

**Consideration for Cardiac Patient in Dental Set-UP: A Review**

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**Abstract**

Dental management in medically compromised patients is very important aspect in daily clinical practice but also it is the most neglected one which results in adverse consequences. Proper emergency kit should be available in every clinic and dentist should have basic knowledge of every medical condition. Also before commencing any dental procedure or prescribing any medications, prior consultation from the physician should be done. Patients with cardiovascular diseases represent one of the most

common groups of medically compromised patients seen in dental practice. Hence the aim of present review article is to provide complete details of management of Cardiac patient in dental set-up.

**Keywords:** Cardiovascular disease, Oral manifestation, Dental management

**Introduction**

The dental management of patients with special needs, whether medically compromised or with severe disabilities, is sometimes complex and requires a

multidisciplinary and integral approach.<sup>1</sup> Patients with cardiovascular diseases represent one of the most common groups of medically compromised patients seen in dental practice. This group includes patients with hypertension, ischemic heart disease and arrhythmias. Cardiac patients may collapse in the dental clinic due to variety of cardiac emergencies or drug interactions. Hence, patients with cardiac disease may pose a significant risk in dental clinics. Safe and effective dental management of such patients requires close medical and dental coordination, an understanding of the potential hazards during dental treatment, knowledge of drugs used in treatment of cardiovascular diseases.<sup>2</sup> Hence the aim of present review article is to provide complete details of management of Cardiac patient in dental set-up.

### Oral manifestation of cardiovascular diseases

Oral health condition may be a good predictor of cardiovascular health. The mouth is full of bacteria, both good and evil, and the "bad" can enter the bloodstream and cause inflammation of the blood vessels, leading to cardiovascular diseases. Studies have shown that tooth loss and inflamed gums (periodontitis) are markers of heart disease. Another indicator is the color of the lips. Lips are usually red, but may be bluish (cyanosis) in people with heart problems due to system failure and cardiovascular to supply oxygenated blood to tissues; blue lips are probably only caused by a temporary lack of oxygen and pass quite quickly. Heart disease is complex and difficult when it affects adults, but in children the impact is much greater.<sup>3</sup>

Table 1: Oral manifestation of cardiovascular diseases	
Condition	Oral manifestation
Cardiac failure	Cardiac failure has symptoms evolving with purple cyanosis. The oral mucosa is pink-cyanotic, especially during periods of decompensation, and the labial mucosa is blue-purple. <sup>4</sup>
Atherosclerosis	It is manifested in the oral cavity by osteoporosis, to which is added the resorption of dental alveolar processes and changes in the temporomandibular joint. In the oral mucosa, the epithelium thins, keratinizes, the salivary glands atrophy, which leads to decreased salivary secretion, which becomes increasingly viscous, by increasing the percentage of mucin. Decreased salivary secretion is a major cause of aggravation of cariogenic factors. Local factors, such as dental joint disorders and decreased oro-dental hygiene, play a predominant role. Tooth mobility evolves slowly. The dental pulp changes its structure because the vessels and nerve fibers are poorly irrigated by progressive obliteration of the apical phenomenon. Decreased vascularity and pulpal fibro-calcareous degeneration decrease pulpal resistance to subsequent aggressions. <sup>5</sup>
Hypertension	Gingival bleeding was one of the common clinical features seen in hypertensive patients. Hypo salivation was also found as one of the clinical manifestations in hypertensive patients. This hypo salivation was related to the sustained increase in both systolic as well as diastolic blood pressure and also in patients who were under antihypertensive medication especially with diuretics. <sup>5</sup>
Angina	There are no oral findings specific to angina (or coronary atherosclerotic heart disease in general); however, medications used to treat angina can result in oral changes. Gingival hyperplasia can be caused by calcium channel blockers (e.g., amlodipine, nifedipine, felodipine, verapamil, and

diltiazem).<sup>6</sup>

### Rules for safe dental treatment in cardiac patients

The basics of safe dental treatment of patients with cardiovascular diseases start with a comprehensive dental evaluation involving a thorough medical history and premedical assessment (mainly the assessment of vital signs like pulse, blood pressure, the rate and depth of respiration and temperature) at the first dental appointment is a necessity. Once the dentist discovers that the patient is hypertensive or has other cardiovascular problems, the risk associated with the proposed dental treatment should be weighed with regard to the medical conditions and/or current medications that will demand a modification in the manner in which dental care will be provided. It may also be necessary to evaluate the medications taken by the patients to prevent interaction of cardiac drugs with the drugs prescribed by the dentists.<sup>7</sup>

