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COMFORTING THE DENTAL SURGEON- A REVIEW ON ERGONOMICS

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ABSTRACT

Dental work requires considerable concentration and attention to detail. Dental professionals are concerned about patients' comfort, but probably pay little attention to their own until they begin to experience discomfort or pain. Today, more dentists are becoming aware of occupational hazards and paying more attention to the prevention of hazards. Ergonomics have come into the profession in a big way. Applying ergonomics to the practice of dentistry not only could provide safety benefits but a practice might also improve performance objectives through greater productivity. Thus, this paper does not intend to establish a standard of care for treating Musculoskeletal disorders (MSD) or even establish particular interventions as the norm for improving comfort or productivity. Rather, the following interventions should be considered by the practitioner in light of his or her own experience and needs. These interventions require an awareness of how to fit the job to the worker and not the worker to the job.

INTRODUCTION

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 'fit' between people and their work. It takes account of the worker's capabilities and limitations in seeking to ensure that tasks, equipment, information and the environment suit each worker. The musculoskeletal health of dental professionals has been the subject of numerous studies worldwide, and their focus has been on the pain experienced by the practitioner. Because their work area is narrow, performance of dental treatment results in a very inflexible work posture [1]. 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 treating the patient in the supine position. Being seated made little difference in how frequently operators experience pain. When operators sit, pain occurs not only in their backs, but also their necks, 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. Dentistry is a social interaction between helper and recipient in their limited job setting and with personal characteristics (Fig 1). A healthy dentist is one of the most important component in a successful dental practice. Dentists can,

and do experience illnesses and problems that can disrupt or impair a practice [2].

Mechanisms Leading to Musculoskeletal Disorders (MSDs) in Dentistry: [3,4].

Prolonged Static Postures (PSPs): Dentists frequently assume static postures. 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 shortened muscles which can become ischemic and painful, exerting asymmetrical forces that can cause misalignment of the spinal column.

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

Spinal Disk Herniation and Degeneration: In unsupported sitting, pressure in the lumbar spinal disks increases. During forward flexion and rotation, a position often assumed by dental operators, the pressure increases further and makes the structure vulnerable to injury.

Ergonomic Risk Factors in Dentistry [5,6].

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

Wrist and Hand: Carpal Tunnel syndrome (CTS) has been associated with both repetitive work and forceful work. Symptoms can appear from any activity causing prolonged increased (passive or active) pressure in the carpal canal.

Low Back Pain: Low-back discomfort has been associated with dental work in numerous studies. Good posture correlated negatively with back pain and dentists who sat 80 percent to 100 percent of the day reported more frequent lower-back pain, than those that do not sit as often.

Psychosocial Factors: Dentists with work-related MSDs show a significant tendency to be more dissatisfied at work and to be more burdened by anxiety, experiencing poorer psychosomatic health and feeling less confident with their futures.

Ergonomic Risk Factors in General:

Mechanical Stresses Mechanical stresses are defined as impingement or injury by hard, sharp objects, equipment or instruments when grasping, balancing or manipulating. Mechanical stresses are encountered when working with forearms or wrists against the edge of a desk or work counter. The muscles and tendons are impinged when pressed into the sharp edge.

Force: It is the mechanical or physical effort to accomplish a specific movement or exertion. For example, using the hands instead of a clamp to hold an object while performing a task such as placing an inter proximal composite restoration. The amount of force required by an activity can sometimes be magnified causing even more muscular fatigue. If for example, in the just described dental procedure the arms are also elevated at the time [7].

Posture: It is the position of a part of the body relative to an adjacent part as measured by the angle of the joint connecting them. Postural stress is assuming an extreme posture at or near the normal range of motion. Posture is one of the most frequently cited occupational risk factors. There is a neutral zone of movement for every articulating joint in the body. For each joint the range of motion is defined by movements that do not require high muscular force or cause undue discomfort. Injury risks increase whenever work requires a person to perform tasks with body segments outside their neutral range in a deviated posture. For the upper arm and shoulder area neutral posture is relaxed with the shoulders down and on the same plane, with arms at the side. Working with the arms abducted away from the body, overextended and shoulders hunched places these joints at the end of their normal range of motion, requires higher muscular force and greatly increases the risk for injury [8].

