

Work Related Hazards in Orthodontics : A Review

Dr. Gaurav Gupta

Asst. Professor
Dept. of Orthodontics &
Dentofacial Orthopaedics

M.A. Rangoonwala College of Dental Sciences &
Research Centre, Pune (Maharashtra)

Dr. Sharadha Gupta

Asst. Professor
Dept. of Periodontics

Dr. Anand A. Tripathi

Asst. Professor
Dept. of Orthodontics &
Dentofacial Orthopaedics
VYWS's Dental College & Hospital
Amravati (Maharashtra)

Dr. Nitika Tripathi

Speciality Medical Officer
Dept. of Ophthalmology
ESIS Hospital, Mohan Nagar
Chinchwad, Pune (Maharashtra)

Abstract

Orthodontists are exposed to many occupational hazards; their effects appear as ailments that affect the dental practitioner and tend to intensify with age. These problems include musculoskeletal conditions due to improper body posture; physical hazards from light, noise, and trauma; biological risks from irradiation and microorganisms; and chemical detrimental sources. Studies dealing with occupational hazards among orthodontists are less. The aim of this article was to review and classify the health risks of practicing orthodontics and associated pathology.¹

Key Words: Orthodontist, Musculoskeletal Hazards, Dry eyes.

Health Hazards

Health hazards for clinical orthodontists include physical factors such as lights, noise, vibration, heat, and trauma. Lights affect the eyes and vision. Office lighting and dental chair light are critical for optimal working conditions in an orthodontic setting. Additionally, other forms of light are used during daily procedures; the most important is the curing light for polymerization of bonding materials. Lasers were introduced in orthodontics for ceramic bracket debonding and cosmetic gingival contouring.^{9,10} The hazards associated with laser light range from corneal/lens to retinal damage depending on the wavelength of the beam produced by each appliance. Eyestrain can also be a problem, due to concentration, insufficient lighting, and inappropriate position of working light in relation to the orthodontist. Maculopathies can be caused by poor lighting. Photoreceptor cells called rods are responsible for peripheral and dim light vision; they receive light and cones, which provide central, bright light, fine detail, and color vision. Blue light is an important element in "natural" lighting, and it can also contribute to our psychological health.² Research, however, shows that high illumination levels of blue light can be toxic to cellular structures, test animals, and human foetal retinas. The eyes of people operating curing lamps are at risk from acute and cumulative effects, mainly due to back reflection of the blue light. Blue light is an important element in "natural" lighting, and it can also contribute to our psychological health. Research, however, shows that high illumination levels of blue light can be toxic to cellular structures, test animals, and human foetal retinas. The eyes of people operating curing lamps are at risk from acute and cumulative effects, mainly due to back

reflection of the blue light. Penetrating injuries (eg. from wire segments or adhesive chips during debonding) and UV light (from photo-polymerizing units) are risk factors for cataracts.³ Infections can be caused by splashing material, aerosols, and trauma from wires, burs, and other projectiles. Trauma associated with microorganisms could cause various eye infections. Chemical burns come from acids or alkaline substances. Acids are usually less dangerous than alkalis because they tend to precipitate tissue proteins, which form barriers and inhibit deeper penetration; therefore, lesions are limited to lids, conjunctiva, and cornea. Alkalis saponify lipids in the corneal epithelium and bind to mucoproteins and collagen in the corneal stroma. In this way, they disrupt the normal barriers of the cornea, gain rapid access to the more posterior parts of the eye, and can cause severe eye complications including cataract and secondary glaucoma. The risk of eye hazards from acids mostly relates to the patient during bonding; additional eye protection such as glasses might be necessary.⁵ The presence of alkalis and their potentially hazardous effects can arise from the careless use of disinfectants or other liquid materials sprayed on surfaces or appliances. The operator must use protective eyewear. Dry-eye syndrome is related to reduced blinking (prolonged concentration), decreased tear production, or increased tear evaporation caused by excessive lighting, heat, or air-conditioning.⁸ Symptoms of dry eye syndrome include irritation, foreign body sensations, stringy mucous, and transient blurred vision. Burning sensation, itching, photophobia, and tired or heavy feeling of the eyelids are less frequently reported.