It is important to monitor the patient's condition and to interrupt procedures when the patient becomes restless or cardiac problems arise. An angina attack can occur in the dental chair due to stress, pain and anxiety triggers.<sup>8</sup> Pain can be felt in the jaw, from where it can radiate to the neck and throat, so in some cases the patient and the dentist may interpret it as toothache.<sup>9</sup>

Psychological and physiological stress during dental appointments has the potential to significantly alter hemodynamic stability. Dental treatment has the potential to induce stress. Such stress can be either physiological (pain) or psychological (anxiety, fear). The body responds to the stress by increased release of catecholamines (epinephrine and norepinephrine) from the adrenal medulla into the cardiovascular system. This, in turn, can increase the workload on the heart (that is, increased heart rate and strength of myocardial contraction and an increased myocardial oxygen requirement) in patients with

hypertension or coronary artery disease. Therefore patients with some forms of cardiovascular disease are vulnerable to physical or emotional stress that may be encountered during dental treatment.<sup>8</sup> This means a stress-reduction protocol is suggested for post-myocardial infarction patients, including profound local anesthesia, preoperative or intraoperative sedation and excellent post-operative analgesia. The dental visit should be short – up to 30 min – and in the middle of the day. Morning hours, with the highest incidence of myocardial infarction, and late afternoon hours, when fatigue and stress levels are high, should be avoided. During dental procedures, a supine position should be avoided, as it leads to the return of blood from peripheral areas to the central circulation system and may overload pulmonary circulation. In cases of systolic heart failure following myocardial infarction, this overload may result in the aggravation of heart failure, including pulmonary edema after re-verticalization, and further contribute to orthostatic syncope.<sup>10</sup>

The patient should continue to take the medication before the appointment as directed by the attending physician. If the patient's regular therapy includes nitrates, the patient should bring them. In cases of anxiety disorders and stress, administration of 5–10 mg of diazepam is recommended the night prior to the visit and 1–2 h before the treatment. In this case, the patient should not drive a motor vehicle.<sup>9</sup>

### Management of specific cardiac patient in dental setup

**Hypertension:** Hypertension is a chronic illness affecting more than a billion people worldwide. The high prevalence of the disease is concerning and must be considered when treating dental patients. Its lack of symptoms until more serious problems occur makes the

disease deadly. Dental practitioners can often be on the frontlines of prevention of hypertension by evaluating preoperative blood pressure readings, performing risk assessments, and knowing when to consider medical consultation of a hypertensive patient in a dental setting.

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Dental office is an ideal screening place to identify undiagnosed/uncontrolled patients with hypertension. Bogari DF et al. (2019) assesses the knowledge and behavior of dentists toward performing proper management of hypertensive patients in Saudi Arabia. He found that there was a lack of knowledge and behavior toward proper management of patients with hypertension in dental sociality. Broadening the breath of dentists' responsibilities to include screening and working together with physicians will help improve the community dental and general health of visiting patients and should be the goal of all dentists.<sup>12</sup>

#### **Dental management**<sup>6,13</sup>

1. A well-controlled hypertensive patient does not pose a risk in clinical practice.
2. Prior to dental treatment, the patient blood pressure should be recorded, and the treatment should be postponed if the values are higher. When the patient does not present good blood pressure control, it is best to refer him to the physician.
3. The patient is to be instructed to take his or her medication as usual on the day of dental treatment. Prior to such treatment, the patient blood pressure should be recorded.
4. **Optimal Pain Control-** Effective control of operative and post-operative pain after surgical, periodontal, or other dental procedure is the most important thing that a dentist can do to minimize elevation in blood pressure.

5. **Stress and anxiety reduction:** It is preferable for the visits to be brief and in the morning. The prescription of anxiolytic agents may prove necessary in particularly anxious patients (5-10 mg of diazepam the night before and 1-2 hours before the appointment) before dental treatment, or alternatively sedation with nitrous oxide may be considered.
6. In the case of emergency dental visits, treatment should be conservative, with the use of analgesics and antibiotics. NSAIDs should not be prescribed for longer than this five-day period.
7. **Caution with the use of vasoconstrictors:** Incorporation of a vasoconstrictor to local anesthetic provides better pain control, which in turn reduces anxiety and stress usually associated with dental treatment. But the commonly used vasoconstrictors such as epinephrine and neocobefrin can cause a rise in heart rate. Hence, the use of vasoconstrictor should be limited in individuals with cardiac disease, taking care not to exceed 0.04 mg of adrenaline (4.5ml of standard local anaesthetic solution containing 0.009 mg of Adrenaline tartrate per ml). In turn, if anesthetic reinforcement is needed, it should be provided without a vasoconstrictor. It is also important to eliminate intravascular administration therefore careful aspiration before any injection is mandatory.

