Review Article

# Endodontic Considerations in a Medically Compromised Patient: An Overview

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## ABSTRACT

**Aim:** The aim of this article is to overview the published work on the endodontic treatment outcome on medically compromised patients in medical and dental literature for their better management.

**Summary:** The manual and electronic search was done to review the published literature. Endodontists must be well equipped with the knowledge to diagnose the underlying medical conditions and modify the dental treatment and medications accordingly in order to avoid any complication in medically compromised patients.


**Keywords**: Asthma, endodontics, cardiac diseases, diabetes, radiation therapy

## INTRODUCTION

One of the challenges faced by dental specialists today is in the assessment and management of patients with increasingly complex medical conditions. Not only has the average expectancy increased dramatically over the past 50 years, but geriatric patients are much more likely to be at least partially dentulous and have a complex medical history and the use of multiple medications. The common medical conditions encountered by the dentist in daily practice include patients with cardiac diseases, pulmonary diseases, hypertension, diabetes, bleeding disorders, pregnant patients and patients undergoing radiation therapy.[1]

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Patients suffering from cardiac diseases like ischemic heart disease, hypertension, valvular disease and heart murmurs are prone to angina or myocardial infarction, dental care providers must be prepared to recognize and manage so that untoward events are prevented or their impact mitigated. Dental patients suffering with obstructive pulmonary disease, such as chronic bronchitis, emphysema and bronchial asthma can be treated with minor adjustments in the procedures. Diabetes is a disease of metabolism resulting from impaired insulin secretion, varying degrees of insulin resistance or both. Management of the diabetic dental patient should focus on periodontal health and the delivery of comprehensive dental care with minimal disruption of metabolic homeostasis and recognition of diabetic co morbidities. To avoid any complication whether minor or life threatening due to bleeding disorders a dentist must learn to diagnose and manage bleeding disorders in a dental office.[2] In order to ascertain a patient's medical status a thorough history taking is of paramount importance. The present article contains a brief description of above mentioned diseases and guidelines for the endodontists to manage such medical conditions in a dental office.

## METHOD OF COLLECTION OF DATA

Dental and Medical literature pertaining to a medically compromised patient undergoing endodontic treatment was searched using PubMed and Medline data base. Special emphasis was given on peer review journals until July 2013. The MeSH words used were endodontic treatment, medically compromised patient and medical history. The peer reviewed journals pertaining to clinical applications were also included. The textbooks on the cardiovascular diseases, respiratory diseases, bleeding disorders and cancer were also referred for relevant information.

## HISTORY TAKING

Obtaining a thorough medical history is of great importance.[3] It is an information gathering process for assessing a

patient's health status, comprises a systematic review of the patient's chief or primary complaint, a detailed history related to this complaint, information about past and present medical conditions, pertinent social and family histories, and a review of symptoms by organ system. Interpretation of the information collected achieves three important objectives: enables the monitoring of medical conditions and the evaluation of underlying systemic conditions of which the patient may or may not be aware; provides a basis for determining whether dental treatment might affect the systemic health of the patient; provides an initial starting point for assessing the possible influence of the patient's systemic health on the patient's oral health and/or dental treatment.[4,5]

Despite its frequent omission from the dental record, the past dental history (PDH) is one of the most important components of the patient history. This is especially evident when the patient presents with complicating dental and medical factors such as restorative and periodontal needs coupled with a systemic disorder such as diabetes. Significant items that should be recorded routinely are the frequency of past dental visits, previous restorative, periodontal, endodontic, or oral surgical treatment; reasons for loss of teeth, untoward complications of dental treatment and fluoride history. Information on the general features of past treatment (rather than specific and detailed tooth by-tooth descriptions) are needed at this time. In regard to radiation or other therapy for oral or facial lesions, exact information is needed about the date and nature of diagnosis, the anatomical location of the treatment, the names, addresses, and telephone numbers of the physicians and dentists involved and the facility (hospital or clinic) where the treatment was given Likewise, details of any previous untoward complications of dental treatment must be recorded or must be obtained subsequently if not immediately available from the patient.[6]

