

# Dental Management of the Cardiovascular Compromised Patient: A Clinical Approach

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## ABSTRACT

Cardiovascular disease trends, complications, and associated therapeutics, impact the dental health and treatment. Such patients require special consideration with regard to when and which dental treatment is appropriate and what precautions are required. A clinical approach is provided for the dental management of patients with Arterial hypertension, Heart failure, and Ischemic Heart disease, Cardiac Arrhythmias, Infective Endocarditis, Stroke and Cardiac Pacemaker. A Medline-PubMed search was conducted of the literature over the last 20 years using the keywords: "cardiovascular diseases", "dental management", "arterial hypertension", "heart failure", "ischemic heart disease", "cardiac arrhythmias", "infective endocarditis", "stroke" and "cardiac pacemaker". A total of 46 articles were reviewed, of which 32 were literature reviews, 3 were expert committee guides and updates and 11 original research papers. The appropriate management of dental patients with cardiovascular disease is contingent on appropriate assessment and evaluation. This article aims to allay many of these uncertainties by describing the commoner cardiac conditions, the risk they pose during dental practice and how they may affect dental treat-

ment. It outlines prophylactic and remediable measures that may be taken to enable safe delivery of dental care.

**Key words:** Cardiovascular disease, Dental management, Arterial hypertension, Heart failure, Ischemic heart disease, Cardiac arrhythmias, Infective endocarditis, Stroke and cardiac pacemaker.

**Key message:** This review aims to allay many of these fears and focuses on common Cardiovascular compromised conditions and risk they pose during dental practice that necessitate extra awareness and caution to prevent potential complications causing otherwise unnecessary morbidity and mortality.

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## INTRODUCTION

Cardiovascular disease is the leading global cause of death, accounting for more than 17.3 million deaths per year.<sup>1</sup> Nearly half of all African-American adults have some form of cardiovascular disease. Compared with western countries, most Asian countries have higher age related mortality from cardiovascular disease.<sup>2</sup> Along with the associated morbidity, such disorders are important because many patients are associated with treatment. So, patient with cardiovascular disease constitute risk cases in dental practice. The dental management of these medically compromised patients can be problematic in terms of oral complications, dental therapy, and emergency care. The present study consists of a literature review dental management of patients suffering from various cardiovascular diseases.

## MATERIALS AND METHODS

A Medline-PubMed search was conducted of the literature over the last 37 years using the keywords: "cardiovascular diseases", "dental management", "arterial hypertension", "heart failure", "ischemic heart disease", "cardiac arrhythmias", "infective endocarditis", "stroke" and "cardiac pacemaker". A total of 46 articles were reviewed, of which 32 were literature reviews, 3 were expert committee guides and updates and 11 original research papers.

## Cardiovascular diseases and their dental management

1. **Hypertension:** Hypertension is high blood pressure. Hypertension is defined as values >140 mmHg systolic pressure and/or >90 mmHg diastolic pressure.<sup>3,4</sup>

## Dental management:

1. A well-controlled hypertensive patients does not pose a risk in clinical practice.
2. 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.<sup>5,6</sup>
3. 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.
4. 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.<sup>7,8</sup>
5. Patients with cardiovascular disease are at a greater risk of massive endogenous adrenalin release secondary to deficient local anesthesia than of reaction to the small amount of vasoconstrictor used in local anesthetics.<sup>9,10,11,12</sup> Nevertheless, vasoconstrictor use should be limited, taking care not to exceed 0.04 mg of adrenaline.<sup>1</sup>

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2. **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>14</sup>

#### Dental management:

1. Dental treatment is to be limited to patients who are in stable condition.
2. 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.
3. In patients administered digitalis agents (digoxin, methyl digoxin), the vasoconstrictor dose is to be limited to two anesthetic carpules, since this drug combination can favor the appearance of arrhythmias.
4. Aspirin (acetylsalicylic acid) can lead to sodium and fluid retention, and therefore should not be prescribed in patients with heart failure.
5. 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>14,15</sup>
3. **Cardiac arrhythmias:** A cardiac arrhythmia can be described as an abnormality in rate, regularity, or site of origin of the cardiac impulse.<sup>16</sup>

