

The way you do, the way you live: Ergonomics in Dentistry.

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Abstract

Ergonomics is a way to work smarter, not harder by designing tools, equipment, work stations and tasks to the worker and not the worker to the job. There is an increasing load of musculoskeletal disorder amongst the dental surgeons worldwide primarily due to ill working environment and mal-practices. This article gives a broad vision on how ergonomics play most vital role and detailing its application to prevent various ailments related to the topic. This also well highlights the measures that can be undertaken for better ‘us’ and a successful ‘patient’ outcome too. For a dentist, application and benefits of ergonomics outlay the work related risks by adapting good postures, sufficient lighting and easy access to required instrumentation and materials for different working practices, procedures and patients.

Keywords: Ergonomics, Musculoskeletal Disorders, Mal-practices, Simplification Techniques.

Introduction

Ergonomics is a study of work, including the tasks, the technology and the environment, in relation to human capabilities which leads to improved productivity, reduced injuries and greater work satisfaction. The scope of ergonomics in dentistry is large: it ranges from chemistry

between the dental team to lighting, noise, odor conditions and to the used equipment and software (1).

The musculoskeletal health of the dental professionals worldwide has been the major subject of numerous studies done in various parts of the world. Studies indicate that the back, neck, shoulder or arm pain is present in up to 81% of dental operators (2). The pains experienced by the dentists are varied, it becomes alarming when its nature is continuous and show signs of damage and disability. Thus a good sitting posture, use of handy instruments, managing the early signs of disability are considered ‘saving’ from a permanent irreversible damage.

Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are the most common ailment faced by dental practitioners. It has been seen that it is one of the most common (29.5%) reasons of early retirement among dentists (3). The symptoms of MSD are:

- a) Extreme fatigue in the neck and shoulders.
- b) Weakness in hands, cramping.
- c) Numbness, tingling, burning in fingers, hands and arms.
- d) Clumsiness and dropping of objects.
- e) Decreased range of motion, grip strength and coordination.

Various mechanisms were explained that lead to MSDs which directly explained the detrimental effects of being 'ergonomically' poor (4,5).

- a) **Prolonged static postures**; resulting in series of events that result in excruciating pain, injuries and carrier withdrawals.
- b) **Muscle ischemia/necrosis and imbalances**; the result of a straight, prolonged awkward postures lead to stressed and shortened muscles which become ischemic and painful leading to spinal column dis-alignment due to continuous symmetrical forces.
- c) **Spinal disk herniation and degeneration**; it is basically observed during the positioning as forward flexion and rotation with repeated increasing pressure on the spinal disks.
- d) **Hypomobile joints**; a prolonged static posture limiting the joint movements due to restricted muscle contractions, resulting in decreased synovial fluid production.

Thus its observed that the basic problem faced is due to the 'position' of the dentist during the ongoing procedures which lead to repeated episodes of "LOWER BACK PAIN (LBP)". A 12 month period prevalence of LBP among Queensland dentists was observed to be around 53.7% which was similar to that reported in Denmark, Israel and United States (6).

The other health ailments faced are "HAND AND WRIST" problem which is due to chronic, repetitive movements of the hand and wrist, especially with hand in 'pinch' position, wrist deviated from neutral posture into an abnormal position, working for too long period without giving rest or alteration of hand, mechanical stresses to digital nerves from sustained grasps, forceful work and extended use of vibratory instruments (1). Some common conditions are:

- **De Quervain's Disease:** is a painful inflammation of tendons in the thumb that extend to the wrist.
- **Trigger finger:** is a painful condition that causes the fingers or thumb to catch or lock when bent. In the thumb its called **trigger thumb**.
- **Carpal Tunnel Syndrome:** is numbness, tingling, weakness, and other problems in the hand because of pressure on the median nerve in the wrist.
- **Guyon's Syndrome:** is an entrapment of the ulnar nerve as it passes through a tunnel in the wrist called Guyon's canal.

One more common term used is "Tension Neck Syndrome". In this there is pain, stiffness and muscle spasms in the cervical musculature, often referring pain between the shoulder blades or the occiput and sometimes numbness or tingling into one arm or hand. Forward head posture may precede this syndrome, precipitating muscle imbalance.