### Significance of Medical and Dental History

Dental care causes changes to the patient's homeostasis. The results of the microbiologic, physical, and psychological stimuli caused by dental care may be altered by underlying medical conditions. Therefore, modifications necessary for providing safe and appropriate dental care are often determined by underlying medical conditions. A risk assessment needs performed to evaluate and determine the modifications to be implemented before, during and after dental treatment. Different modifications may be necessary at each stage of treatment e.g. antibiotic prophylaxis or steroid replacement may be necessary before treatment, or it may not be possible to place the patient in a supine position during dental procedures, or specific haemostatic agents may be need to be employed after extractions.

Many different medical conditions are discussed hereby, and protocols for the modification of dental care are suggested. However, it is the responsibility of the oral health care provider to obtain all the pertinent information that may have an impact on the patient's care.[6,7]

## ENDODONTIC CONSIDERATIONS IN CARDIO-VASCULAR DISORDERS PATIENT

Cardiovascular disease have become increasingly common in modern times therefore a dentist must be aware of the modifications precautions to taken in a patient suffering from cardiovascular disorders. The revised AHA guidelines for a heart patient are are available at AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines.[8]

**Hypertension:** Blood pressure is determined by how much blood the heart pumps (ie cardiac output) and by the resistance to blood flow in the vascular system. Cardiac output in turn is determined by how often the pump contracts (i.e. heart rate) and by the amount of blood ejected during each beat (i.e. stroke volume).[9] Hypertensive patients are defined as those receiving treatment for hypertension or those with a mean systolic blood pressure (SBP) of 140 mm Hg or greater and/or mean diastolic blood pressure (DBP) of 90 mm Hg or greater.[10] Patients with untreated or inadequately treated hypertension are at increased risk of developing acute complications like myocardial infarction and stroke and chronic complications of hypertension.

**Endodontic Management:** Although clear guidelines for establishing a cut off point for dental treatment emergency or routine are lacking, it is generally accepted that patients with SBP greater than 180 or DBP greater than 110 should be taken for medical consultation and treatment prior to dental treatment and only emergency management of pain or acute infection should be considered.[11]

Although vasoconstrictors may precipitate significant elevations in blood pressure, numerous studies have shown that the use of one to two cartridges of 2% lidocaine with 1:100,000 epinephrine (0.018 to 0.036 mg Adr) is of little significance in most patients with hypertension. By improving the level of anesthesia, vasoconstrictors lower the risk of endogenous catecholamine release that may result from inadequate pain control. For patients with advanced disease, however, special precautions are required. Elective dental care should be avoided in the following situations: Patients with blood pressure greater than or equal to 180/110 (Stage III hypertension); Patients who have hypertensive symptoms Hypertensive symptoms include occipital headache, failing vision, ringing in the ears, dizziness, weakness, and tingling of the hands and feet. If emergency dental treatment is necessary, medical consultation is required and vasoconstrictor amounts should be limited to one to two cartridges of 1:100,000 solution (0.018 to 0.036

mg of epinephrine). In patients with blood pressure of 160-179/100-109 (Stage II hypertension), epinephrine should be limited to three cartridges (0.054 mg). The use of retraction cord with epinephrine and intraligamentary and intrabony injections should be avoided in these patients.[10,11]

**Ischemic Heart Disease:** When coronary atherosclerotic heart disease becomes sufficiently advanced to produce symptoms, it is referred to as ischemic heart disease. It is relatively common in the general population, especially with increasing age, and typically presents as angina or heart failure.[12] Angina is often precipitated by physical activity or stress and may radiate to the arm or jaw or may present as facial or dental pain. Fear and anxiety associated with a dental procedure may be a precipitating factor for angina in some patients.[13]