Vibration: It has been found to be an etiological factor in work environments utilizing tools vibrating in the frequency band of 20 to 80 Hz. Dental hand pieces and powered automatic instruments operate at higher frequencies in the 5000 to 10,000 Hz range, and duration of exposure to vibratory force during dental procedures is relatively short. Thus, it would appear that the exposure to this risk factor in dentistry is relatively small. The vibratory peaks experienced using dental hand pieces is in the frequency range similar to driving a car.

Nevertheless, handling of vibrating instruments was found to be associated with nerve trapping, early arthrosis and Reynolds's syndrome resulting in subsequent hand and finger pain. Therefore, considerations such as taking micro-breaks of 50 seconds in between treating patients, lessening the hours using vibrating instruments and even finger exercise would be useful in reducing the muscle strain and optimizing the strength capacity of the operator [9].

Repetitions: Repetition rate is defined as the average number of movements or exertions performed by a joint or a body link within a unit of time. Repeated identical or

similar motions performed over a period of time could cause over-extension and overuse of certain muscle groups, which could lead to muscular fatigue. Interestingly, symptoms often relate not to the tendon and muscle groups involved in repetitive motions, but to the stabilizing or antagonistic tendon and muscle groups used to position and stabilize the extremity in space. Sometimes, by varying tasks, muscle groups have periods of activity alternated with periods of rest, which may be beneficial in reducing the possibility of injury. Of course, risk factors are only part of the story. As noted above, two individuals exposed to the same combination of risk factors and to the same degree will respond differently. One worker may not experience any discomfort, while another might develop a MSD. Why this is so, it is not fully understood. Nevertheless, studies have identified some "worker predisposing factors". Those factors might increase a person's probability of developing an MSD. Some predisposing factors (i.e., age, rheumatoid arthritis, renal disease, hormonal imbalances, diabetes, and hypothyroidism) are biological mechanisms that could account for an increased occurrence of tissue damage and MSD.

For other factors (i.e., weight, wrist dimension) there is epidemiological evidence but the mechanism is less clear. Still other factors are even less well established (i.e. genetics, general conditioning). In addition, there are a host of non-work risk factors inherent to the hobbies and other activities a person engages in when away from work (i.e., knitting, crocheting, bowling, computer use, excessive driving) [10].

Interventions for Consideration in the Dental Practice: In addition to widely recognized general interventions, consider the following interventions as well [11-17].

- Exercise caution in purchasing equipment
- Early Treatment of MSDs
- Posture and stools
- Patient positioning
- Hand instruments
- Automatic instruments
- Lighting and magnification
- Four-handed dentistry
- Supervised exercise/stretching
- Proper temperatures
- Procedures and administration

Exercise Caution in Purchasing Equipment: When purchasing new equipment, dentists should consider the ergonomic ramifications of the purchase and be aware that the term "ergonomically designed" could simply be a marketing ploy. There are, unfortunately, no industry standards. Consequently, dentists should develop an understanding of ergonomic risk factors and the concept behind ergonomic interventions to help them make more knowledgeable decisions about instrument and equipment purchases.

Early Treatment of MSDs: Early intervention is of the utmost importance. Early symptoms in the wrist and hand respond to conservative medical management that includes rest, icing, non-steroidal anti-inflammatory drugs and splints. Early intervention could be important in order to achieve a better result at less cost and inconvenience [12].

Posture and Stools: The posture adopted during the practice of operative dentistry has changed over the years. Originally, dentists commonly stood to provide treatment. With the introduction of four-handed dentistry in the 1960's, sitting became the preferred position. The sitting position was also an attempt to reduce the fatigue and discomfort sometimes associated with dental practice. Unfortunately, the seated working position has not eliminated the potential for discomfort or injury in dentistry. In many cases, dental care providers adopt whatever position is necessary to access the oral cavity [13].

The key objective for the dental care provider is to adopt a position that allows him or her to achieve optimal access, visibility, comfort and control at all times. Ideally, when providing patient care, muscles should be in a relaxed and well-balanced position with the exception, of course, of those muscles performing the actual task. The operator's stool should support every operator in neutral posture; therefore it should be fully adjustable [14].

When looking in profile at a human body, there are four curves in the spine. The first curve is the backward curve at the tailbone. This is followed by a forward curve at the lower spine, a backward curve at the upper spine and ends with a forward curve at the neck. The two forward curves counterbalance the two backward curves. These curves allow the entire trunk; to remain balanced over the centre of gravity. Since the operator is most commonly in a seated position while working, the design and use of the stool becomes a critical part of the balance. The operator's stool should have a broad base pan to support the buttocks and thighs, including a slight forward tilt with a "waterfall-tapered" edge.

