REVIEWS ARTICLE

Oral Cavity: A mirror for cardiovascular disorder

Nidhi Thakur,1 Vishal kumar2

ABSTRACT

Dentistry and Medicine are interrelated entities within the health care delivery system. The dentist is a specialist who must be able to diagnose practically all types of disorders involving the stomatognathic system. He should be familiar oral manifestations of systemic diseases and should be competent to manage them and further refer those patients for consultation. Certain life threatening emergencies can and do occur in dental office. The ability to provide supportive care during these periods of crises is essential.

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INTRODUCTION

Life threatening emergency could be due to Cardiac disorders which are important in relation to dental practice for many reasons. Cardiac disorder is responsible for 34.3% of all deaths i.e. 1 out of every 2.9 deaths occur because of cardiac problems.1,2 During the last decade, poor oral health has been found to be significantly correlated to cardiovascular disease.

Our professional duties are not limited to the provision of dental care. As the new guidelines clearly indicate oral health care providers can have a significant impact on the prevention, early diagnosis, evaluation and management of patients with cardiovascular diseases and we are thus challenged to take a proactive part in the overall health care of all patients.

CONGENITAL HEART DISEASE

Congenital heart disease (CHD) is one of the most common inborn defects occurring in approximately 0.8% of newborn infants.

COARCTATION OF THE AORTA

Morgagni (1760) first described coarctation of the aorta4.

Oral manifestations

The abnormal vascular pressure in the head and the neck during early development of coarctation of the aorta results in a marked enlargement of the mandibular arteries and the branches leading to the individual teeth. The radiolucencies resulting from these enlarged vascular channels are unusually conspicuous in jaw radiographs5. Healy presented two consistent dental findings prominence of the circulatory canals in the dental radiographs and prognathism. The dental pulps also revealed marked dilatation of the capillaries.6

TETRALOGY OF FALLOT

The malformation is composed of 4 constant features:

- Pulmonary stenosis
- Overriding aorta
- Ventricular septal defect
- Right ventricular hypertrophy

Source of Support: Nil
Conflict of Interest: None

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Oral manifestations

- There is a general bluish red discoloration of the oral mucosa with severe marginal gingivitis and bleeding.
- The tongue is often deeply fissured and edematous
- The teeth are structurally normal, but both the deciduous and the permanent teeth are delayed in their eruption.

DENTAL MANAGEMENT OF CONGENITAL HEART DISEASE

- Dentoalveolar infection is more common and potentially devastating in individuals with congenital heart disease. Kaner et al (1946) demonstrated that dentin was poorly calcified in those with congenital heart disease and that this may predispose such individuals to caries. Systemic septic embolization, a form of so called paradoxic embolization, is common. Valachovic and Hargreaves believe pulpectomy to be contraindicated in primary dentition since root resorption can expose untreated accessory canals that might seed the blood with organisms.
- The treatment plan for those with congenital heart disease must include the following:
  a. Medical consultation
  b. Antibiotic prophylaxis
  c. Prompt and vigorous treatment of all oral infection

VALVULAR HEART DISEASE

Endocarditis, or inflammation of the endocardium, results in deformities of the valves, causing incompetence of the valve or narrowing (stenosis) of the orifice guarded by the valve.

Dental Management

- During each patients evaluation a history of congenital or rheumatic heart disease must be sought, as well as a history of heart murmur and rheumatic fever.
- Hard physical findings within the dentist’s realm are not the rule with valvular heart disease, but important information sometimes may be gleaned through careful evaluation of the vital signs and examination of head, neck and extremities.
- Antibiotics prophylaxis is indicated for all dental procedures.

RHEUMATIC DISORDER

Rheumatic fever is an inflammatory disease which occurs as a delayed sequel to pharyngeal infection with group A streptococci.

Dental aspects and management of rheumatic fever

Acute rheumatic fever patients are exceedingly unlikely to be seen during an attack, but emergency dental treatment may be necessary. No special precautions should be necessary as there appears to be little risk of Infective endocarditis at this stage. The most common method of management is to give antibiotic cover on the assumption that the history is valid. General anesthesia should be avoided, but if essential must be given in hospital.

INFECTIVE ENDOCARDITIS

Infective endocarditis is a fatal disease which occurs due to colonization of the endocardium or prosthetic valve by the microorganisms. It remains a life threatening infection despite improvements in diagnosis and management.