Noise Related Hazards

The effects of occupational noise in the orthodontic office can lead to noise-induced hearing loss (NIHL); symptoms can include difficulty with speech communication and other auditory signals, fatigue, and tinnitus. The symptoms of NIHL increase gradually with continual exposure.⁵

Chemical Related Hazards

Chemical factors include latex and associated allergies, monomers, and sterilization and radiology fluids. Although gloves enhance the barrier abilities of the skin and help decrease cross contamination, adverse reactions to latex are side effects. The general population has a low sensitivity to latex, but in the health care field, due to the continuous exposure to the allergens, sensitivity has been reported to be much higher. According to OSHA, "Allergy to latex

was first recognized in the late 1970s. Since then, it has become a major health concern as an increasing number of people in the workplace are affected. Health care workers exposed to latex gloves or medical products containing latex are especially at risk. Immediate allergic reactions to latex can appear in those who have been repeatedly exposed to latex proteins through glove wearing and have developed high levels of IgE antibodies. Clinical signs include rash, rhinitis, edema, bronchospasms, and allergic shock.^{6,7} Alternatively, allergens absorbed by the skin combine with proteins and form antigens as T cells, and become activated "custom T cells" that circulate in the blood and lymphatic systems. This sensitization stage creates the environment for a more immediate response to these allergens on a future contact with the host. The binding of the custom T cells and the re-entering antigen induce immune responses that result in usually localized tissue damage (contact dermatitis). The reaction is usually not life threatening and has a delayed onset. Signs and symptoms include rash, itching, and skin exfoliation. Allergic contact dermatitis caused by methacrylates is common among dental professionals.

Sterilization and radiology fluids are used to decontaminate or sterilize instruments, surfaces, and impressions contaminated with blood and saliva. Sterilant chemicals include aldehydes, phenols, and quaternary ammonium compounds. These chemicals can cause lung problems and dermatitis. Radiology fluids contain chemicals such as ammonium thiosulfate, potassium sulphite, potassium carbonate, hydroquinone, diethylene glycol, acetic acid, and glutaraldehyde. These substances can cause symptoms ranging from skin irritation to allergy and pulmonary edema if mishandled. Careful handling of fluids, according to the manufacturer's directions, and sufficient ventilation are recommended.⁷

Biologic factors include microorganisms and particles. In the dental office, the main source of infection is through interaction of the patient with the healthcare giver. This can occur from direct contact with blood, body fluids, secretions, and excretions (except sweat), regardless of blood presence, non-intact skin and mucous membranes regardless of blood presence. A thorough analysis of the infection hazards in dental and orthodontic practices is beyond the scope of this article; this information is provided in standard sterilization disinfection courses in pre- and postgraduate dental curricula.

Infection can occur indirectly by contact with contaminated instruments, surfaces, equipment, and materials. Contact of sensitive body areas with infected droplets expelled from infected persons at short range or inhalation of suspended microorganisms that can survive for long periods can occur in the office environment.

Musculoskeletal Hazards

Orthodontists often develop musculoskeletal problems, which are related to suboptimal work-environment ergonomics that might be responsible for improper sitting postures and movements causing unnecessary musculoskeletal loading, discomfort, and fatigue. Insufficient or inappropriate equipment, inappropriate work-area design, direct injuries, repetitive movements from working with dental instruments, or sitting for extended times with a flexed and twisted back are contributing factors to neck and low-back ailments. The limited research in the orthodontic literature showed increased risks for developing these types of pathology. Upper and lower back pain and intervertebral disc disease (acute or chronic) are responsible for work absence in the general population.⁸ However, in evaluating absence from work, a differentiation is appropriate between employed and self-employed people, since the latter, often running a single clinician-operated practice, would be reluctant to miss from work for prolonged periods of time. The dental chair position and the dentist's stool position and orientation relative to that of the patient, combined with the doctor's effort to maintain visibility of the oral environment, result in awkward positions over long periods of time; these in turn result in back problems. The symptoms include low back pain, stiffness and ciatica with neurological features such as tingling, paresthesia, and muscle weakness. Neck problems are associated with a similar etiology, especially

awkward body and head posture, which are often required for direct vision into the mouth.⁷ The introduction of magnifying loupes is probably the only development over the years that helps dentists keep a more neutral or balanced posture. The symptoms include intermittent neck pain, often radiating to the shoulders (with stiffness); headaches; tingling, or pins and needles down the arms and fingers, resulting in weakness; and clumsiness.