**Endodontic Management:** Treatment modification considerations for patients with ischemic heart disease should include morning appointments, short appointments, oral premedication with an anxiolytic drug or nitrous oxide or oxygen sedation, limited use of vasocontrictors, adequate pain management (during and after the dental appointment), and possible cardiac monitoring.[14]

**Heart Murmurs and Valvular Disease:** Patients with valvular disease present two primary considerations for dental treatment: potential risk for infective endocarditis and risk of excessive bleeding in patients on anticoagulant therapy.[15]

**Endodontic Management:** Dental management requires evaluation of the type of heart condition and the risk of bacteremia due to the planned dental procedure. According to the recent guidelines, antibiotic prophylaxis is now recommended only for patients with valular disease associated with the highest risk of adverse outcomes from infective endocarditis. For patients in the highest risk category, antibiotic prophylaxis is recommended for dental procedures that involve manipulation of gingival or the periapical tissue. In general, procedures associated with nonsurgical root canal-treatment such as local anesthetic injection, placement of the rubber dam, and instrumentation when contained within the canal system do not place the patient at significant risk for infective endocarditis. The incidence and magnitude of bacteremia when canal instrumentation does not extend into the periapical tissues is very low, and almost all bacteria are eliminated from the blood within 10 minutes and therefore antibiotic prophylaxis is not required.[16]

## ENDODONTIC CONSIDERATIONS IN BLEEDING DISORDERS PATIENTS

Many dental procedures are associated with postoperative bleeding, which in most cases, is self-limiting and non-problematic. However, a small but significant segment of the population has an increased risk of bleeding due to inherited bleeding disorders, in which even relatively minor invasive procedures can precipitate a prolonged bleeding episode.[17,18]

**Endodontic Considerations:** Endodontic treatment is generally low risk for patients with bleeding disorders. Non surgical endodontic procedure can be performed without any modification in anticoagulant therapy, although it is important to ascertain that patient's International normalised ratio (INR) value is in the therapeutic range of (2 to 3.5) especially if a nerve block injection is required.[19,20] Periapical surgery may pose a greater challenge for hemostasis even for patients well maintained within the therapeutic range therefore a consultation with the patient's haematologist is required in developing an appropriate treatment plan.[21-23]

Dental pain can usually be controlled with a minor analgesic such as paracetamol (acetaminophen). Aspirin should not be used due to its inhibitory affect on platelet aggregation. The use of any non-steroidal anti-inflammatory drug (NSAID) must be discussed beforehand with the patient's hematologist because of their effect on platelet aggregation. Replacement of deficient coagulation factors or platelet transfusion may be required prior to periapical surgeries. But it may not be required in routine endodontic procedures. There are no restrictions regarding the type of local anesthetic agent used although those with vasoconstrictors may provide additional local hemostasis.[24,25]

## ENDODONTIC CONSIDERATIONS IN A DIABETIC PATIENT

Diabetes mellitus is a disease of glucose, fat and protein metabolism resulting from impaired insulin secretion, varying degrees of insulin resistance, or both. It is characterized by hyperglycemia with or without glycosuria resulting from an absolute or conditional deficiency of insulin.[26,27] Diabetes Mellitus is diagnosed as a fasting blood glucose level greater than 125mg/dL and the normal fasting blood glucose level is considered to be less than 110mg/Dl. Patients with fasting plasma glucose levels greater than 110 mg/dl but less than 126mg/dL represent a transitional condition between normal and DM and are considered to have impaired glucose tolerance.[28,29] Glycated hemoglobin (hemoglobin A1c, $HbA_{1c}$, A1C, or $Hb_{1c}$ or HbA1c), a form of hemoglobin, measured primarily to identify the average plasma glucose concentration over prolonged periods of time. It is formed in a non-enzymatic glycation pathway by hemoglobin's exposure to plasma glucose. Normal levels of glucose produce a normal amount of glycated haemoglobin (<6% HbA1c). As the average amount of plasma glucose increases, the fraction of glycated hemoglobin increases in a predictable way. This

serves as a marker for average blood glucose levels over the previous months prior to the measurement. In diabetes mellitus, higher amounts of glycated hemoglobin, indicating poorer control of blood glucose levels, have been associated with cardiovascular disease, nephropathy, and retinopathy. Monitoring $HbA_{1c}$ in type 1 diabetic patients may improve outcome.[30]