The seat should be adjusted so the operator's knees are slightly below the hip level so the thighs are 100° – 110° to the trunk with the feet resting flat on the floor. Variations in footwear such as high-heeled shoes or thick soles could demand a higher seating base. The backrest or lumbar support should be adjusted to fit in the center of the operator's lower back where the forward curve of the lower back meets the backward curve of the middle back. The operator should sit back as far as possible to take maximum advantage of the lumbar support. The risk for low-back pain is associated with work undertaken for prolonged periods of time in a seated position. Continual seating for a prolonged period results in activation of the upper and lower erector spinae muscles, and in significantly greater low-back compressive loading in the lumbar spine region than exists when standing [15].

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 (Yamalik, 2007): [13-15].

(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 the pelvis, which keeps back aligned and promotes the natural curvatures of back.

(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.

(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.

(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.

(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 circulation. Allow each side of 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 Own 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.

(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.

Posture varies depending on the dental stool selected, so careful selection is crucial. The dental stool must fit correctly; it must offer neutral back, neck and shoulder support for optimal posture; must be at the correct height and tilt; and must offer optional arm and elbow support. One size does not fit all — there are wide variations in clinicians' heights and body shapes, and the stool must fit the individual for whom it is intended. An incorrectly fitting chair may exacerbate rather than reduce the risk of work-related musculoskeletal injuries. Important design considerations include the height of the stool's cylinder, the depth of the stool and the style and presence of armrests [13].

Factors in Dental Stool Selection:[15].
- Seat angle, depth and style
- Back support — height and tilt
- Shoulder support
- Adjustability of seat height
- Seat fabric
- Stability - five casters, wide base

Seat Angle, Depth and Style: Dental stools may have a horizontal, tilting (**Fig 2**) or saddle-style seat (**Fig 3**). Horizontal seats can result in posterior rotation of the

pelvis with resultant "slouching" posture. It can also cause compression on the posterior thighs and associated blood vessels, and should be avoided. Saddle-style and tilted seats help avoid pressure to the posterior thighs, and maintain the lumbar curve of the lower back by placing the pelvis in a more neutral position, which naturally balances the spinal curves [16].

If using a tilted seat, the optimal angle is between 5 degrees and 15 degrees — a shallower incline will not optimize posture nor relieve pressure, and a steeper incline may result in the clinician sliding forward on the seat pan, thus losing contact with the backrest. The seat should be padded and, irrespective of overall design, should be shaped so that the front edge of the seat has a sloped edge, which helps reduce pressure on the back of the thighs. In addition, when the clinician is completely seated with his or her back against the back support, there should be at least three finger widths of free space from the seat edge to the back of the clinician's knee; this ensures proper stool usage and avoids the application of any inappropriate pressure in this region.

The depth of dental stools ranges from 14 inches to 18 inches. Particularly for a tilted stool, it is important that the seat's material be textured i.e., not slippery so that the clinician does not slide forward during procedures, thereby disrupting an ergonomic working posture. One study assessed dental students' posture with two different designs of seat over a period of time, following training in use of the seats. It found that use of a saddle seat (Bambach) could result in a more improved posture compared to use of a conventional stool, and that the students could maintain an ergonomic working posture that may reduce the risk of work-related injuries [14].

A greater trunk-to-thigh angle than can be achieved with a conventional seat is ergonomically desirable. Tilting seats and saddle-style stools open the hip angle to greater than 90 degrees and may also enable closer positioning to the patient. This will help prevent the tendency to lean forward to reach closer to patients. The height of the stool from the floor to the base of the seat is critical. If the stool is too high, it will cause the operator to perch on the edge of the seat, losing contact with the backrest of the chair. If too short, the clinician's pelvis will tend to roll backward, causing flattening of the lumbar spine. Cylinder height (short, medium or tall) should be determined prior to purchase to ensure proper usage of the stool by the operator [17].

Back and Shoulder Support: Back support is obtained by selecting a chair with a backrest that can be correctly adjusted for height and angulation (Fig 4). Lumbar support is helpful in avoiding any damaging spinal compression and muscular activity, by maintaining an ergonomic spinal curve of the seated person. Tilted seats do not flatten the lower back curve as much as nontilted stools do. The lumbar support need be only eight inches or so in height to be effective.

