blood pressure screening

To take blood pressure readings in oral health settings, it is recommended the client sit quietly for five minutes in a chair with their feet flat on the floor and the arm on which the cuff is placed is supported at heart level. Wrap the cuff snuggly around the bare upper arm. There are various cuff sizes available depending on the age and size of the client. A cuff that is too small will give a high reading and a cuff that is too large will give a low reading. Automated cuff-style, bicep blood pressure measurement is preferred over manual and auscultatory measurement in adults. Follow the manufacturer's instructions for the automated device and record the reading. Wrist and finger monitors yield less reliable readings. [49] [50]

Many factors influence the accuracy of blood pressure readings, including technique, cuff size, the client's arm position, type of measurement device, white coat effect, room temperature, and recent use of alcohol, caffeine, or nicotine. [51]

Screening and recording blood pressure readings is recommended for all client baseline assessments. If blood pressure is within the normal range, it may not be necessary to take the client's blood pressure at every appointment. However, it is recommended that blood pressure be reconfirmed and recorded at a subsequent appointment. Taking blood pressure is required for clients with diagnosed hypertension, CVD, diabetes, chronic kidney disease, etc. Having a baseline blood pressure reading for every client is beneficial in case of a medical emergency as it provides quantitative values for comparison. [52]

Once blood pressure is taken, a decision to proceed with treatment will depend on the systolic and/or diastolic readings, the presence of various risk factors, the type of oral care procedure, and the health of the client. [51]

Antihypertensive medications

Antihypertensive medications can have a variety of oral adverse effects, including xerostomia, gingival hyperplasia, lichen planus type lesions, and dysgeusia. These

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medications may also induce orthostatic hypotension and interact with vasoconstrictors (e.g., epinephrine) and nonsteroidal anti-inflammatory drugs (NSAIDs).[12] [46]

Xerostomia
Xerostomia (dry mouth) is the most commonly reported adverse effect of antihypertensive medications and tends to increase with the amount of drug taken. Xerostomia increases risk of dental caries, periodontal disease, halitosis, oral infections (e.g., candidiasis), and traumatic oral lesions.

Management strategies for xerostomia include:
- Drinking more water
- Sucking on ice chips
- OTC saliva substitutes, moisturizers, and lubricants
- Sugarless gums, mints, lozenges to help stimulate saliva flow (e.g., xylitol-sweetened)
- Limiting alcoholic beverages and beverages high in sugar or caffeine, such as juices, sodas, teas or coffee (especially sweetened).
- Smoking cessation
- Nighttime use of bedside humidifiers
- Changing the brand of antihypertensive medication, if possible
- Utilizing prescription parasympathomimetic agents, such as pilocarpine, cevimeline, bethanechol chloride, or anethole trithione. [46] [53]

Gingival hyperplasia
Gingival hyperplasia is an often-observed adverse reaction to calcium channel blockers, such as nifedipine. The tissue overgrowth can impact mastication, speech, esthetics, and quality of life. Gingival overgrowth can compromise oral health, as tissue can become inflamed from plaque accumulation under enlarged gingiva where it is not easily removed. [46] [49]

Management strategies for gingival hyperplasia include:
- Increasing oral hygiene regimes.
- Nonsurgical periodontal therapy (i.e., scaling and root planing), supplemented with oral hygiene instruction and frequent recare appointments.
- Gingivectomy in severe cases. However, recurrence is common.
- Substituting the causative medication, if possible. [46]

Oral lichenoid reaction
The clinical presentation and histology of oral lichenoid reaction (OLR) is identical to that of oral lichen planus.[13] OLR is often observed adverse drug reaction to various antihypertensive medications. It can present as bilateral white papules forming reticular or annular plaque-like patterns on the buccal mucosa, palate, gingiva, and tongue. It

[12] Health Canada Public Advisory: NRA-Amlodipine 5 mg tablets: One lot recalled as some bottles may contain the wrong drug
[13] Refer to Episode 75 for discussion on oral lichen planus.

