

Prosthodontic Considerations in Cardiovascular Patients- A Comprehensive Prospective

Dr. Sumit Singh Phukela

Professor and Head, Department of Prosthodontics, Faculty Of Dental Science, SGT University,
Gurgaon, India, E Mail sumit.phukela@sgtuniversity.org

Abstract

Prosthodontic treatment involves the replacement & restoration of teeth by artificial substitutes. Its focus is to restore function, esthetics & comfort. Cardiovascular diseases (CVD) comprise of a group of diseases of the heart and vascular system affecting majority of individuals worldwide. Ischemic heart disease, Hypertension, Dysrhythmias, and Infective Endocarditis are some of the cardiovascular conditions most commonly seen among the population. Prosthodontics can offer exceptional satisfaction for both Patient & the Dentist. The present review throws some light on various cardiovascular conditions commonly seen in Prosthodontic practice and a systematic approach toward their management.

Key words ;Hypertension Angina Pectoris Myocardial Infarction Congestive Heart Failure

Introduction

Disease can be defined as a definite deviation from the normal state, characterized by a series of symptoms. Disease may be caused by developmental disturbances, genetic factors, metabolic factors, living agents, & physical & chemical or the radiant energy or the cause may be unknown. It can transform unhealthy, unattractive dentition with poor function into a comfortable, healthy occlusion. Co-existent cardiovascular disease is the most frequently cited medical condition for patient referral from general dental practitioners to hospital departments, which reflects widespread concern over potential problems during treatment¹. Cardiovascular diseases are one of the main causes of mortality in the developed world^{2,3}. The prevalence of CVD is reported to be 2–3 times higher in the urban population as compared to the rural population.⁴ Important goal of treatment to manage patients with cardiovascular diseases is to deal with all the identified risk factors involved. Current medications which the patients are taking and allergies to any drugs and also any potential drug interactions and side effects are noted⁵. The present

study offers a review of the heart diseases most often seen in prosthodontic practice, such as ;Hypertension Angina Pectoris Myocardial Infarction Congestive Heart Failure



FIGURE 1

HYPERTENSION

Hypertension is a key risk factor for cardiovascular disease⁶. Hypertension has been identified by WHO as one of the most significant risk factors for morbidity and mortality worldwide and is responsible for the deaths of approximately nine million people annually⁷. Hypertension is largely identified in this way by physicians routinely or opportunistically assessing blood pressure in a primary care clinic setting⁸. However, it has been estimated that between a third and a half of hypertensive patients remain undiagnosed, indicating the need for better screening⁹. Once a person has been screened and found to have high blood pressure, ambulatory blood pressure monitoring (ABPM) is regarded as the most accurate way to diagnose hypertension and is recommended by guidelines to routinely confirm elevated blood pressure readings^{10,11}. Advances in technology have allowed for the development of new 'cuff-less' BP monitoring devices however, which continuously monitor BP without disruption to daily activities. Cuff-less BP monitoring devices utilize smartphone or wearable sensor technologies that can estimate BP from ECG signals, Photoplethysmogram (PPG) signals (using infrared light on the finger to estimation of skin blood flow), or a combination of both.¹²

Hypertension



FIGURE 2

Management Of Hypertension

Self-monitoring of blood pressure can improve blood pressure control and is an increasingly common part of hypertension management. It is well tolerated by patients and has been shown to be a better predictor of end organ damage than clinic measurement.^{13,14,15} Hypertension is treated with medications which may have an impact on dental/prosthetic therapy because of their numerous side effects. These include orthostatic hypotension, dehydration, sedation, xerostomia & depression. *These side effects may alter treatment*

- Orthostatic hypotension affects a patient brought from a supine to an upright position