Static supports i.e., armrests may offer benefits by providing support during procedures. Shoulder support is aided by armrests, which help prevent back, shoulder and neck pain. Armrests are particularly useful if the clinician is staying in one position for an extended period of time. At first the stool may feel bulky, and there may be the perception that it is not possible to get close enough to the patient. However, after a period of adjustment, the benefits of armrests will become evident.

Patient Positioning: While the patient's chair should provide support and comfort for the patient, it should also be adjustable to allow the operator to maintain neutral posture while working. Supine positioning of the patient in the chair is usually the most effective way to help maintain neutral posture. One result is that the maxillary occlusal plane of the patient is then perpendicular to the floor, creating the greatest access and the most effective visual line to the oral cavity. The chair should be raised so the operator's thighs can freely turn beneath the patient's chair (Fig 5). Clearance around the patient's head should at least allow unimpeded operator access from the 7:00 to the 12:30 position (Fig 6), for right-handed operators. The headrest should stabilize the patient's head, while allowing enough movement to position the patient and maximize access. A fully adjustable headrest will allow support for the cervical curvature and permit tilting of the patient's head. Rather than adjust the operator's position, re-position the patient's head whenever possible. For most intraoral access sites, the maxillary plane should be extended 7 degrees beyond the vertical. For treating the maxillary second and third molars, the maxillary plane should be 25 degrees beyond the vertical. For the mandibular anterior teeth, bring the patients chin down so the maxillary plane is 8 degrees ahead of the vertical.

Hand Instruments: Various features of dental instruments may have an effect on ergonomic issues. These include: [13]

- Size and shape of the entire instrument
- Diameter of the instrument handle
- Surface configuration where the instrument contacts the fingers
- Weight of the instrument including attachments
- Balance and alignment of the instrument
- Manoeuvrability of the instrument in space
- How well the moving parts can be manipulated
- Maintenance of the cutting edge

Hand-pieces should be as light as possible and well balanced. Hose length should be as short as possible; extra hose length adds weight. Avoid retractable or coiled hoses. The tension in the hose is transferred to the wrist and arm as the hose is stretched. Ideally, use a pliable hose with a swivel mechanism in the barrel of the hand-piece so that it can rotate with minimal effort.

Lighting & Magnification: Improvements in visualization of the operative site were first obtained through the use of

fiber optic lights on high-speed hand pieces, followed by fiberoptic and LED lights attached to ultrasonic scaler inserts. These applications resulted in greatly improved visibility for dentists and dental hygienists. Nonetheless, visualizing the operative site remained challenging. The more recent introduction of magnification aids has significantly improved visualization, postural habits and productivity. Properly selected and adjusted, magnification devices can help prevent the clinician from gradually tilting his or her head and leaning forward over the patient, which could result in head and neck strain and musculoskeletal injures over time. Available magnification devices include the procedure scope, loupes (or telescopes), magnification lenses (reading glasses) and dental operating microscopes. Depending on the type of magnification selected, the clinician can work with a head posture of less than 25 degrees forward. This is achieved with loupes by a set focal range, with operating microscopes by a fixed position of the microscope and screen, and with procedure scopes by a fixed position of the LCD screen.

Procedure Scopes (Extraoral Cameras): They project the clinical site onto an LCD screen placed at eye level, allowing the clinician to sit upright (Figure **7**). They can be wall- or ceiling-mounted, attached to a counter, or placed on a cart. The scopes reduce eye fatigue and offer up to 23 times magnification (depending on the model), and the clinician can view the whole mouth on the screen. The procedure scope is used in place of an examination light and has a color-corrected LED light with three brightness levels. It enables neutral spine alignment, reducing the risk of neck and back strain and injuries. The scope does not generate heat and is safe for both patients and dental healthcare workers. The learning curve is approximately two weeks long.

Microscopes: Operating microscopes were first used in endodontics in the late 1980s. Since then, their use has expanded to other disciplines including periodontal procedures; prosthodontics and general dentistry. They enable more precise visibility and greater precision during procedures. As with the procedure scope, the clinician carries out the procedure while looking ahead, and does not need to bend or flex the neck, upper spine or lower back to improve visibility.

