MANAGEMENT OF PATIENTS WITH MEDICALLY COMPROMISED IN ENDODONTICS: A REVIEW

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ABSTRACT

Successful endodontic therapy necessitates a thorough understanding of medical issues as well as the suitability of treatment planning. This review article focuses on a variety of medical issues that dental professionals may face and how to handle them in order to avoid consequences. It is critical to minimize potential medical issues when the treatment is carried out to save the tooth for individuals with medically compromised. As a result, endodontists must be aware of common disorders and medicines that affect endodontic therapy and management options in medically compromised patients.

Keywords: Endodontic therapy, Endodontists, Medically Compromised Patients.

I. INTRODUCTION

The identification and treatment of patients with complicated medical conditions is one of the problems that dental specialists face today. An absolute knowledge of a patient’s medical problems is vital for providing safe and appropriate dental treatment in the context of any systemic disorders, other underlying general health conditions, intake of medications, or other oral pathologies. The most frequent medical issues that dentists see on a daily basis include drug allergies, cardiac abnormalities, pulmonary diseases, endocrine disorders, infectious diseases, pregnant patient, renal disorder, psychogenic problems and patients undergoing radiation therapy. A thorough assessment of the medical history is essential for optimal dental therapy of medically compromised individuals. Therefore, a thorough evaluation of the medical conditions of the patient is the first priority in the management of medically complex cases, which necessitate care to prevent potential complications. For patients having systemic diseases some modifications in treatment plan or drugs may be required in order to prevent probable interaction with their current medications or systemic health stability. Dental practitioners and their staff need to have appropriate skills, training and equipment available to deal with such conditions that may help reduction in occurrence of acute medical emergencies in medically compromised patients. 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.

II. HYPERTENSION

Hypertension is defined as a systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater, or taking antihypertensive medication.

Endodontic management: To avoid causing acute complications, it is important to conduct the endodontic procedure with control of pain and anxiety. During the dental treatment, the use of vasoconstrictor to local anaesthetic provides better pain control and reduces anxiety and stress. But the vasoconstrictors may precipitate significant elevation in blood pressure. However, the use of one to two cartridges of 2% lidocaine with 1:100,000 epinephrine (0.018 to 0.036 mg) is of little significance in most patients with hypertension. In turn, it should be given without a vasoconstrictor if anaesthetic reinforcement is required. It is also important to eliminate
intravascular administration therefore careful aspiration before any injection is mandatory. 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.

In patients with blood pressure of 160-179/100-109 (Stage II hypertension), three cartridges of epinephrine should be capped (0.054 mg). The use of retraction cord with epinephrine and intraligamentary and intrabony injections should be avoided in these patients. 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. Long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs) may antagonize the antihypertensive effect of diuretics, beta-blockers, alpha-blockers, vasodilators, and angiotensin-converting enzyme inhibitors. Paracetamol can be used to avoid this side effect.

III. 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.

Endodontic management: Dental treatment should be limited to emergency care, preferably in a hospital setting, in patients with heart failure. 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. 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. Short appointments, and availability of sublingual form of nitroglycerine (0.4-0.8 mg) are needed to be followed as safety procedures.

IV. CARDIAC ARRHYTHMIAS

A cardiac arrhythmia can be described as an abnormality in rate, regularity, or site of origin of the cardiac impulse. Furthermore, the conduction of the impulse may be irregular within the heart. Fatigue, dizziness, syncope, and angina are signs that may be due to arrhythmia.

Endodontic Management: Endodontic management requires evaluation of the type of heart condition and the risk of bacteremia due to the planned dental procedure. Antibiotic prophylaxis is now recommended only for patients with valvular disease associated with the highest risk of adverse outcomes from infective endocarditis. Antibiotic prophylaxis for dental operations involving the manipulation of gingival or periapical tissue is recommended for patients in the highest risk group. Modern pacemakers are more resistant to electromagnetic interferences; caution is required when using electrical devices (e.g., ultrasound and electric scalpels). The use of vasoconstrictors in local anesthetics poses potential problems for patients with arrhythmias because of the possibility of precipitating cardiac tachycardia or another episode of arrhythmia. As required, a local anaesthetic without vasoconstrictor can be used. The procedure should be stopped, oxygen should be administered, and the patient's vital signs should be evaluated if arrhythmia occurs during dental care. In the event of chest pain, sublingual nitrates should be administered. The patient should be placed in the Trendelenburg position, with vagal maneuvering where necessary (Valsalva maneuver, massage in the carotid pulse region, etc.).