In more severe situations, disc prolapse can occur and later degeneration (cervical spondylosis). Because the shoulder muscles are innervated by the brachial plexus, there is also strain on the shoulder muscles (pain, weakness) that will complicate the situation further if there is coexisting rotator cuff pathology. The rotator cuff of the shoulder consists of the supraspinatus, infraspinatus, subscapularis, and teres minor muscles, which are responsible for abduction, rotation of the shoulder, and stabilization of the humerus head on the glenoid during movement. The most common tendon to be affected is the supraspinatus (tendonitis, partial tear, complete tear, and degeneration). Tendonitis usually causes pain and discomfort that worsens with movements. Tears also cause weakness in abduction; old and degenerative tears cause impingement in the subacromial region (arc pain in abduction, eased beyond 90°-100°). Although direct injuries are rare in dentistry, eccentric loading of the tendon or the muscle and working with the arm in an abducted position for a long time is common. Cervical spondylosis can cause further muscle weakness, which will give rise to more pain exacerbated by radiating pain from nerve root irritation. Carpal tunnel syndrome (CTS) is the most common nerve entrapment syndrome. It involves entrapment of the median nerve at the level of the wrist. In the work environment, CTS results from rapid,

repetitive, and daily use of the hand and fingers for many hours at a time. The problem is compounded when working with a bent wrist, exerting force, working with vibratory tools, and in cold environments. Rapid movement of tendons in the synovial tube causes inflammation and fluid build-up. This can result in atrophy of the thenar muscles; tingling in the thumb, index, middle, and half of the ring finger; night pain; and pain when handling tools. Trigger finger is thickening of the tendon, making it difficult for the tendon to move in and out of the sheath during flexion. The finger can be locked in flexion and requires force to move. Possible causes are degeneration, repeated trauma, or repetitive movements with hand tools.^{9,10}

References

1. Jacobsen N, Hensten-Petersen A. Occupational health problems and adverse patient reactions in orthodontics. *Eur J Orthod* 1989; 11:254-64.
2. Jacobsen N, Hensten-Petersen A. Changes in occupational health problems and adverse patient reactions in orthodontics from 1987 to 2000. *Eur J Orthod* 2003; 25:591-8.
3. Altuna G, Freeman E. The reaction of skin to primers used in the "single-step" bonding systems. *Am J Orthod Dentofacial Orthop* 1987;91:105-10
4. Sahai A, Malik P. Dry eye: prevalence and attributable risk factors in a hospital-based population. *Indian J Ophthalmol* 2005;53:87-91
5. Setcos JC, Mahyuddin A. Noise levels encountered in dental clinical and laboratory practice. *Int J Prosthodont* 1998;11:150-7.
6. Bagramian RA, McNamara JA Jr. A prospective survey of percutaneous injuries in orthodontists. *Am J Orthod Dentofacial Orthop* 1998;114:654-8.
7. McNamara JA Jr, Bagramian RA. A prospective survey of percutaneous injuries in orthodontic assistants. *Am J Orthod Dentofacial Orthop* 1999;115:72-6.
8. Sims AP, Roberts-Harry TJ, Roberts-Harry DP. The incidence and prevention of ocular injuries in orthodontic practice. *Br J Orthod* 1993;20:339-43.
9. Toroglu MS, Bayramoglu O, Yarkin F, Tuli A. Possibility of blood and hepatitis contamination through aerosols generated during debonding procedures. *Angle Orthod* 2003;73:571-8.
10. Toroglu MS, Haytac MC, Koksai F. Evaluation of aerosol contamination during debonding procedures. *Angle Orthod* 2001;71:299-306.

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