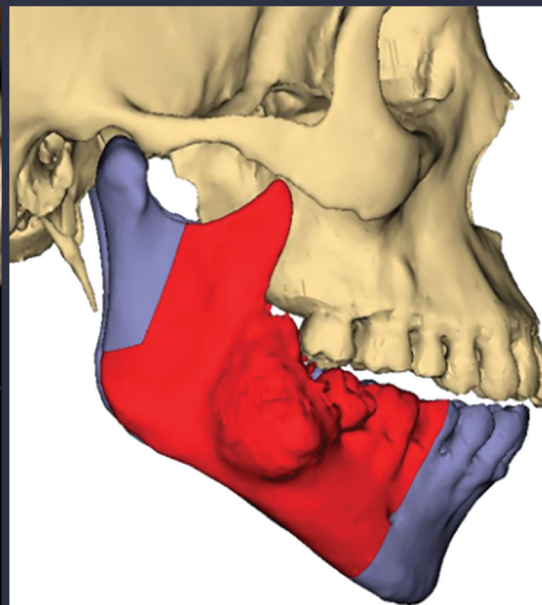


Oral and Maxillofacial Surgery, Medicine, and Pathology for the Clinician

Edited by **Harry Dym** | **Leslie R. Halpern** | **Orrett E. Ogle**



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Oral and Maxillofacial Surgery, Medicine, and Pathology for the Clinician

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Edited by

Harry Dym, DDS

*Chairman, Department of Dentistry and Oral and Maxillofacial Surgery
Brooklyn Hospital Center
Brooklyn, NY, USA*

*Clinical Professor, Oral and Maxillofacial Surgery
Columbia University College of Dental Medicine
New York, USA*

Leslie R. Halpern, DDS, MD, PHD, MPH, FACS, FICD

*Professor and Section Chief of Oral and Maxillofacial Surgery
New York Medical College/NYCHHC
New York, USA*

Orrett E. Ogle, DDS

*Former Chief and Residency Program Director Oral and Maxillofacial Surgery
Woodhull Hospital Center
Brooklyn, NY, USA*

*Former Associate Clinical Professor of Oral Surgery
Columbia University College of Dental Medicine
New York, USA*

*Lecturer, Mona Dental Program
Faculty of Medicine, University of the West Indies
Kingston, Jamaica*

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Contributors

Shelly Abramowicz, DMD, MPH, FACS

Section Chief, Pediatric Oral and Maxillofacial Surgery
Children's Healthcare of Atlanta
Associate Professor and Director of Research, Oral and
Maxillofacial Surgery and Pediatrics
Emory University School of Medicine
Atlanta, GA, USA

David R. Adams, DDS

Associate Professor (Clinical) Oral and Maxillofacial
Surgery University of Utah School of Dentistry
Salt Lake City, UT, USA

Nathan Adams, MD, DMD, FACS

Assistant Professor
University of Utah School of Dentistry
Salt Lake City, UT, USA

Dina Amin, DDS, FACS

Clinical Associate Professor
Head and Neck Oncology and Microvascular
Reconstructive Surgery
Department of Oral and Maxillofacial Surgery,
School of Dentistry
Texas A & M University, TX, USA

Ricardo Boyce, DDS

Chief and Program Director, General Dentistry and
Oral Medicine
The Brooklyn Hospital Center
New York, USA

Steven Caldroney, DDS, MD, FRCS

Private practice in oral and maxillofacial surgery
Framingham, MA, USA

Michael Chan, DDS

Director OMFS
Department of Veterans Affairs, New York Harbor
Healthcare System

Senior Attending OMFS
The Brooklyn Hospital Center
New York, USA

Earl Clarkson, DDS

Chairman of Dentistry and Department of Oral and
Maxillofacial Surgery
The Brooklyn Hospital Center
New York, USA

Prince Dhillon, DMD, MD

Assistant Attending Oral and Maxillofacial Surgeon
Department of Dentistry
St Barnabas Hospital
Bronx, NY, USA

Jonathan C. Elmore, DDS

Former Resident
Department of Oral and Maxillofacial Surgery
The Brooklyn Hospital Center
New York, USA

Yijiao Fan, DDS

Resident, Oral and Maxillofacial Surgery
The Brooklyn Hospital Center
New York, USA

Michael A. Gladwell, MD, DMD, FACS

Assistant Professor
University of Utah School of Dentistry
Salt Lake City, UT, USA

Tarun Kirpalani, DMD

Oral and Maxillofacial Surgeon Resident
The Brooklyn Hospital Center
New York, USA

Vivian Lim, DDS

Resident
NYC Health + Hospitals/Woodhull
New York, USA

Gary W. Lowder, DDS

Associate Professor (Clinical) TMD and DSM
University of Utah School of Dentistry
Salt Lake City, UT, USA

Pushkar Mehra, BDS, DMD, FACS

Professor and Chair
Department of Oral and Maxillofacial Surgery
Boston University
Boston, MA, USA

Justine S. Moe, DMD, MD

Clinical Assistant Professor, Residency Program
Director, Oral and Maxillofacial Surgery, Associate
Fellowship Director, Oral/Head and Neck Oncologic and
Reconstructive Surgery
University of Michigan
Ann Arbor, MI, USA

Junaid Mundiya, DMD

OMS private practice, Suffolk Oral Surgery Associates
OMS Attending, St Barnabas Hospital
New York, USA

Mihai Radulescu, DMD, FRCD(C), FACS

Assistant Professor in Surgery
OMFS Residency Attending
Geisinger Commonwealth School of Medicine
Scranton, PA, USA

Andrew R. Rahn, DDS

Adjunct Instructor
University of Utah School of Dentistry
Salt Lake City, UT, USA

Arvind Babu Ravendra Santosh, BDS, MDS

Oral and Maxillofacial Pathologist
Senior Lecturer, School of Dentistry
Faculty of Medical Sciences, The University of the West
Indies, Mona, Jamaica
Research Fellow, Faculty of Dental Medicine

Department of Oral Medicine
Universitas Airlangga, Surabaya, Indonesia

Feiyi Sun, DDS

Oral and Maxillofacial Surgeon Resident
The Brooklyn Hospital Center
New York, USA

Alexander Toth, DMD

Assistant Oral and Maxillofacial Surgeon
Windsor Dental Center
New Windsor, NY, USA

Bryan Trump, DDS, MS

Associate Professor
University of Utah School of Dentistry
Salt Lake City, UT, USA

Michael Turner, DDS, MD, MSc

Chief, Oral and Maxillofacial Surgery
Mount Sinai Hospital
Program Director
Mount Sinai/Jacobi Einstein
Residency in Oral and Maxillofacial Surgery
Associate Professor
Icahn School of Medicine at Mount Sinai
New York, USA

Dwight Williams, DDS, MPH

Assistant Director of Oral and
Maxillofacial Surgery
Woodhull Medical Center
Brooklyn, NY, USA
Owner, Optimum Dental Care
Bronx, NY, USA

Lester Woo, DDS

Oral and Maxillofacial Surgeon
Lakewood, WA, USA

Preface

The successful practice of dentistry and oral surgery requires the serious practitioner to engage in a lifelong pursuit of continuous knowledge improvement and education, while failure to do so will ultimately lead to poor patient clinical outcomes along with a diminished sense of satisfaction with their chosen profession. Textbooks such as this are a valuable resource in assisting the dentist and oral surgeon in the pursuit of up-to-date clinical information that can assist them in their practice.

I am grateful to all our contributors for their well-written additions to this text. Despite their busy schedules, they have all provided valuable concise clinical information that should prove meaningful for our readers, including younger dentists as well as established dental and oral surgical practitioners.

I am indebted to my coeditor and colleague Dr Orrett E. Ogle who I have known and worked with for over four decades; he is a trusted friend and mentor. Dr Ogle is also an educator and a gifted clinician who has dedicated his entire professional career to the education of dental and oral and maxillofacial surgery residents.

Dr Leslie R. Halpern, my other coeditor, is also a dear friend who, like Dr Ogle, has spent her entire career involved in the education of dental students in the area of oral and maxillofacial surgery.

I have been privileged to spend my entire career working at the Brooklyn Hospital Center where I am Chairman of the Department of Dentistry and Oral and Maxillofacial Surgery. I am indebted to Ms Lizanne Fontaine, Chairperson of the Brooklyn Hospital Center Board of Trustees, and Mr Gary Terrinoni, President and CEO of the Brooklyn Hospital Center, for their continued support of my department.