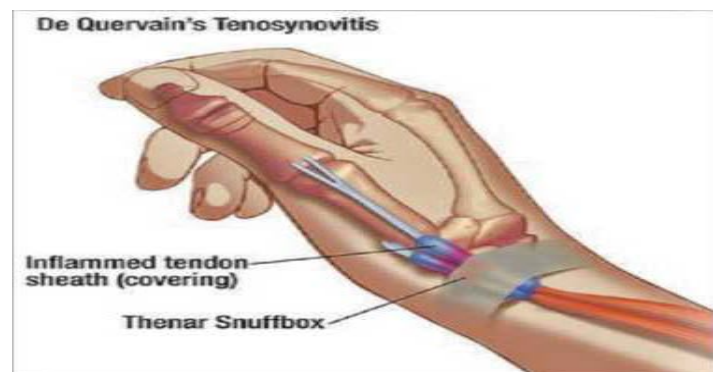


Figure 1: De Quervain's Disease

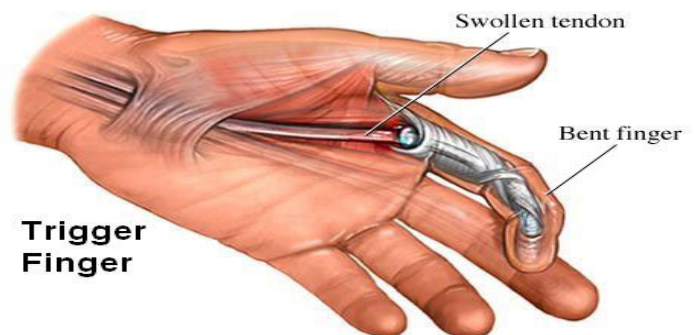


Figure 2: Trigger Finger

Guyon's Canal Syndrome (Handlebar Palsy)

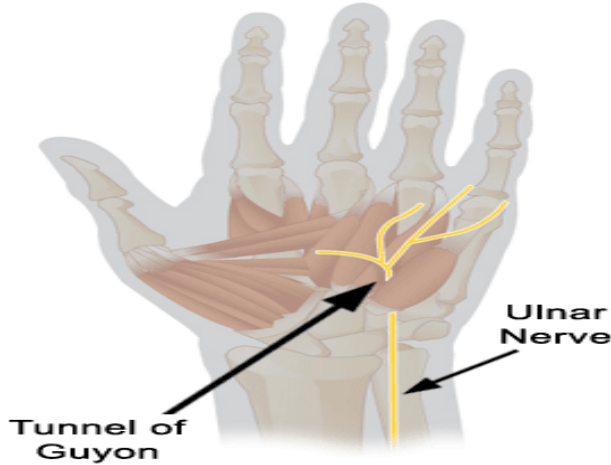
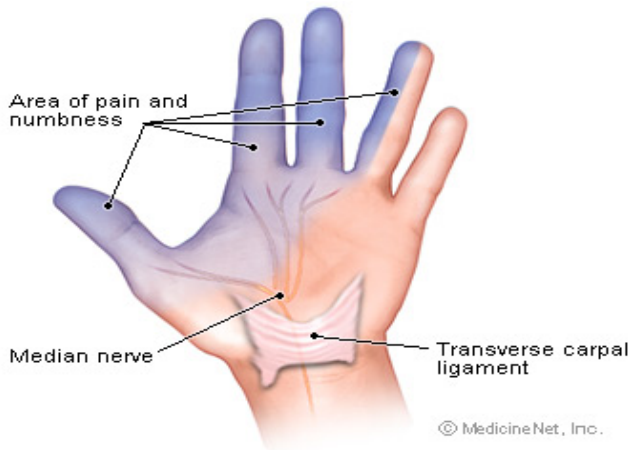


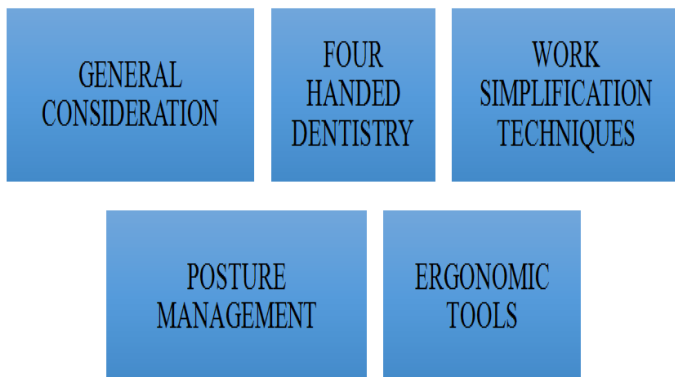
Figure 3: Guyon's Canal Syndrome



Carpal Tunnel Syndrome

Figure 4: Carpel Tunnel Syndrome

Measures to Overcome



General Consideration

- a) Incorporate brief 'stretch break' period between patients. (Figure 5a, 5b)
- b) Develop a patient difficulty scale to ensure difficult treatment sessions are not performed consecutively.
- c) Increase treatment time for more difficult patients.
- d) Alternate heavy and light calculus patients through out the day.
- e) Alternate procedures performed.

