Dental Management in the Medically Compromised Patient

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Overview

As of November 1, 2011 the world's population is estimated to be 7 billion. Within this mass of humanity is a substantial number of people that are elderly; the graying of the world's population is predicted to produce millions of individuals with systemic medical conditions that can affect oral health and dental treatment. The dental management of these medically compromised patients can be problematic in terms of oral complications, dental therapy, and emergency care.

This review focuses on a number of medical problems that dentists might encounter in daily practice that necessitate extra knowledge and care to prevent potential complications causing otherwise unnecessary morbidity and mortality. These include diabetes, multiple drug interactions, cardiac abnormalities, and infectious disease.

The first step in managing the patient with medical problems is acquiring a thorough health history; the second step is for the clinician to fully understand the significance of the disease that may be endorsed by the patient. Each identified condition can affect dental care in a unique manner. For example, medication prescribed for a medical condition might produce a problem during the administration of a local anesthetic, or it could interact with pain medication prescribed post intervention. The dental clinician needs to understand the potential complications that can occur as a consequence of dental treatment of a medically compromised patient and when pretreatment or post-treatment medication or emergency care is indicated.[1]

Certain medically compromised patients should only be treated in a hospital setting where emergency issues, should they arise, can be immediately addressed and promptly attended to in a controlled manner. For example, the patient with a significant bleeding problem or thrombocytopenia arising as a primary condition or secondary to medication, radiation, or leukemia is best managed in an in-patient environment where replacement of platelets can be provided before the procedure or afterwards if spontaneous bleeding occurs (eg, following a tooth extraction).

Dental management of the medically compromised patient requires acquisition of a complete health history of the patient. This should include documentation via questionnaire as well as a verbal history. A comprehensive health history questionnaire should include questions about the patients cardiovascular, hematologic, neural and sensory, gastrointestinal, respiratory, dermal, mucocutaneous, and musculoskeletal, endocrine, and urinary systems as well as questions related to sexually transmitted diseases, drug use (eg, alcohol, tobacco), allergies, x-ray exposure or treatment, medications, and hospitalizations. Preferably an oral history should also be obtained as a review of systems (ROS). This oral ROS often elucidates information that is only touched on by a questionnaire.[2]

The dental history should also include questions related to current oral conditions such as periodontal disease or oral ulceration and past dental treatment and potential complications from prior intervention including treatment failure and the delivery of anesthesia or post-treatment medication.

Technical considerations

Examination of the patient with a history of medical problems should be more extensive than that associated with the healthy patient. Physical assessment should include evaluation of the patient's general appearance (eg, weight, posture, skin, and nails), blood pressure and temperature, pulse rate, respiratory rate, a thorough head and neck inspection (including assessment of lymph nodes, salivary glands, otologic assessment, assessment of breath smell), and cranial nerve examination.

In patients that present with problems identified at examination that have not previously been reported to a health care practitioner the dentist can be instrumental in defining potential pathology and making the appropriate referral for additional medical evaluation. Such patients should be referred for medical assessment prior to dental treatment.

In the patient with pre-existing disease, preparation for dental treatment should include determination of disease status. For example, treatment of the patient with diabetes needing extensive oral surgery (eg, multiple extractions or periodontal surgery) necessitates knowing the level of brittleness of the disease. This can be determined by requesting a fasting glucose level and/or a 2-hour postprandial blood glucose level (FBS) and HBA_1 C values prior to treatment.

In this example, a well-controlled diabetic patient will have values for FBS of less than 125mg/dL, a PP less than 140mg/dL, and an HBA_1 C of less than 7%. In the uncontrolled patient, the FBS will be greater than 140 mg/dL, the PP greater than 200mg/dL, and the HbA_1 C greater than 8%. Out-of-range values warrant additional medical evaluation.

In the patient with uncontrolled diabetes needing emergency oral surgery for acute infection, dental procedures need to be modified. For example, the anesthetic should be mepivacaine without epinephrine, and the patient should be dosed with antibiotic following treatment. In the controlled insulin-dependent diabetic, asking how much is used and how often the patient injects him or herself during the day is important. Similarly, for other nondiabetic conditions, ascertaining the disease status and whether the condition is controlled or uncontrolled may be important. More information related to this condition is covered in the subsection below.

Other laboratory tests that may be necessary prior to dental treatment include a complete blood count with differential and tests for hemostasis, hepatitis B and C, and HIV.

Planning for dental treatment in the medically compromised patient primarily involves having an understanding of the nature of the patient's disease and how it can impact their physiology and his/her response to dental management and postdental treatment healing. Knowing how to manage potential complications is also important and is presented in the following description of specific medical conditions.