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may also present as erythematous erosive and ulcerative lesions. OLR can cause burning sensations, bleeding, pain, and general discomfort. [46]

Management strategies for symptomatic OLR lesions include:
- Avoiding mechanical trauma (e.g., from ill-fitting prostheses).
- Topical corticosteroids (e.g., clobetasol)
- Changing the causative medication often resolves the condition. [46]

Dysgeusia
Dysgeusia (taste alteration) has been reported in approximately 30% of people prescribed antihypertensive medications. Dysgeusia can impact psychological well-being, quality of life, appetite (e.g., increased preference for salt and sugar), nutritional status (e.g., consuming fewer calories and healthy foods, such as fruits and vegetable), body weight, and medication adherence, leading to more severe physiologic consequences. Prolonged xerostomia may also lead to dysgeusia. Smoking, alcohol, and suboptimal oral self-care can also contribute to taste disturbances. [46] [54]

Management strategies for dysgeusia include:
- Xerostomia management.
- Client education on oral self-care, smoking cessation, and reducing alcohol consumption.
- Alpha lipoic acid and zinc supplements have been shown to improve taste perception, although research is limited.
- Lifestyle modifications, such as avoiding metallic silverware and bitter tasting foods, increasing the consumption of flavourful high-protein foods.
- Changing the causative antihypertensive medication, if possible. [46]

Orthostatic hypotension
Antihypertensive medications may cause light-headedness or syncope (i.e., orthostatic hypotension) on standing after prolonged treatment in the supine position, resulting in falls and injury. Orthostatic hypotension can be managed by allowing the client to sit upright for a few minutes, followed by assistance on standing. [46]

NSAIDs
NSAIDs are often prescribed in oral health settings for their analgesic and anti-inflammatory properties. Long-term use of NSAIDs can reduce the effects of some antihypertensive medications. The average rise in blood pressure with chronic NSAID use is 5 mmHg, which over time can increase risk of CVD, including heart failure. Managing this potentially detrimental reaction includes limiting the duration of treatment with NSAIDs to five days, as the use of NSAIDs for a few days shows almost no clinical relevance. In addition to limiting duration, other analgesics, such as acetaminophen, may be prescribed to avoid this effect. [46] [55]

Vasoconstrictors
Vasoconstrictors in local anesthetic, such as epinephrine, helps to provide profound anesthesia by mitigating systemic uptake, thus extending duration and providing local hemostasis. In addition, dulling sensory nerve fibres can alleviate stress experienced by

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the client. Stress can increase blood pressure. However, administering vasoconstrictors into the circulation system can also cause an increase in blood pressure. Therefore, special consideration must be given to clients with hypertension. [46]

Research has concluded administering local anesthetic with vasoconstrictors shows little clinical relevance when done within accepted guidelines. Appropriate local anesthetic administration containing a vasoconstrictor outweighs the risk by limiting stress-induced increases in blood pressure resulting from dental pain and anxiety. The effects of vasoconstrictors on systemic blood pressure are dose-dependant. Aspiration before injection to mitigate system load is also important.

In general, limiting the epinephrine dose to 0.04 mg per appointment is safe for adults with hypertension. This is equivalent to the use of:

- One cartridge of anesthetic containing 1:50,000 epinephrine;
- Two cartridges of anesthetic containing 1:100,000 epinephrine; or
- Four cartridges of anesthetic containing 1:200,000 epinephrine

Due to the high concentration of epinephrine in epinephrine-impregnated gingival retraction cords, their use is discouraged in clients with hypertension. [46] [49]

Antihypertensive medications, adverse effects, and interactions [46] [50]

Type	Examples: drug name (brand name)	Adverse effects	Potential interactions
Angiotensin-converting enzyme (ACE) inhibitors	Benazepril (Lotensin) Captopril (Capoten) Enalapril (Vasotec) Fosinopril (Monopril) Lisinopril (Prinivil, Zestril) Moexipril (Univasc) Quinapril (Accupril) Ramipril (Altace) Trandolapril (Mavik)	Xerostomia Dysgeusia Ageusia Lichenoid reactions Rash Chronic cough Angioedema of lips, tongue, face Burning mouth Gingival bleeding Neutropenia	NSAIDs Orthostatic hypotension
Angiotensin II receptor blockers	Azilsartan (Edarbi) Candesartan (Atacand) Eprosartan (Teveten) Irbesartan (Avapro) Losartan (Cozaar) Olmesartan (Benicar) Telmisartan (Micardis) Valsartan (Diovan)	Xerostomia Dysgeusia Angioedema of lips, tongue, face Sinusitis Chronic cough	Systemic antifungals Sedatives Orthostatic hypotension
Calcium channel blockers	Amlodipine (Norvasc) Diltiazem (Cardizem) Felodipine (Plendil) Isradipine (Dynacirc)	Xerostomia Gingival hyperplasia Dysgeusia Erythema multiform	Macrolide antibiotics NSAIDS