V. ISCHEMIC HEART DISEASE

Ischaemic (or ischaemic) heart disease is a disorder characterized by a decrease of the heart's blood supply. Ischemia means a "reduced blood supply". The majority of ischaemic heart disease is caused by atherosclerosis, which is typically present even though angiography makes the arterial lumens look fine. The thickening of the intimal layer of the arterial wall caused by the deposition of lipid plaques is atherosclerosis. Initially there is sudden severe narrowing or closure of either the large coronary arteries and/or of coronary artery end branches by debris showering downstream in the flowing blood. The narrowing or closing is primarily caused by the covering of atheromatous plaques within the ruptured artery wall, resulting in a heart attack in turn (Heart attacks caused by just artery narrowing are rare). Angina is also caused by tension or physical activity and can radiate to the arm or jaw or may manifest as facial or dental pain. Fear and anxiety associated with a dental procedure may be a
precipitating factor for angina in some patients. 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.

**Endodontic Management:** For patients with ischemic heart disease, treatment adjustment considerations should include appointments in the morning, short appointments, oral premedication with an anxiolytic drug or nitrous oxide or oxygen sedation, pain management during and after a dental visit, and the use of vasoconstrictors to be kept bare minimum. If nitrates are prescribed, the patient should carry them to every dentist appointment in case chest trouble arises. Premedication to relieve anxiety and stress can be offered in the case of extremely anxious patients (5-10 mg of diazepam the night before and 1-2 hours before treatment). In order to prevent orthostatic hypotension, the patient should be put in the position most comfortable for him or her (semi-supine) and should get up carefully. Blood pressure and pulsoxymetric monitoring can be needed prior to and during dental care, depending on the patient.

VI. INFECTIVE ENDOCARDITIS PATIENTS

**Endodontic Management:** Health questions will be involved in the treatment of patients with infective endocarditis, covering the past of all possible risk groups. The patient's physician should be consulted if there is any doubt. When undergoing dental procedures due to transient bacteremia, patients with a medical history of rheumatic heart disease, congenital heart diseases, prosthetic heart valves and grafts and pace makers are vulnerable to infective endocarditis (IE). IE may be assumed when simultaneous occurrence of heart murmurs and unknown fever persisting for more than 7 days occurs in patients with prosthetic valve following dental treatment. Pretreatment chlorhexidine mouthrinses are recommended before procedures, because they significantly reduce the presence of bacteria on mucosal surfaces. For an adult patient, general prophylaxis is a single dose of 2 g of oral amoxicillin 30-60 minutes before the dental procedure. Azithromycin 500 mg can be used in penicillin-allergic patients. Resistance to antibiotic prophylaxis (AP) in patients with Infective Endocarditis includes resistance to beta lactam antibiotics, risk of anaphylaxis, and allergies.

**Patient taking Antiplatelet and Anticoagulant Drugs**

For disorders involving the cardio- and cerebrovascular systems, a variety of oral antiplatelet medications are available, which can be used separately (SAPT) or in combination as dual antiplatelet therapy (DAPT). After percutaneous coronary intervention (PCI) with stenting, DAPT is commonly used in patients with symptomatic peripheral vascular disease who undergo percutaneous revascularization of the lower extremity and for the prevention of recurrent stroke. Aspirin, clopidogrel, and dipyridamole are the frequently recommended medications for patients prone to coagulative disorders and cardiac arrest to reduce the risk of recurrent ischaemic events during the first year after acute coronary syndrome (ACS). Before obtaining cardiologists’ consent for discontinuing clopidogrel, the potential systemic risk should be carefully analysed and the best possible solution for stopping antiplatelets and anticoagulants should be considered as all measures to prevent over-instrumentation and periradicular surgery. The conditions with high risk are 1) Drug-eluting coronary stents placed within 12 months. 2) Coronary stent of bare metal within 1 month of placement. Under these conditions, the referral decision should only be considered for invasive conditions.

**Endodontic Management:** Prothrombin time is measured with the international normalized ratio (INR), and it is used to monitor the effects of anticoagulants on patients. The accepted range of INR to perform elective endodontic procedures is 2-4 and should be checked on the day prior to endodontic therapy. If INR 3.5, dose adjustment is required, and the treatment should be postponed until the INR of the patient has decreased to less than 3.5.

