When a tooth becomes infected and painful, the dentistry offers two possibilities. However, many individuals prefer the option of saving the teeth rather than extraction option. Endodontic treatment is a judicious procedure of removing the infected dental pulp and peri-radicular exudates using appropriate instruments and biocompatible chemicals in adjunct to medicaments to preserve the inert nature of the tooth. When the procedure is carried out in healthy individuals, it is sufficient to concentrate on the technical course of action, but when there is a demand to preserve the tooth for patients with systemic illness and who are under medical management, it is equally important to avoid the potential medical emergencies. Hence, practitioners must be aware of common diseases, and drugs that have an impact in endodontic treatment and the management options in such cases. This review aims to highlight the clinical conditions that require special endodontic attention.

Methods

A Medline-PubMed literature search was carried out with the help of MeSH-authorized passwords: “Medically compromised,” “dental management,” “infective endocarditis,” “hypertension,” “arrhythmia,” “asthma,” “renal diseases,” “antiplatelet and anticoagulants.” The search was restricted to the past 10-year articles published in English.

Cardiac Disorders

Hypertension

It is a common burden with an increased risk for angina and ischemic heart diseases, myocardial infarction, and cerebrovascular conditions.

Hypertension is defined as values >140 mmHg for systolic and/or >90 mmHg for diastolic. It is essential to perform the endodontic procedure with control of pain and anxiety to avoid triggering acute complications.

The next level of consideration is to monitor the drug interactions. Interaction of local anesthesia (LA) with nonselective beta-blockers may increase LA toxicity. The cardiovascular effects of epinephrine may be potentiated by the use of...
medications such as nonselective beta-blockers (propanolol and nadolol). Guidelines recommend decreasing the dose and increasing the time interval between epinephrine injections. 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. The short-term administration has, however, a clinically meaningful effect, and paracetamol can be used to avoid this side effect.

**Congestive Cardiac Failure**

In congestive cardiac failure, there is a mismatch between blood supply and organ demand. Angina and recent myocardial infarction of <6 months duration are the conditions requiring contraindications for elective procedures; however, emergency endodontic procedures can be carried out in a hospital-attached dental practice with cardiologist’s consent. Points need to be considered are as follows:

1. Premedication, 2–5 mg diazepam 1 h prior to procedure to reduce anxiety
2. Anesthesia without vasoconstrictors can be used for procedures
3. Short appointments, semi-supine chair position, and availability of sublingual form of nitroglycerine are needed to be followed as safety procedures
4. Patients receiving aspirin can be considered normal, though increased bleeding may be associated.

**Infective Endocarditis**

Patients with a medical history of rheumatic heart disease, congenital heart disease, prosthetic heart valves and grafts, and pacemakers are prone for infective endocarditis (IE) when undergoing dental procedures due to transient bacteremia. Another important risk group to be noted is intravenous drug abusers, and recurrent dental procedures due to transient bacteremia. Another important risk group to be noted is intravenous drug abusers, and recurrent IE should be suspected when patients with prosthetic valve following dental treatment develop simultaneous onset of cardiac murmurs and unknown fever persisting for more than 7 days. The associated symptoms may include chills, night-time perspiration, reduced appetite, tiredness, and discomfort that typically manifest approximately 2 weeks after the endodontic procedure with periapical instrumentation or perforation. The characteristic clinical indication is the occurrence of petechiae with a pale center on the skin of the flexure surfaces of the extremities, supraclavicular site, mucosa of the lower conjunctiva, and hard palate.

So far, there is no established antibiotic prophylaxis (AP) exists for IE including penicillin regimen. However, to satisfy the hospital protocols, preventive measures should be undertaken with AP. The general prophylaxis for an adult patient is a single dose of 2 g oral amoxicillin 30–60 min before the dental procedure. For penicillin-allergic patients, azithromycin 500 mg can be used. Points against the AP in IE patients include resistant development for beta-lactam antibiotics, risk of anaphylaxis, and allergy.

**Valvular Diseases and Prosthetic Valves**

Prosthetic heart valves carry the higher risk of thromboembolism, and valves placed in the aortic region are more risky than the one in mitral position. In addition, patients with a history of previous thromboembolism, ongoing sustained atrial fibrillation, valve prosthesis, older age, and left ventricular dysfunction are considered as a high-risk group. Aspirin is the exclusive antithrombotic choice, however warfarin plus aspirin is prescribed for patients with high risk of thromboembolism.

**Antiplatelet and Anticoagulant Drugs**

Aspirin, clopidogrel, and dipyridamole are the frequently recommended medications for patients prone to coagulative disorders and cardiac arrest. In more susceptible patients, clopidogrel is combined with aspirin for additive effort. Before obtaining cardiologists’ consent for discontinuing clopidogrel, the potential systemic risk should be thoroughly evaluated, and all the measures to avoid over instrumentation and periapical surgeries should be considered as the best possible alternate to stop antiplatelets and anticoagulants.

The high-risk conditions include:
1. Drug-eluting coronary stents placed within 12 months
2. Bare metal coronary stent within 1 month of placement.

In these conditions, the decision for referral should be considered only for invasive conditions.

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.

In case of situations where clopidogrel should be stopped for time being, then discontinuation should not exceed 5 days because the threat of stent thrombosis become vulnerable after 5 days. To take a decision about stopping antiplatelet therapy, the following protocol is recommended:

1. Discuss the treatment with patient’s cardiologist
2. As much as possible, minimal risk endodontic procedures should be preceded without complete discontinuation of antiplatelet cover.

