

Ergonomics in General Dental Practice

Priyanka Airen Sarkar, Anand L Shigli

Department of Pedodontics and Preventive Dentistry, Modern Dental College and Research Centre, Indore

(Received August, 2011)

(Accepted November, 2011)

Abstract:

An ounce of prevention is better than pounds of cure That's what dental health care workers spend their day telling their patients, but it also applies to working conditions that can cause pain in the neck, shoulder and hand to a dentist. In dental clinics, there are very few activities that can cause sudden injuries, rather it is an accumulation of harmless working positions over months and years, which are repeated so often that they cause irreversible injuries.

This article includes Musculoskeletal disorders / Repetitive Strain Injuries (MSDs /RSIs) and the signs, symptoms and risk factors of these types of injuries, so that one can be aware of developing problems and can change his /her approach to work or alter the workstation setup to prevent further injury. The article discusses the important issues of posture and offers different exercises to work with comfort, efficiency and ease.

Key Words: Ergonomics, RSI, MSD & Exercises.

Introduction:

Dentistry is a social interaction between helper and recipient in their limited job setting and with personal characteristics. A healthy dentist is one of the most important component in a successful dental practice. Despite the fact, that though 88% of dentists report good or excellent health (Kupcinkas & Petrauskas, 2003), some studies show that one out of ten dentists reports having poor general health and three out of ten dentists report having poor physical state (Gorter et al, 2000). Dentists can, and do experience illnesses and problems that can disrupt or impair a practice. Yet, there are growing evidences that suggest increased vulnerability within the profession to certain disorders and afflictions that can only be categorized as practice related.

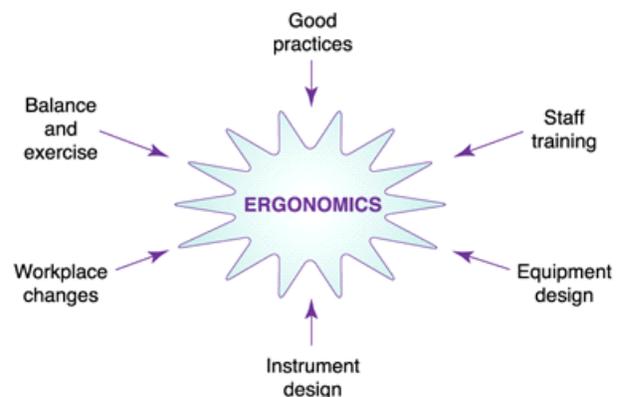
These problems can be avoided by increasing awareness of the postures used during work, redesigning the workstation to promote neutral positions, examining the impact of instrument use on upper extremity pain, and following healthy work practices to reduce the stress of dental work on the practitioner's body (Jabbar, 2008).

Recently, "Ergonomics" has become a popular term. The term has been used with most professions but increasingly in the dental profession. It is a discipline that studies workers and their relationship to their occupational environment. This includes many different

concepts such as, how dentists position themselves and their patients, how they utilize equipment, how work areas are designed and how all of this impact the health of dentists (Russel, 1973).

In Greek, "Ergo," means work and, "Nomos," means natural laws or systems. Ergonomics, therefore, is an applied science concerned with designing products and procedures for maximum efficiency and safety. It is also a study of the relationship among the personnel, equipment and environment in the work area. Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability. Ergonomics is concerned with the efficiency of persons in their working environment. It takes account of the worker's capabilities and limitations to ensure that tasks, equipment, information and the environment suit each worker (Kahri, 2005).

The musculoskeletal health of dental professionals has been the subject of numerous studies worldwide, and their focus has been on the pain



Corresponding Author: Dr. Priyanka Airen Sarkar, Department of Pedodontics and Preventive Dentistry, Modern Dental College and Research Centre, Indore-453112
Phone No.: 8871492435
E-mail : priyankairen@gmail.com

experienced by the practitioner. Because their work area is narrow, dental treatment is performed, in a very inflexible work posture. Studies indicate that back, neck and shoulder or arm pain is present in up to 81% of dental operators (Bramson et al, 1998).

