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Case Report

Ergonomics in Dentistry: A Review

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Abstract

Preventing musculoskeletal problems associated with the workplace is only one aspect of ergonomics. High productivity, the prevention of illnesses and injuries, and greater worker satisfaction are all guaranteed by the successful use of ergonomics. On the other hand, improper use might result in musculoskeletal disorders (MSDs) that are connected to the workplace. In order to provide the dental professional with a comprehensive overview of ergonomic risk factors as well as a foundation for comprehending the ongoing conversation about ergonomics, its diagnosis, treatment, and regulation, this article gives forth broad, crucial background information on ergonomics.

Keywords: *Ergonomics, Dentistry, Musculoskeletal disorders*

Introduction

The Greek words "ergos," which means "work," and "nomos," which means "natural law of systems," are the roots of the English word ergonomics. Ergonomics is described by the International Ergonomics Association as "a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design to optimize human well-being and overall system performance."1 An appropriate posture is crucial for a dental healthcare practitioner. In addition to improving access and visibility while working, it also ensures the avoidance of chronic impairment and repetitive strain injuries. However, poor or awkward posture increases a person's risk of developing musculoskeletal disorders.2,3

The application of ergonomics in dentistry is discussed in the current article. It makes an effort to evaluate several MSDs that affect dental professionals, including their categorization, prevalence, signs and symptoms, and distribution. It also highlights the significance of ergonomic practices and approaches for the intervention and prevention of disabling MSDs among dental professionals.

Musculoskeletal Disorders: Musculoskeletal problems that are made worse or continue longer by work circumstances or workplace risk factors are referred to as work-related musculoskeletal disorders, which are conditions where the work environment plays a key role. Jobs involving lengthy, forceful, or repeated hand motions, as well as frequent or heavy lifting, pushing, dragging, or carrying large things, are common examples of these workplace risk factors. The degree of danger is influenced by the strength, regularity, and length of exposure to these conditions.4

Some of the common sign and symptoms of MSD are as follows:2,5

1. Inflammation
2. Redness
3. Decreased range of motion.
4. Loss of function
5. Tingling
6. Numbness
7. Stiffness
8. Pain/tenderness
9. Muscle weakness
10. Fatigue
11. Decreased grip strength
12. Loss of normal sensation of the body parts
13. Uncoordinated movements
14. Hypersensitive hands and fingers

15. Cramping of finger and thumb leading to weaker grip

Classification of MSD's 6,7

Neural diseases: Ulnar neuropathy, Carpal tunnel syndrome.

Diseases of the neck: Cervical Spondylosis, Tension Neck Syndrome, cervical disc disease, Brachial plexus compression.

Diseases of the shoulder: Trapezius myalgia, Rotator cuff tendonitis, Rotator cuff tears, and adhesive capsulitis.

Diseases of the Forearm, Elbow and Wrist: de Quervains disease, Tendonitis, Tenosynovitis, Epicondylitis.

Hand-Arm vibration syndrome: Reynaud's disease.

Diseases of the back: Low Back Pain (LBP), Upper back pain.

Objective of Ergonomics6

1. Ergonomics objectives
2. Decreasing the chances of musculoskeletal problems.
3. Increasing worker comfort while improving worker safety.
4. Employee fatigue should be maintained to a minimum.
5. Upgrade the job to a high grade.

Consequences of MSD's: MSDs can result in early fatigue, discomfort, and a negative outlook on work. Workstations that are poorly built have the biggest effect on the neck. One of the causes of this can be poor vision of the patient's oral cavity. The operator tends to bend into awkward positions, which causes a movement away from a balanced stance. Incorrect neck position can also cause backache by radiating to the back. In a 2018 investigation of ergonomic postures during everyday

activities, it was shown that none of the operators possessed the ideal neck position.8,9 Additionally, several dentists have experienced upper and lower back pain. Similar to a relative lack of the stomach and gluteal muscles, pelvic girdle rigidity can exacerbate lower back pain. Without a break, repetitive wrist and hand flexion and augmentation exercises put mechanical pressure on the progressed nerves. By working in a space that is ergonomically constructed, MSDs can be prevented.10,11

Risk Factors for Musculoskeletal Disorders

1. When we are working, awkward postures are deviations from neutral or normal positions. One example is the difference between handling things with a bent back and a straight back. Dental staff members adopt awkward positions as they work together to arrange patient operations. Awkward positions are also taken for the patient's comfort and a wider field of vision bad placement and bad posture are closely associated to muscular pain.12 Lindfors et al.'s study of female healthcare professionals revealed a direct link between demanding jobs and upper extremity conditions.13 Diaz-Caballero et al. came to the conclusion in another investigation that adopting uncomfortable postures could result in muscular soreness.14

2. Forceful exertion exerts a tremendous amount of load on the muscles, tendons, ligaments, and joints, causing them to fatigue. Such actions, when carried out frequently, can lead to musculoskeletal problems.3