Acknowledgment is due to my colleagues Dr Earl Clarkson and Dr Peter Sherman for their ongoing friendship; they have always been available for consultation and support.

Appreciation is due to all my past and present oral and maxillofacial surgical residents as they have been the impetus for my passion in teaching and writing.

Finally, all credit is due to my wife Freidy who has always stood by me these many decades.

Harry Dym

Part I
Basics

1

Patient Evaluation and Management of Medical Problems in the Oral Surgery Patient

Orrett E. Ogle

When a new patient presents for an oral surgical procedure, it is the responsibility of the surgeon to not only address the patient's dental issues but also to assess the patient's medical status to ensure that he/she can provide surgical services that is medically appropriate for each patient.

The first encounter with a new patient should always involve a medical history as part of the initial evaluation. The most efficient and commonly used method of obtaining the medical history is to use a medical questionnaire. There are several types of questionnaires available for both adults and children but it is best for the dentist to select one that is detailed and comprehensive. The more detailed the health questionnaire, the more information will be obtained and the dentist will be better able to make informed decisions. A detailed medical history will identify potential management problems (physiologic and pharmaceutical) and allow the oral surgeon to formulate a treatment plan in light of the medical status. On the questionnaire, all health questions must be answered. Pertinent positive answers must be addressed and certain negative answers, such as allergies or bleeding history, must be confirmed. The patient should be verbally questioned about the severity and control of their disease. All medications must be noted.

The purpose of taking the medical history is to achieve the following specific goals.

- The identification of potential management problems (physiologic and pharmaceutical) and referral for further medical evaluation if necessary.
- Assessment of risk potential.

- Formulation of a dental/oral and maxillofacial surgery (OMFS) treatment plan to minimize risk in light of the medical status.
- Avoidance of drug interactions.

Once the dentist has obtained the full medical history, a useful step in patient assessment based solely on the history is to assign an American Society of Anesthesiologists (ASA) physical status classification (Box 1.1). This will inform the dental team of the degree of risk the patient's physical ailments constitute and simplify decision making (Figure 1.1).

Risk Assessment

Risk (the probability that an adverse event will occur during dental treatment due to an existing underlying disease) assessment will allow the dentist to make treatment decisions, which will act as a framework to avoid complications during or after the oral surgical intervention and produce an optimal outcome. Some quick risk assessments that should be made from the medical history include the following.

- The patient's physiologic reserves: cardiovascular disease (CV) assessment.
- Risks of infection: diabetes mellitus, immune deficiencies.
- Current medications: bleeding risks, drug interactions, medications that need to be modified before dental treatment.
- Control of chronic diseases: diabetes, hypertension, heart problems, arthritis, other chronic diseases which may cause modification to routine surgical care.

Box 1.1 Modified ASA classification

- **ASA 1:** Normal healthy patient
- **ASA 2:** Patient with mild systemic disease. Patient with one systemic disease that is controlled
- **ASA 3:** Patient with severe systemic disease. Two or more systemic diseases – controlled or uncontrolled. One systemic disease that is not controlled
- **ASA 4:** Patient with severe systemic disease that is a constant threat to life

- **ASA 5:** Moribund patient who is not expected to survive without surgical intervention.
- **ASA 6:** Declared brain-dead patient whose organs are being removed for donor purposes

Factors not listed in the ASA classification but that must be regarded as an additional risk are extreme age (more than 80 years), increased body mass index, and pregnancy that is close to the estimated date of delivery.

Source: Modified from [1].

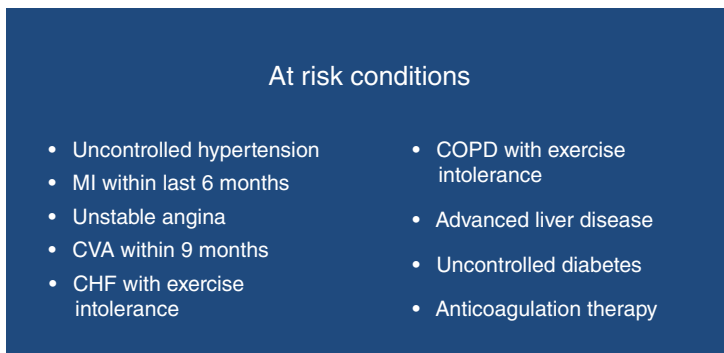
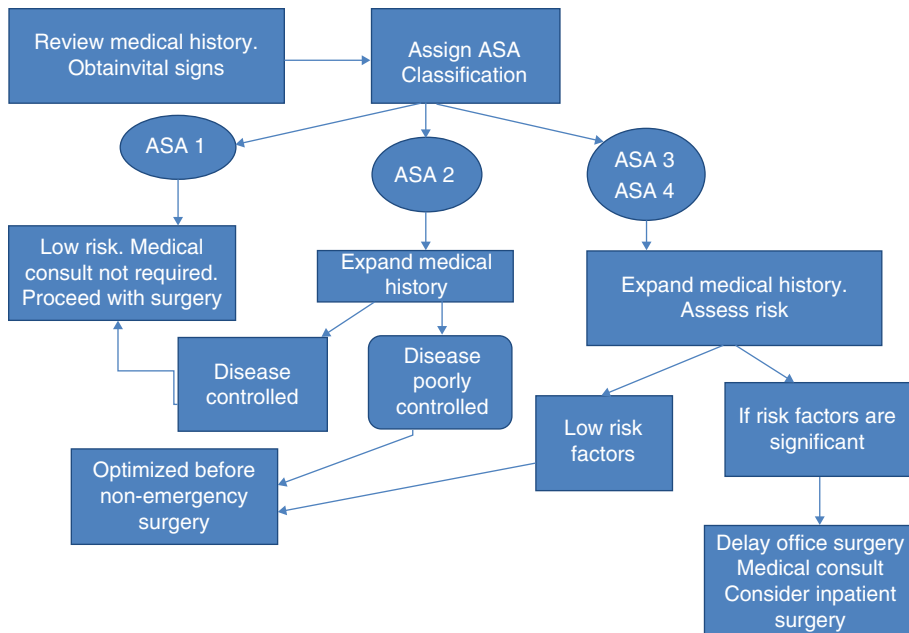


Figure 1.1 After determining the ASA classification, follow the algorithm to decide how the patient should be managed.

Documentation

Medical/dental notes are important to any clinical practice, and the dental practitioner is urged to keep accurate records and adequately document all encounters with

patients. Chart notes should be written immediately after seeing each patient and it is good practice to write notes in full sentences that are well organized and include the pertinent data from the encounter. Acceptable medical abbreviations can be used. Good clinical notes will be very useful

to the practitioner if ever having to defend a legal claim of clinical negligence. Most importantly, billing documents should not be included anywhere within the clinical notes.

As a part of the documentation, the history form must be dated and signed by the patient or parent/guardian and by the dentist. Failure of the dentist to sign the form may imply that he/she did not review it. Any medical condition that could affect dental treatment or that could be affected by dental treatment should be noted on the record treatment page under a section for past medical history. If the condition is critical (e.g., allergies or heart conditions), the external portion of the chart should be flagged with a sticker for medical alerts or annotated in red ink. Electronic records should also be flagged using the method available in the software system. For individuals with a serious illness, the name and telephone number of the primary care physician should also be obtained. Oral surgery practice will often not have multiple office visits, but if there are serious medical issues, the health history should be updated at every procedural visit (e.g., two-stage implant surgery or serial extractions) and any changes in the condition should be noted in the record.

The patient's medical record should also list all drugs that the patient is currently taking – both prescribed and over-the-counter medications. The oral surgeon should know what each drug (particularly recently introduced ones) is and why it is being used. Medications are a useful indication of conditions for which the patient is being treated. Special attention should be paid to side-effects associated with the medications, because some side-effects may affect dental treatment. For example, heart medications, blood pressure drugs, muscle relaxants, and other medications may contribute to bladder control problems. Patients taking these drugs may need to urinate frequently and will not be able to tolerate long appointments. Thiazides, all diuretics, alpha-blockers, and carbonic anhydrase inhibitors are examples of drugs that will cause frequent urination and urgency [2].