Back pain is the most common complaint followed by neck pain and shoulder pain, though they all are usually mild. Most dentists today work in the sitting position and treat the patient in the supine position. Being seated made little difference in how frequently operator experience pain. When operators sit, pain occurs not only in their back, but also in their neck, shoulders and arms. While the occasional backache or neck ache is not a cause for alarm, if regularly occurring pain or discomfort is ignored, the cumulative physiological damage can lead to an injury or a career-ending disability (Valachi & Valachi, 2003).

Some Symptoms of Musculoskeletal disorders (MSDs):

- Excessive fatigue in the shoulders and neck
- Tingling, burning, or other pain in arms
- Weak grip, cramping of hands
- Numbness in fingers and hands
- Clumsiness and dropping of objects
- Hypersensitivity in hands and fingers

Some Signs of MSDs

- Decreased range of motion
- Loss of normal sensation
- Decreased grip strength
- Loss of normal movement
- Loss of co-ordination

Some Risk Factors for MSDs

- Repetition
- Forceful exertions
- Awkward postures
- Contact stress
- Vibration
- Poorly designed equipment workstation
- Improper work habits
- Genetics
- Medical conditions
- Poor fitness level
- Physical/mental stress
- Lack of rest/recovery
- Poor nutrition
- Environmental factors
- Poor lighting

Off-the-Job activities that can contribute to MSDs:

- Home computer use
- Repetitive activities using the fingers
- Sports activities
- Prolonged/awkward postures at home
- Use of household tools
- Activities involving repeated heavy lifting, bending, twisting, or reaching

Mechanisms MSDs in Dentistry:

Prolonged Static Postures (PSPs): When the human body is subjected repeatedly to PSPs, it can initiate a series of events that may result in pain, injury or a career-ending MSD.

Muscle Ischemia/Necrosis and Imbalances: During treatment, operators strive to maintain a neutral, balanced posture and find themselves in sustained awkward postures. These postures often lead to stressed and shortened muscles which can become ischemic and painful, exerting asymmetrical forces that can cause misalignment of the spinal column (Al Wazzan et al, 2001).

Hypomobile Joints: During periods of PSPs or when joints are restricted due to muscle contractions, synovial fluid production is reduced and joint hypomobility may result.

Spinal Disc Herniation and Degeneration: In unsupported sitting, pressure in the lumbar spinal discs increases. During forward flexion and rotation, the pressure increases further and makes the spine & disc vulnerable to injury (Al Wazzan, et al 2001).

Neck and Shoulder Injury: Repetitive neck movements and continuous arm and hand movements affecting the neck and shoulder demonstrate significant associations with neck MSDs.

Carpal-Tunnel Syndrome (CTS): It has been associated with both repetitive work and forceful work. Symptoms can appear from any activity causing prolonged and increased pressure (passive or active) in the carpal canal (Shugars et al, 1987).

Low Back Pain: Low back discomfort has been associated with dental work in numerous studies.

Psychosocial Factors: Dentists with work-related MSDs show a significant tendency to be more dissatisfied at work. They are burdened by anxiety, poor psychosomatic health and thus feel less confident with their future (Shugars et al, 1987).

Some Elements of an Improper Workstation Setup (Sadig, 2000):

- Dentist's or patient's chair is too high/low.
- Dentist's chair has no lumbar, thoracic, or arm support.
- Instrument table is not positioned properly.
- Lighting is inadequate for the task.
- Edges of tables/worksurfaces are sharp/uncomfortable.
- Ventilation makes workspace cold.
- Work environment is damp and cold.

Importance of posture:

The elements of an improper workstation setup force the dental practitioner to assume many harmful postures when performing various procedures on the patient. These positions put pressure on nerves and blood vessels, cause excessive strain on muscles, decrease circulation and cause wear and tear on the joint structures.

Some Improper Postures That Dentists Take:

- Working with the neck in flexion and tilted to one side.
- Shoulders elevated.
- Side bending to left or right.
- Excessive twisting.
- Forward bending/overreaching at waist.
- Shoulders flexed and abducted.
- Elbows flexed greater than 90°.
- Wrists flexed/deviated in grasping.
- Thumb hyperextension.
- Position maintained for 40+ minutes per patient.