Diabetes

Disease nature

Diabetes effects blood glucose metabolism and vessel pathology. The condition may be the result of absolute insulin deficiency (type 1 diabetes), a problem with insulin function (termed relative or type 2 diabetes), or both conditions. Other types of diabetes include gestational diabetes and diabetes occurring secondary to other diseases. The prevalence of diabetes is estimated to be increasing worldwide; over 16 million people in the US may have diabetes mellitus, with 20% over 65 having the disease.[3]

Impact on physiology

A deficiency in insulin or a problem with its metabolic activity can result in an increased blood glucose level (ie, hyperglycemia). Hyperglycemia leads to an increase in the urinary volume of glucose and fluid loss, which then produces dehydration and electrolyte imbalance. This later problem, if severe, may result in coma. The stress of the disease also results in an increase in cortisol secretion. It is the inability of the diabetic patient to metabolize and use glucose, the subsequent metabolism of body fat, and the fluid loss and electrolyte imbalance that causes metabolic acidosis. It is the hyperglycemia and ketoacidosis coupled with vascular wall disease (microangiopathy

and atherosclerosis) that alters the body's ability to manage infection and heal. Complications in the diabetic patient that can occur during and after dental treatment include hypoglycemia, coma, or infection and delayed healing.

Dental management

In patients with controlled diabetes, no special treatment is required for routine dentistry including prophylaxis and dental restorative care. The patient should be told to continue with their normal eating and injection regimen. Morning appointments are recommended because cortisol levels are highest at this time and will provide the best blood glucose level. The morning meal should not be skipped.[4]

Likewise, the type 1 patient should not be scheduled immediately after an insulin injection because this may result in a hypoglycemic episode. No more than 2 carpules of lidocaine 1:100,000, prilocaine HCL (1:200,000), or bupivacaine with 1:200,000 epinephrine should be delivered for anesthesia.

In the moderately-controlled diabetic patient, a maximum of 2 carpules of bupivacaine or prilocaine should be used and, if a major procedure is planned (eg, multiple extractions, periodontal surgery), an antibiotic should be prescribed following therapy. Following surgery the patient's food intake should include the proper caloric content and protein/carbohydrate/fat ratio to maintain glucose balance.

In the uncontrolled or brittle diabetic patient, only acute dental infection should be treated on an outpatient basis. Delivered anesthetic should not include epinephrine. Antibiotics should be prescribed following treatment and monitored carefully for sensitivity and efficacy. In-patient intervention is recommended for more complicated dental treatment because precise insulin management and post treatment care with respect to infection and electrolyte balance may be needed.[5]

Complications/management/prevention

Reportedly, the most common in-office complication that occurs during treatment of the diabetic patient is hypoglycemia resulting from a severely depressed glucose level. Symptoms may include mood change, hunger, and weakness and signs include sweating, tachycardia, and mental disturbance. The patient usually senses that they are becoming hypoglycemic and request a source of sugar such as orange juice.

More severe hypoglycemia is associated with hypotension, hypothermia, seizures, coma, and death. Prevention of the condition includes appropriate screening for blood glucose levels pretreatment; an awareness of potential complications related to co-morbid cardiovascular disease, renal failure, or cerebrovascular accidents; morning appointments; symptom awareness; and having sugar available during treatment.

If hypoglycemia appears to be developing, dental treatment should be terminated and glucose administered. Loss of consciousness is the most serious complication of hypoglycemia. Medical assistance should be quickly sought and, if the dentist is knowledgeable with IV procedure, an IV should be placed with immediate delivery of 25-30 mL of a 50% dextrose solution or 1 mg of glycogen. Glycogen can also be provided by intramuscular or subcutaneous delivery.

Post-treatment problems can include delayed healing and infection. In uncontrolled diabetics, electrolyte imbalance can also present a problem following dental treatment.

Drug Reactions

With the aging of the population, more and more people are taking single and multiple drug regimens for medically complex problems. Some of these medications can interact with drugs typically prescribed by dentists, over-the-counter (OTC) or naturopathic preparations taken by the patient, alcohol, and even food.

With dentists now managing patients with chronic facial pain (eg, TMJ, TMD, myofascial pain, atypical facial pain, burning mouth syndrome), certain drugs may be used that impact cardiovascular and central nervous system function. Drugs used to treat these conditions are typically prescribed long term which, in the face of reduced organ function in the aged and other factors, can result in increased blood levels and subsequent organ failure. In addition, prescribed medications can cause a spectrum of allergic reactions and secondary intraoral effects such as gingival hyperplasia and other mucosal pathology.[6]

Four primary classes of medications are usually prescribed by dentists that can be problematic in the patient taking

medication for systemic disease: anesthetics, sedative-hypnotics, pain medications, and antibiotics. The severity rating for drugs within these classes varies from major (ie, potentially life threatening or causing permanent body damage), moderate (ie, could change the patient's clinical status and require hospitalization), to minor (ie, no change or mild effects). The risk of drug interactions is dependent on patient age (eg, very young and elderly), gender, and relative health (eg, the presence of comorbid disease or liver or kidney abnormality).

The following summarizes potential problems associated with the 4r classes of medications prescribed by dentists.