Management of Patients with Medical Problems

Patients will present to the dentist with one or multiple established diagnoses which will be garnered from the medical history. These conditions may alter how dental care is delivered. Medical illness may predispose the patient to acute physiologic decompensation under stress or failure to do well post treatment. Drugs prescribed by a dentist may lead to a drug interaction which may negatively

compromise the medical therapy. The job of the clinician is to know how these medical problems will impact dental care or how dental care may affect the medical care. The dentist must therefore be aware of potential outcomes and what precautions must be taken to minimize risks. They must identify issues that should be addressed prior to treatment (e.g., insulin, warfarin, or aspirin use), illnesses that may cause physiologic decompensation during treatment (e.g., angina, seizure disorders, or asthma), and conditions that may affect the posttreatment phase (e.g., diabetes [infection and delayed wound healing] or aspirin use [impaired hemostasis]) [1].

Approximately one in seven Americans is over the age of 65. People 65+ represented 14.5% of the population (46.2 million) in 2014 but are expected to grow to be 21.7% of the population by 2040 [3]. This aging population will produce millions of people with systemic medical conditions that will present for dental care and they will undoubtedly become a numerically significant part of oral surgical practice in the upcoming years. It is imperative, therefore, that the dental practitioner has a full understand of the potential complications that can occur as a consequence of dental treatment of a medically compromised patient and how office management may need to be modified to prevent potential complications. Each systemic disease will affect dental care in its own unique way and there is no generalized protocol that will be applicable in all situations.

This chapter will review some of the more common medical problems that oral surgeons may encounter in their daily practice and present suggested methods for managing individuals with existing disease. There is a long list of diseases (Box 1.2) that can impact dental care, but only the more commonly seen ones can be discussed in this chapter.

A starting point for the oral surgeon preparing to treat a patient with a preexisting disease should be the determination of disease status. Is the patient in optimal condition despite the underlying disease; where in the continuum of disease is the patient; and, lastly, is it possible to reverse the disease? A disease that is poorly controlled, deterioration in symptoms or changes in the condition of the patient will warrant medical evaluation and appropriate referral should be made. An individual with moderate disease who has frequent exacerbations should be reevaluated at each visit. Always remember that unless it is a true dental emergency (infection, trauma, severe pain), the surgery can be delayed and the first responsibility of the clinician is to ensure that the patient is in as good a medical condition as possible. For patients whose disease is stabilized, routine office surgery will generally not present a problem.

Box 1.2 Diseases that may affect dental treatment

- Cardiovascular disease: hypertension, coronary artery disease, stroke, heart failure, certain congenital heart diseases
- Endocrine disorders: diabetes, parathyroid and thyroid diseases, adrenal gland alterations
- Hepatic disease
- Renal disease
- Pulmonary disease: asthma, chronic obstructive pulmonary disease (COPD)
- Pregnancy
- Bleeding disorders: drug induced, congenital
- Malignancies: chemotherapy, radiation therapy
- Allergies (drugs, latex, others)
- Medical conditions associated with geriatric patients
- Eating disorders: bulimia, anorexia
- Leukemia
- Anemia
- Blood-borne pathogens: HIV, hepatitis B and C
- Poor nutrition
- Obstructive sleep apnea

The management of specific diseases is described below.

Cardiovascular Disease

Cardiovascular (CV) disease is America's leading health problem, and the leading cause of death. Cardiovascular problems that may cause modification of dental treatment plans and will be discussed here include hypertension, ischemic heart disease (coronary artery disease [CAD]), myocardial infarction (MI), strokes, cardiac arrhythmias, and heart failure.

Hypertension

Hypertension is a highly prevalent cardiovascular disease, with a steep increase with aging, that is frequently encountered in the dental setting. Table 1.1 summarizes the classification of hypertension from the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure [4].

Patients with stage 2 or 3 hypertension are at increased risk because the stress from surgery may further increase blood pressure and trigger a devastating complication such as stroke or cardiac arrest. To date, there are no randomized clinical trials that set a limit on the maximum blood pressure for elective oral surgical treatment. Long years of clinical practice, however, have indicated that oral surgery would only be deferred at blood pressure readings of systolic >160 mmHg or diastolic >100 mmHg [5]. Without obvious target organ disease, there are no grounds for postponing oral surgery, nor is one isolated reading of a high blood pressure immediately before surgery a reason not to do the surgery. Emergency dental procedures could be performed for stage 2 patients but should be avoided in patients with a blood pressure of greater than 180/110 mmHg. These individuals should be referred for immediate medical attention and the dental emergency managed in the hospital if severe, e.g., Ludwig angina. Hypertension is associated with several comorbidities such

as ischemic heart disease, cardiac failure, strokes, and kidney disease and, as a result, the surgeon should rule out these diseases or make sure that they are stable before sedation or in-office general anesthesia.

The most important aspect of treating hypertensive patients is effective control of pain and anxiety. Endogenous catecholamines triggered by pain and stress may increase blood pressure and cardiac output. The dental surgeon should aim at good pain control and decreased anxiety. One of the easiest and most effective methods of controlling anxiety is the use of nitrous oxide, which has excellent sedative, analgesic, and antihypertensive properties, or, preferably, IV sedation with midazolam with or without supplemental nitrous oxide/oxygen. When administering N₂O to patients using beta-blockers, hypotension may occur and the blood pressure should be monitored.

In many patients, local anesthesia (LA) is often the method of pain control and local anesthetics with epinephrine are widely used because they produce longer and more effective anesthesia. Small doses of local vasoconstrictor produce minimal change in blood pressure readings [6, 7]. The maximum recommended dose of epinephrine in a patient with cardiac risk is 0.04 mg, which is equal to what is contained in about two cartridges of LA with 1:100,000 epinephrine, or four cartridges with 1:200,000 epinephrine [8]. If adequate anesthesia is not achieved with the

Table 1.1 Classification of hypertension.

| Classification | Systolic | Diastolic |
|------------------|----------|-----------|
| Normal | <120 | <80 |
| Pre-hypertension | 121–139 | 81–89 |
| Stage 1 | 140–159 | 90–99 |
| Stage 2 | 160–179 | 100–109 |
| Stage 3 | ≥180 | ≥110 |

two cartridges containing the vasoconstrictor then the anesthesia may be supplemented with a nonvasoconstrictor-containing agents such as mepivacaine 3%. Again, IV sedation is always an option.

The question of using local anesthetic with epinephrine in patients taking nonselective beta-blockers (propranolol and nadolol) has been raised. The small amounts of epinephrine combined with LA used in routine dental procedures are unlikely to be a problem in patients on nonselective beta-blockers [9]. The use of vasoconstrictors in hypertensive individuals still remains controversial. There are no absolute contraindications to the use of vasoconstrictors in dental local anesthetics, since epinephrine is an endogenously produced neurotransmitter [10]. In addition, the release of endogenous epinephrine from inadequate pain control would be far greater than the injected exogenous epinephrine. The American Heart Association and the American Dental Association issued a joint statement in 1964 stating that “the typical concentrations of vasoconstrictors contained in local anesthetics are not contraindicated with cardiovascular disease so long as preliminary aspiration is practiced, the agent is injected slowly, and the smallest effective dose is administered” [11].

Antihypertensive drugs can have several oral manifestations such as xerostomia, oral lichenoid reactions, and gingival hyperplasia but these expressions will not alter the actual clinical management of the hypertensive patient. These drugs, however, have side-effects that may be consequential. Angiotensin-converting enzyme (ACE) inhibitors are associated with cough and loss of taste (ageusia) or taste alteration (dysgeusia). Patients taking enalapril, for example, may have a dry cough and may have to cough frequently. This coughing will be disruptive when it is necessary for the patient to keep their mouth open or blood is in their mouth. Diuretics may cause frequent urination or even urinary incontinence. Patients may have to make more frequent bathroom visits, making them intolerant to long dental procedures. With elderly patients, in rare cases they may need to be excused during the procedure. The antihypertensive medication should not be stopped or altered.

Other groups of patients who are not necessarily hypertensive but whose blood pressure should be monitored are: (i) diabetic patients; (ii) elderly patients in whom orthostatic hypotension is a common problem due to altered blood pressure regulatory mechanisms and autonomic dysfunction; and (iii) pregnant women, because pregnancy may alter the patient's BP values and more than 10% of pregnant women have relevant hypertension [12].