Some Tips for Working With Good Posture (Yamalick, 2007):

(1) *Maintain an erect posture:* by positioning chair close to the patient, one can minimize forward bending or excessive leaning over the patient. Place feet flat on the floor to promote a neutral or anterior tilt to your pelvis, which keeps back aligned and promotes the natural curvatures of back (Fig. I).

(2) *Use an adjustable chair with lumbar, thoracic and arm support:* A good chair is essential for maintaining good posture. A chair should have important features like, adjustable height, width, tilt, backrest, seat pan and armrests, because in most dental offices, many people of different sizes use the same workstation (Fig. II).

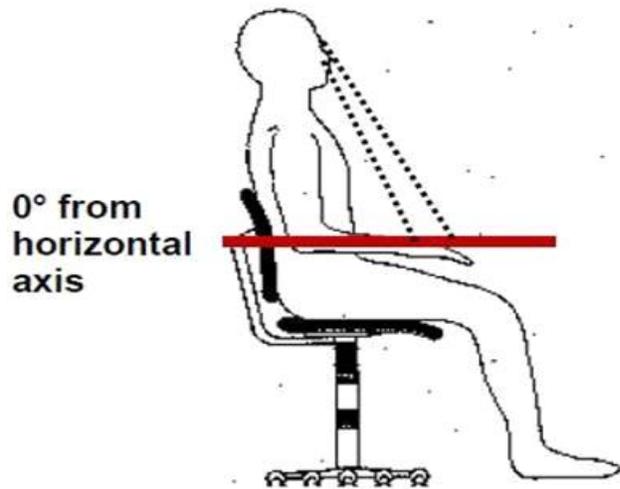


Fig 1 Erect posture of body (Courtesy - Prevention of work related MSDs in dental clinic: www.asstsas.qc.ca).



Fig. II: Use an adjustable chair

(3) *Work close to your body:* Position the chair close to the patient and position the instrument tray close to the chair. This way, dentist does not have to overextend himself to reach the patient or instruments, putting excessive stress on back, shoulders and arms. Think of the 90° rule of having elbows, hips, knees, and ankles all forming 90° angles (Fig. III).

(4) *Minimize excessive wrist movements:* Try to keep them in a neutral position (palms facing each other, shoulder width apart with wrists straight), which puts wrist muscles and tendons in a much better relationship to perform the work.

(5) *Avoid excessive finger movements:* When one can combine the excessive forces needed to hold the instruments with the amount of repetitions that he/she can perform each day, one can see the tremendous toll that this takes on the small muscles of fingers. Retraining of shoulders and arms to position hands,

rather than making the small, forceful movements with fingers.

(6) *Alternate work positions between sitting, standing and side of patient:* Switching positions allows certain muscles to relax while shifting the stress onto other muscles and increasing your circulation. Allow each side of your body to share the stress rather than performing the same motion in the same way which causes cumulative trauma in the overused side.

(7) *Adjust the height of your chair and the patient's chair to a comfortable level:* If dentists chair is too low and the patient's chair is too high, this causes elevation of shoulders and can lead to neck problems and can pinch nerves. Alternately, if dentists chair is too high and the patient's chair is too low, flexion of neck down and bend wrists back to compensate can lead to neck and hand problems. Remember the 90° rule and keep elbows at a 90° angle with wrists straight and shoulders relaxed (Fig. III).

(8) *Consider horizontal patient positioning:* If workstation allows the patient to recline into a horizontal position, it will allow a dentist to sit above the patient's head with good ergonomic posture and he can use each arm equally in more natural position.

(9) *Check the placement of the adjustable light:* Position the adjustable light to avoid strain on the neck

(10) *Check the temperature in the room:* Temperature of workspace should not be too cold because this will decrease the circulation and blood flow of extremities. Most often, the dental work environment is damp and cold, so be certain to wear gloves and warm up the hands before working.