Local anesthetics

Although rare, local anesthetics can be associated with toxicity (central nervous system and cardiac problems), allergy, hemoglobin abnormality (methemoglobinemia), and can interact with several classes of medication.[7, 8]

Toxicity issues (cardiac and CNS problems)

If delivered in excess, most local anesthetics can produce toxicity such as CNS excitation, convulsions, and cardiac arrest. Respiratory depression can also occur. Liver disease impairing liver amidase activity or decreasing hepatic blood flow may increase toxicity potential if large doses of amide local anesthetics are delivered or absorbed over a short time period. Specific drug combinations have been documented as problematic with respect to toxicity. For example, local anesthetic toxicity may result from the combination of lidocaine with bupivacaine. Another adverse drug reaction that is associated with combined medication involves the application of local anesthetic (mepivacaine) with opiate (meperidine) pain medication taken for pain associated with systemic disease.

Epinephrine or other vasoconstrictors delivered with local anesthetic help to reduce anesthetic toxicity but may confound cardiac and CNS status. In patients taking Digoxin, the administration of anesthetic with epinephrine can lead to cardiac excitation. During standard dental treatment, the amount of vasoconstrictor delivered is typically below the level at which toxicity develops. However, because of the dual vasoconstrictive and vasodilative effects of epinephrine, which is typically used, even doses normally used can result in a change in blood pressure, particularly with intravenous delivery. An unrecognized underlying cardiovascular problem may further confound potential change in the heart rate consequent to delivery of the drug.[9]

In patients that abuse cocaine, delivery of anesthetic containing epinephrine could induce deleterious sympathomimetic effects.

The potential interaction of vasoconstrictor and 2 classes of medications warrant specific notation: levonordefrin injection or the use of epinephrine-impregnated gingival retraction cord coupled with a tricyclic antidepressant prescribed for depression and the interaction of epinephrine and nonselective β-blockers may result in acute hypertension. Such an interaction is most likely to occur with intravascular injection, but the initial dose of a dental anesthetic injected via a cartridge that has 1:100,000 epinephrine has been recommended to only involve one-half the cartridge initially, with the patient monitored closely during subsequent injections.

An excessive dose of prilocaine combined with dapsone can lead to methemoglobinemia. Bupivacaine has also been associated with an increased risk of local nerve damage.

Management/Prevention

A toxic reaction to dental anesthetic can be prevented by recognition of several factors: the potential interaction with medications taken for systemic disease, the potential effects of age and confounding health issues on drug metabolism, the slow delivery of anesthetic, the use of proper aspiration technique, an awareness of the vascular anatomy of the injection site, and the delivery of the appropriate amount of anesthetic. In the case of a patient experiencing a sense of cardiac discomfort (an acute tachycardic response) associated with the use of an epinephrine impregnated gingival retraction cord, the material should be removed and a cord without epinephrine substituted. A true toxic reaction to anesthetic involving cardiac or CNS complications warrants immediate medical attention.

Sedative hypnotics

Many patients are prescribed this class of medication for anxiety, sleep disturbance, or pain resulting from systemic disease. This class of medications may also be prescribed by a dentist prior to dental treatment or as a short-term intervention for masticatory muscle spasm, trismus, or TMD.[10]

Toxicity issues

The primary issue with the sedative hypnotics is CNS depression. Drugs prescribed by dentists in this class of medications commonly include the benzodiazepines, the nonbarbiturate nonbenzodiazepines such as chloral hydrate, meprobamate, and carisoprodol. Drugs used during conscious sedation may also contain ultrashort or short-acting and intermediate-acting barbiturates such as methohexital (Brevital) or thiopental (Pentothal), and clinicians managing TMD pain may prescribe butalbital (Fioricet, Fiorinal). Of all the sedative-hypnotics, the benzodiazepines are reported to have the highest morbidity and mortality rates. Death is usually the result of respiratory arrest. This can occur from single drug use (eg, suicide) but can also occur as a result of the interaction with other medications prescribed for systemic disease or self-prescribed in cases of drug abuse.

The benzodiazepines are metabolized in the liver. Hence, disease effecting liver function may increase blood levels of these drugs. The sedative effect of the sedative-hypnotics is increased in patients using alcohol and may be worse with alcohol abuse. Macrolide antibiotics (eg, erythromycin) increase the serum levels of the benzodiazepines, with the exception of lorazepam (Ativan), because they interfere with the oxidative reactions that inactivate these drugs.

Relative toxicity of this class of medications is dose dependant. Barbiturates may be of greatest concern because of their narrow therapeutic-to-toxic range of activity. Tolerance can also develop quickly, so a greater potential for abuse exists.

In patients using cimetidine, isoniazid, and oral contraceptives, metabolism of benzodiazepine is retarded, which can lead to an increase in sedation. Barbiturates such as Phenobarbital can increase the risk of hepatic toxicity with co-prescribed acetaminophen. An additive depression can also occur when medications in this class are prescribed in combination with other CNS depressant drugs (eg, valproic acid [Depakote]).

In patients taking certain corticosteroids such as Medrol (methylprednisolone), the plasma level of Xanax may be increased.