The clinician is neutrally aligned in an ergonomically favourable position provided the microscope is correctly adjusted, with neck flexion at a maximum of 5 degrees. Using a microscope (Fig 8) lets the clinician focus the eyes specifically on the operative field. The optics in the microscope enables the ergonomic posture by bending the image almost to a right angle. The range of magnification varies depending on the specific microscope. Low-resolution microscopes can have six times magnification, while high-resolution microscopes attain 20 times magnification.

A further advantage of dental microscopes is that the clinician does not need to wear anything or carry any weight or cables. As the magnification of the microscope increases, the operating field decreases in both depth and range.

Dental Loupes (Telescopes): They are the most frequently used form of magnification. They offer from two to five times magnification. With appropriate selection, well-adjusted loupes can enhance posture and position during procedures, resulting in improved ergonomics. Forward head posture should be no more than 25 degrees during use.

Fixed Loupes: Fixed have a preset declination angle that is fixed, with the scope mounted into the lens. Since they are fixed, the loupes do not get knocked out of alignment. Compared to flip-up loupes, they are lighter and offer a wider field of vision — the scope is closer to the eyes (Fig 9). Prescription lenses can be included in the carrier lens of the fixed loupes to enable distance viewing, and the actual scope itself can have a prescription. If the clinician wears prescription lenses and the prescription changes, the loupes will need to be modified by the loupes manufacturer.

Flip-up loupes As their name suggests, flip-up loupes (Fig 10) can be flipped-up during a procedure, with the scope mounted in front of the lens. Advantages of flip-up compared to fixed loupes include a better declination angle for head posture and the ability of the clinician's regular optician to change prescriptions. On the other hand, flip-up loupes are typically heavier than fixed loupes and can also be knocked out of alignment.

Four-Handed Dentistry: Dental assistants create a more efficient environment for the operator by eliminating unnecessary motion; decreasing twisting and turning movement; decreasing long reaches and unbalanced posture. Four-handed dentistry is based on a set of principles that define the conditions under which efficiency can be attained. The principles of four-handed dentistry are:

• Patient treatment is planned in advance in a logical sequence.
• Instruments and equipment used are based on ergonomic principles.
• Pre-planned instrument setups in cassette, tray or pre-bagged format
• All instruments, equipment and materials for the patient's appointment are in the operatory and readily accessible by the assistant before the team is seated.
• The operator, assistant, and patient are comfortably seated in balanced posture.
• Motion economy is practiced
• Equipment and instruments should be centered around the assistant.

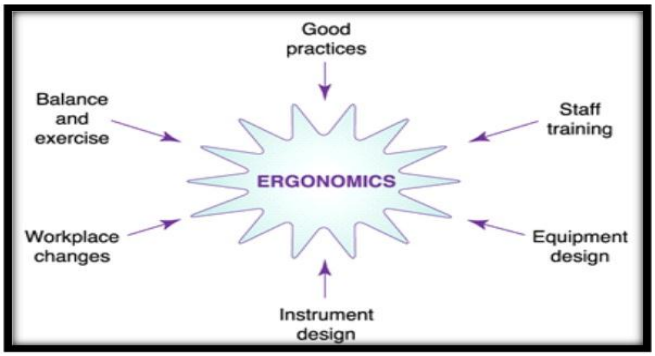
• Instruments and materials should be delivered and retrieved by the assistant without the operator having to shift focal length or leave the finger rest.
• Instruments and materials are transferred in the transfer zone only.
• The operator assigns all legally delegable duties to qualified assistants based on the state's guidelines.

Supervised Exercise/Stretching: Because dental work has become more sedentary, larger muscle groups, responsible for cardio-respiratory health and overall endurance, are relatively inactive. Extreme metabolic and functional demands are placed on the smaller muscle groups of the arms and hands. It is important to balance the sedentary with activities that promote conditioning and physical fitness. 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. Periodic stretching (**Fig 11**) should be done throughout the workday. Resting hands frequently is believed to be one of the most important factors in preventing MSD**.** 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. 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. 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.

Proper Temperatures: Within the work environment, low room temperatures, manipulation of cold materials or instruments and exposure to cold air exhaust can contribute to low finger temperatures. There are no standards for finger temperatures, but it is recommended that hands and fingers be kept above 25° C or 77° F to avoid detrimental effects on dexterity and grip strength.