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Type	Examples: drug name (brand name)	Adverse effects	Potential interactions
	Nicardipine (Cardene) Nifedipine (Adalat, Procardia) Nisoldipine (Sular) Verapamil (Isoptin)		
Diuretics	Chlorothiazide (Diuril) Chlorthalidone (Hygroton, Thalitone) Hydrochlorothiazide (HydroDiuril, Microzide) Indapamide (Lozol) Metolazone (Mykrox, Zaroxolyn)	Xerostomia Lichenoid reactions	NSAIDS Epinephrine Orthostatic hypotension
Beta blockers			
Cardioselective	Acebutolol (Sectral) Atenolol (Tenormin) Betaxolol (Kerlone) Bisoprolol (Zebeta) Metoprolol (Lopressor)	Xerostomia	
Noncardioselective	Carteolol (Cartrol) Nadolol (Corgard) Penbutolol (Levatol) Pindolol (Visken) Propranolol (Inderal) Timolol (Blocadren)	Xerostomia Dysgeusia Lichenoid reactions	NSAIDs Epinephrine
Alpha blockers	Doxazosin (Catapres) Prazosin (Minipress) Terazosin (Hytrin)	Xerostomia Dysgeusia	NSAIDS Orthostatic hypotension
Combined alpha/beta blockers	Carvedilol (Coreg) Labetalol (Normodyne, Trandate)	Dysgeusia	NSAIDS Orthostatic hypotension
Central acting agents	Clonidine (Catapres, Kapvay) Guanfacine (Tenex) Methyldopa (Aldomet)	Xerostomia Dysgeusia Lichenoid reactions (specific to methyldopa) Sedation Parotid pain	Orthostatic hypotension
Vasodilators	Hydralazine (Apresoline, Dralzine) Minoxidil (Loniten)	Lupus-like oral and skin lesions Lymphadenopathy Gingival bleeding Infections Facial flushing	NSAIDS Orthostatic hypotension

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Dental anxiety[14]
Various oral health procedures can cause an increase in blood pressure because of dental fear and anxiety experienced before and during treatment. Therefore, it is crucial to create an anxiety-free environment for clients with and without hypertension.

Strategies to manage dental anxiety and stress may include:
- Short morning appointments
- Establishing a good rapport with the client
- Appropriate pain management during treatment
- Premedication with sedative/anxiolytic agents one hour before the appointment.
- Administering nitrous oxide
- Using music during treatment has been shown to reduce stress. [46] [47] [50]

Take home messages
- Hypertension is often asymptomatic. Oral health clinicians may be the first to detect undiagnosed hypertension or find that hypertension is uncontrolled despite pharmacological intervention. For this reason, it is essential to screen clients' blood pressure and refer for further assessment as warranted. Early diagnosis and treatment are critical to reduce the burden of CVD complications.
- A comprehensive medical history, including any medications, is necessary to manage clients with hypertension, as antihypertensive medications can cause adverse oral effects, impact oral care, and negatively interact with drugs commonly prescribed in oral healthcare.
- Oral health clinicians need to be aware of the risk factors associated with hypertension so they can counsel clients early to help prevent the condition.
- Promoting good oral health and educating clients on the link between hypertension and oral health reduces the risk of periodontal disease and potentially the risk of hypertension, lessening the burden of cardiovascular and oral diseases and their related sequelae.

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Client Resources

Oral Health and Overall Health, ODHA Factsheet
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Periodontal (Gum) Disease, ODHA Factsheet
https://odha.on.ca/wp-content/uploads/2016/08/Gum-Disease.14.1-copyright.pdf

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Brushing, Flossing, Rinsing, ODHA Factsheet
https://odha.on.ca/wp-content/uploads/2016/08/Brushing-Flossing.23.1.pdf

Dry Mouth, ODHA Factsheet
https://odha.on.ca/wp-content/uploads/2016/08/ODHA-Facts-Dry-Mouth.VFS18-copyright.pdf

Smoking and Smokeless Tobacco, ODHA Factsheet
https://odha.on.ca/wp-content/uploads/2016/08/ODHA-Facts-Smoking.VFS19.1-copyright.pdf

Smokers' Helpline Online for help and information on quitting smoking, vaping and tobacco: www.smokershelpline.ca or call 1-877-513-5333

Tools for a smoke-free life
https://www.canada.ca/en/health-canada/campaigns/quit-smoking.html

Support to quit smoking
https://www.ontario.ca/page/support-quit-smoking

Quit Smoking with STOP on the Net
https://intrepidlab.ca/en/stop/stop-on-the-net

Additional Resources

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