Although not directly related to systemic disease, prolonged use of anxiolytic drugs has also been associated with weight gain, which can confound a number of systemic disorders such as hypertension, diabetes, and coronary artery disease.

Management/prevention

Potential interactions and toxicity can be avoided by taking a careful history concerning medication and recreational drug use.

Pain medications

With dentists managing more complex orofacial pain problems than those simply caused by tooth pathology, the potential for toxicity from drug interactions increases considerably. Many classes of medications can be prescribed for acute and chronic pain arising from systemic disease. Off-label prescribing for chronic pain management is also used by physicians for treating various chronic pain problems and dentists treating chronic conditions such as TMD, atypical neuralgia, glossodynia, and atypical facial pain.

Medications that are used for treating chronic pain include the opioid-narcotics, antidepressants, anticonvulsants, and non-steroidal anti-inflammatory preparations.

Toxicity issues

The side effects of opioid use include sedation, respiratory depression, dependence, nausea, miosis, and constipation. The prescription of another narcotic postdental treatment or a sedative-hypnotic drug can be problematic for the patient already taking opioid/narcotic medication for a medical condition or abusing these drugs. The analgesia effect of an opioid may be reduced with co-administration of fluoxetine (Prozac) or paroxetine (Paxil), but this does not appear to be the case with other SSRI medications. Tramadol, a centrally-acting analgesic used to reduce somnolence and constipation associated with opioid use or to prevent opioid abuse, can lower seizure threshold, so it should be used cautiously. Tramadol combined with an SSRI can result in serotonin syndrome. CNS depression is always a consideration when opioid is combined with sedative hypnotic medications.

Opioid that is combined with acetaminophen is commonly used as an analgesic product, but acetaminophen may cause or exacerbate hepatic damage so it should not exceed 4 g per day.

SSRIs should not be prescribed with tramadol. Since tricyclic antidepressants can potentiate the sympathetic effects of epinephrine or levonordefrin, local anesthetic containing these agents should be administered cautiously in patients taking them for depression or other psychiatric or pain disorders. When SSRIs are combined with non-steroidal anti-inflammatory drugs (NSAIDs) an enhanced risk for gastrointestinal bleeding exists.

NSAIDs are typically used for moderate pain, including pretreatment and post-treatment dental pain. Their long-term use has been associated with gastrointestinal problems, including bleeding and ulceration, as well as kidney damage and cardiovascular problems. In addition, blood pressure medication may also be compromised by co-prescription of NSAIDs[11] .

Antibiotics

The primary risk for the dentist treating a patient with systemic disease is co-administration of an antibiotic that interacts with previously prescribed medication, resulting in an increased blood level of the drug, reduced activity of the antibiotic that is taken, or unpleasant side effects. Antibiotics of concern include the tetracyclines, metronidazole, erythromycin, and clarithromycin. Another potential problem with antibiotics is allergy and anaphylaxis, although recent evidence suggests that this may not be as prevalent as previously thought.[12]

Toxicity issues

Although this is not a serious problem, the alcoholic patient prescribed metronidazole may experience flushing, headache, palpitation, and nausea. This antibiotic also increases blood lithium levels in the patient using the drug to manage bipolar disorder by inhibiting renal excretion. This can lead to confusion, ataxia, and kidney damage. In patients taking digoxin (digitalis) for atrial fibrillation, atrial flutter, or heart failure, the blood drug level may be elevated when erythromycin or tetracyclines are prescribed. This can lead to increased salivation, visual disturbances, and arrhythmias.

In patients taking the anticoagulants warfarin and anisindione to prevent emboli, a prescription of tetracyclines or other broad-spectrum antibiotic may alter vitamin K synthesize in the gut and, in the absence of vitamin K supplementation, could increase the risk of bleeding and hematuria, bruising, and hematoma formation. Quinolone antibiotic agents (eg, ciprofloxacin) reduce metabolism of theophylline, and an increase in the blood level of this drug can cause cardiac dysrhythmias and convulsions. Doxycycline used in periodontal system formulations (Atridox) is not recommended in women who are pregnant or breastfeeding or in children under the age of 8 because of potential bone and tooth development abnormalities.

In tuberculosis patients taking the antituberculosis drug rifampin, clinical studies suggest that this medication alters estrogen and progestin in birth control preparations, potentially rendering the oral contraceptive ineffective. This drug interaction has also been reported with penicillin, erythromycin, tetracycline, and cotrimoxazole, although the failure of oral contraceptives when coupled with these antibiotics remains controversial.

Other antibiotics, such as chloramphenicol, can cause and exacerbate pre-existing anemia. The aminoglycosides have been shown to affect the eighth cranial nerve, resulting in dizziness, vertigo, and deafness. This may be an important consideration in managing the dental patient with partial deafness.

Finally, in terms of medication management, the prolonged use of topical corticosteroid for oral ulceration is discouraged. The use of a systemic corticosteroid for managing atypical neuralgia or facial neuropathic pain can be problematic in terms of glucose management and infection.