Angina Pectoris

Angina pectoris is chest pain that occurs when an area of the heart muscle is not receiving an adequate oxygen

supply. It is the primary symptom of CAD, the most common type of heart disease. Angina attacks which could lead to infarction and cardiac arrest may be precipitated by dental treatment.

The risk in patients with a history of angina is that they may have an attack during dental treatment secondary to stress. The risk increases with increase in classification (Tables 1.2 and 1.3). The most dangerous complication to be concerned about with angina is a heart attack. Totally elective surgical procedures in patients with unstable angina should be delayed until they can be stabilized. Emergencies – infections, severe pain, trauma – should be treated as an inpatient in a hospital setting with monitoring of cardiac status with ECG by an anesthesiologist. Frequently, patients with unstable angina will be given anticoagulants, which will need to be addressed.

The angina patient should be scheduled for short appointments, preferably in the morning [13]. Local anesthetic with epinephrine (1:100000) should be injected slowly after aspiration and when possible nitrous oxide-oxygen sedation or IV sedation provided. The patient with mild or moderate angina should be advised to bring their nitroglycerin tablets to the scheduled surgical visit in case of an attack during treatment. Persons with a history of frequent attacks, or with attacks often triggered by situational anxiety should be given sublingual nitroglycerin prophylactically 5–10 minutes before injection of LA. Although not absolutely contraindicated, epinephrine should be avoided in this group as the transient tachycardia may stress the myocardium and provoke an attack. Mepivacaine would be a reasonable substitute. Angina may also be avoided by delivery of oxygen via nasal cannula at 3 L/min during the dental procedure.

If the patient develops chest pain during treatment:

- loosen tight clothing around the waist to facilitate breathing
- administer nitroglycerin (best to use the patient's own nitroglycerin tablets), one tablet sublingually. Positive drug action is hastened by sitting the patient upright in the dental chair and asking them to inhale deeply. Relief should follow within 1–3 minutes and reach a peak at 5 minutes [14]
- if the first tablet does not relieve the pain, wait 5 minutes and administer another tablet. Up to three tablets may be given with 5 minute intervals between each tablet
- blood pressure readings should be taken after each tablet since nitroglycerin can lower the blood pressure. If the systolic pressure falls by more than 20–30 mmHG, do not administer another dose. If the chest pain is unresolved, give aspirin and call the local EMS (911) service.

Table 1.2 Classification of angina pectoris.

| Stable angina | Unstable angina |
|--|---|
| <ul style="list-style-type: none"> • Chest pain/discomfort that occurs with a predictable, reliable amount of exertion or stress, and when that pattern has been present for more than 4 weeks • It is triggered by activities that increase cardiac demand – physical and emotional exertion or stress • The pain or discomfort is similar to past episodes of angina with similar amounts of exertion and usually resolves in less than 5 minutes • The chest pain usually stops after medication is taken or at rest • Stable angina can become unstable | <ul style="list-style-type: none"> • Chest pain occurring for the first time, or has been happening for less than 2 weeks • If there is a change in the usual pattern of angina that occurs with exertion • Unstable angina can occur without exertion • If the symptoms stop, they usually return in a short period of time • The pain is often more severe and lasts longer than stable angina – more than a few minutes • The pain may not go away with rest or use of angina medication |

For all angina patients, the dosage of epinephrine should be limited to that contained in two 1.8 mL cartridges of anesthetic containing epinephrine 1:100000.

Myocardial Infarction

Myocardial infarction (heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia) [15]. It is unlikely that a dental patient will suffer a MI without having a history of ischemic heart disease. Based on the medical history of heart disease, the dentist should be able to fairly accurately recognize an MI and take appropriate actions. When there is a suspicion of a MI, the oral surgery should attach an ECG machine as soon as possible, and monitor vital signs.

As previously mentioned, the patient's history is critical and sometimes may provide the only clue that the person could be having a MI. Patients with typical acute MI usually present with retrosternal chest pain on the left side that is intense and continuous for 30–60 minutes. The pain often radiates up to the shoulder, down to the left arm, and up to the neck and jaws. They may also complain of lightheadedness, shortness of breath, and nausea.

Physical examination findings may vary but typical clinical findings include:

- profuse sweating
- increased pulse which may be irregular

Table 1.3 Symptomatic classification of angina pectoris.

| Class | Description |
|-----------|---|
| Class I | Angina only with strenuous exertion |
| Class II | Angina with moderate exertion |
| Class III | Angina with mild exertion. Difficulties walking one or two stores or climbing one flight of stairs at normal pace |
| Class IV | Angina at rest |

- blood pressure is initially elevated (because of peripheral arterial vasoconstriction resulting from an adrenergic response to pain, anxiety, and ventricular dysfunction) [15]
- increased respiratory rate
- peripheral cyanosis.

Not all patients will experience the same symptoms or experience them to the same degree. However, the more signs and symptoms that are present, the greater the probability that the individual may be having a heart attack. If the patient develops chest pain, administer nitroglycerin and take the blood pressure. If nitroglycerin does not decrease the pain or the pain persist for longer than 15 minutes, then suspect that the patient is having a MI. A MI will not respond to nitroglycerin.

When it is believed that the person is having a MI, have them chew a 325 mg tablet of chewable aspirin. If the chewable form is unavailable, then use regular aspirin. (Aspirin has a bitter taste, thus may be difficult to chew and may cause nausea.) Aspirin will work within 15 minutes to prevent the progression of clots in the coronary arteries and allow oxygen-rich blood to get to the damaged heart muscle.

MONA is the classic mnemonic for the treatment of an acute MI (morphine, oxygen, nitroglycerin, aspirin). Although the mnemonic is MONA, this does not describe the order in which the drugs are used, it is only a memory guide. Treatment steps are as follows.

- Stop dental procedure.
- Give sublingual nitroglycerin until it is proven that the chest pain is not angina.
- Take vital signs.
- Call EMS.
- Administer MONA (oxygen, 325 mg aspirin chewed for 30 seconds then swallowed, nitroglycerin and morphine for pain control if necessary). In addition to morphine, nitrous oxide/oxygen via a nasal cannula may be used until EMS arrives if the chest pain is severe and the morphine is not adequately controlling the pain.
- Monitor vital signs every 5 minutes.

The practitioner should be prepared to start basic life support (BLS) if the patient goes on to have a cardiac arrest. The use of an AED (automatic external defibrillator) may be necessary since most deaths caused by MI occur early and are attributable to primary ventricular fibrillation (VF).

For patients who have had a heart attack, elective oral surgery should NOT be done within the first 6 months after the MI. If patient needs extraction before 6 months, consult with the cardiologist as there may still be cardiac irritability with an increased risk of a secondary cardiac event. Patients are generally placed on antiplatelet medications (usually clopidogrel in combination with aspirin) for 12 months after a MI. When there is a need for tooth extraction, these medications should not be stopped. Try to limit extractions to a single tooth, but no more than three teeth. Limited amounts of LA with vasoconstrictor should be used and bleeding controlled with local hemostatic measures – hemostatic agents, sutures, and extended pressure.

Stroke/Cerebrovascular Accident

A stroke, or cerebrovascular accident (CVA), is the rapid loss of brain function(s) due to disturbance in the blood supply to the brain. This can be due to ischemia caused by blockage (thrombosis, arterial embolism) or a hemorrhage (bursting a blood vessel). Stroke survivors are always at risk for a recurrent stroke, therefore the dentist must be diligent about ways to prevent another stroke. Researchers have reported that patients who had an ischemic stroke within 3 months before undergoing elective surgical/dental procedure were at relatively high risk for cardiovascular events and mortality but that the risks stabilized after 9 months. These results suggest that patients who have sustained a stroke should wait 9 months before having elective procedures [16, 17]. After 9 months, surgical procedures may be provided with the use of LA containing epinephrine 1:100,000 alone or in conjunction with IV sedation.

Since CAD and stroke share many of the same risk factors, several types of cardiovascular diseases may be present in stroke patients. If the stroke patient has associated cardiovascular problems, the dosage of epinephrine in LA should be reduced to conform to recommendations for the specific cardiovascular disease.

Patients who have had a stroke are often on antiplatelet agents – usually aspirin, clopidogrel or aspirin plus clopidogrel. The dentist should question the patient regarding their antiplatelet regimen. For simple exodontia, local hemostatic measures should be used.