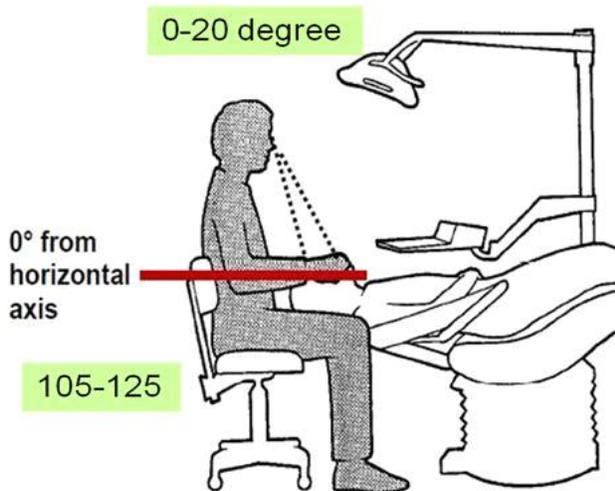


Fig. III: 90° rule-keep elbows at a 90° angle with wrists straight and shoulders relaxed. Courtesy - Prevention of work related MSDs in dental clinic: www.asstsas.qc.ca).

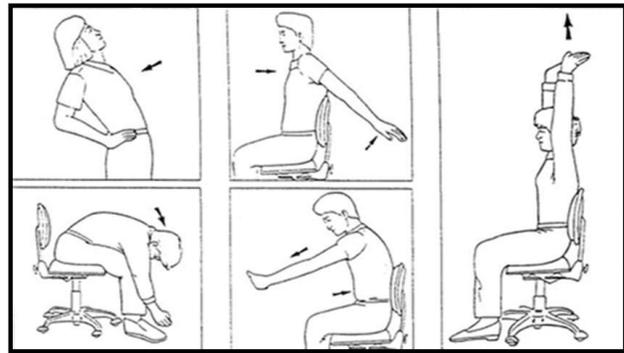


Fig. IV: Body stretching exercises adopted from: www.Posturedontics.com.

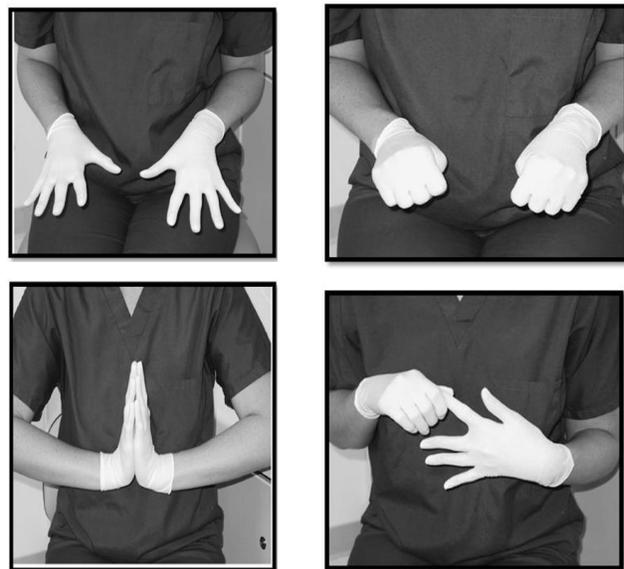


Fig.V: Different hand exercises adopted from: www.posturedontics.com

Body Strengthening Exercises (Valachi & Valachi, 2003):

- A. Stretching and strengthening the muscles that support the back and neck and those used in the forearm, wrist, and hand will help them remain strong and healthy(Fig. IV).
- B. Periodic stretching throughout the workday.
- C. Resting hands frequently is believed to be one of the most important factors in preventing CTS
- D.To relieve eyestrain caused by focusing intensely at one depth of vision for long periods, look up from the task and focus eyes at a distance for approximately 20 seconds.
- E. Move the head down slowly and allow the arms and head to fall between the knees; hold for a few seconds; raise slowly by contracting the stomach muscles and rolling up, bringing the head up last.
- F. Try head rotation for neck stiffness. Head

rotation involves tilting the head from right to left, as well as forward and backwards without forcing the motion beyond a range of comfort.