#### Dental management:

1. Anxiolytics can be used to lessen stress and anxiety.<sup>16,17</sup>
2. Although modern pacemakers are more resistant to electromagnetic interferences, caution is required when using electrical devices (e.g., ultrasound and electric scalpels).<sup>18</sup>

If arrhythmia develops during dental treatment, the procedure should be suspended, oxygen is to be provided, and the patient vital signs are to be assessed. Sublingual nitrites are to be administered in the event of chest pain. The patient should be placed in the Trendelenburg position, with vagal maneuvering where necessary (Valsalva maneuver, massage in the carotid pulse region, etc.).

4. **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>19,20</sup> *Streptococcus viridans* ( $\alpha$ -hemolytic streptococci) is the most common cause of endocarditis following dental or oral procedures.

#### Dental Management:

1. Individuals who are at risk for developing bacterial endocarditis should establish and maintain the best possible oral health to reduce potential sources of bacterial seeding.
2. In general, 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>23</sup>
5. **Ischemic Heart Disease:** Ischemic heart disease is characterized by a reduction (partial or total) in coronary blood flow. In 90% of all cases,

this occurs following thrombus formation secondary to an atheroma plaque that occludes the arterial lumen, though other factors such as cold, physical exercise or stress can act as coadjuvant factors or (less frequently) trigger the event themselves.<sup>24</sup> Chest pain (angina) occurs when coronary occlusion is partial and no myocardial necrosis is produced, while acute myocardial infarction is observed when coronary occlusion is total and necrosis is produced as a result. In turn, sudden death may also occur, generally as a result of arrhythmias.<sup>14</sup>

#### Dental management:

1. In dental practice a minimum safety period of 6 months has been established before any oral surgical procedure can be carried out. After this safety period, the treatment decision should be established on the basis of the situation and medical condition of each individual patient.<sup>25,26,14</sup> If nitrates are used, the patient should bring them to each visit to the dental clinic, in case chest pain develops.<sup>18</sup>
2. In the case of very anxious patients, premedication can be administered to lessen anxiety and stress (5-10 mg of diazepam the night before and 1-2 hours before treatment).
3. The patient should be placed in the position most comfortable for him or her (semi-supine), and should get up carefully in order to avoid orthostatic hypotension. Depending on the patient, blood pressure and pulse oxymetric monitoring may be required before and during dental treatment.
4. If the patient is receiving anticoagulants, the international normalized ratio (INR) on the day of treatment should be determined, and treatment should be provided within the recommended limits (< 3.5), with local hemostasis if surgery is planned. If the patient is receiving antiplatelet medication, excessive local bleeding is to be controlled.
5. The local hemostatic measures that can be used comprise bone wax, sutures, gelatin of animal origin, regenerated oxidized cellulose, collagen, platelet rich plasma, thrombin, fibrin sealants, electric or laser scalpels, antifibrinolytic agents such as tranexamic acid.<sup>27</sup>
6. **Cardiac pacemakers and implantable cardioverter-defibrillators:** Automated Implantable Cardioverter Defibrillators (AICDs) or otherwise simply known as Implantable Cardioverter Defibrillators (ICDs) have been in use for more than 30 years. An ICD is a small battery-powered electrical impulse generator that is implanted in patients who are at a risk of sudden cardiac death due to ventricular fibrillation and ventricular tachycardia.

In practice, the most common cause of problems is the electrosurgical unit or diathermy. Diathermy is best avoided in patients with pacemakers. If diathermy must be used, bipolar diathermy is preferred. If unipolar diathermy must be used, the ground pad should be placed so that the pacemaker or its leads do not lie within the electric field (between the ground pad and the instrument). Thus, it is commonly recommended that if diathermy is to be used, ICD devices should be programmed off immediately prior to surgery and on again postoperatively.<sup>28,29</sup>

#### Dental Management:

1. All patients who have any type of implantable cardiac devices should provide the details of manufacturer's identification card like manufacturer of the device, model number, serial number, date of implantation, and mode of operation to their oral health provider.<sup>30,31,32</sup>
2. Dental professionals should encourage sterilized working environment.
3. Before any therapeutic service dentist should consult patient's cardiologist and if needed, cardiologist should be informed about the dental procedure.