**Oral manifestations of Diabetes Mellitus:** Independent of the severity of plaque accumulation, gingivitis, periodontitis, and periodontal bone loss are associated with diabetes mellitus, especially when poorly controlled. Defects in immune status, altered bacterial flora and microvascular disease are the postulated pathogenesis of diabetic periodontal disease. In uncontrolled diabetes, there are chances of infection and poor wound healing.[31,32]

**Endodontic Considerations:** In a diabetic patient the dentist should ascertain how well controlled the condition is. Dental appointment scheduling should take into account the importance of nutritional consistency and the avoidance of appointments that will overlap with or prevent scheduled meals, especially in patients receiving insulin, sulfonyhurea or meglitinide oral therapy because of the risk of hypoglycemia. If an appointment is likely to lead to a delayed or missed meal, the diabetic regimen may have to be modified with the assistance of the patient's diabetologist. It has been well established that hyposalivation, gingivitis, periodontitis and periodontal bone loss are well associated with DM, especially when poorly controlled. Surgical procedures in well controlled diabetics do not require prophylactic antibiotics. However, when surgery is indicated in poorly controlled diabetics, antibiotic prophylaxis consisting of amoxicillin 500 mg twice daily should be considered due to the altered function of neutrophils in diabetics.[33,34]

## ENDODODONTIC CONSIDERATIONS IN A PATIENT WITH LUNG DISORDERS

Asthma is a respiratory disease characterized by reversible, diffuse stenosis or stricture of the peripheral bronchi, increased responsiveness or sensitivity to different stimuli, and frequently also signs or laboratory test evidence of an allergic alteration. A distinction is to be made between allergic and non-allergic asthma.[35,36]

**Endodontic Considerations:** Oral health care providers need to be aware of the potential for dental materials and products to exacerbate asthma. These items include dentifrices, fissure sealants, tooth enamel dust and methyl methacrylate. Fluoride trays and cotton rolls also have been implicated in promoting asthmatic events.[37-39]

Patients' immune status depends on the level of immunosuppressive medications they are taking. Only the most severely affected asthmatic patients who are taking large doses of systemic corticosteroids fall into this category. The same category of patients also may be at risk of adrenal suppression. The clinician should consider the need for prophylactic administration of antibiotics to prevent postoperative complications and for corticosteroid replacement therapy to prevent acute adrenal crisis.[40,41]

Improper positioning of suction tips, fluoride trays or cotton rolls could trigger a hyper reactive airway response in sensitive subjects. Rubber dams should be used judiciously to avoid possible respiratory compromise or aggravation. Prolonged supine positioning, bacteria-laden aerosols from plaque or carious lesions and ultrasonically nebulized water also can be asthma triggers in the dental setting. In the event of an acute asthmatic attack during dental treatment, the clinician should stop the procedure, remove all intraoral implements and rule out foreign body aspiration, and initiate the emergency protocol for managing acute asthmatic exacerbation

**After Endodontic Treatment:** Owing to allergy, as much as 20% of patients with asthma may experience severe exacerbations of bronchoconstriction after ingesting aspirin and other nonsteroidal anti-inflammatory drugs, or NSAIDs. As a result, the analgesic of choice for these patients is acetaminophen. However, recent studies have suggested that long-term daily or weekly acetaminophen use is associated with a more severe asthma. Although there is reason for caution, acetaminophen still is the preferred analgesic for asthmatic patients[42]