**Periprocedural recommendations in case of dental procedure**

<table>
<thead>
<tr>
<th>Presumed bleeding risk of procedure</th>
<th>SAPT/DAPT with ASA ± clopidogrel</th>
<th>VKA</th>
<th>DOACs</th>
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<tr>
<th>Unlikely to cause bleeding</th>
<th>perform dental procedure without interruption</th>
<th>Perform dental procedure without interruption, if INR is 3.5 24 hours before the intervention.</th>
<th>Continue therapeutic anticoagulation, perform dental procedure at trough concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low bleeding risk dental procedures</td>
<td>Perform dental procedure without interruption</td>
<td>Perform dental procedure without interruption, if INR is 3.5 24 h before the intervention. Delay if INR &gt;3.5 and adjust VKA dose until INR 3.5</td>
<td>Continue therapeutic anticoagulation, perform dental procedure at trough concentrations</td>
</tr>
<tr>
<td>High bleeding risk dental procedures</td>
<td>Perform dental procedure without interruption</td>
<td>Perform dental procedure without interruption, if INR is 3.5 24 h before the intervention. Delay if INR &gt;3.5 and adjust VKA dose until INR 3.5</td>
<td>Delay (rivaroxaban, edoxaban) or skip (apixaban, dabigatran) one dose on the morning of the dental intervention</td>
</tr>
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</table>

*Application of local haemostatic measures and other preventive strategies recommended, e.g. limiting the surgical site or performing the dental intervention in the morning. SAPT: single antiplatelet therapy; DAPT: dual antiplatelet therapy; ASA: acetylsalicylic acid; VKA: vitamin K antagonist; DOAC: direct oral anticoagulant; INR: international normalized ratio.

In the event of a temporary discontinuation of clopidogrel, discontinuation should not exceed 5 days as the risk of stent thrombosis becomes vulnerable after 5 days. It is recommended to take a decision about stopping antiplatelet therapy that firstly, discuss the treatment with patient’s cardiologist and secondly, minimal risk endodontic procedures should be preceded as much as possible without complete discontinuation of antiplatelet cover.\(^{23}\)

VII. ASTHMA

Asthma is a common chronic disease characterized by repeated episodes of obstruction of the respiratory tract. Finally results in an increase in airway resistance and progressive difficulty with breathing.

**Endodontic Management:** Before starting the endodontic procedure, it is essential to clarify about the type (mild, moderate, and severe), frequency of attack, and precipitating factors for avoiding the stimulators and we should follow the emergency protocols.\(^{24}\) Patients who use inhalers for management of asthma should be instructed to bring these device to their appointments.

Using careful placement of intraoral trays and suction tips, dental dams, and maintained supine positioning, practitioners should strive to prevent provoking an asthma episode with aerosols and particles (from dental materials and hard tissue) during treatment.\(^ {25,26}\) For potentially distressed asthma patients, the use of nitrous oxide should be considered as it is neither a respiratory depressant nor an irritant to the bronchial tree.\(^ {27}\) About local anesthetics, some may be sensitive for sulfite preservatives, hence it is better to avoid agents containing vasoconstrictors. Dental teams are encouraged to be familiar with protocols for emergency response.

If situation demands the use of conscious sedation, hydroxyzine and benzodiazepines are preferred. If the individual is conscious during an asthma attack, make the patient to sit upright to take two puffs of his or her inhalant (fast-acting bronchodilator) every 20 minutes for up to an hour.\(^ {27}\) If there is no improvement after three doses, administer positive-flow oxygen as supportive treatment and monitor vital signs (oxygen saturation levels should be 93% to 95% in adolescents, and 94% to 98% in children ages 6 to 12).\(^ {27,28}\) If there is still no change, contact emergency medical services and administer epinephrine 1:1000 concentration, 0.01 mg/kg of body weight to a maximum dose of 0.3 mg).
Diabetes Mellitus

Diabetes mellitus (DM) is a metabolic disorder characterized by elevated plasma glucose level due to defect in insulin secretion or impaired function of insulin or both.\textsuperscript{29} Diabetes Mellitus is diagnosed as a level of fasting blood glucose greater than 125 mg/dL and less than 110 mg/dL is considered the normal level of fasting blood glucose. 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.\textsuperscript{30,31} Normal levels of glucose produce a normal amount of glycated haemoglobin (<6% HbA1c).