Conditions considered for Antibiotic Prophylaxis by American Heart Association (AHA)

High Risk Conditions

- Prosthetic cardiac valves
- Bioprosthetics
- Homograft
- Previous history of Bacterial Endocarditis
- Complex cyanotic CHD
- Surgically constructed systemic pulmonary shunts

**Moderate Risk Condition**
- Other congenital cardiac malformations
- Acquired valve dysfunction
- Hypertrophic cardiomyopathy
- Mitral Valve prolapse with valvular regurgitation

**Low or Negligible Risk Conditions:**
- Isolated atrial septal defect
- Ventricular septal defect
- Patent ductus arteriosus
- Previous coronary arteries bypass graft surgery
- Mitral valve prolapses without valve regurgitations
- Physiologic, functional, or innocent heart murmurs
- Previous Kawasaki disease without valve dysfunction
- Previous rheumatic fever without valve dysfunction
- Cardiac pacemakers and implanted defibrillators

**Recommendations by AHA regarding dental procedures and antibiotic prophylaxis:**

**Endocarditis prophylaxis recommended:**
- Dental extractions
- Periodontal Surgery, scaling, root planning, probing and recall maintenance
- Placement of dental implants
- Reimplantation of avulsed teeth
- Endodontic instrumentation or surgery beyond the apex of teeth
- Subgingival placement of orthodontic fibers/strips
- Initial placement of orthodontic bands but not brackets
- Intraligamentary local anesthetic injections
- Prophylactic cleaning of teeth or implants where bleeding is anticipated

**ANTIBIOTIC REGIMES**

<table>
<thead>
<tr>
<th>Situation</th>
<th>Doses</th>
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<tbody>
<tr>
<td><strong>Standard general prophylaxis</strong></td>
<td>Adults: amoxicillin 2 g</td>
</tr>
<tr>
<td></td>
<td>Children: amoxicillin 50 mg/kg oral 1 h before procedure</td>
</tr>
<tr>
<td><strong>Unable to take oral medication</strong></td>
<td>Adults: ampicillin 2 g V or IM</td>
</tr>
<tr>
<td></td>
<td>Children: ampicillin 50 mg/kg IM or IV, within 30 min before procedure</td>
</tr>
<tr>
<td><strong>Allergic to penicillin</strong></td>
<td>Adults: clindamycin 600 mg/ azithromycin or clarithromycin 500 mg</td>
</tr>
<tr>
<td></td>
<td>Children: clindamycin 20 mg/kg azithromycin or clarithromycin 15 mg/kg 1 h before procedure</td>
</tr>
<tr>
<td><strong>Allergic to penicillin and unable to take oral medication</strong></td>
<td>Adults: clindamycin 600 mg IV or IM</td>
</tr>
<tr>
<td></td>
<td>Children: 20 mg/kg IV within 30 min before procedure</td>
</tr>
</tbody>
</table>

Guidelines for such prophylaxis are of 2 types. UK (BSAC) guidelines and AHA guidelines. The AHA guidelines are commonly used.
ADA risk Procedures

**Prophylaxis in susceptible patients:**\(^{12-20}\)

**High risk category**
- Dental extractions
- Periodontal procedures including surgery, scaling, root planing and probing
- Dental implant placement, reimplantation of teeth
- Endodontic instrumentation or surgery beyond the tooth apex
- Subgingival placement of antibiotic fibers or strips
- Initial placement of orthodontic bands but not brackets
- Intraligamentary local anesthetic injections
- Prophylactic cleaning of teeth or implants with anticipated bleeding.

**Procedures not recommended for prophylaxis:**\(^{12,16}\)
- Restorative dental procedures with or without retraction cord.
- Local anesthetic injections (except for intraligamentary)
- Intracanal endodontic procedures, post placement and build up
- Placement of rubber dams
- Postoperative suture removal
- Placement of removable orthodontic or prostodontic appliances
- Taking oral impressions
- Taking oral radiographs
- Orthodontic appliance adjustment
- Shedding of primary teeth.

**Dental management**

Infected endocarditis only rarely follows dental procedures and it is not proven that antimicrobial prophylaxis effectively prevents endocarditis.\(^{21}\) Inflammation of the oral tissues such as gingivitis leaves an “open door” for microbes. It would appear prudent, at least from medico legal perspective to provide antibiotic prophylaxis as recommended by AHA or BSAC.

**ISCHEMIC HEART DISEASE**

This condition represents a narrowing of one or more of the coronary arteries because of atherosclerotic plaque formation as a result of vascular injury.\(^{16}\)

**Dental identification and evaluation**

Dentists can usually identify patients with angina in 2 ways. The first is from health questionnaires that ask about heart trouble or chest pain,\(^{22}\) second is from patients reported use of medication.

**Oral manifestation**

Angina is a rare cause of pain in the mandible, teeth or other oral tissue or pharynx. Drugs used in the case of patients with angina may cause oral adverse effects such as lichenoid lesions (calcium channel blocker) gingival swelling (calcium channel blockers or ulcers (nicorandil))\(^{23}\)

**Oral Manifestations of myocardial infarction**

A myocardial infarction patient complains of pain radiating to head and neck region especially to mandible. It is generally described as dull aching pain .\(^{24}\)

**PERICARDIAL DISEASE**

The pericardium is a silent structure that normally causes no sound on auscultation and no findings on inspection or palpation.