Ergonomic Stretches

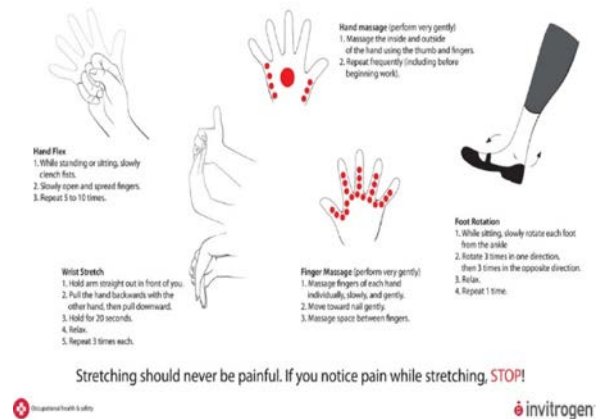


Figure 5 a: Stretches

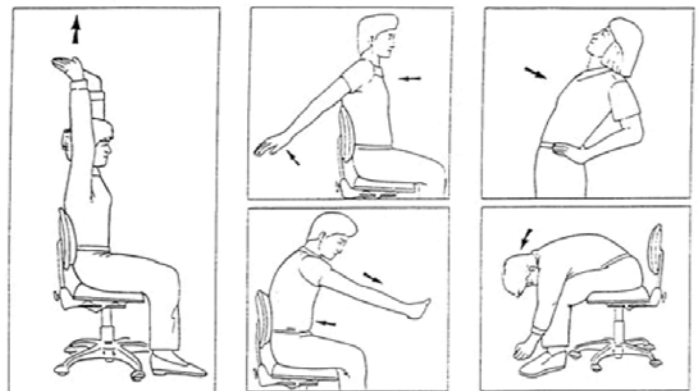


Figure 5 b: Stretches

Four handed dentistry: (Figure 6a,6b)

It is an ergonomically sound way to practice dentistry using the skills of the dental assistant while including work simplification techniques. The term was first recorded in a conference on "training dental students to use chair side assistants" in 1960.

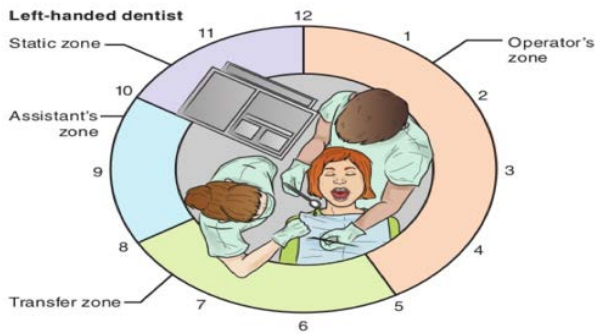


Figure 6a: Four handed dentistry.

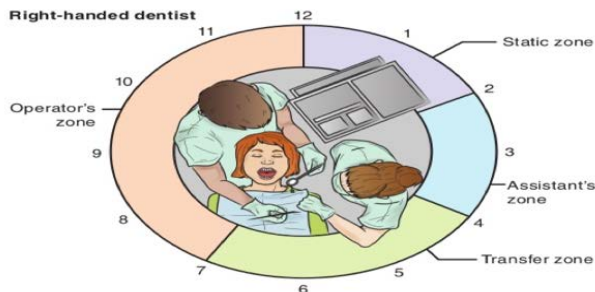


Figure 6b: Four handed dentistry.

Work Simplification Technique

These techniques are applied in dental office for making work easier, safer and more effective and to make the work environment comfortable.

Four principles are:

1. **Elimination** of necessary equipment, instruments, steps in procedure and movements.
2. **Combination** of two instruments or pieces into one.
3. **Rearrangement** of equipment and material in the operatory, scheduling of patients or steps in clinical procedures for better advantage of available time and space.
4. **Simplification** of equipment to patients to be managed.

Posture Management

Many studies give a special mention about the ergonomically correct 'posture' for the dentists (7); it includes: (Figure 7)

- Maintenance of erect posture
- Use of adjustable chair with lumbar, thoracic and arm support.

- Avoid excessive finger and wrist movements.
- Alternate work positions.
- Adjust the height of your chair and patient's chair to a comfortable level.
- Consider horizontal patient positioning.



Figure 7: Correct Sitting Posture

Ergonomic Designing of Dental tools/ instruments:

(Figure 8&9)

The features of the instruments that are ergonomically assured should be: (8)

- Hollow or resin handles
- Round, knurled or compressible handles
- Carbon steel construction (for instruments with sharp edges)
- Lightweight, balanced models (cordless preferred)
- Sufficient power
- Built-in light sources
- Angled vs. straight-shank
- Pliable, lightweight hoses
- Swivel mechanisms
- Easy activation and maintenance
- Adequate lumen size
- Ease in cleaning
- Knurled handles (no finger cut-outs)
- Easy activation and placement

A good grip of the handpiece instrument enhances the quality of the instrument and the working ability. (Figure 10)



Figure 8: Hand Instruments



Figure 9: Automatic Handpieces



Figure 10: Demonstrating a good grip on holding the instrument(9).

Conclusion

The ergonomic standard mandated by the OSHA (Occupational Safety and Health Administration) recommended that the most efficient and effective way to remedy “ergonomic hazards” causing musculoskeletal strain should be through engineering in the work station

(10). Ergonomics therefore, is an applied science concerned with designing products and procedures for maximum efficiency and safety (11).

The constant reminders for all the dental hygienists would be “the way you do, the way you live”. The health of the patient is directly related to doctor’s own well being too. MSDs have a great propensity to be prevented by working on a good environment and correct working habits. The various exercises highlighted in this article take up their great importance in decreasing the morbidities due to MSDs. Thus a timely action and a smart work place is a boon for both patient and the practitioner.



Figure11: Ergonomic posture (12)

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