**Dysrhythmias:** Patients with cardiac dysrhythmias may require special precautions during dental therapy. Antidysrhythmic drugs commonly are used, many of which have side effects such as gingival overgrowth or xerostomia that may impact the dentition or periodontium. The use of local anesthetics with vasoconstrictors may be contraindicated in patients with refractory dysrhythmias; dental treatment may best be accomplished in a controlled medical setting with careful cardiac monitoring. Some

dysrhythmias are treated with implantable pacemakers or automatic defibrillators in addition to drug therapy. Pacemakers and automatic defibrillators present a low risk of infective endocarditis and do not require prophylactic antibiotic coverage before dental therapy. Older pacemaker models were unipolar and could be disrupted by equipment that generates an electromagnetic field, such as ultrasonic instruments and electrocautery units. Most pacemakers placed within the last 30 years are bipolar and generally are not affected by the small electromagnetic fields created by dental equipment. Automatic defibrillators often activated without warning, which may cause sudden movement and endanger the patient in the dental setting. The dental health care provider must be aware of this potential during treatment, and may need to stabilize the operating field through use of a bite-block or other such devices.<sup>14-16</sup>

**Ischemic heart disease:** Ischemic heart disease, most commonly manifested as angina or myocardial infarction, is the major cause of sudden death in the United States. It usually is caused by decreased coronary blood flow, increased myocardial oxygen demand or both. There are three types of angina: stable, unstable and variant (Prinzmetal's angina). It is clear from the literature that psychological or physiological stress may exacerbate ischemic symptoms. Therefore, use of a stress reduction protocol and profound anesthesia is an integral part of periodontal therapy for these patients.<sup>17,18</sup>

Stable angina generally is caused by atherosclerotic narrowing of coronary vessels and presents with infrequent episodes of pain, usually precipitated by physical exertion or emotional stress. The medications most commonly used to treat patients with stable angina include nitrates such as nitroglycerin,  $\beta$ -adrenergic blocking agents and calcium channel blockers.<sup>19</sup>

Periodontal treatment planning may be altered in these patients by the need for shorter appointments, use of only small amounts of vasoconstrictor in local anesthetics and possible indications for preoperative or intraoperative conscious sedation. Supplemental oxygen delivered via a nasal canal may help prevent intraoperative anginal attacks. The drugs of choice for treating an acute anginal attack are 100 percent oxygen and sublingual nitroglycerin. The patient may be instructed to bring his or her own nitroglycerin tablets to each appointment, and the health care provider also may place nitroglycerin tablets in the emergency medical kit. Unstable angina occurs when there is a dramatic increase in the frequency or severity of anginal attacks or when angina appears while the patient is at rest. Patients with unstable angina generally are not candidates for elective dental therapy, and consultation with the patient's physician usually is indicated. If emergency dental care is needed, preoperative anxiolytic agents may be indicated for stress reduction and to minimize endogenous epinephrine release. The dentist should closely monitor the patient's hemodynamic status and oxygen saturation before and during treatment. Variant angina (that is, Prinzmetal's angina) usually occurs at rest and probably is caused by coronary artery spasm. The other major category of ischemic heart disease frequently encountered by oral health care providers is myocardial infarction. Researchers and clinicians commonly recommend that patients not receive routine dental care for at least six months after experiencing a myocardial infarction. This recommendation is based on the fact that the peak mortality rate following myocardial infarction occurs during the first year, primarily resulting from the increased electrical instability of the myocardium after the infarction.<sup>20</sup>

**Post-myocardial infarction dental treatment:** The risk of death or myocardial infarction within 30 days of a dental procedure is less than 1%. However, a patient following a heart attack is at high risk of the re-occurrence of cardiovascular events.<sup>21</sup>