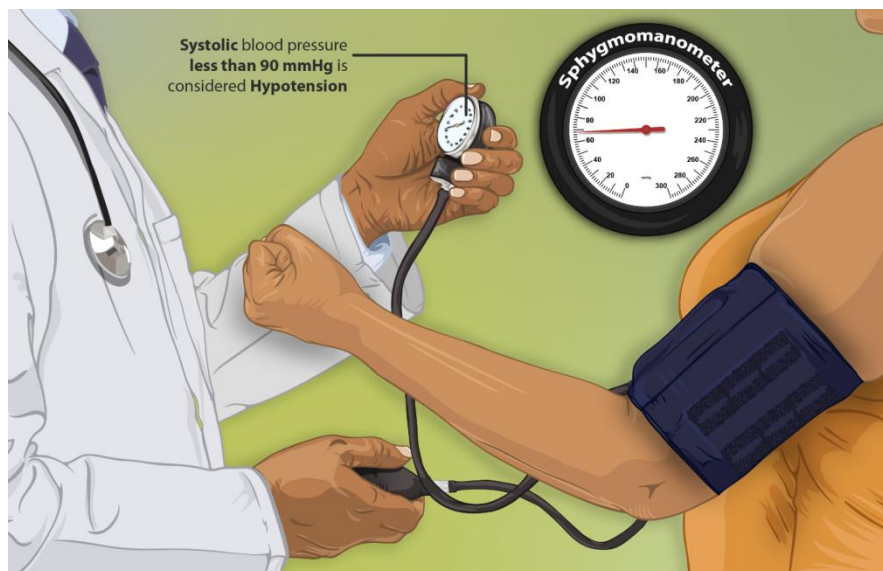


FIGURE 3

The patient may faint therefore for such patients the dental chair should be set upright gradually

Among the 13 broad categories of oral side effects of 200 most frequent prescribed drugs reported side effects are mainly of Xerostomia. This may lead to increased periodontal diseases, caries & bacterial infection caused by loss of protection by saliva.



FIGURE 4

Xerostomia also decreases the valve seal of soft tissue – borne removable prosthesis & increases the risk of abrasions & sorespots. Management of such patients includes saliva substitutes, salivary stimulants, frequent glasses of water throughout the day, strict control of diet to decrease cariogenicity & avoidance of alcohol & tobacco products. Calcium channel blockers used to treat hypertension or congestive heart failure can cause gingival hyperplasia around the teeth or implants (similar to dilatin) & have been linked to erythema multiforme & other types of oral ulcerations



FIGURE 5

Anxiety greatly affects the blood pressure, therefore a stress reducing protocol is indicated for a hypertensive patient. An early appointment is beneficial because the medication may still have an effect on the elderly patient

ANGINA PECTORIS



FIGURE 6

Angina pectoris (AP) is the clinical manifestation of inadequate myocardial oxygen delivery and is common among patients with stable ischaemic heart disease¹⁶ Heberden's classic description of the symptoms was a 'painful and most disagreeable sensation in the breast, which seems as if it would extinguish life...but the moment they stand still, all this uneasiness vanishes'¹⁷. The exact etiology of stable angina is not well defined; however, it is thought to be secondary to a mismatch between myocardial supply and demand^{18,19}. Angina pectoris or chest pain or cramp of the cardiac muscle, is a form of coronary heart disease. Occasionally the myocardium needs more oxygen laden blood than it receives. Transient myocardial oxygen demand is in excess of the supply. It is a symptomatic expression of transient myocardial ischemia. The prognosis for patients with stable angina varies, but there is an annual mortality rate of up to 3.2%. Long-term prognosis is influenced by left ventricular systolic function, extent of coronary artery disease (CAD), exercise duration or effort tolerance, and comorbid conditions²⁰

Artherosclerosis of the coronary vessel is the usual cause, although anemia or hypotension, emboli, acquired arthritis, & hereditary connective tissue disease may also be involved

The classical symptom of retrosternal pain often develops during stress or physical exertion, radiates to the shoulders, left arm, or mandible, or right arm, or neck, palate & tongue. These symptoms are relieved by rest.