Procedures and Administration: The appointment schedule can be used to reduce stress and strain. Alternate easy with difficult cases throughout the day and provide buffer periods that accommodate emergency patients or extra time for difficult procedures or patients. With difficult patients and procedures, alter the sequence of the tasks to be performed, whenever possible. For example, in order to increase task rotation, instead of scaling the entire mouth, then polishing all the teeth followed by flossing, consider doing these tasks a quadrant at a time.

Figure 1. Courtesy: Ergonomics in General Dental Practice.



People's Journal of Scientific Research 2012; 5(1):57-60.

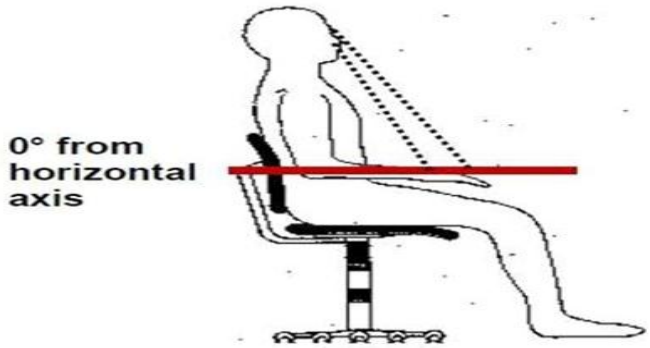
Figure 2. Traditional Tilting Dental Stool (Royal Dental)

Ergonomics in General Dental Practice. People's Journal of Scientific Research 2012; 5(1):57-60.

Figure 3. Saddle-Style Stool (Scandex)

Ergonomics in General Dental Practice. People's Journal of Scientific Research 2012; 5(1):57-60.

Figure 4. Erect posture of body



Courtesy - Prevention of work related MSDs in dental clinic: www.asstsas.qc.ca

Fig 5. Patient Positioning Courtesy: Sirona Dental Company

Fig 6: Position Of Operator Relative To Chair

Courtesy: Principles of Operative Dentistry - Basic Principles. Nadhir Boukhenifra

Fig 7: Erect posture Courtesy: Photograph © 2008 Posturedontics.

Fig 8: Dental Operating Microscope (Global Microscopes)

Courtesy: Ergonomics And Injury In The Dental Office. A Peer-Reviewed Publication Written By Bethany Valachi.

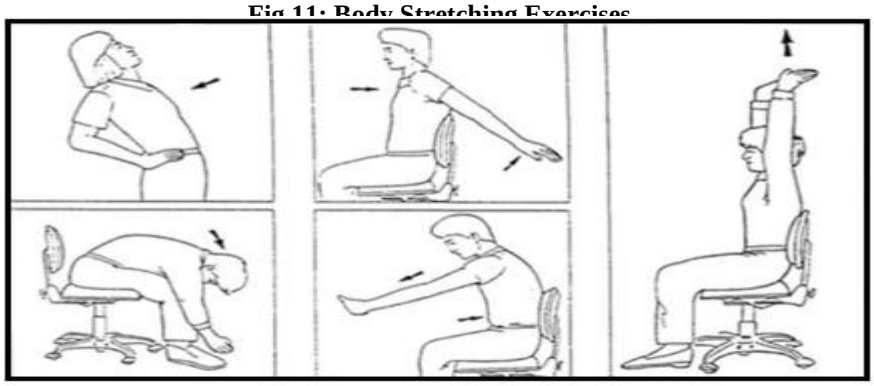
Fig 9: Fixed (TTL) Dental Loupes

Courtesy: Ergonomics And Injury In The Dental Office. A Peer-Reviewed Publication Written By Bethany Valachi.

Fig 10: Flip-Up Dental Loupes

Courtesy: Ergonomics And Injury In The Dental Office. A Peer-Reviewed Publication Written By Bethany Valachi.

Fig 11: Body Stretching Exercises



Adopted From: Www.Posturedontics.Com

CONCLUSION

Repetitive strain injuries are on the rise in dentistry. Many dentists/dental hygienists have experienced some type of musculoskeletal pain in their shoulders and neck, hands and wrists, low back, or forearms and elbows. Studies need to be conducted on the impact of dental work on the development of nerve and muscle pathologies, which would prevent dentists from providing the highest quality of service and could threaten their professional careers. Ergonomics have come into the profession in a big way. Meanwhile, the importance of following proper ergonomic principles should be realized so that 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**.**

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. 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.

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