On average, someone in the US suffers a stroke every 40 seconds and every 4 minutes, someone dies of stroke [18].

When an individual has a stroke, it occurs quickly and the symptoms often appear without warning. The main symptoms of stroke are as follows [19].

- Confusion, including trouble with speaking and understanding.
- Headache, possibly with altered consciousness or vomiting.
- Numbness of the face, arm or leg, particularly on one side of the body.
- Trouble with seeing, in one or both eyes.
- Trouble with walking, including dizziness and lack of coordination.

Management of suspected stroke patient includes the following measures.

- Stop dental procedure.
- Give oxygen.
- Take vital signs.
- Recognize stroke: using the F.A.S.T. acronym can help identify the onset of stroke more quickly [19].
 - *Face drooping*: if the person tries to smile, does one side of the face droop?
 - *Arm weakness*: if the person tries to raise both their arms, does one arm drift downward?
 - *Speech difficulty*: if the person tries to repeat a simple phrase, is their speech slurred or strange?
 - *Time to call 911*: if any of the above signs are observed, contact the local EMS.
- Call EMS – 911. Alert the 911 operator that you are calling about a suspected stroke patient. Stroke patients should be transported rapidly to the closest available certified stroke center. If no stroke centers exist, the patient should be transported to the nearest hospital that provides emergency stroke care. In order for a stroke patient to have the best prognosis, they will need to be treated at a hospital within 3 hours of their symptoms first appearing.
- Continue to monitor vital signs until EMS arrive.
- If cardiopulmonary resuscitation is necessary, place the patient in a supine position and initiate cardiopulmonary resuscitation.
- Elevate the patient's head slightly, if the blood pressure is elevated.
- Continue cardiopulmonary resuscitation or other supportive care until EMS arrive to transport the patient to an emergency facility.

Cardiac Arrhythmias

An arrhythmia is simply a disorder of the heart rate (pulse) or in the regularity with which the heart beats. Some arrhythmias may be harmless while others may cause

cardiovascular collapse and sudden death. It is very unlikely that a person with a healthy heart would experience any momentous cardiac arrhythmia during dental treatment. An increase in heart rate and transient irregular beats are common reactions to the injection of epinephrine in LA and generally should not be disturbing.

In patients with preexisting heart disease, however, the circumstances may be different. Individuals with underlying heart disease are at increased risk for developing harmful arrhythmias from the stress of dental care. This risk is significantly increased in patients with cardiomyopathies, heart failure, and valvular disease. Such patients should therefore be evaluated by their physician and fully optimized, if necessary, before nonurgent surgical procedures. Pain and multispace infections may necessitate hospital admission and inpatient surgery. The oral surgeon should keep their advanced cardiovascular life support (ACLS) certification current and be prepared to manage dangerous arrhythmias. It is important that the oral surgeon confirms at the procedural visit that patients with heart disease have been taking their medications regularly.

Patients who have been identified from their history as disposed to developing harmful arrhythmias should be managed by a stress and anxiety reduction protocol. IV sedation with midazolam or propofol (propofol has antiarrhythmic and proarrhythmic effects) may be ideal. Local anesthetic with epinephrine should be used to obtain adequate pain control. The total dose of epinephrine should be limited to no more than two 1.8 mL cartridges. The use of periodontal ligament or intraosseous injections using a vasoconstrictor-containing LA is not recommended in these patients [20].

If a high-risk cardiac patient with severe heart disease is suspected of having an arrhythmia during treatment, the dentist should discontinue treatment or rapidly complete the surgery, give supplemental oxygen and closely monitor the rhythm with an ECG machine along with the overall

condition. While monitoring the cardiac rhythm, a sample strip in lead 2 should be recorded and placed in the chart. When in doubt, the patient should be referred to a physician for medical evaluation. With any loss of consciousness, even if brief, EMS should be called to transport the patient to a hospital emergency department.

Atrial fibrillation is the most common chronic arrhythmia. These patients are usually under medical care and the main issue regarding surgical treatment will be the anticoagulant which is used in patients with atrial fibrillation.

Heart Failure

Congestive heart failure (CHF) is defined as inability of the heart to pump oxygenated blood to meet the metabolic needs of the body [21]. Patients often may not be aware that they are in heart failure as this disease develops over a prolonged period of time and patients often fail to notify their physician of changes in symptoms. Even patients who are aware that they have CHF will often not inform their dentist. The treating dentist may have to determine if the patient is in heart failure based on their symptoms and should question patients with history of hypertension, CAD, cardiomyopathy, valvular heart disease, and diabetes about symptoms of CHF. Box 1.3 lists some common symptoms of CHF. A good method to assess risk in the patient with heart failure is to use the New York Heart Association classification of heart failure (Table 1.4).

Treatment Guidelines

- *Class 1 and 2: Low risk.* Oral surgery can be performed without additional work-up or medical evaluation. The dentist should verify that the patient has been taking their medication as prescribed. Appointments should be short (20 minutes) and office procedures simple. Dental chair position is generally not a problem in this class of patients [23].

Box 1.3 Common signs of heart failure

Shortness of breath during activity (most commonly), at rest, or while sleeping, which may come on suddenly and wake the individual

- Chronic fatigue and difficulty with activities of daily living, such as shopping, climbing stairs, carrying groceries, or walking
- Persistent cough that produces white or pink blood-tinged mucus

- Swelling in the feet, ankles, legs, or abdomen
- Increased heart rate and heart palpitation
- Confusion, impaired thinking, memory loss, and feelings of disorientation

Source: Adapted from American Heart Association. Heart failure signs and symptoms. www.heart.org/HEARTORG/Conditions/HeartFailure/WarningSignsforHeartFailure/Warning-Signs-of-Heart-Failure_UCM_002045_Article.jsp#.WKEtgzsrLIU

Table 1.4 New York heart association classification of heart failure.

| NYHA class | Symptoms |
|------------|---|
| Class 1 | Patients with cardiac disease but with no limitations in physical activity |
| Class 2 | Slight limitation of physical activity. Fatigue, palpitations, and dyspnea with ordinary physical activity, but no symptoms at rest |
| Class 3 | Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea, or anginal pain |
| Class 4 | Inability to carry on any physical activity without discomfort. Symptoms may be present even at rest. Any physical activity results in increased discomfort |

Source: Adapted from NYHA [22].

- **Class 3: Moderate risk.** Obtain medical consultation before treatment. Optimize patient if possible. No extensive treatment. Avoid the use of epinephrine or levonordefrin. Short visits. Keep chair in semi-supine or upright position during treatment.
- **Class 4: High risk.** Not candidates for elective oral surgery. For pain and infection, treat in hospital with monitoring by an anesthesiologist.

surgeon look for complications of the diabetes. Patients with significant complications related to the disease are at increased risk for bad outcomes during or after oral surgery. Individuals with significant complications of their diabetes should be referred to a diabetic specialist for evaluation and to obtain a glycemic control that is as good as it could be.

Common complications of diabetes are listed in Box 1.4 and risks in Box 1.5.

In the uncontrolled or brittle diabetic patient, only acute dental infection should be treated on an outpatient basis. Local anesthesia with epinephrine is not contraindicated as the small amounts of epinephrine in dental local anesthetics at 1:100 000 concentration will have no significant effect on blood glucose levels. Antibiotics should be prescribed following treatment and monitored carefully for sensitivity and efficacy [26, 27]. Patients with controlled diabetes require no alterations to their delivery of dental care.