## ENDODONTIC CONSIDERATIONS IN A HIV POSITIVE PATIENT

HIV is a blood-borne retrovirus infection transmitted primarily by blood and bodily fluids by intimate sexual contact and parenteral route. After infection enzyme reverse transcriptase allows the virus to integrate its own DNA into the genome of an infected cell and replicate using the infected cell's ribosomes and protein synthesis. Initially immune seroconversion with antiviral antibody production occurs followed by a significant decrease in $CD4^+$ lymphocytes over a period of up to years. The most effective management in the progression of HIV infection and AIDS is a Combination of antiviral agents known as highly active anti-retroviral therapies (HAART), which has significantly increased the lifespan and the quality of life of individuals infected with HIV.[43,44]

**Drug Interactions and Anti-Retroviral Therapy**: A significant challenge faced by HIV-positive patients and their health care provider is the potential for adverse drug interactions. Because HIV-positive patients usually take an antiretroviral regimen of three or more drugs from at least two different classes potential for unwanted side effects and

toxicities also exists.[45]

HIV antiretroviral therapy levels can also be altered by the body's pharmacokinetic properties. The majority of HIV medications on the market are metabolized through the liver via the cytochrome P450 enzyme system (CYP45O). More specifically, the most abundant isoenzyme of the CYP45O system, CYP3A4, metabolizes about half of the antiretroviral drugs currently on the market. Because the drugs are metabolizes through the same pathway competition exists among drugs to bind to the isoenzymes. This competition may then cause an increase in the blood plasma level of drugs, leading to drug toxicities, unwanted side effects, and potential resistant HIV strains. However, not all drug interactions have negative consequences. Some protease inhibitors, such as ritonavir, serve to boost other drug levels. These protease inhibitors can be administered at lower dosages, thereby reducing the metabolism of other simultaneously administered antiretroviral drugs.[46,47]

**Endodontic Considerations**: Dentists should be keenly aware of potential drug interactions in their HIV-positive patients. Many of the medications dentists commonly administer or prescribe may interfere with the metabolism of the antiretroviral medications.[48,49] Statistically, the chances of treating a HIV-positive patient in a dental practice have increased because of a steady state of new HIV infections annually and increasing longevity from highly active antiretroviral therapy. Thus HIP-positive patients are seeking routine dental care versus episodic treatment for the oral manifestations of HIV/AIDS, and dental clinicians should know how to appropriately care for them. Controversy exists in the literature regarding the need for antibiotic coverage before performing dentistry. A small subgroup of patients with advanced HIV disease may require customized modification, such as antibiotic prophylaxis or transfusion of blood products for their care.[50] However, no data currently exists supporting the need for routine antibiotic coverage to prevent bacteremia or septicemia arising from a dental procedure. Additionally, the dental clinician should know the medications that their HIV-positive patients are taking, understand the potential drug interactions with medications they prescribe and be prepared to prescribe medications from a different class when interactions are possible. Finally, the practitioner should be aware of occupational risks in treating these patients, should familiarize himself / herself with the CDC's post exposure prophylactic guidelines, implement preventive measures to prevent occupational exposures, and provide occupational risk training for their staff.[51,52]

## ENDODONTIC CONSIDERATIONS IN A PREGNANT PATIENT

Pregnancy is a dynamic physiological state evidenced by several transient changes. These can develop into various physical signs and symptoms the can affect the patient's health, perceptions, and interactions with others her environment. Dental practitioners with minimal training in gestational medicine may be hesitant to treat their pregnant patients. Because of a fear of injuring either mother or unborn child, some practitioners may withhold care or medications from their patients, inadvertently causing harm. An understanding of the patient's physiologic changes, the effects of chronic infection or illicit drug and alcohol usage, and the risks or benefits of medications is necessary to adequately advise a patient on her options regarding medical care.

**Drugs Used In Endodontics:** Fortunately, many drugs in a dental office's armamentarium are considered to be generally safe for both pregnant patients and their unborn children. Most dental professionals should have access to a medication reference, if questions arise regarding a proposed drug's efficacy or safety. However, if a dental professional has any doubts about either dental medication choices or the risk factors for pregnant patients, he or she should refer to the patient's obstetrician.