4. For oral prophylaxis, the dentist should consider the use of hand scalers although piezoelectric scalers are documented to be safe.
5. Care should be taken not to place electrical cords over patient's chest.
6. Unshielded pacemakers should be covered with a lead apron.
7. Dentists should be aware of symptoms of pacemaker malfunction such as difficulty in breathing, lightheadedness, dizziness, change in pulse rate, prolonged hiccoughing, swelling in chest and arm, and chest pain. In such conditions, cardiologist should be consulted immediately.
7. **Patients on anticoagulant therapy:** Anticoagulant treatment is very common in cardiac patients. For a healthy person without anticoagulant treatment, the International Normalized Ratio (INR) = 1. Anticoagulant treatment usually targets to an INR between 2.0–3.0. In certain high-risk situations (e.g. a mechanical mitral valve prosthesis), higher INR values 2.5–3.5 (–4.0) may be required.<sup>33-36</sup>

### Dental management:

Warfarin treatment may interact with several drugs, causing derangement of anticoagulant treatment. Following are the key recommendation for dental treatment.<sup>37</sup>

1. The risk of significant bleeding in patients on oral anticoagulants and with a stable INR in the therapeutic range 2-4 (i.e.<4) is very small and the risk of thrombosis may be increased in patients in whom oral anticoagulants are temporarily discontinued. Oral anticoagulants should not be discontinued in the majority of patients requiring outpatient dental surgery including dental extraction.
2. The risk of bleeding in patients on oral anticoagulants undergoing dental surgery may be minimized by:
  - a. The use of oxidized cellulose (Surgicel) or collagen sponges and sutures.
  - b. 5% tranexamic acid mouthwashes used four times a day for two days. Tranexamic acid is not readily available in most primary care dental practices.
3. Patients taking warfarin should not be prescribed non-selective NSAIDs and COX-2 inhibitors as analgesia following dental surgery.
8. **Stroke Patient:** Stroke (produced by cerebral hemorrhage or cerebral ischemia) is a serious neurological accident, often fatal, due to a sudden interruption of the oxygenated blood supply to the brain.<sup>38,39</sup>

### Dental management:

1. Blood pressure and pain should be monitored and maintained during the entire intervention.<sup>40,41</sup>
2. If the required dental treatment may cause bleeding, anticoagulant systemic medication may cause serious hemorrhage, therefore anti-coagulant drugs like heparin should be stopped at least 6-12 hours before treatment. Six hours after bleeding, when blood clots are built up, heparin systemic treatment can be resumed.<sup>42</sup>
3. The minimal amount of anesthetic solutions should be injected, concentration of added epinephrine should be very low (1:100,000 or 1:200,000).<sup>43</sup>
4. If the patient shows symptoms of stroke, he should get oxygen therapy immediately and should be referred to a hospital as soon as possible.<sup>44-46</sup>

### CONCLUSION

Cardiovascular disease is one of the most common disease in the developed and developing countries as well. In most developing countries

it is the most common cause of death followed by cancer and cerebrovascular disease. It is therefore important for dental surgeons to know the medical problems of each individual patient, the treatments received, and the possibilities for dental treatment. In addition, dental surgeons must be able to identify medical emergencies and adopt the opportune measures to avoid them or treat them quickly and effectively.

### CONFLICT OF INTEREST

No Conflict of interest declared

### ABBREVIATION USED

HF: Heart failure; NSAIDs: Nonsteroidal anti-inflammatory drugs; INR: international normalized ratio; AICDs: Automated Implantable Cardioverter Defibrillators; ICDs: Implantable Cardioverter Defibrillators.

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