Cardiac Abnormalities

Cardiovascular problems that warrant special attention and dental-treatment-plan modification include infective endocarditis, surgically corrected cardiovascular lesions, ischemic heart disease, myocardial infarction, cardiac arrhythmias, and congestive heart failure. In patients with cardiovascular disease, the most important considerations during treatment include the maintenance of blood pressure, pulse, cardiac output, and myocardial oxygen and the prevention of bacteremia via prophylactic antibiotic.

Generally, best practice suggests that a comprehensive dental evaluation should involve a thorough medical history and premedical evaluation, if required, and an examination that includes assessment of vital signs (eg, pulse, blood pressure, the rate and depth of respiration, and temperature). Dental treatment should include short morning appointments, good procedural pain control, stress and anxiety reduction that could include preoperative or intraoperative conscious sedation or other nonpharmacologic techniques, good postoperative follow-up with pain control using appropriate medication, and pretreatment and post-treatment antibiotic coverage for specific

conditions as recommended by the American Dental Association and the American Heart Association.[13]

Infective endocarditis, surgically corrected heart disease, and antibiotic coverage

In April, 2007, the American Dental Association and its Council on Scientific Affairs published a position paper that provides newly revised guidelines for the prevention of infective endocarditis (IE). These guidelines, endorsed by the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the American Heart Association, among others, reflected current research assessing dental procedure related bacteremia, endocarditis prevention, and the most common pathogens associated with the condition. The new guidelines reduce the classes of patients for whom antibiotic prophylaxis is recommended because the risk of morbidity resulting from antibiotic use outweighs its probable benefits.[14]

The pathogenesis of infective endocarditis (IE) is complex and involves a number of different factors. Vessel turbulence leading to platelet deposition and damage to the endothelium of the cardiac valve or surgically constructed pulmonary shunt or conduit must exist, combined with a bacteremia arising from oral trauma with microorganisms that are capable of adhering to the site (ie, typically streptococci, staphylococci, and enterococci), and bacterial proliferation at the site of adherence.

Multiple studies suggest that tooth extraction, periodontal surgery, tooth cleaning and scaling, rubber dam placement, and root canal therapy can cause a bacteremia.[15, 16] Although evidence exists that bacteremia can follow dental treatment and dental hygiene procedures, because of potential allergy, resistance, and cost-effectiveness, among other factors, the Counsel restricted the classes of patients for whom short-term antibiotic prophylaxis before dental procedures is recommended. Prevention via systemic antibiotic application is generally discouraged because, in addition to the above, a lack of viable supportive research exists and, further, contradictory results exist.[17, 18]

The classes of conditions warranting antibiotic coverage include patients with artificial heart valves, patients having a history of infective endocarditis or having had a cardiac transplant that develops a heart valve problem, and patients with a congenital heart condition that includes repaired cyanotic congenital heart disease with shunts or conduits, repaired congenital heart defects with prosthetic material or devices having been placed during the first 6 months after the procedure, and any repaired congenital heart defect with residual defect.

Best practice includes the following ADA, AMA, and AHA recommended prophylactic antibiotic regimen for the above conditions (2007) as follows:

- Able to take oral medication: Amoxicillin 2 g (50 mg/kg)
- Unable to take oral medication: Ampicillin 2 g IM or IV (50 mg/kg IM or IV); Cefazolin or ceftriaxone 1 g IM or IV (50 mg/kg IM or IV)
- Allergic to penicillin or ampicillin: Cephalexin 2 g (50 mg/kg); Clindamycin 600 mg (20 mg/kg); Azithromycin or clarithromycin 500 mg (15 mg/kg)
- Allergic to penicillin or ampicillin and unable to take oral medication: Cefazolin or ceftriaxone 1 g IM or IV (50 mg/kg IM or IV); Clindamycin 600 mg IM or IV (20 mg/kg IM or IV)

Functional murmurs and organic heart murmurs do not require prophylactic antibiotic. To control the risk of IE in patients for whom antibiotic prophylaxis is no longer recommended, the ADA recommends that individuals potentially predisposed maintain good oral hygiene and avail themselves of professional dental care as needed.

In patients needing heart valve surgery, recent evidence suggests that presurgery dental treatment may not improve survival. In a reported study,[17] 149 subjects that received comprehensive dental treatment 3-6 months prior to surgery were compared with 103 control subjects not receiving treatment. Sixteen years after the heart valve surgery morbidity endpoint data were compared to access survival; the study found that fewer patients survived in the study group than the control group (18% versus 7%).

Ischemic heart disease with angina

Angina attacks resulting from cardiac ischemia may be precipitated by dental treatment. This can lead to infarction and cardiac arrest. This patient cohort benefits from empathy, short morning appointments, premedication with anxiolytics or prophylactic nitroglycerin, nitrous oxide-oxygen sedation, and slow delivery of an anesthetic with epinephrine (1:100,000) coupled with aspiration. The patient with mild or moderate angina should be reminded to have with them their nitroglycerin tablets in case of an attack during treatment. Additionally, oxygen deprivation in the patient with severe ischemic disease and angina can be avoided by delivery of oxygen via nasal cannula at

3L/min during dental treatment.