3. The risk of dental staff members developing MSDs can rise with static postures kept for an extended period of time. According to Valachi and Valachi, holding a static position for an extended period of time wears out the muscles and causes muscle imbalance, which results in pain, muscle ischemia, necrosis, trigger points, and muscle substitution. Later, MSD develops due to protective muscle contraction, joint hypomobility, nerve compression, spinal disc degeneration, and herniation.15

4. Long work hours, poor fitness levels, mental stress, improper lighting, and wrong workstation design are other risk factors that might lead to the development of MSDs.16,17

5. The risk of acquiring MSDs increases when dental professionals perform repetitive motions often, continuously, and for extended periods of time. Scaling tasks had the highest ergonomics risk level, according to a baseline risk identification of ergonomic factors study done among dental professionals by Chaiklieng S et al. and Pirvuc et al.18,19

Prevention of MSD's

Following interventions should be considered in the dental practice:

Workstation: Proper workstations may include the following:20

1. Dentist's or patient's chair height
2. Lumbar, thoracic or arm support in dentist's chair
3. Position of instrument table
4. Adequate lighting
5. Edges of work surfaces should be comfortable
6. Proper ventilation
7. Pleasant temperature.4

Posture

1. Always try to maintain an erect posture
2. Use an adjustable chair with lumbar, thoracic and arm support
3. Work close to your body
4. Minimize excessive wrist movements.
5. Avoid excessive finger movements.

6. Alternate work positions between sitting, standing and side of patient.

7. Adjust the height of your chair and the patient's chair to a comfortable level.

8. Consider horizontal patient positioning.

9. Check the placement of the adjustable light.

Arrangements of Equipment

The layout of the work area and equipment should be such that there is a reduced risk of MSDs; dental staff should remain in a neutral stance when operating. All the necessary dental equipment should be set up so that reaching for it only requires a slight change in posture. Instruments should be easy to reach while working, hence they should be placed within "comfortable distance" (22–26″ for most individuals), neither above shoulder height nor below waist height. The usual working area and the maximal working area are separated when a person is seated in an upright position. The arc formed by sweeping the forearm while holding the upper arm at the side is the normal working area. The arc formed when the arm is fully extended is the working area's maximum. The maximum horizontal reach should be utilized for less frequently used items, whereas the normal horizontal reach should be used for regularly used instruments like diagnostic tools, handpieces, saliva ejectors, high-volume evacuators, etc.1

Instrument selection: The tool accomplishes the majority of the work and requires less force when the working edges are not blunt. When using tools with blunt or dull edges, more force is required. Additionally, the use of portable, strong mechanical hand pieces should be encouraged rather than manual ones.6

Magnification and lighting: The parallel alignment of the light beam in the observing direction produces shadow-free illumination, which enhances job quality. A more upright posture is made possible by the use of dental loupes and a microscope with various magnification levels, which lessens back and neck strain.6,22

Gloves: Each oral healthcare professional needs to wear gloves that are the right size and length. Although the impact of gloves on hand discomfort has not yet been studied, they have been suggested

as a possible cause of carpal tunnel syndrome in an indirect manner.4

Physical Exercise: Although there is research to suggest that those in poor physical condition may be more prone to musculoskeletal injuries, there is no evidence to suggest that using stretching or exercise practices will effectively avoid MSDs. Stretching and exercise should be done under the guidance of a doctor or physical therapist when treating an MSD. By performing workouts incorrectly, harm may occur, or a previous injury may become worse.4

Proper Temperature: To keep dexterity and grip strength from deteriorating, hands and fingers should be kept at a temperature of at least 25°C (77°F). Temperatures, on the other hand, are not regulated.5

Four-Handed Dentistry: In four-handed dentistry, the dentist and assistant collaborate to carry out operations that are created with the patient's best interests in mind. A qualified chairside assistant aids the dentist in carrying out the technical procedure during any dental treatment provided in a dental office. The effective use of a dental assistant's additional pair of hands in a four-handed dentistry setup is universally acknowledged as the best way to deliver dental services.22,23

Alternate between standing and sitting: You can ease back pressure by standing. But during some procedures the dental practitioners are required to sit. When one sits their whole-body weight is transferred to their girdle area. By rotating between the 2 postures, one set of muscles gets a respite while the effort is moved to another. Alternating between sitting and standing might be a good approach to avoid injury.24,25

Conclusion

Due to their prolonged procedure-based working hours and awkward postures, dental professionals are among those who are most susceptible to MSD. It has been documented that clinicians can contract illnesses ranging from a straightforward sprain to carpal tunnel syndrome. The effectiveness of the dentist is affected by a variety of other factors, including the hand piece's constant vibration, the lighting in the work area, the design of the tool, and others.

Maximum production is ensured by ergonomics, along with the avoidance of disease and injury. On the other hand, a poor application may lead to MSD at work. If you experience signs of occupational stress or detect warning signs, you must consult a doctor as soon as you can.

By adhering to some simple guidelines and preserving a good posture, MSDs can be prevented. To increase awareness among dental professionals, regular CDE seminars and lectures should be conducted. Regular use of four-handed dentistry should be encouraged in order to maximise efficiency and convenience.

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