Management

The dental emergency kit should include nitroglycerine tablets (0.3 to 0.4 mg) or translingual spray, which are replaced every 6 months because of their short shelflife. During an angina attack all dental treatment should be stopped immediately. Nitroglycerine is administered sublingually & 100% oxygen is given at 6L/min, with the patient in a semi-supine or 45° position. Vital signs should be monitored after nitroglycerine is administered because transient hypotension may occur.

There is a decrease in pressure, which causes a decrease of the blood flow to brain

Pulse rate may increase up to 160 beats/min. Blushing of the face & shoulders is common

A headache may occur after administration, often analgesics are indicated

MYOCARDIAL INFARCTION

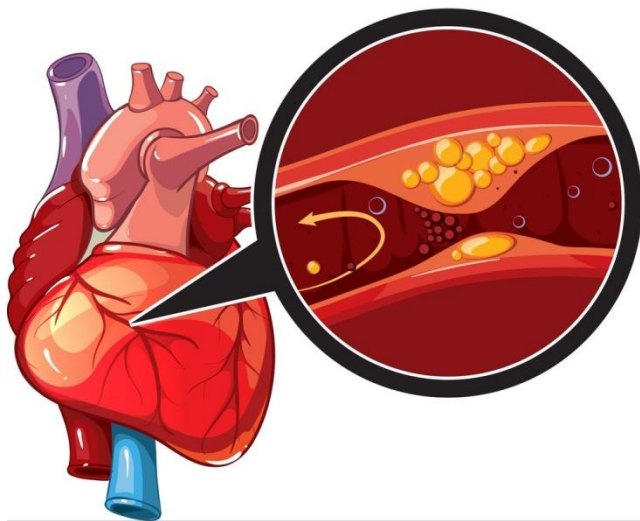


FIGURE 7

Acute Myocardial infarction, usually referred to in lay terms as a heart attack, is most often caused by a decrease or stoppage of blood flow to a portion of the heart, leading to necrosis of heart muscle.²¹ The role of thrombosis as a cause of AMI was debated for decades in the 20th century until the 1970s, when it

was clearly established as the cause of nearly all AMIs seen at autopsy and most large AMIs presenting clinically^{22,23}. Myocardial infarction is prolonged lack of oxygen that causes injury to the heart. The patient usually has severe chest pain in the substernal or left precordial area during a myocardial infarction episode

It may radiate to the left arm or the mandible. This pain is similar to angina pectoris but is more severe. Cyanosis, cold sweat, weakness, nausea or vomiting & irregular & increased pulse rate are all signs & symptoms of myocardial infarction

Management

The dental evaluation should include the dates of all episodes of myocardial infarction.

Medical consultation should preclude any extensive restorative or surgical procedure

Patients with a myocardial infarction episode in the preceding 6 months may have dental examinations without any special protocol *Any treatment should be postponed for 6 months*

Patients who experienced a Myocardial Infarction 6–12 months preceding consultation may have examinations, nonsurgical procedures & simple emergency surgical procedures performed after medical consultation

Longer procedures should be segmented into several shorter appointments

CONGESTIVE HEART FAILURE



FIGURE 8

Heart failure constitutes an increasing health hazard with major demands on health care resources. Recent major advances in drug treatment have yet to be translated into increased survival of heart failure patients

in the community at large .Knowledge of the basic pathophysiological processes and the mechanisms whereby they induce the clinical expressions of heart failure continues to increase, spurred on, not only by the development of new drugs, but also by increasing refinement of methods of evaluating their efficacy The targets for therapeutic intervention may be categorized (i) haemodynamic, neuroendocrine and metabolic disorders (ii) symptoms and quality of life, (iii) morbidity and mortality risks. Symptoms and quality of life are the prime concerns of the physician in the treatment in the individual patient²⁴

Medications prescribed for Congestive Heart Failure are classified as threeD's:

1. Digitalis (digoxin,lanoxin)
2. Diuretics (furosemide,lasix)
3. Dialators(ACE)

Trigeminal neuralgia like symptoms may occur with the use of digitalis

Calcium channel blockers are given to treat Congestive Heart Failure & Hypertension

SABACUTE BACTERIAL ENDOCARDITIS



FIGURE 9

Despite advances in medical and surgical therapy, Infective endocarditis (IE) remains a highly morbid and deadly infection. ²⁵Bacterial endocarditis is an infection of the heart valves or the endothelial surfaces of the heart. It is the result of bacterial growth on the damaged cardiac surfaces

The microorganisms most often associated with endocarditis following dental treatment are alpha-hemolytic streptococcus viridans & less frequently staphylococci & anaerobes. Diagnosis of *Bacterial endocarditis* is made in part by echocardiographic findings. The presence of an oscillating intracardiac mass, either on a valve, in the path of a regurgitant jet, or on implanted material, is the classic finding, though abscess or new partial dehiscence of a prosthetic valve also meets diagnostic criteria ²⁶*Dental procedures causing transient bacteremia are a major cause of bacterial endocarditis*

Altered surfaces of the heart have many causes, the best known to the dental profession is the mitral valve defect from rheumatic fever

The risk of bacterial endocarditis increases with the amount of intraoral soft tissue trauma



FIGURE 10

There is a correlation between the incidence of endocarditis & the number of teeth extracted or the degree of a preexisting inflammatory disease in the mouth



FIGURE 11

A 6 times higher incidence of bacteremia is found in patients with severe periodontal disease. If scaling & root planning are performed before subsequent procedures, the risk of endocarditis is greatly reduced. Chlorhexidine painted on the isolated gingiva or irrigation of the sulcus 3 – 5 minutes before any procedure reduces the postoperative bacteremia

CONCLUSION

Cardiovascular diseases result in changes of oral mucosa, maxilla and mandible. Patients with a wide variety of cardiovascular diseases are frequently encountered in Prosthodontic practice and it is necessary to treat them. Safe and effective dental management of such patients requires close medical and dental coordination, an understanding of the potential hazards during Prosthodontic treatment, knowledge of drugs used in treatment of cardiovascular diseases, and the potential adverse effects of drugs commonly used in periodontal practice. Prosthodontic procedure should not be planned until the systemic condition of the patient is evaluated.

References

1. Chaudhry S, Jaiswal R, Sachdeva S Dental considerations in cardiovascular patients: A practical perspective Indian Heart J 2016. Jul-Aug; 68(4) 572-575
2. Marta Cruz-Pamplona, Yolanda Jimenez-Soriano, Maria Gracia Sarrión-Pérez Dental considerations in patients with heart disease J Clin Exp Dent. 2011; 3(2): e97-105.
3. Jiménez-Beato G, Machuca-Portillo G. Heart and periodontal diseases: Does evidence exist of association? Med Oral Patol Oral Cir Buccal. 2005; 10: 215-20.
4. Park K. 23rd edition. 2016. Park's textbook of Preventive and Social Medicine
5. Jowett N.I., Cabot L.B. Patients with cardiac disease: considerations for the dental practitioner. *Br Dental J.* 2000; 189(6): 297–302
6. Curr Hypertens Rep. 2019; 21(6): 44. Kitt J, Fox R, Tucker KL, MacManus New Approaches in Hypertension Management: a Review of Current and Developing Technologies and Their Potential Impact on Hypertension Care
7. Organisation WH. World Health Organization (2013), A global brief on hypertension. Report. 2013 April 2013. Contract No.: WHO/DCO/WHD/2013.2