If co-morbid pulmonary disease (chronic obstructive pulmonary disease) exists, the dose of oxygen provided via cannula or nitrous-oxygen delivery should not exceed 3L/min. Patients will also benefit from being placed in a semireclined position in the dental chair. The above considerations aid in the patient acceptance of a rubber dam necessary to prevent potential aspiration of fluid or materials. Anticholinergic drugs used to reduce salivary flow during complex restorative care should be avoided because of the increased risk of pneumonia in patients with concomitant pulmonary edema.[19, 20]

This group of patients may also be taking ß-adrenergic blocking agents and calcium channel blockers.

The prevention of complications relies on the above considerations. For added protection of the patient during complex dental treatment, automatic monitoring of cardiac status by ECG or pulse and blood pressure instruments should be considered and/or the patient should be treated as an inpatient in a hospital setting.

Myocardial infarction

Although relatively uncommon in the dental setting, cardiac arrest as a result of myocardial infarction (MI) can occur. In patients with a history of MI, dental treatment should not be pursued for at least 6 months after the cardiac event. The patient's physician should be contacted prior to treatment and verification sought regarding the patients current cardiac status. As with the ischemic patient, short morning appointments are best. The combination of an MI with congestive heart failure increases risk to the patient so only emergency treatment should be provided on an outpatient basis. The onset of chest pain and shortness of breath during dental treatment warrants discontinuation of the procedure and immediate medical consultation or hospitalization.[19, 20]

Several other considerations associated with cardiac instability are important to consider. For example, a patient post MI may be on anticoagulant medication, and the dose may need to be reduced if dental extractions or periodontal surgery is necessary. Even prolonged aspirin use can affect bleeding time. Potential complications can be avoided by acquiring a prothrombin time on the day of surgery to verify the patient's ability to clot.

As previously noted in the section on drug interactions, potential adverse reactions need to be taken into account after treatment (eg, the interaction between NSAIDs, penicillin, tetracyclines, metronidazole, and anticoagulants) because prophylactic antibiotic may need to be considered to prevent infection. Cardiac patients may also be prescribed digitalis, which can increase nausea as well as exacerbate the gag reflex, a consideration if a rubber dam is not used. Additionally, in patients with pacemakers, electrocautery and the use of a Cavitron should be avoided.

Be aware that a 20-40 fold increase in endogenous epinephrine occurs with stress, so management of this factor is extremely important in the provision of dental treatment.

Cardiac arrhythmias

Patients with cardiac arrhythmias are at greater risk for more serious cardiac complications including cardiac arrest. Most patients presenting for dental treatment will know they have an arrhythmia and will be taking controlling medication such as procainamide, quinidine, or propranolol. Medical consultation should be sought before dental treatment to verify the patient's cardiac status and confirm the medications that are being taken and if they are being taken as prescribed. Complications during dental treatment can be prevented by reducing stress and anxiety and providing short morning appointments. If the patient's cardiac status is unclear, treating in a more controlled hospital environment may be best.

Best practice also includes the avoidance of excessive anesthetic with epinephrine. The excessive delivery of anesthetic with epinephrine by intraligamentary injection is contraindicated because it has been reported to act in a similar manner to intravenous epinephrine injection.[21]

Congestive heart failure

The challenges in treating the patient with congestive heart failure are numerous. A determination must be made via physician consultation on the status of the disease prior to treatment (ie, is it stable or unstable?). The condition is often confounded by hypertension, a history of MIs, renal failure, thyrotoxicosis, and chronic obstructive pulmonary disease (COPD). Antibiotics need to be prescribed (with the same caveats as noted above in relation to interaction with other prescribed medications) following treatment to prevent infection. The amount of epinephrine delivered can be a critical confounder of the disease. A dentist treating the patient with congestive

heart failure should be prepared for potential complications.

Consequently, in the patient with multiple co-morbid conditions, only urgent dental needs should be provided. For the patient who is deemed stable and without significant complications, routine conservative dental care can be performed in an outpatient setting. Prior to treatment, a prothrombin time should be obtained, and, during treatment, the patient should be placed in an upright position to prevent additional pulmonary fluid collection.

Infectious Diseases

A number of recent studies assessing the oral health – related quality of life in people with infectious disease suggest that they experience significant issues related to oral care that may propel them to seek dental tratment.[18, 22, 23]

Infectious conditions that are problematic in terms of dental management include hepatitis B (HBV), hepatitis C (HCV), HIV, and tuberculosis. Less likely to cause a problem but of additional concern are viral infections such as that seen in severe acute respiratory syndrome (SARS) or methicillin-resistant Staphylococcus aureus (MRSA). At issue are several potential complications that can occur during dental treatment such as the risk of transmission, medication interactions in patients being treated for active disease, and management of the patient with comorbid organ disease or other complications related to viral infection or associated with medication management (eg, susceptibility to bleeding, oral disease, or respiratory infection). In addition, the transmission of cold and flu virus from staff to patients with immune suppression resulting from treatment of the viral infection is also a concern.

