Other Safety Issues: Eye Protection, Noise Control and Ventilation

Eye Protection

Both dental personnel and patients are at risk of suffering eye-related injuries during dental procedures. Vision impairment or damage associated with dental treatment can be caused by physical trauma, chemical irritation, infectious agent, and light radiation associated with visible light curing units.

Physical eye trauma is quite common. High-speed and ultra-speed handpieces rotate at 180,000 to 500,000 rpm causing particles to be projected up to 50 mph. Projectiles include pieces of amalgam, tooth enamel, calculus, pumice, and broken dental burs.

With the advent of four-handed dentistry, the patient’s risk for eye trauma has increased. Great care must be taken when passing instruments over the patient. Dental items should be transferred over the patient’s chest rather than over the face. Patients who wear glasses should continue to wear them during treatment. Safety goggles should be provided during treatment for patients who do not normally wear glasses.

Many chemical substances used in dental offices can cause eye damage or trauma if mishandled. Substances that should be handled with extra care are: Varnish, bleach, formocresol, eugenol, hydrogen peroxide, phosphoric acid, methyl methacrylate, chloroform, glutaraldehyde, alcohol, and x-ray photochemicals. These potentially hazardous chemicals must be used carefully at all times.

Aerosols containing infectious organisms are a source of contamination in the dental office. Coolant spray or mist associated with high-speed handpieces and ultrasonic scalers can transmit bacteria, which may contaminate the eyes and the respiratory system. Also, removal of bacteria-laden calculus can cause both physical and microbial infections if projected into the unprotected eye. Of utmost concern is the spread of viral pathogens through aerosols of blood or saliva. Protection and prevention are the key to avoiding exposure to contaminated aerosols in the dental office.

Increased use of visible light cured composite resins has been accompanied by the development of many visible light curing (VLC) units. Most units emit light in a specific range of 380 nanometers (nm) to 6000 nm with peaks of 467 nm to 502 nm. This is the blue light in use today. Evidence exists that photochemical injury to the retina can occur as a result of exposure to this short-wavelength light. The ADA Council on Scientific Affairs recommends that caution be exercised when operating VLC units and that the appropriate protective eyewear be used.

Guidelines for the Use of Visible Light Cure Units

1. Never look directly at the light and do not point it toward others.
2. Do not look directly at scattered light or tooth glow for more than one second.
3. Use the delay switch so the tip can be placed properly before the light is activated.
4. If the unit comes with a filter for the tip, use it as directed by the manufacturer.
5. Shield the operating team from the light by using your thumb or a mirror as a barrier.
6. When possible, distribute the operation of VLC units evenly between dental team members.
7. Use filtered spectacle lenses if you are doing a high volume of procedures requiring light-cured materials.
8. Choose a tinted lens that effectively blocks light in the range below 500 nm.

**Emergency Treatment of Eye Injuries**

If an accident occurs, dental personnel should be able to perform first aid.

*Nonpenetrating Injury*

1. Assess
2. Irrigate
3. Reassess
4. Refer if needed

*Penetrating Injury*

1. Assess
2. DO NOT apply pressure
3. Lightly patch
4. Refer

*Acid Splash*

1. Irrigate
2. Continue irrigation — ½ hour
3. Emergency referral

*Base (Alkali) Splash*

1. Irrigate
2. Continue irrigation — 1 hour
3. Emergency referral

*Other Liquids*

1. Irrigate
2. Assess
3. Advise patient to seek treatment if needed

*Infections*

   Should always be treated by physician

The possibility for numerous types of eye injuries exists in the dental office for the dental staff and patient. As required by the Occupational Safety and Health Administration (OSHA), dental staff should wear a either a face shield or shatter-resistant eyeglasses with side shields when
performing or assisting any procedure that could result in projectiles, chemicals, or aerosols entering the eye.

An eyewash station must also be readily available in case a foreign substance does enter the eye. A station should be located within 25 feet (or 10 seconds) of all employees. Eyewash stations can either be directly plumbed or faucet-mounted, but they should be capable of a minimum flow rate of approximately one-half gallon per minute. Eyewash stations should be identified with an “Eye Wash Station” label or sign.

All dental personnel also must be educated concerning eye safety in the dental office. Most eye-related injuries can be prevented with proper education, adequate protective eyewear, and the correct handling of dental instruments and materials.

Noise Control

Noise levels at a given intensity and duration in any environmental situation are a potential health hazard. Since the development of new dental instruments and equipment, the potential for auditory problems has been a concern for the dental profession. Factors influencing the risk of acoustic trauma are age, physical condition, existing hearing condition of the individual, intensity or loudness (measured in decibels, Db) of the equipment, length of exposure, and the time between exposures.

The air-driven high-speed handpiece is often identified as a potential noise hazard. Early model handpieces had increased noise levels reported between 80-94 Db at 12 inches and 75-104 Db at six inches, which posed some risk of causing hearing impairment. Currently available models have decibel levels equal to or lower than the standards set by the Occupational Safety and Health Act of 90 Db maximum for eight hours of permissible continuous exposure per day (OSHA requires a hearing conservation program for any exposure above an eight-hour average of 85 Db).

NIOSH has set the following safety standard recommendations for the dental office:
1. Handpieces should be adjusted to below 85 Db for eight-hour exposure.
2. An audiometric test should be taken at the start of employment and every sixth year thereafter, with checkup audiograms every two years.
3. When the noise intensity is above the recommended level, engineering controls should be used to reduce exposure.
4. Personal protective equipment should be utilized by individuals exposed to noise above the recommended level and are required for noise exceeding 115 Db.
5. Personnel exposed to noise should be informed of hazards, symptoms, and precautions.
6. Optimum maintenance procedures should be observed for rotary equipment, including methods of decreasing wear deterioration and utilization of concentric burs.

Studies have shown the risk of developing Noise Induced Hearing Loss (NIHL) in the dental clinic is minimal. However, dental personnel should be aware that some potential hazards due to noise levels do exist in the dental environment and that everyday noise exposures such as those associated with transportation, power tools, and entertainment produce an additive effect. Hearing loss also increases with years of exposure and in a logarithmic relation to exposure duration. There is no way to undo damage caused by noise once it has occurred, so prevention is essential.

**Ventilation**

Air has long been recognized as a route of transmission for infectious, toxic, or carcinogenic agents. The agents involved in a dental environment are anesthetic gases, dental materials, chemical fumes and pathogenic microorganisms aerosolized from the dental staff, patient, and dental equipment. The persons inhaling these airborne materials are stressed by them. Short of death or overt disease, this stress becomes part of the total stress on the dental staff, and, therefore, affects their quality of life in an insidious manner. Purity of air is clearly of prime concern in a health care facility, since patients are often in a generally weakened condition.

The heating, ventilation, and air conditioning of dental facilities have, by tradition, been based on concepts of prevention of nosocomial infection, elimination of toxic hazards, and comfort of patients and staff. Provision of efficient heating, ventilation, and air conditioning is a major part of providing a healthful environment for patients and staff. Healthful air is air with as few contaminants as possible. This can be attained either by the introduction of outside air into facilities for dilution purposes or by filtration.

Unfortunately, there are currently no national consensus standards for ventilation in the dental environment. The American Dental Association does not have guidelines in this area.