The most burdened group of patients are those treated conservatively – currently only a small number, due to the pressure of cardiac society guidelines pertaining to early invasive treatment. In these cases, the natural course of the disease lasts for more than 6 weeks. This is the period needed for a post-infarction scar to form, to create collateral circulation and to restore the contractility of damaged (but not necrotic) areas of the myocardium. To avoid late infarction complications, all procedures excluding emergency treatments should be avoided in this period. This also applies to dental surgery. Former AHA guidelines extended this period to 6 months, during which avoiding dental surgery was recommended, as the risk of complications was considered highest in this period.<sup>22</sup>

Due to advances in cardiac management in the last 2 decades, these limitations are no longer recommended. Firstly, there is widespread access to invasive methods of treatment of infarctions, allowing immediate reperfusion of tissues, thus avoiding early and late complications. In addition, on the 2nd day after myocardial infarction patients are subjected to early cardiac rehabilitation; this is continued after discharge in rehabilitation centers, where patients undergo fitness tests in the first month of convalescence. When a patient's test tolerance is found to be good, the risk of recurrence is considered low, and if the attending physician does not find otherwise, there are no contraindications to dental treatment.<sup>22,23</sup>

### **Heart failure**

Heart failure (HF) is defined as the incapacity of the heart to function properly, pumping insufficient blood towards the tissues and leading to fluid accumulation within the lungs, liver and peripheral tissues.<sup>24</sup>

### **Dental management**

Dental treatment should be limited to emergency care, preferably in a hospital setting, in patients with heart failure. Placing a patient with poorly compensated heart failure in supine position can cause shortness of breath and can precipitate pulmonary edema, thus complicating dental treatment procedures.<sup>25</sup>

It is advisable to avoid vasoconstrictors in patients receiving digitalis as it can precipitate cardiac arrhythmias. Since aspirin can lead to sodium and fluid retention, it is prudent to avoid it in patients with heart failure. Medications used by patients with heart failure can be associated with certain side effects of dental significance like xerostomia, lichenoid reaction, and orthostatic hypotension.<sup>9</sup>

Dental treatment is to be limited to patients who are in stable condition. The patient should be placed in the semi-supine position in a chair, with control of body movements (which should be slow), in order to avoid orthostatic hypotension. In the event of an emergency and after contacting the emergency service, the patient should be placed seated with the legs lowered, and receiving nasal oxygen at a rate of 4-6 liters/minute. Sublingual nitroglycerin tablets are indicated (0.4-0.8 mg), and the dose may be repeated every 5 or 10 minutes if blood pressure is maintained.<sup>8</sup>

### **Infective Endocarditis**

Endocarditis is a life-threatening disease, although it is relatively uncommon. Endocarditis usually develops in individuals with underlying structural cardiac defects who develop bacteremia with organisms likely to cause



endocarditis. Some surgical and dental procedures and instrumentations involving mucosal surfaces or contaminated tissue cause transient bacteremia that rarely persists for more than 15 minutes. Blood-borne bacteria may lodge on damaged or abnormal heart valves or on the endocardium or the endothelium near anatomic defects, resulting in bacterial endocarditis or endarteritis.<sup>8</sup>

**Dental management**

Table 2: Antibiotic regimens for a dental procedure

Route	Drug	Regimen: Single dose 30 to 60 min before procedure	
		For adult	For children
Oral	Amoxicillin	2g	50 mg/kg
Unable to take oral medication	Ampicillin or Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV
Allergic to penicillins or ampicillin — Oral	Cephalexin*	2g	50 mg/kg
	Clindamycin	600 mg	20 mg/kg
	Azithromycin	500 mg	15 mg/kg
	clarithromycin		
Allergic to penicillins or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone* or Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM/IV 20 mg/kg IM/IV
* Cephalosporins should not be used in a person with a history of anaphylaxis, angioedema or urticaria with penicillins or ampicillin.			

**Conclusion**

There is an increasing population of cardiac compromised people in the community. Most will require dental treatment at some stage and will usually seek it away from a hospital environment. Thus there is a real risk that adverse interactions between medical conditions and dental treatment may occur on some occasions, even fatal ones. It is not possible for any one individual to know the details of all medical conditions, their treatment and the possible interactions with dental treatment. However, by the application of some sound general principles the risks of any potential interactions can be evaluated. The

Antimicrobial prophylaxis is recommended for procedures associated with significant bleeding from hard or soft tissues, periodontal surgery, scaling, and professional teeth cleaning. In such an event, data from experimental animal models suggest that antimicrobial prophylaxis administered within 2 h following the procedure will provide effective prophylaxis.<sup>26</sup>

essential steps are: knowledge of the medical history of all patients, potential drug interactions and management of medical emergencies.

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