**Dental management of pericarditis**

Asymptomatic patients with a history of pericardial disease requires no special management. Regular search for clinical signs of cardiac decompensation has to be carried out. These patients should therefore receive antibiotic chemoprophylaxis when dental care is provided.\(^{19}\)

**CARDIAC ARRHYTHMIAS**\(^{25}\)

A cardiac arrhythmia is defined as the
disturbance in the rhythm of heart.

**Dental Management of Cardiac Arrythmias**

I. Unwarranted stress and excessive use of epinephrine should be avoided in these patients.

II. Patients with history of palpitations, dizziness, angina, dyspnea or syncope may have cardiac arrhythmia.  

III. The dentist can prevent many cardiac arrythmia related medical emergencies by being aware of the high risk patients.  

IV. Patients with AF presents a challenge for dental practitioners as these patients tend to be medically complex.  

V. We should also determine if patient is receiving anticoagulation therapy and if so, what agent is being used. If anticoagulant (warfarin) is used obtain international normalized ratio, or INR, values for patients. If INR value is between 2.0 and 4.0 we can consider leaving anticoagulation protocol unchanged for:  

   • Simple oral surgical procedures.  
   • Consider using tranexamic acid mouth rinses post surgically  
   • Avoid using non steriodal anti inflammatory agents.

VI. Appointments are best made for late morning or early afternoon.

VII. Reduce patient’s anxiety by giving premedication with a short acting benzodiazepine

VIII. Vasoconstrictors in appropriate concentration in the local anesthetic are beneficial.

IX. Gingival retraction cords containing epinephrine should be avoided.

**CARDIAC FAILURE**

Cardiac failure is the inability of the ventricles to maintain normal cardiac outflow.

**Dental Management of Heart Failure**

The dentist first must assess the degree of failure and adequacy of treatment. The New York Heart Association (NYHA) has devised a functional classification of heart disease that grades the severity of CHF. It also can be used to aid in the dental management of patients.

1. Class I – No limitation of physical activity. No dyspnea, fatigue, or palpitations with ordinary physical activity.

2. Class II – Slight limitation of physical activity is present. These patients have fatigue, palpitation and dyspnea with ordinary physical activity but are comfortable at rest.

3. Class III – Marked limitation of activity less than ordinary physical activity results in symptoms, but patients, are comfortable at rest.

4. Class IV – Symptoms are present at rest, and any physical exertion exacerbates the symptoms.

The dental treatment for these patients should not be undertaken without the consent of physician. Patients with unstable CHF present a definite challenge that mandates specific management considerations.

**HYPERTENSION**

Hypertension is a leading cause of mortality world wide. It affects more than 20% of the adult population and about 3% of the pediatric population.

**Oral health considerations**

**Gingival enlargement**

Drugs used in these patients such as calcium channel blockers may cause gingival enlargement.

**Periodontal disease**

Studies have demonstrated a possible link between periodontal disease and coronary heart disease. Inflammation associated with periodontal disease provides an environment for transient bacteraemia to occur during activities of daily living like eating, tooth brushing and flossing. Periodontal infection in patients with hypertension appears to represent another major risk factor for ischemic heart disease.

**Lichenoid stomatitis**

A condition called lichenoid stomatitis can be
seen in hypertensive patients. The diagnosis can be confirmed when the condition can be resolved after the offending drug is discontinued.\textsuperscript{28}

\textbf{Xerostomia}
It is a common complication of antihypertensive drug therapy. Reduced salivary flow is generally related to drugs parasympathetic or antimuscarinic effect.\textsuperscript{28}

\textbf{Dental Considerations for Hypertensive Patient}

1. Vital signs should be monitored.
2. Stress and anxiety can elevate the blood pressure.
3. General anesthesia is not recommended on an outpatient basis.
4. Local anesthetics are recommended for patients with hypertension because they can decrease pain and increase comfort. Most recommendations advise caution in using local anesthetics with epinephrine in hypertensive patients. The maximum recommended dose of local anesthetic solution for a patient with hypertension is two 1.8ml cartridges (for a total dose of 3.6ml) with 1 in 100000 units epinephrine for per appointment\textsuperscript{29-33} given slowly with aspiration with one quadrant at a time
5. The efficacy of antihypertensive agents can be decreased by some NSAIDS.
6. Lichenoid reaction has been reported with many anti hypertensives.
7. In hypertensive patient undergoing oral and maxillofacial surgery perioperative management of acute and emergent hypertension is of great concern. Pre and post operative pain control are important factors contributing to blood pressure management.

\textbf{CONCLUSION}

Cardiovascular disorder is the leading causes of mortality worldwide. It is a multifactorial disorder which can have different clinical presentations depending on the part of the cardiovascular system involved. The recent research work has suggested the significant correlation between the dental infection and the cardiovascular disorder. Poor oral condition has been found to be strongly correlated to cardiovascular diseases as well as cerebral infarction. The dental team can play a vital role in monitoring, detecting and reinforcing compliance with recommended therapies. An apt knowledge can also help us to detect the vast number of undetected cases of cardiovascular disorders and effective dental care can be rendered by working in collaboration with physician.

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