

Periodontal Treatment in Patients with Cardiovascular and Endocrine Disorders: A Review

M. Esther Albina^{1*}, Sahithi Annavarapu², Asma Naaz³, C. V. Sruthi Vyaasini⁴, Minakshi⁵, Manvitha Pabbathi⁶

¹Department of Periodontics, Tirumala Dental College, Nizamabad, Telangana, India.

²Consultant Periodontist, Raksha Superspecialty Dental Clinic, Hyderabad, Telangana, India.

³Department of Periodontics, Meghna Institute of Dental Sciences, Nizamabad, Telangana, India.

⁴Department of Periodontology and Oral Implantology, J.N.Kapoor DAV (C) Dental College, Yamuna Nagar, Haryana, India.

⁵Department of Periodontology, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh, India.

⁶Department of Periodontics and Implantology, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India.

Abstract

The presence of systemic disease in patients requiring periodontal therapy creates challenges for management. Alteration of treatment plans, with emphasis on physician consultation and preventive periodontal care, is frequently needed to minimize the impact of periodontal disease on the systemic condition. Conversely, detection and treatment of systemic disorders may impact upon the status of the periodontium and the success of periodontal therapy.

Keywords: Diabetes, Hypertension, Periodontal, Thyroid.

INTRODUCTION

A large number of patients seeking periodontal care have significant medical conditions which may alter the treatment plan and therapy provided. Cardiovascular diseases account for two-thirds of all consultations, followed by respiratory diseases and diabetes. As the age of the average dental patient increases in the coming years, it is predicted that a greater number of older and more medically compromised patients will seek dental care.^[1,2]

Identification of potential systemic disorders is a prerequisite to assessing the impact of such conditions on periodontal care. The method of choice for such identification is the comprehensive medical history.^[3] The evaluation attempts to detect physical disabilities, infectious diseases, harmful habits, and signs and symptoms suggestive of undiagnosed or poorly controlled systemic disorders.^[4] Since the success of periodontal treatment may be affected by identification and control or modification of systemic factors, the medical history generally comprises the first step in therapy. Care of the medically compromised patient often is complicated, requiring specialists. However, the occurrence of compromised patients is so common that practitioners must know how to recognize and prevent problems associated with dental management, and to use consultations and referrals appropriately.^[5]

DISCUSSION

Cardiovascular diseases

Cardiovascular diseases are the most prevalent category of systemic disease. These conditions include hypertension, angina pectoris, myocardial infarction (MI), previous cardiac bypass surgery, previous cerebrovascular accident, congestive heart failure (CHF), presence of cardiac pacemakers, or automatic cardioverter-defibrillators, and infective endocarditis (IE).^[5,6]

Hypertension

Hypertension is the most common cardiovascular disease. Hypertension is divided into primary and secondary types. Approximately 95% of all hypertensive patients have primary hypertension. The remaining 5% have secondary hypertension.^[7] Periodontal procedures should not be performed until accurate BP measurements and histories

Address for correspondence: Dr. M. Esther Albina,
Department of Periodontics, Tirumala Dental College, Nizamabad,
Telangana, India. Mobile: +91-9949522124.
E-mail: estheralbina149@gmail.com

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have been taken to identify those patients with significant hypertensive disease. The time of day also should be recorded because BP varies significantly throughout the day.^[8]

If a patient is currently receiving antihypertensive therapy, consultation with the physician may be warranted regarding the current medical status, medications, periodontal treatment plan, and patient management. The dentist must inform the physician regarding the estimated degree of stress, length of the procedures, and complexity of the individualized treatment plan.^[9] Morning dental appointments were once suggested for hypertensive patients. However, recent evidence indicates that BP generally increases around awakening and peaks at midmorning. Lower BP levels occur in the afternoon; therefore afternoon dental appointments may be preferred.^[5]

No routine periodontal treatment should be given to a patient who is hypertensive and not under medical management. For patients with systolic BP greater than 180 mm Hg or diastolic BP greater than 110 mm Hg, treatment should be limited to emergency care until hypertension is controlled. Analgesics are prescribed for pain and antibiotics for infection. Acute infections may require surgical incision and drainage, although the surgical field should be limited because excessive bleeding may be seen with elevated BP.^[10]

When treating hypertensive patients, the clinician should not use a local anesthetic containing an epinephrine concentration greater than 1:100,000 nor should a vasopressor be used to control local bleeding. Local anesthesia without epinephrine may be used for short procedures (<30 min). In a patient with hypertensive disease, however, it is important to minimize pain by providing profound local anesthesia to avoid an increase in endogenous epinephrine secretion.^[5,10]