In general, morning appointments are advisable for patients with diabetes since endogenous cortisol levels are typically higher at this time. Because cortisol increases

Endocrine Disorders

Diabetes Mellitus

Diabetes is a major US public health issue and both the CDC [24] and the American Diabetes Association [25] reported that in 2012, 9.3% (approximately 29.1 million) of the US population had diabetes. Because of the number of people with diabetes in society, practicing dentists are likely to encounter it frequently. Patients with diabetes mellitus are at risk for a multitude of complications that are directly related to the disease itself and it is imperative that the

Box 1.4 Complications of diabetes mellitus

Hypertension

- Polyuria: may reflect glycosuria or chronic kidney disease
- History of poor/slow wound healing
- Peripheral arterial disease: problems with lower limb ischemia – pain and/or cramping in the lower leg due to inadequate blood flow to the muscles

- Chronic kidney disease (diabetic nephropathy)
- Cardiovascular disease: evidence of angina, postural hypotension (a late indication of autonomic neuropathy)
- Neuropathies: numbness, pain, paresthesia, leg ulcers; symptoms/history of transient ischemic attacks

Box 1.5 Risks in diabetic patients

Postoperative wound infection
 Poor vascularization: slow wound healing
 Increased frequency of MI which may be silent (no obvious symptoms)

Cardiac arrest as a consequence of autonomic neuropathy
 Stroke: generally increased risk in diabetes mellitus

blood sugar levels, the risk of hypoglycemia is less [26]. The most serious event that can occur while treating diabetic patients is the development of hypoglycemia (blood sugar below 70 mg/dL). This complication is most often a result of lack of coordination between the use of hypoglycemic medications and food intake. It is the current belief of many physicians who treat diabetes that management with intensive glycemic control will limit, delay or prevent the chronic complications of diabetes. Because of this intensive diabetes treatment, oral surgeons may encounter patients with an increased risk of hypoglycemia which is a true medical emergency requiring prompt recognition and treatment. Insulin and sulfonylureas are the drugs that are responsible for most of the hypoglycemia seen in diabetic subjects.

Except in elderly or chronically ill individuals or in association with prolonged fasting, severe hypoglycemia is unlikely to occur when appropriate doses of oral glucose-lowering agents are used to manage blood glucose. Mild hypoglycemia may occur and can be managed very easily with sugary drinks. Sulfonylureas, which stimulate the pancreas to release more insulin both right after a meal and then over several hours, can cause hypoglycemia. Combination pills may cause hypoglycemia if one of the medications contained in the combination has this effect. (See Table 1.5 for medications which may cause hypoglycemia.)

The dentist should use the medication guide to schedule and management patients. Patients taking medication that can cause severe hypoglycemia should be given morning appointments, take their medication, and be sure to have a good morning meal. Hypoglycemia with metformin, miglitol, pioglitazone, and similar drugs is uncommon and patients taking these medications can be scheduled at any time of day but should be advised to maintain their usual eating regimen.

For patients using short- and/or long-acting insulin therapy, their appointments should be scheduled so they do not coincide with peak insulin activity, which would increase the risk of hypoglycemia. Check the patient's

Table 1.5 Oral antiglycemic medications.

| Can cause hypoglycemia | Hypoglycemia is rare |
|---|--------------------------------------|
| Glimepiride (Amaryl [®]) | Metformin (Glucophage [®]) |
| Glyburide (Diabeta [®] , Micronase [®]) | Repaglinide (Prandin [®]) |
| Glipizide (Glucotrol [®] , Glucotrol XL [®]) | Nateglinide (Starlix [®]) |
| Micronized glyburide (Glynase [®]) | Pioglitazone (Actos [®]) |
| <i>Combination drugs</i> | Acarbose (Precose [®]) |
| Glyburide + metformin (Glucovance [®]) | Miglitol (Glyset [®]) |
| Glipizide + metformin (Metaglip [®]) | |

injection times and type of insulin and schedule appropriately. Box 1.6 lists various types of insulin. These patients should take their medication and maintain their eating regimen if being treated under local anesthesia. For patients scheduled for sedation, the dose of insulin should be modified. A widely used regimen is for the patient to take half of the normal dose of insulin preoperatively and the remaining half after surgery when food is consumed. Some oral surgeons doing IV sedation prefer to use normal saline as fluids rather than dextrose 5% in water (D5W); however, for the small amounts of fluids used during IV sedation in oral surgery, D5W should not produce wide fluctuations in blood glucose levels in most patients.

For example, the greatest risk of hypoglycemia would be about 45–90 minutes after injecting lispro insulin, 3–5 hours after glargine and 4–8 hours after NPH.

The risk for head and neck cancer is almost 50% higher in patients with diabetes than in individuals without diabetes. It is recommended that dental patients with diabetes be screened annually for oral cancer [28].

Thyroid Disease

Thyroid disease is relatively common with an increased prevalence in women and the elderly [29]. Patients who have well-compensated thyroid disease (euthyroid) do not need special consideration prior to oral surgery as long as it can be documented that the patient is on a stable dose of

Box 1.6 Types of insulin and peak activity

- *Short-acting insulins*: aspart, lispro, and glulisine. Onset of action of approximately 15 minutes, *peak at 1–1.5 hours* and last 3–4 hours.
- *Intermediate-acting insulins*: isophane insulin, also known as neutral protamine Hagedorn (NPH). These have an onset of action of 2–4 hours, *peak at 6–7 hours* and last 20 hours.
- *Long-acting insulin analogs*: detemir and glargine. They have an onset of action at 1–3 hours, *peak at 5 hours*, then plateau and last for 20–24 hours. They are used once or twice daily, and achieve a steady state to produce a constant level of insulin.

Source: Information from www.diabetesnet.com/about-diabetes/insulin/insulin-action-time and Slagle M. Medication Update. South Med J. 2002;95.

medication and has been euthyroid for the past 6 months. Monitoring of thyroid function on an annual basis is customarily a part of routine care. Patients who have recently been diagnosed with a thyroid disorder, those who have not seen their endocrinologist in over a year, do not take their medications regularly or with vague history of a thyroid disorder should be seen by their physician before nonurgent oral surgical procedures. Every attempt should be made to get these individuals euthyroid before extensive nonurgent dental treatment. (Methimazole is the preferred drug to quickly reverse hyperthyroidism but it will require an average of 6 weeks to lower T4 levels back to normal) [30]. Table 1.6 outlines the risk of uncontrolled thyroid disease to the surgeon. For emergency situations, pulse, blood pressure, and temperature should be assessed and a decision made based on the clinical picture. Local anesthesia without epinephrine should be used.

Patients with poorly controlled hyperthyroidism, oral surgical procedures or the injection of exogenous epinephrine can precipitate thyroid storm – a potentially life-threatening condition. For patients with hypothyroidism, the risk is less and clinical decisions should be made on the severity of hypothyroidism. Their cardiovascular status should be checked.

Analgesics containing acetylsalicylic acid are contraindicated in patients with hyperthyroidism because acetylsalicylic acid interferes with the protein binding of T4 and T3, thereby increasing their free form. This may worsen the symptoms of thyrotoxicosis [31]. NSAIDs should also be used with caution.

Some medications used to treat thyroid disease may have an effect on surgical treatment. Propylthiouracil (PTU) has antivitamin K activity and can cause hypoprothrombinemia that could pose a risk for hemorrhage. Thus, patients taking PTU must be carefully evaluated before oral surgery [32]. Thionamides can result in oral infections and inadequate wound healing and methimazole, like PTU,

can increase the risk of bleeding and can lower white blood cell count, effects which tend to develop rapidly and precipitously, and not gradually. This will increase the risk of infections. Patients should have a CBC done before extensive oral surgery.

Adrenal Insufficiency

Adrenal insufficiency (AI) is an endocrine disorder caused by the inadequate production of mineralocorticoids and glucocorticoids by the adrenal cortex.

The vast majority of patients with AI that oral surgeons will encounter are on chronic glucocorticoids which can suppress the HPA axis, resulting in the patient not being able to produce sufficient levels of ACTH and cortisol to meet physiologic demands during stressful events. Physiologically, the result is a selective glucocorticoid deficiency. Adrenal crisis with hypotension and shock may occur if these individuals are subjected to physiologic stress from surgery and/or general anesthesia. However, adrenal crisis is rare in dental patients, with only six reports having been published in the past 66 years [33].

In reality, the evidence that adrenal crisis does in fact occur is mainly anecdotal. There are only a few case studies that show confirmed clinical and biochemical evidence of intraoperative AI in patients who did not receive perioperative glucocorticoids after stopping them shortly before surgery [34].

To prevent the potential life-threatening complication of adrenal crisis, it is recommended that supplemental glucocorticoid (steroid prep) be given to those patients with presumed HPA axis suppression. Any patient who has been taking more than 10 mg of prednisone or its equivalent per day for more than 3 weeks, who has received corticosteroids 10 mg daily within the 3 months preceding the current dental encounter, or is on high-dose inhaled corticosteroids (for example, beclometasone 1.5 mg a day) probably has HPA axis suppression and should be considered for supplemental steroid. Most anesthesia and endocrine texts recommend perioperative supplemental glucocorticoids in patients who have had HPA axis suppressive doses of glucocorticoids within 1 year of major surgery [34].