Endodontic Management: In a diabetic patient the dentist should ascertain how well controlled the condition is. Endodontic appointment should be scheduled taking into account the patient’s diet and type of anti-diabetic medicament administered, in order to avoid 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. Delayed wound healing and increased susceptibility to infection need more consideration to avoid risk in endodontic practice. Morning appointments following regular diet and diabetic medications, along with appropriate antibiotic coverage, will minimize the adverse effects on routine endodontic practice. 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.\textsuperscript{32} However, DM patients with associated cardiac and renal complications need physician’s guidelines to precede with endodontic treatment.

The favorable lab investigation report to carry out endodontic procedure is as follows: fasting blood sugar <100 mg/dl; postprandial blood sugar <200 mg/dl; and HbA1c <7%.

VIII. THYROID DISORDERS

Thyroid disease is a frequent condition caused by over- or under-function of the thyroid gland, and its clinical severity ranges from asymptomatic to life-threatening.\textsuperscript{33} Thyroid storm is an emergency condition associated with untreated hyperthyroidism, and is caused by a hypermetabolic state. Symptoms may include tachycardia, atrial fibrillation, fever, excessive sweating, nausea, vomiting and others.

Endodontic Management: When vasoconstrictors are used in local anesthetic medications, they stimulate the heart, causing dysrhythmias, tachycardia, and thyrotoxic crises in hyperthyroid individuals. As a result, local anesthetic along with low dosages of epinephrine should be used.\textsuperscript{34} If a patient with a thyroid disease passes out during dental treatment, the procedure should be stopped right once and emergency treatment administered. Patients should be positioned supine with their legs elevated and their airway secured. It's important to check the ventilation and circulation. If body temperature unexpectedly rises while the patient is unconscious, it is important to consider the possible thyroid storm. Call for emergency transportation in this case.\textsuperscript{35} In order to plan for emergencies, including future thyroid storms, dentists should have clear advanced knowledge of medical history for thyroid disease patients.

IX. PREGNANCY

Pregnancy is a changing physiological state that manifests itself in a variety of ways. These might manifest as a variety of bodily signs and symptoms, which can have an impact on the patient's health, perceptions, and relations with others.

Endodontic Management: Dentists with little or no experience in gestational medicine may be hesitant to treat pregnant patients. Some practitioners may withhold care or prescriptions from their patients for fear of hurting the mother or the unborn child, inflicting harm unwittingly. A dentist should provide invasive care to an otherwise healthy pregnant woman if dental caries is the source of pain or acute infection, regardless of the patient's pregnancy stage.

For pregnant women who do not have any contraindications, such as allergies, lidocaine and prilocaine (FDA category B rating) should be the first-line options for local anaesthetic. Animal studies have shown that higher-than-therapeutic doses of bupivacaine cause embryo mortality. When used in low quantities in pre-packaged local anaesthetic cartridges, vasoconstrictors like epinephrine or levonorderfrin do not damage the fetus. Precautions
should be taken by 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.

The first line antibiotics (FDA as category B) for pregnancy risk includes the penicillin family, such as erythromycin, azithromycin, clindamycin, metronidazole, and the cephalosporins. Tetracycline should be normally avoided due to their likelihood of chelating bone and teeth. All nonsteroidal anti-inflammatory drugs are not safe for the foetus. Neither Aspirin and diflusinal are contraindicated for a pregnant woman. Ibuprofen, ketoprofen, and naproxen are contraindicated in the third trimester of pregnancy. The first-line nonsteroidal anti-inflammatory drug of choice should be acetaminophen (FDA B) for all three trimesters of pregnancy. If stronger pain medication is necessary, most narcotic combinations are relatively safe for short durations.

In first trimester of pregnancy, there is greater risk of susceptibility to stress and teratogens occurs during this time and 50% to 75% of all spontaneous abortions occur during this period. The recommended dental management includes oral hygiene instructions and thereby plaque control, emergency treatments only and avoid routine radiographs.

Organogenesis is complete in the second trimester, therefore the risk to the fetus is minimal. During the second trimester, some elective and emergent dentoalveolar surgeries are more safely performed. If necessary, scaling, polishing, and curettage may be performed. Unless absolutely necessary, avoid regular radiography.