In 1983, following growing awareness of HIV transmission, the Centers for Disease Control and Prevention (CDC) began to make dentists conscious of the need for universal precautions. A Standard for Bloodborne Pathogens was developed by the Occupational Safety and Health Administration in 1991, and 1993 saw the development of specific concepts related to infection control in dentistry. The American Dental Association (ADA) published standards in 1995 as did the Organization for Safety and Asepsis Procedures in 1997. The CDC released its most recent standards in 2003. The latter have remained relatively unchanged since this publication.

A potential problem associated with the treatment of patients with infectious disease is that while millions of people worldwide are, per published data, infected and thousands may be infected every year, a large number of these people are unaware of their disease. For this reason, best practices include "Universal" (now termed "Standard" by the CDC) versus selective precautions.

Note that although dental procedures may contaminate the saliva with blood, the relative risk of disease transmission to dental personnel is considered extremely small. Occupational exposure, however, no matter how small the risk, remains an important concern for dental staff including assistants, hygienists, lab technicians, and dentists. Hence, education of all staff, whether administrative or clinical, is extremely important if patients with infectious disease are to be managed in an outpatient setting.[24]

Somewhat disturbing, however, is recent evidence that in terms of basic knowledge as applied to clinical practice, a discrepancy appears to exist between what should be practiced and what is actually occurring in clinical practice. For example, an observational study out of the UK found that only 50% of surgeries had a management policy on infection control, and 74% of dental practitioners and only 57% of dental nurses recognized the symbol used to define a single use device.[18]

Precautions

Wounds and needle sticks following dental procedures that result in oral bleeding and subsequent instrument or materials contamination represent the biggest problem with respect to potential viral transmission to clinical staff. Two other areas of concern with respect to viral contamination include potential backflow associated with dental restorative equipment (eg, high speed handpieces that use water and compressed air and their cross-connections) and aerosols and salivary/water droplets produced during restorative dental procedures. The later is of concern with respect to potential airborne transmission of some diseases (eg, tuberculosis, N1H1).

In 2003, the CDC published an updated guideline for the management of patients with infectious disease. This latest report revisited recommendations previously made in 1993 and provides additional suggestions related to education of dental health-care personnel; prevention of transmission of bloodborne pathogens; hand hygiene; personal protective equipment, contact dermatitis and latex hypersensitivity; sterilization and disinfection of patient-care items; environmental infection control, dental unit waterlines, biofilms and water quality; dental handpieces and other devices such as those used in radiology; parenteral medications; oral surgical procedures; and dental

laboratory considerations.

Dental health care personnel are encouraged to read this literature as a first step in providing appropriate precautions in the clinical setting. The guidelines are comprehensive and offer practical solutions that need to be followed to prevent inadvertent transmission of disease. The document also provides a list of definitions, a review of the current science behind disease transmission and control, and a precise summary of the most effective protocols that are recommended.

Three appendixes have been added and include: 1) a regulatory framework for disinfectants and sterilants which includes a summary of resistant micro-organisms to germicidal chemicals in decreasing order, 2) immunizations that are strongly recommended for health care personnel, and 3) methods for sterilizing and disinfecting patient-care items and environmental surfaces. The document also recommends that offices establish in writing a manual based on the published guidelines and the establishment of an infection-control coordinator to audit the implementation of policies, sterilization procedures, and clinical practices.

Staff training updates are recommended to be delivered yearly. Many different methods of training can be employed, including self-study courses, programs presented by a facilitator or staff person, webinars, university-sponsored lectures/trainings, and DVD-based programs. A number of different for-cost packages are also available on the WEB (see web references).

To avoid complications from medication interactions in the patient with infectious disease, prior to treatment, the patient's physician should be contacted and queried regarding current medications, precautions related to immune suppression or thrombocytopenia, which would necessitate a platelet count and bleeding time prior to invasive (eg, extraction or periodontal surgery) intervention, and the extent of potential organ damage (eg, liver, see above). Immune suppression, if present, does not require prophylactic antibiotic therapy.

To protect dental personnel from airborne illnesses such as the H1N1 virus, all staff should be vaccinated appropriately, patients with influenza-like illnesses should not be examined or treated until they are free of fever, patients identified as having such illness at check-in be rescheduled, only "urgent" dental care be provided in a room with a closed door, staff should wear personal protective garments before entering the treatment room, and, in the case of H1N1, all active staff personnel wear a disposable N95 respirator fit-tested when performing procedures on the patient, and, if this is not possible, a good fitting surgical face mask, and that spray or spatter potentially occurring during the dental procedure be minimized. It also goes without saying that sick personnel should not come to work until fever free.