The benefits of the small doses of epinephrine used in dentistry far outweigh the potential for hemodynamic compromise. The smallest possible dose of epinephrine should be used, and aspiration before injection of local anesthetics is critical. If the hypertensive patient exhibits anxiety, use of conscious sedation in conjunction with periodontal procedures may be warranted.^[10]

Beta-adrenergic receptor antagonists, or β -blockers, are typically used to treat hypertension. β -blockers are either cardioselective, blocking only β -1 cardiac receptors (β 1 receptors), or nonselective, blocking both β -1 cardiac receptors and β -2 peripheral receptors (β 2 receptors).^[8]

Ischemic heart diseases

Ischemic heart disease includes disorders such as angina pectoris and MI. Angina pectoris occurs when myocardial oxygen demand exceeds supply, resulting in temporary myocardial ischemia. Because stress often induces an acute anginal attack, stress reduction is important. Profound local anesthesia is vital, and conscious sedation may be indicated for anxious patients. Supplemental oxygen delivered by nasal cannula may also help prevent intraoperative anginal attacks.^[11,12]

Patients who treat acute anginal attacks with nitroglycerin should be instructed to bring their medication to dental appointments. Nitroglycerin should also be kept in the office emergency medical kit. The patient's nitroglycerin should be readily accessible on the dental tray in case it is needed during treatment. Because the shelf life of nitroglycerin is relatively short, the expiration date of the patient's nitroglycerin should be noted, as should the expiration date of the nitroglycerin in the office's emergency medical kit.^[13]

Restrictions on use of local anesthetics containing epinephrine are similar to those for the patient with hypertension. In addition, intraosseous injection with epinephrine-containing local anesthetics using special systems (e.g., Stabident, Fairfax Dental) should be done cautiously in patients with ischemic heart disease, because it results in transient increases in heart rate and myocardial oxygen demand.

If the patient becomes fatigued or uncomfortable or has a sudden change in heart rhythm or rate during a periodontal procedure, the procedure should be discontinued as soon as possible.^[5]

A patient who has an anginal episode in the dental chair should receive the following emergency medical treatment:

1. Discontinue the periodontal procedure
2. Administer 1 tablet (0.3–0.6 mg) of nitroglycerin sublingually
3. Reassure the patient, and loosen restrictive garments
4. Administer oxygen with the patient in a reclined position
5. If the signs and symptoms cease within 3 min, complete the periodontal procedure if possible, making sure that the patient is comfortable. Terminate the procedure at the earliest convenient time
6. If the anginal signs and symptoms do not resolve with this treatment within 2–3 min, administer another dose of nitroglycerin, monitor the patient's vital signs, call the patient's physician, and be ready to accompany the patient to the emergency department
7. A third nitroglycerin tablet may be given 3 min after the second. Chest pain that is not relieved by three tablets of nitroglycerin indicates likely MI. The patient should be transported to the nearest emergency medical facility immediately.^[9]

MI is the other category of ischemic heart disease encountered in dental practice. Dental treatment is generally deferred for at least 6 months after MI because peak mortality occurs during this time. After 6 months, MI patients can usually be treated using techniques similar to those for the stable angina patient.^[14]

CHF

CHF is a condition in which the pump function of the heart is unable to supply sufficient amounts of oxygenated blood to meet the body's needs. Patients with poorly controlled or untreated CHF are not candidates for elective dental procedures. These individuals are at risk for sudden death, usually from ventricular arrhythmias.^[12]

Medical management of CHF may include use of calcium channel blockers, direct vasodilators, diuretics, angiotensin-converting enzyme inhibitors, α -receptor blockers, and cardiotonic agents such as digoxin. Each of these medications has potential side effects that may have an impact on periodontal therapy. Because of the presence of orthopnea (inability to breathe unless in an upright position) in some CHF patients, the dental chair should be adjusted to a comfortable level for the patient rather than being placed in a supine position. Short appointments, stress reduction with profound local anesthesia and possibly conscious sedation, and use of supplemental oxygen should be considered.^[9,12]

IE

IE is a disease in which microorganisms colonize the damaged endocardium or heart valves. Although the incidence of IE is low, it is a serious disease with a poor prognosis, despite modern therapy.^[15]

The practice of periodontics is intimately concerned with the prevention of IE. In fact, IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities than caused by a dental procedure. Thus the prevention of periodontal inflammation is paramount.^[16]

The following guidelines should aid in the development of periodontal treatment plans for patients susceptible to IE:

- Periodontal disease is an infection with potentially wide-ranging systemic effects. In patients at risk for IE, every effort should be made to eliminate this infection. Teeth with severe periodontitis and a poor prognosis may require extraction. Teeth with less severe involvement in a motivated patient should be retained, treated, and maintained closely
- All periodontal treatment procedures (including probing) require antibiotic prophylaxis; gentle oral hygiene methods are excluded from the study. Pretreatment chlorhexidine rinses are recommended before all procedures, including periodontal probing because these oral rinses significantly reduce the presence of bacteria on mucosal surfaces
- To reduce the number of visits required and thereby minimize the risk of developing resistant bacteria, numerous procedures may be accomplished at each appointment, depending on the patient's needs and ability to tolerate dental treatment
- When possible, allow at least 7 days between appointments (preferably 10–14 days). If this is not possible, select an alternative antibiotic regimen for appointments within a 7-day period
- Evidence does not support or refute a need to place patients at risk for IE on extended antibiotic regimens after treatment. Therefore patients who have had periodontal surgery are not generally placed on antibiotics for the 1st week of healing (unless there are specific indications to do so). If patients are placed on such regimens, the dosages are inadequate to prevent

endocarditis during ensuing appointments. Therefore the standard prophylactic antibiotic dose is still needed. For example, if a patient was placed on 250 mg of amoxicillin 3 times a day for 10 days after periodontal surgery and was returning to the office for more treatment on the 7th day, the patient would still require a full 2.0-g dose of amoxicillin before that treatment. Alternatively, clindamycin or azithromycin could be used at the second appointment

- Regular recall appointments, with an emphasis on oral hygiene reinforcement and maintenance of periodontal health, are extremely important for patients susceptible to IE.^[12,17]

Endocrine disorders

The endocrine system is responsible for hormonal secretion and is closely related to the central nervous system, as it diversifies its functions through the hypothalamus and pituitary glands. Following are some endocrine disorders that are relevant from dental point of view:^[18]

- a. Diabetes mellitus
- b. Thyroid disorders
 - Hyperthyroidism
 - Hypothyroidism.
- c. Adrenal insufficiency

Diabetes mellitus

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia due to defects in insulin secretion, insulin action, or both resulting in disturbances of carbohydrate, fat, and protein metabolism.^[19]

The diabetic patient requires special precautions before periodontal therapy. Over the past decade, the medical management of diabetes has changed significantly in an effort to minimize the debilitating complications associated with this disease.^[20] If the clinician detects intraoral signs of undiagnosed or poorly controlled diabetes, a thorough history is indicated. Periodontal therapy has limited success in the presence of undiagnosed or poorly controlled diabetes.^[12]

If a patient is suspected of having undiagnosed diabetes, the following procedures should be performed:

1. Consult the patient's physician
2. Analyze laboratory tests: Fasting blood glucose and casual glucose
3. Rule out acute orofacial infection or severe dental infection; if present, provide emergency care immediately
4. Establish best possible oral health through nonsurgical debridement of plaque and calculus; institute oral hygiene instruction. Limit more advanced care until diagnosis has been established and good glycemic control obtained.^[21]

If a patient is known to have diabetes, it is critical that the level of glycemic control be established before initiating periodontal treatment. The primary test used to assess glycemic control in a known diabetic individual is the glycosylated (or glycated) hemoglobin (Hb) assay. HbA1c is more often used

test. This assay has been shown by a large international study to provide an accurate measure of the average blood glucose concentrations over the preceding 2–3 months.^[22]

The therapeutic goal for many patients is to achieve and maintain an HbA1c below 8%. Patients with relatively well-controlled diabetes (HbA1c <8%) usually respond to therapy in a manner similar to nondiabetic individuals. Poorly controlled patients (HbA1c >10%) often have a poor response to treatment, with more postoperative complications and less favorable long-term results.^[23]

Periodontal infection may worsen glycemic control and should be managed aggressively. Diabetic patients with periodontitis should receive oral hygiene instructions, mechanical debridement to remove local factors, and regular maintenance. When possible, an HbA1c of less than 10% should be established before surgical treatment is performed. Systemic antibiotics are not needed routinely, although recent evidence indicates that tetracycline antibiotics in combination with scaling and root planing may positively influence glycemic control. If the patient has poor glycemic control and surgery is absolutely needed, prophylactic antibiotics may be given; penicillins are most often used for this purpose. Frequent reevaluation after active therapy is needed to assess treatment response and prevent recurrence of periodontitis.^[20,24]

Diabetic patients should be asked whether they have glucometers and how often they use them. Because these devices provide instantaneous assessment of blood glucose, they are highly beneficial in the dental office environment.^[25]

The following guidelines should be observed:

1. Patients should be asked to bring their glucometer to the dental office at each appointment
2. Patients should check their blood glucose before any long procedure to obtain a baseline level. Patients with blood glucose levels at or below the lower end of normal before the procedure may become hypoglycemic intraoperatively. It is advisable to have such a patient consume some carbohydrate before starting treatment. For example, if a 2-h procedure is planned and the pretreatment glucose level is 70 mg/dL (lower end of normal range), providing 4 oz of juice preoperatively may help prevent hypoglycemia during treatment. If pretreatment glucose levels are excessively high, the clinician should determine whether or not the patient's glycemic control has been poor recently. This can be done by thorough patient questioning and by determining the most recent HbA1c values. If glycemic control has been poor over the preceding few months, the procedure may need to be postponed until better glycemic control is established. If glycemic control has been good, and the currently high glucometer reading is a fairly isolated event, the surgical procedure may proceed
3. If the procedure lasts several hours, it is often beneficial to check the glucose level during the procedure to ensure that the patient does not become hypoglycemic

4. After the procedure, the blood glucose can be checked again to assess fluctuations over time
5. Any time the patient feels symptoms of hypoglycemia, blood glucose should be checked immediately. This may prevent onset of severe hypoglycemia, a medical emergency.^[26]

The most common dental office complication seen in diabetic patients taking insulin is hypoglycemia. Hypoglycemia does not usually occur until blood glucose levels fall below 60 mg/dL. However, in patients with poor glycemic control who have prolonged hyperglycemia (high blood glucose levels), a rapid drop in glucose can precipitate signs and symptoms of hypoglycemia at levels well above 60 mg/dL.^[27]

Periodontal treatment often can be timed to avoid peak insulin activity. Checking the pretreatment glucose with the patient's glucometer, checking again during long procedures, and checking again at the end of the procedure provides a better understanding of the patient's insulin pharmacodynamics and help prevent hypoglycemia. If hypoglycemia occurs during dental treatment, therapy should be immediately terminated. Treatment guidelines include the following:^[27,28]

- Provide approximately 15 g of oral carbohydrate to the patient
- 4–6 oz of juice or soda.

Thyroid disorders

Thyroid hormones influence the growth and maturation of tissues, energy metabolism and turnover of both cells and nutrients.^[18]

- i. Thyrotoxicosis or poorly controlled thyroid disorders^[29]
 - Should not receive therapy until their condition stabilizes
 - Medications such as epinephrine and other vasopressor amines not to be given.
- ii. Hyperthyroidism^[30]
 - Carefully evaluated to determine the level of medical management
 - Treated in a way that limits stress and infection
 - Medication such as epinephrine and other vasopressors given with caution.

Adrenal insufficiency

Disorders that affect the adrenal glands result in overproduction or underproduction of adrenal products. Excess production of the adrenal glands results in the overproduction of cortisol, mineralocorticoids, androgens, or estrogen in isolation or combination. Insufficient adrenocortical function may occur primarily or secondarily. Primary adrenocortical insufficiency is uncommon and is known as Addison's disease. The more common form, secondary adrenocortical insufficiency, results from hypothalamic or pituitary disease or from the administration of exogenous corticosteroids.^[18,31]

Dental management guidelines for patients with adrenal insufficiency^[12,31]

- Define risk subjects
- Ensure patients take their usual glucocorticoid dose before a stressful surgical procedure
- Schedule surgery in the morning, when cortisol level usually is highest
- Provide proper stress reduction, since anxiety can increase cortisol demand
- Minor surgeries require minimal steroid coverage
- Major surgeries and those lasting more than 1 h and involving general anesthesia should be performed in a hospital with steroid supplementation
- Use of nitrous oxide-oxygen or intravenous/oral benzodiazepine sedation helpful
- Avoid general anesthesia for out patient procedures, since it increases glucocorticoid demand
- Avoid the use of barbiturates, since these drugs increase the metabolism of cortisol and decrease blood level of cortisol
- Discontinue drug therapy that decreases cortisol levels (e.g.: ketoconazole) at least 24 h before surgery, with the consent of physician.
- Provide adequate post-operative pain control
- Monitor blood pressure throughout the procedure and after. Any fall below 100/60 mm Hg should receive fluid replacement and if needed corticosteroids
- Recognize signs of hypotension, hypoglycemia and hypovolemia and take corrective action quickly.

CONCLUSION

A wide variety of systemic diseases may result in severe, rapid periodontal attachment loss, often with premature exfoliation of teeth. The rarity of many of these conditions makes controlled clinical trials of therapeutic approaches impossible. Instead, published case reports reveal that numerous treatment methods have been attempted, with varying results. However, more recent literature suggests the possibility of greater success in the future using combinations of mechanical periodontal treatment, antimicrobial agents, and systemic drugs to modulate the host response.

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