Local anaesthetics are among the most commonly used medications by dentists. Lidocaine and prilocaine have been given an FDA category B rating when given in a therapeutic range and should be the first-line choices for local anesthesia for pregnant women who do not have any contraindications, such as allergy. Bupivicaine, mepivicaine, and articaine have each been given FDA category C ratings. Bupivicaine's rating stems from animal studies demonstrating embryo death with higher-than-therapeutic dosages.

Additionally, the use of vasoconstrictors such as epinephrine or levonorderfrin, is not contraindicated when they are a part of the commercially available local anaesthetics. Though given a C rating, these vasoconstrictors, when used in low concentrations in pre-packaged local anaesthetic cartridges, cause no foetal harm as long as normal precautions are taken. These precautions include avoiding injection within the blood vessels and maintaining total dosages at or below therapeutic ranges such as 0.04 mg for epinephrine and 0.2 mg for levonorderfrin.

Frequently, the best treatment option for a patient is to immediately address pain or infections at the source. However, there are occasions when infections cannot be treated immediately with invasive dental care and antibiotics may be a necessary course of action. Many of the dentist's first line antibiotics are rated by the FDA as category B for pregnancy risk. These include the penicillin family, the erythromycins (except for the estolate form), azithromycin, clindamycin, metronidazole, and the cephalosporins. However tetracycline, minocycline, and doxycycline are given D ratings due to their likelihood of chelating bone and teeth. Thus tetracycline should be normally avoided.[53]

When discussing pain, the dental professional should be aware of the potential pitfalls. Not all nonsteroidal anti-inflammatory drugs are safe for the foetus. Neither aspirin nor diflusinal are recommended for a pregnant woman. Aspirin and diflusinal have both been associated with prolonged gestation and labour, anaemia, increased bleeding potential and premature closure of the ductus arteriosus of the heart. Even ibuprofen, ketoprofen, and naproxen are contraindicated in the third trimester of pregnancy, where they are considered as FDA category D choices, due to their risks of prolonged labour, haemorrhage risk during delivery and premature closure of the ductus arteriosus. However, these three analgesics are given a category B rating for the first two trimesters of pregnancy. The first-line nonsteroidal anti- inflammatory drug of choice should be acetaminophen. Acetaminophen has earned an FDA B rating for all three trimesters of pregnancy. If stronger pain medication is necessary, most narcotic combinations are relatively safe for short durations, despite their risks for foetal growth retardation or foetal dependency if prescribed for long periods. Oxycodone has received a B rating for short-term usage, while meperidine, hydrocodone, propoxyphene and codeine are FDA category C narcotic medications, though they are still considered to be reasonably safe for short-duration pain control. However, long-term narcotic usage is ill- advised, as the foetus may develop either neonatal depression or withdrawal symptoms.

When treating anxiety in the dental setting non-pharmaceutical methods are preferred because they reduce the foetus's exposure to medication. Most benzodiazepines for anxiolytic relief must be administered with extreme caution and consultations with the patient's physician because most drugs in this class are classified in categories C or D for pregnancy risk. Triazolam which is listed by the FDA in category X is absolutely contraindicated in gestational patients. Intranasal nitrous oxide use is controversial because there is risk of reduced uterine blood flow or tetratogenic effects when it is used in high concentrations.[53,54]

**Endodontic Considerations**: Many dental professionals may he apprehensive about providing dental care to their gestational patients due to fears of inadvertently harming the fetus. However, few dental procedures are contraindicated during non-complicated pregnancies. Dental hygiene procedures, such as prophylaxis, deep scaling, or root planning are allowable in any trimester of a normal pregnancy. Dental prophylaxis is encouraged to not only minimize the bacterial load of periodontal pathogens, but also to reinforce good oral hygiene habits for the patient.