In third trimester, it is safe to perform routine dental treatment in the early part of the third trimester, but from the second half of the third trimester routine dental treatment should be avoided. The pregnant mother may experience an increasing level of discomfort. Short dental appointments should be scheduled with appropriate positioning while in the chair to prevent supine hypotension. The recommendations includes instruction Oral hygiene, and plaque control, scaling, and curettage may be performed if necessary. Elective dental care should be avoided during the second half of the third trimester and avoid routine radiographs except when needed.

X.  EPILEPSY

The word “epilepsy” is derived from the Greek word “epilambanein” meaning to take or to seize. Modern medicine defines epilepsy as a chronic neurological disorder characterized by frequently recurrent seizures. Seizures can be defined as the discontinuity of normal brain functions due to sudden electrical discharges. Epileptic seizures are reversible and recurrent in nature.

Endodontic Management: Endodontic treatment can be carried out with the knowledge to recognize the early signs of a seizure and to take precautions to avoid such incidents. The appointment should be given to the patient in early hours of the day, treatment sessions should be kept short and sudden stimulants like shimmering bright lights and extreme noise should be avoided. For patients who are adequately controlled with medication, they can undergo endodontic management in a routine way; however, patients whose seizure activity does not decrease in intensity following anticonvulsant treatment may need additional anticonvulsant or sedative medication, hence there is a need of consultation with a neurologist prior to a dental appointment. If a patient has an epileptic seizure during dental treatment, following measures should be taken:

1. Treatment should be stopped and all dental instruments should be removed. The patient should be helped into the supine position.

2. Any tight clothing the patient is wearing should be loosened.

3. The patient should be monitored to make sure his/her airway does not become obstructed.

If, however, the seizure lasts longer than expected and persists despite medicine, the patient should be taken to the hospital. The patient should be sent home to recuperate once he or she has regained consciousness. The patient's treatment should be postponed until he or she feels better.
XI. HEPATITIS

Hepatitis is inflammation of the liver that may result from infectious or other causes. Noninfectious hepatitis can result from excessive or prolonged use of toxic substances such as drugs (i.e., acetaminophen, alcohol, halothane, ketoconazole, methyldopa and methotrexate) or, more commonly, alcohol.

**Endodontic Management:** The recommendations for infection control practice in dentistry published by the Centers for Disease Control and Prevention (CDC) and the American Dental Association have become the standard of care to prevent cross-infection in dental practice.

A patient with active hepatitis should not get dental treatment other than emergency care until clinical and biochemical recovery has been achieved. Liver disease has important implications for patients receiving dental treatment. The most frequent problems associated with liver disease in clinical practice refer to the risk of viral contagion on the part of the dental professionals and rest of patients (cross infection), the risk of bleeding in patients with serious liver disease and alterations in the metabolism of certain drug substances which increases the risk of toxicity. HCV has been detected on different surfaces within the dental clinic after treating patients with hepatitis C, and the virus moreover is able to remain stable at room temperature for over 5 days. Strict sterilization measures are therefore required, since deficient sterilization can expose both the dentist and other patients to hepatitis infection.

XII. HIV PATIENTS

HIV is a blood-borne retrovirus infection transmitted primarily by blood and bodily fluids by intimate sexual contact and parenteral route. In view of the nature of this blood borne pathogen, HIV (a non-transforming retrovirus of lentivirus family) infection and AIDS have important implications for dental practitioners. Several conditions may be seen in patients suffering from AIDS viz. bacterial (multiple and recurrent) infections, fungal infections (predominantly candidiasis) and viral infections (e.g. cytomegalovirus).

**Endodontic Management:** 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. Because of the steady rise in new HIV infections each year and the increasing longevity of highly active antiretroviral therapy, the chances of treating an HIV-positive patient in a dental practice have increased statistically. The prognosis for successful healing of necrotic teeth with chronic apical periodontitis following root canal treatment is essentially the same for HIV-positive patients as for non-infected patients. Controversy exists in the literature regarding the need for antibiotic coverage before performing dentistry. There is currently no evidence that routine antibiotic coverage is necessary to prevent bacteremia or septicemia following a dental operation. Furthermore, the dental practitioner should be aware of the medications that their HIV-positive patients are taking, be aware of the possibility for drug interactions with the medications they provide, and be ready to provide medications from a different class if interactions are suspected. 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.

XIII. 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 well prepared with relevant knowledge of systemic diseases and are able to offer a high level of endodontic care while minimising the possible complications associated with the patient's general health.

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