**Respiratory Disorders**

**Asthma**

Asthma is a persistent condition that affects the respiratory system characterized by inflammation and bronchoconstriction.
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. [16]

If dental patients give a history of using bronchodilator inhaler, it is essential to advise the patients to bring the inhaler during each dental visit. Anxiety is a trigger, and dental treatments often trigger an acute asthmatic attack. A well-planned and uncomplaining approach of the dentist and dental team members may help to lessen the anxiety. If situation demands the use of conscious sedation, hydroxyzine and benzodiazepines are preferred.

For severe conditions, procedures should be carried out with the physician’s consent.

It is necessary to avoid NSAID group, barbiturates, and narcotics for all patients, and for patients on theophylline, it is necessary to avoid erythromycin and ciprofloxacin. About local anesthetics, some may be sensitive for sulfite preservatives, hence it is better to avoid agents containing vasoconstrictors.

If a patient suddenly shows the symptoms of acute asthmatic attack during the dental treatment, the following steps should be administered:[17]
1. Stop the dental treatment and help the patient to sit upright or lay supine in a relaxed position
2. Maintain the airway open and deliver agonists with inhaler or nebulizer
3. Provide oxygen supply through face mask nasal hood or cannula
4. In case where no positive results obtained, administration of subcutaneous epinephrine will help (1:1000 solution, 0.01 mg/kg of body weight to a maximum dose of 0.3 mg).

**Chronic Obstructive Pulmonary Disorder**

Chronic obstructive pulmonary disorder (COPD) is a collective term for lung diseases including chronic bronchitis, emphysema, and chronic obstructive airway diseases.[18] COPD patients have breathing problems primarily due to their constricted airways.

Medical treatment is directed toward managing the acute and chronic symptoms because COPD cannot be cured completely. For endodontic procedures, selection of local anesthetic is important and LA-containing epinephrine and levonordefin should be avoided because their sulfite component may induce acute asthmatic attacks and allergic manifestations. When antibiotic therapy is indicated, macrolides (i.e., erythromycin, azithromycin, and clarithromycin), ciprofloxin, and clindamycin should be avoided in patients taking theophylline because of the potential adverse effect of methylxanthine toxicity. Acetaminophen and Cox-2 inhibitors can be used as anti-inflammatory drugs for these patients since they do not precipitate bronchospasm.

**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.[19] 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, and insulin dose adjustment may be considered in periapical surgical procedures. However, DM patients with associated cardiac and renal complications need physician’s guidelines to proceed 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%.

**Patients on Corticosteroid Therapy**

It is necessary to assess whether patient is currently on steroid therapy or there is a history of steroid intake for 2 weeks or longer within the past 2 years. In such condition, the patient’s physician should be consulted if any extrastroid will be needed and confirm the pre- and post-procedural steroid dosages to avoid the risk of adrenal crisis.[20] Increased dose shift is not compulsory if the prednisolone dose is <7.5 mg/day. Morning appointments should be preferred for these patients.

**Renal Diseases**

For renal disease patients with conservative medical management, the frequent episodes of hypertension necessitate monitoring the blood pressure during the procedure. Nephrotoxic drugs such as tetracyclines and aminoglycosides must be strictly avoided. Antibiotics such as amoxicillin/clavulanate, erythromycin, azithromycin, and analgesics such as paracetamol and ibuprofen do not require any dose alteration for these patients.[21]

**For nephritic patients on hemodialysis**

During hemodialysis, the patient’s blood is anticoagulated with heparin to assist blood transportation.[22] For this reason, endodontic procedures with a risk of bleeding should not be executed on the day of hemodialysis. When performing endodontic procedures that tend to bleed, protamine sulfate can be administered to block the anticoagulant effect. However, bleeding can happen due to platelet dysfunction and potential anemic status that necessitate the precaution for hemostatic measures. These patients are highly prone to the risk of infection and of transmission possibility of hepatitis B virus, hepatitis C virus, and HIV. Appropriate diagnostic tests must be carried out to confirm the negative results for these infections.

**Renal transplant patients**

Treatment with corticosteroids, calcineurin inhibitors (Cs, tacrolimus), and inhibitors of lymphocyte proliferation...
(azathioprine and mycophenolate mofetil) is common in renal patients, and hence, they will be in an immunosuppressed state. Antibiotic prophylaxis, as per nephrologist’s guidelines, is mandatory prior to endodontic procedure.

**Epileptic Patients**

Epilepsy is a disease characterized by an alteration of awareness, performance, and mental activities, as well as by involuntary muscle contractions.[23] Epileptic seizures are reversible and recurrent in nature.[24] 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. 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.[25]

**Hepatitis C and B**

Endodontic procedures can be provided for these patients with adequate sterilization care and infection control protocol. The most critical component is in choosing the medications, and drugs metabolized in the liver should be avoided. Ampicillin and tetracycline are the antibiotic choice, and acetaminophen can be considered for analgesic purpose.[26]

**Conclusion**

Although there is a range of systemic illness, this article focused on only selected conditions that need utmost care. Furthermore, patients suffering from mentioned conditions may prefer endodontic therapy than extraction due to their health condition as well as psychological status. It is mandatory to know the boundaries of restorative care provision for medically compromised patients before referring them for obtaining medical fitness. With adequate knowledge and necessary pretreatment preparation, endodontic treatment can be effectively provided for needy patients.

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**Conflicts of interest**

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