If dental caries is the source of pain or acute infection in an otherwise healthy gestational woman, a dentist should provide invasive care no matter what the patient's phase of pregnancy. Dental decay also presents an additional source of bacterial load on the patient. As previously mentioned local anesthetics are acceptable for use in pregnant women. Additionally there is no contraindication for using diagnostic procedures deemed necessary, such as appropriate radiographs, during a patient's pregnancy, as long as normal safety precautions are followed. These precautions include beam collimation, high-speed film, limited exposures, and lead-apron protection for the patient. It is estimated that the average full-mouth dental film series may expose the fetus to 1 x $l0^{-1}$ rads of radiation, far below the tetragenic risk to the unborn child.[55]

Bouts of great joy, anxiety, or fear can be common during pregnancy. When combined with dental fears or phobia, pregnant patients may delay or avoid dental care. Anxiety may lead to transient increases in blood pressure, gastrointestinal upset, hyperventilation, or uterine cramping. Often counselling and addressing the causes of the patient's fears help relieve the symptomology.

## ENDODONTIC CONSIDERATIONS IN A PATIENT UNDERGOING CANCER CHEMOTHERAPY AND RADIATION THERAPY

Cancers that are amenable to surgery and do not affect the oral cavity require few treatment plan modifications. Preceding cancer treatment, all sources of inflammation and potetential infection should be eliminated. Whenever possible, non-restorable teeth and those with poor long-term periodontal prognosis should be extracted more than two weeks prior to radiation therapy. Symptomatic non-vital teeth can be endodontically treated at least 1 week before initiation of chemotherapy. Many cancer patients have indwelling catheters that may be susceptible to infection, and while controversial American Heart Association (AHA) has recommended antibiotic prophylaxis (Table 1).[56]

If the patient is receiving chemotherapy the dentist should be familiar with the patients WBC Count and platelet status. Endodontic procedures can be performed if the neutrophil count is greater than 2000 cells per cubic mm and platelets are greater than 50,000 per cubic mm. Post radiation osteonecrosis (PRON) results from radiation induced changes in the jaws, may arise in bones exposed to high radiation, and is characterised by asymptomatic or painful bone exposure . Protocols used to reduce radionecrosis include selection of endodontic therapy over extraction, expert atraumatic surgical procedures, considering the use of non lidocaine local anesthetics that contain no or low concentrations of epinephrine and prophylactic antibiotics plus antibiotics during the week of healing.[57]

**Table 1: Recommended antibiotic regimens for antibiotic prophylaxis**

| Regimen | Drugs |
|---|---|
| Standard regimen | Adults: 2.0 g Amoxicillin<br>Children: 50 mg/kg Amoxicillin |
| Patients allergic to penicillin or already taking penicillin class of medication | Adults: 2.0 Cephelexin or other 1st or 2nd generation cephalosporin<br>Or<br>600 mg Clindamycin<br>Or<br>500 mg Azithromycin or Clarithromycin<br>Children: 50 mg/kg Cephelexin or other 1st or 2nd generation cephalosporin<br>(Or) 20 mg/kg Clindamycin<br>Or<br>50 mg/kg Azithromycin or Clarithromycin |
| Alternative IM/IV regime for patients allergic to penicillin and unable to take oral medications | Adults: 1.0g IM or IV Cefazolin or Ceftriazone<br>Or<br>600 mg IM or IV Clindamycin<br>Children: 50 mg/kg IM or IV Cefazolin or Ceftriazone<br>Or<br>20 mg/kg IM or IV Clindamycin within 30 min. before the procedure. |

## CONCLUSION

Medically compromised patient comprise an even increasing percentage of the population because of the rapid advances in medicine which have dramatically increased the survival rate associated with most diseases. Even though endodontic treatment has been preferred choice in such patients, earlier such patients were either referred to the hospital or their treatment was deferred until the optimum physical health state was achieved. The main reason for this was the inadequate training in management of such condition in dental clinics.

Today endodontists are better equipped with applicable knowledge of systemic diseases and can deliver high standard of endodontic treatment and at the same time minimize the potential problem related to general health of the patient.

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