Steroid supplementation for dental procedures is listed in Table 1.7.

Hepatic Disease

Liver disease is important to the dentist due to potential bleeding problems, effects on the metabolism of drugs, and the possibility of being exposed to serious viral infections. The most frequently encountered liver disease in clinical practice is hepatitis, with hepatitis C (HCV) being the most

Table 1.6 Risks with poorly controlled thyroid disease.

| Hypothyroidism | Hyperthyroidism |
|--|---|
| <ul style="list-style-type: none"> • Increased bleeding from small vessels in mucosa and skin • Delayed wound healing and susceptibility to infection • Cardiovascular disease from arteriosclerosis and elevated low-density lipoproteins. Poor cardiac output, angina • Exaggerated responses to local anesthetics | <ul style="list-style-type: none"> • Elevated blood pressure and heart rate • Increased levels of anxiety, and stress or surgery can trigger a thyroid storm • Arrhythmias • Epinephrine is contraindicated |

Table 1.7 Steroid recommendations for dental procedures.

| | Routine dentistry LA | Minor oral surgery LA | Minor surgery GA | Major surgery GA |
|-------------------------|---------------------------------|---|-------------------------------------|---|
| Long-term steroid usage | No supplement | Supplement | Supplement | Supplement |
| Supplemental action | None | Double the usual dose on the day of surgery | 100 mg hydrocortisone intramuscular | 100 mg hydrocortisone as a bolus preop and 50 mg q8h for 48 h |

GA, general anesthesia; LA, local anesthesia.

No alteration of local anesthetic use is required for patients with adrenal insufficiency. *Source:* Adapted partially from Gibson N, Ferguson JW. Steroid cover for dental patients on long-term steroid medication: proposed clinical guidelines based upon a critical review of the literature. *Br. Dent. J.* 2004;197:681–685.

problematic. This poses the risk of the dentist contracting HCV and of cross-infection in the office. Other significant risks are bleeding in patients with advanced liver disease and alterations in the metabolism of certain drugs.

For patients with active hepatitis, strict sterilization measures are required. Needles that have been used to penetrate tissues should be covered immediately after use and discarded in special containers. Instruments used in any surgical procedures should be isolated and sterilized after each use. Sterilization should be done with steam under pressure (autoclaving), dry heat, or heat/chemical vapor (gas). Deficient sterilization can expose other patients to hepatitis infection. The dentist and clinical staff should utilize standard universal protective measures and barrier techniques.

The risk of bleeding during oral surgery is related to the severity of the liver disease. Surgery is contraindicated in patients with acute hepatitis, acute liver failure, end-stage liver disease, or alcoholic hepatitis [35]. For patients with stable chronic liver disease, the bleeding during minor oral surgery can generally be controlled with careful, nontraumatic surgical technique, pressure and using hemostatic agents such as oxidized cellulose (Surgicel[®]), absorbable gelatin (Gelfoam[®]), or chitosan hemostatic oral wound dressing (HemCon[®] Dental Dressing). For major oral

surgical procedures, international normalized ratio (INR) results should be obtained. Abnormal results should be discussed with a gastroenterologist and surgery preferably performed in a hospital setting.

The liver is responsible for the metabolism and excretion of the majority of drugs introduced into the human body. Liver disease can alter the metabolism of certain drugs to produce an undesirable effect. The common analgesics, antibiotics, and local anesthetics used in dentistry are generally not a problem in patients with mild-to-moderate liver disease. However, modifications will be necessary in patients with advanced liver disease [36].

All drugs prescribed should be selected with reference to possible hepatotoxicity. Local anesthesia is preferred to IV sedation or general anesthetic as anesthetic agents are mostly metabolized in liver and may be poorly tolerated. For pain control, avoid acetaminophen; NSAIDs are the best choice although they affect platelets and may increase bleeding. The dosage of local anesthetics should be reduced. In these cases, initial injection with rapid-onset anesthetics such as lidocaine or mepivacaine followed by injection with a long-acting anesthetic like etidocaine or bupivacaine may be the best protocol for limiting total anesthetic dosage while achieving an adequate duration of pain control [37]. For antibiotic selection see Table 1.8.

Table 1.8 Guidelines for selection of antibiotics in patients with liver disease.

| Good | Use with extreme caution or avoid | Avoid |
|---------------------------------|--|--------------------------|
| All penicillins and derivatives | Metronidazole | Erythromycin |
| All cephalosporins | | Clindomycin |
| Tetracycline/doxycycline | | Azithromycin |
| Ciprofloxacin | | Amoxicillin/clavulanate |
| Moxifloxacin | | Tetracycline – high dose |
| | | Metronidazole |
| | | Ketoconazole |
| | | Fluconazole |

Source: Data from Andrade RJ, Tulkens PM. Hepatic safety of antibiotics used in primary care. *J. Antimicrob. Chemother.* 2011;66(7):1431–1446.

Renal Disease

Patients with renal disease will be of two types: those with advanced kidney disease who are not on dialysis and those who are on dialysis. Kidney disease usually gets worse slowly over time and symptoms may not appear until the kidneys are badly damaged or no longer functioning. The most frequent causes of chronic renal failure (CRF) are diabetes mellitus (40–60% of all patients with CRF), arterial hypertension (15–30%), and glomerulonephritis (less than 10%) [38].

There is no uniform treatment plan for the patient with kidney disease, and management will depend on the stage of the disease. These patients should be evaluated by a nephrologist and oral surgery provided in consultation with the renal specialist.

Dialyzed Patients

Patients on peritoneal dialysis require no special measures with regard to oral surgery. Patients undergoing hemodialysis will have their blood anticoagulated with heparin to facilitate blood transit through the dialysis machine. To minimize bleeding due to heparinization, oral surgical procedures should be delayed for 4–6 hours after dialysis. To minimize the risk of bleeding and other uremic complications, patients on hemodialysis should preferably have oral surgical procedures on a nondialysis day.

For procedures that will cause bleeding, antibiotic prophylaxis is recommended for the first several months after the placement of synthetic vascular access grafts. The purpose is to avoid bacterial seeding of the grafts before epithelialization occurs [39]. Vancomycin has been routinely used for this purpose, but bacteria have been developing resistance to this drug. Hence, a first-generation cephalosporin in a dosage appropriate for renal function

would be a better choice for empiric therapy [39]. The role of antibiotic prophylaxis for invasive dental procedures in patients on long-term dialysis who have a synthetic arteriovenous fistula is unclear. In a review article, 53% of oral surgeons would consider antibiotic prophylaxis if the patient had a synthetic arteriovenous fistula. The recommended regimen is a single dose of 2 g amoxicillin orally or 600 mg clindamycin orally (if patients are allergic to penicillin) 1 hour preoperatively [40].

Drug choices should be selected by the route of primary elimination, with preference given to drugs that have hepatic clearance. Drugs whose elimination will be altered in renal failure should have dose adjustment or modification of the dosing frequency (Table 1.9).

Pulmonary Disease

Asthma

Dental management of asthmatic patients is primarily aimed at prevention of an acute asthma attack in the dental office. Patients with asthmatic symptoms such as coughing and wheezing should not be treated until their symptoms have been relieved. General guidelines for managing the asthmatic patient are listed in Box 1.7 and emergency management of an acute asthma attack in Box 1.8.

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease refers to a group of diseases that cause airflow blockage and breathing-related problems. It includes emphysema, chronic bronchitis, and in some cases asthma. Chronic bronchitis, emphysema or most often combinations of these two conditions are the two most common diseases classified as COPD. Chronic bronchitis results in excessive tracheobronchial mucus

Table 1.9 Drug use in patients with kidney disease (creatinine clearance <50 ml/min or blood creatinine >2.5 mg/dl).

| Drugs that require no dose adjustments | Drugs that require dose adjustments | Drugs to avoid |
|--|-------------------------------------|----------------|
| Clindamycin | Amoxicillin (I) | Tetracycline |
| Doxycycline | Ampicillin (I) | Aspirin |
| Azithromycin | Amoxicillin/clavulanate (I) | Ibuprofen |
| Acetaminophen | Metronidazole (I) | Naproxen |
| Codeine | Aciclovir (I) | |
| Lidocaine | | |
| Mepivacaine | | |
| Diazepam | | |
| Prednisone | | |

I, increase dosing interval. *Source:* Data from: Plantinga L, Grubbs V, Sarkar U et al. Nonsteroidal anti-inflammatory drug use among persons with chronic kidney disease in the United States. *Ann. Fam. Med.* 2011;9:423-430; Cerveró AJ, Bagán JV, Soriano YJ, Roda RP. Dental management in renal failure: patients on dialysis. *Med. Oral Patol. Oral Cir. Bucal.* 2008;13:419-426; Álamo SL, Esteve CG, Pérez GS. Dental considerations for the patient with renal disease *J. Clin. Exp. Dent.* 2011;3(2):112-119.