- G. Shoulder shrugging can be used to stretch the shoulder muscles that may be stressed from holding oral evacuator, instruments and telephone handset. Pull the shoulders up toward the ears, roll them backward and then forward in a circular motion.

The following exercises can be practiced and performed by dentists on a regular basis in order to prevent MSDs-

Postural Awareness Techniques	* Maintaining a low back curve * Using magnification systems * Adjusting operator chair properly
Positioning Strategies	* Avoiding static postures * Alternating between standing and sitting * Repositioning patients at the proper height * Avoiding twisting
Periodic Breaks and stretching	* Chairside directional stretching * Stretching during microbreaks * Releasing trigger points

Conclusion:

Ergonomics have come into the profession in a big way. Further development of dental ergonomics must take place on the basis of a coherent vision of the future. In this regard, it must be clear exactly what ergonomics is and what developments have already taken place. Some aspects of particular interest are: (i) the prevention of occupational diseases; (ii) legal responsibility for protecting the health and safety of employees and students; (iii) education, academic development and research of dental ergonomics using organizational models in daily dental practice. By practising correct postures, the working capacity and productivity of dental professionals will enhance. They can work in a pain-free environment for quality dental care to their patients.

Right Ergonomics along with regular exercises, relaxation techniques (meditation, biofeedback & yoga), proper nutrition helps us combat stress, thus conserving the productive energy, thereby increasing comfort, improving the quality of life, ultimately leading to extended careers..

Bibliography:

1. Al Wazzan KA, Almas K, Al Shethri SE, Al-Qahtani MQ: Back & Neck Problems Among Dentists and Dental Auxiliaries. *The Journal of Contemporary Dental*

Practice, 2001;2(3):17-30.

2. Bramson JB, Smith S, Romagnoli G: Evaluating Dental Office Ergonomic Risk Factors And Hazards. *Journal of American Dental Association*, 1998;129(2):174-183.
3. Gorter RC, Eijkman MAJ, Hoogstraten J: Burnout and Health among Deutch Dentist. *European Journal Oral Sciences*, 2000;108(4):261-267.
4. Jabbar TAA: Musculoskeletal disorders among dentist in Saudi Arabia. *Pakistan Oral and Dental Journal*, 2008;28(1):135-144.
5. Kahri P: Ergonomics and teamwork in dental treatment. Planmeca, 2005: available from: http://www.planmeca.it/pdf/downloads/PLANMECA_ARTICLE_Ergonomics_and_teamwork_web.pdf
6. Kupcinskas L, Petrauskas D: Hepatitis-Mediku Profesine liga. *Journal of Stomatologija*, 2003;Suppl1: 1:22.
7. Prevention of Work related MSDs in dental clinics ,ASSTSAS 2009. available from: <http://www.asstsas.qc.ca/documents/Publications>.
8. Puriene A, Janulyte V, Musteikyte M, Bendinskaite R: General health of dentists Literature reviews. *Stomatologija, Baltic Dental and Maxillofacial Journal*, 2007;9(1):10-20.
9. Russell JG: Ergonomics in the Dental Surgery, *Occupational Medicine*, 1973;23(4):128-131.
10. Sadig W: Ergonomics in dental practice. *Pakistan Oral & Dental Journal*, 2000;20(2):205-213.
11. Shugars D, Miller D, Williams D, Fishburne C, Srickland D: Musculoskeletal pain among general dentists. *General Dentistry*, 1987;35(4):272-276.
12. Valachi B, Valachi K: Mechanisms leading to musculoskeletal disorders in dentistry. *Journal of American Dental Association*, 2003;134(10):1344-1350.
13. Yamalik NA: Musculoskeletal Disorders (MSDS) and Dental Practice part 2. Risk Faitors for dentistry Magnitage of the problem, prevetion, and gental ergonomics. *International Dental Journal*, 2007;57(1):45-54.

Source of Support : Nil,
Conflict of Interest: None declared.