8. Fleming S, Atherton H, McCartney D, Hodgkinson J, Greenfield S, Hobbs FD, et al. Self-screening and non-physician screening for hypertension in communities: a systematic review. *Am J Hypertens*. 2015;28(11):1316–1324. doi: 10.1093/ajh/hpv02
9. Authorities SH. Health survey for England—2011, health, social care and lifestyles. Health and Social Care Information Centre: SHA (now Public Health England), 2011 (published Dec 2012) 20/12/2012. Report No.
10. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, et al. ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC) *Eur Heart J*. 2013;34(28):2159–2219. doi: 10.1093/eurheartj/ehf151.
11. Whelton PK, Carey RM, Aronow WS, Casey DE, Jr, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2018;138(17):e426–ee83
12. Stojanova A, Koceski S, Koceska N. Continuous blood pressure monitoring as a basis for ambient assisted living (AAL)—review of methodologies and devices. *J Med Syst*. 2019;43(2):24. doi: 10.1007/s10916-018-1138-8.
13. Little P, Barnett J, Barnsley L, Marjoram J, Fitzgerald-Barron A, Mant D. Comparison of acceptability of and preferences for different methods of measuring blood pressure in primary care. *BMJ*. 2002;325(7358):258–259. doi: 10.1136/bmj.325.7358.258
14. Bobrie G, Chatellier G, Genes N, Clerson P, Vaur L, Vaisse B, Menard J, Mallion JM. Cardiovascular prognosis of “masked hypertension” detected by blood pressure self-measurement in elderly treated hypertensive patients. *JAMA*. 2004;291(11):1342–1349. doi: 10.1001/jama.291.11.1342.
15. Grant RW, Pandiscio JC, Pajolek H, Woulfe A, Pelletier A, Kvedar J, Park ER. Implementation of a web-based tool for patient medication self-management: the Medication Self-titration Evaluation Programme (Med-STEP) for blood pressure control. *Inform Primary Care*. 2012;20(1):57–67. doi: 10.14236/jhi.v20i1.48

16. Winchester DE ,Pepine CJ Angina treatments and prevention of cardiac events: an appraisal of the evidence *European Heart Journal Supplements*, Volume 17, Issue suppl_G, December 2015, Pages G10–G18, <https://doi.org/10.1093/eurheartj/suv054>
17. DeLaChapelle CE The recognition of angina pectoris *Circulation* 1960;21:1061-1064
18. Opie LH. Angina pectoris: the evolution of concepts. *J CardiovascPharmacolTher.* 2004;9:S3–9. doi: 10.1177/107424840400900102
19. Talla R Rousan ,Udho Thadani Stable Angina Medical Therapy Management Guidelines: A Critical Review of Guidelines from the European Society of Cardiology and National Institute for Health and Care Excellence *EurCardiol.* 2019 Apr; 14(1): 18–22.
20. Thadani U. Current medical management of chronic stable angina. *J CardiovascPharmacolTher.* 2004;9(Suppl 1):S11–29.
21. Understanding myocardial infarction Version 1. *F1000Res.* 2018; 7: F1000 Faculty Rev-1378. Published online 2018 Sep3. doi: 10.12688/f1000research.15096.1 PMID: PMC6124376
22. Chandler AB, Chapman I, Erhardt LR, : Coronary thrombosis in myocardial infarction. Report of a workshop on the role of coronary thrombosis in the pathogenesis of acute myocardial infarction. *Am J Cardiol.* 1974;34(7):823–33. 10.1016/0002-9149(74)90703-6
23. DeWood MA, Spores J, Notske R, et al. : Prevalence of total coronary occlusion during the early hours of transmural myocardial infarction. *N Engl J Med.* 1980;303(16):897–902.
24. S. H. Taylor Congestive heart failure Towards a comprehensive treatment *European Heart Journal* (1996) 17 (Supplement B), 43-56
25. Jay R. McDonald Acute Infective Endocarditis *Infect Dis Clin North Am* 2009;23(3)643-664
26. Li JS, Sexton DJ, Mick N, et al. Proposed modifications to the Duke criteria for the diagnosis of infective endocarditis. *Clin Infect Dis.* 2000;30:633–8