Box 1.7 General guidelines for managing the asthmatic patient

- Ascertain the frequency and severity of acute episodes.
- Determine how the patient routinely manages their asthma and necessity for past emergency care.
- Review the patient's medications. The more medications needed to control the asthma, the more severe the asthma.
- Schedule appointments from late morning to late afternoon.
- At each visit, confirm that they have taken their most recent scheduled dose of asthma medication.
- Have the patient or parent bring the patient's own metered-dose inhaler bronchodilator to each appointment.
- Patients with moderate to severe persistent asthma should be given a prophylactic dose of beta-2 agonist bronchodilator using their own inhaler before being seated in the dental chair.
- Provide a stress-free environment.
- During treatment, use pulse oximeter for patients with moderate-to-severe persistent asthma.
- Local anesthesia with epinephrine is recommended.
- Avoid aspirin, NSAIDs, and narcotics for pain management. The analgesic of choice is acetaminophen.
- Be able to recognize signs of an asthma attack

Box 1.8 Emergency management of an acute asthmatic attack

- Stop the dental procedure and remove dental materials and/or instruments from the patient's mouth.
- Sit the patient upright.
- Administer a bronchodilator supplied by the patient or from the office emergency kit.
- If there is no improvement, the bronchodilator can be repeated two more times.
- If after three doses of the bronchodilator there is no improvement, take additional measures.
 - *Administer oxygen:* it is very important to keep a satisfactory oxygen saturation level until the patient is free of wheezing or until EMS arrives to transport the patient to an emergency room.
 - *Call for medical assistance:* document the episode in detail and report to the child's primary care physician or to the emergency room physician.
 - *Administer epinephrine* 1:1000 concentration for an adult, 1:2000 concentration for a child.
- If the attack is resolved quickly, the patient may be discharged on their own.
- If the administration of epinephrine was necessary, the patient should be discharged to EMS for transport to the hospital.

Source: Modified and adopted from: Schwartz S. Management of Pediatric Medical Emergencies in the Dental Office: Acute Asthmatic Attack. www.dentalcare.com/en-us/professional-education/ce-courses/ce391/acute-asthmatic-attack; Zhu JF, Hidalgo HA, Holmgreen C et al. Dental management of children with asthma. *Pediatric Dentistry* 1996;18(5):363–370.

production with symptoms ranging from chronic cough and sputum production, severe disabling shortness of breath and cyanosis – the so-called “blue bloater.” Emphysema refers to distention of the air spaces distal to the terminal bronchioles due to erosion of the lining between air sacs. This leads to large air pockets in the lungs, which trap air rather than allowing the absorption of oxygen before exhalation. The most frequent symptom of emphysema is shortness of breath. Patients are barrel chested with pursing of lips upon exhalation.

Patients with COPD need special attention during surgical care to avoid procedures that can limit breathing to avoid further respiratory depression, including the use of adequate pain control and shortened visits. Patients who are under good medical management and have no recent history of lung infections, severe shortness of breath at rest, arrhythmia or CHF may have any indicated oral

surgery. Local anesthesia with epinephrine is acceptable, if there is no concomitant cardiac disease. Patients with mild-to-moderate COPD can undergo conscious sedation with midazolam and propofol.

General guidelines for managing the patient with COPD are listed in Box 1.9.

Pregnancy

Pregnancy produces many changes in the physiology of the cardiovascular, respiratory, hematologic, endocrine, genitourinary, gastrointestinal and orofacial systems of the female patient. All elective dental/oral surgical procedures should be postponed until post partum as treatment of the pregnant patient can seriously affect the lives of the mother and unborn fetus.

Box 1.9 Guidelines for management of patients with COPD

- Avoid treatment if upper respiratory infection is present: common cold, sinusitis, laryngitis, bronchitis, epiglottitis
- Schedule short appointments (20 minutes)
- Use upright chair position
- Use stress reduction techniques
- Do not obstruct breathing
- Use pulse oximeter
- Do not use nitrous oxide-oxygen sedation in cases of severe emphysema
- Avoid narcotics
- Outpatient general anesthesia contraindicated. Sedation with low-dose midazolam or propofol [41, 42] is acceptable but avoid barbiturates and narcotics

Box 1.10 General guidelines for managing the gravid patient

- For pregnant women with hyperemesis, morning appointments should be avoided.
- Short dental appointments should be scheduled during the third trimester.
- Check the blood pressure at each visit. If the blood pressure is elevated, the patient should be referred to her obstetrician to be evaluated for possible development of preeclampsia.
- In the second and third trimesters, ask the patient to empty her bladder just prior to starting the dental procedure.
- During dental procedures, the pregnant patient should be seated in a semi-supine or otherwise comfortable position. The right hip should be elevated 4–5 in. or place the patient in a 5–15% tilt on her left side to relieve pressure on the inferior vena cava [45].
- If the patient becomes nauseous, stop the procedure immediately and reposition the chair upright.

During dental treatment, the supine position of the pregnant female in the dental chair should be avoided for a variety of reasons.

- To avoid the possible development of the “supine hypotensive syndrome of pregnancy.” Approximately 8–10% of women in the second and third trimesters of pregnancy [43] when placed in the supine position may manifest symptoms of pallor, sweating, dizziness, nausea, hypotension, and tachycardia. The supine hypotensive syndrome is caused by the gravid uterus compressing the inferior vena cava when a pregnant woman is in a supine position, leading to decreased venous return centrally [43]. There will be a decrease in cardiac output resulting in hypotension, syncope, and decreased utero-placental perfusion which could be damaging to the fetus. If a woman develops symptoms, she should be turned on her left side which should rapidly resolve the symptoms.
- To avoid the potential decrease in arterial oxygen tension (PaO₂).
- To minimize the risk of dyspepsia from gastroesophageal reflux secondary to an incompetent lower esophageal sphincter. Reflux occurs as a result of increased intragastric pressure due to the enlarging fetus.

- To decrease the risk of developing deep vein thrombosis, due to compression of the inferior vena cava, leading to venous stasis and clot formation [44].

General guidelines for managing the pregnant female are listed in Box 1.10.

A radiation dose of 10Gy (5Gy in the first trimester, when organogenesis is initiated) causes congenital fetal

Table 1.10 Common drugs used in dentistry.

| Drugs that are safe to be used | Drugs to avoid or use with caution | Drugs to be avoided |
|--------------------------------|------------------------------------|----------------------------|
| Amoxicillin | Oxycodone | Tetracycline |
| Penicillin | Hydrocodon | Aspirin ^a |
| Clindamycin | Mepivacaine ^b | Ibuprofen ^a |
| Metronidazole | Bupivacaine ^b | Naproxen ^a |
| Cephalosporin | | Nitrous oxide ^c |
| Nystatin | | |
| Acetaminophen | | |
| Lidocaine | | |

^a Avoid in third trimester.

^b Fetal bradycardia.

^c Associated with spontaneous abortions.

abnormalities. It has been estimated that the dose to the fetus is approximately 1/50000 of that to the mother's head in any exposure ranging from full-mouth X-ray to CT images of head and neck. The exposure of any radiographic films required for management of the pregnant patient in most situations should not place the fetus at increased risk. Adequate shielding and protective equipment must be used at all times [44].

Medications should be prescribed by the dentist that will minimize adverse outcomes. Table 1.10 lists the risks of drugs commonly prescribed in dentistry.

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Conclusion

Oral and maxillofacial surgeons are hospital trained and qualified to manage patients with coexisting medical problems. As the years go by, however, and practice becomes totally office based, some of the medical training may fade. This chapter has reviewed the management of the more frequently encountered medical problems seen in the office setting. The diseases discussed should also serve as a reservoir for people in training and for nonoral and maxillofacial surgeons.

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