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References

1. [Guideline] K Ganda. management of the medically compromised dental patient; part 1. 2006;[Full Text].
2. James A Little, Donald Falace, Craig Miller, Nelson L Rhodus. *Dental management of the medically*

compromised patient, 7th Edition. Ed. James A Little, Donald Falace, craig Miller, Nelson L Rhodus. Mosby, St Louis. 7th Edition. St Louis: Mosby; 2003.

3. Wray L. The diabetic patient and dental treatment: an update. *Br Dent J*. Sep 9 2011;211(5):209-15. [Medline].
4. Living with diabetes. Available at http://www.diabetes.org/living-with-diabetes/treatment-and-care/oral-health-and-hygiene/. Accessed 11/25/11.
5. Lalla RV, D'Ambrosio JA. Dental management considerations for the patient with diabetes mellitus. *J Am Dent Assoc*. Oct 2001;132(10):1425-32. [Medline].
6. [Best Evidence] Hersh E, Moore P. Drug interactions in Dentistry. *J Am Dent Assoc*. 2004;136(3):298-311.
7. [Guideline] Tomovasu Y, et al. Allergic reactions to local anesthetics in dental patients: analysis of intracutaneous and challenge tests. *Open Dent J*. 2011;5:146-149.
8. [Best Evidence] [Guideline] Becker DE, Reed KL. Essentials of local anesthetic pharmacology. *Anesth Prog*. 2006;53(3):98-109.
9. [Guideline] Yagiela, J. Adverse drug interactions in dental practice: interactions associated with vasoconstrictors, part V of a series. *JADA*. 1999;130:701-709.
10. [Guideline] Schwartz TL, Beale M. Pharmacokinetics and drug interactions of the sedative hypnotics. *Psychopharacol Bull*. 2003;37(1):5-9.
11. [Guideline] Llorca, CS, et al. Interactions between ibuprofen and antihypertensive drugs: incidence and clinical relevance in dental practice. *Med Oral Patol Oral Cir Bucal*. 2008;13(11):E717-721.
12. Heinzerling LM, Tomsitz D, Anliker MD. Is drug allergy less prevalent than previously assumed? A 5-year analysis. *Br J Dermatol*. Sep 14 2011;[Medline].
13. [Guideline] Rose LF, et al. Oral care for patients with cardiovascular disease and stroke. *J Am Dent Assoc*. 2002;133(1):375-445.
14. [Best Evidence] [Guideline] Wilson W, Taubert KA, et al. Prevention of Infective Endocarditis, Guidelines from the American Heart Association. A Guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasake Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *J Am Dent Assoc*. 2007;138(6):739-745, 747-760.
15. [Guideline] Savarrio L, Mackenzie D, et al. Detection of bacteraemias during non-surgical root canal treatment. *J Dent*. 2005;33:293-303.
16. [Guideline] Heimdahl A, Hall G, et al. Detection and quantitation by lysis-filtration of bacteremia after different oral surgical procedures. *J Clin Microbiol*. 1990;28:2205-2209.
17. [Best Evidence] [Guideline] Bratel J. Treatment of oral infections prior to heart valve surgery does not improve long-term survival. *Swed Dent J*. 2011;35(2):49-55.
18. [Best Evidence] [Guideline] Smith A, et al. Management of infection control in dental practice. J Hosp Infect. *J Hosp Infect*. 2009;71(4):353-358.
19. [Guideline] McCarthy FM. Safe treatment of the post-heart-attack patient. *Compendium*. 1989;10:598-604.
20. [Guideline] Shuman SK. A physician's guide to coordinating oral health and primary care. *Geriatrics*. 1990;45(8):47-57.
21. [Guideline] McCarthy FM. Recognition, assessment and safe management of the medically compromised patient in dentistry. *Anesth Prog*. 1990;37(5):217-222.
22. Sanchez GA, D'Eramo LR, et al. Impact of oral health care needs on health-related quality of life in adult HIV+ patients. *Acta Odontol Latinoam*. 2011;24(1):92-97.

23. Tomar SL, Pereyra M, Metsch LR. Oral health-related quality of life among low-income adults living with HIV. *J Public Health Dent*. 2011;71(3):241-247.

24. [Best Evidence] [Guideline] Westergard EJ, et al. Controlling bacterial contamination of dental impression guns. *J Am Dent Assoc*. 2011;142(11):1269-74.

25. Martin MV, Longman LP, et al. Infective endocarditis and dentistry: the legal basis for an association. *Br Dent J*. 02, 2007.

26. Pinto Andres, et al. Prescribing NSAIDs to Patients on SSRIs: possible adverse drug interaction of importance to dental practitioners. Dentalaegis, Continuing Education; accessed 11.2.11 (http://cde.dentalaegis.com/courses/19 -prescribing-nsaids-to-patients-on-ssris-possible-adverse-drug-interaction-of-importance-to-dental-practitioners). Dentalaegis, Continuing Education. Available at http://cde.dentalaegis.com/courses/19 -prescribing-nsaids-to-patients-on-ssris-possible-adverse-drug-interaction-of-importance-to-dental-practitioners. Accessed 11/02/2011.