

Review

Posturedontics in dentistry: A review

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Dentistry is a profession that generally produces muscular pain and soreness, they are usually harmless and slow to appear; consequently, the symptoms are usually ignored until they become chronic and permanent lesions are present. When practicing, dentists sometimes are forced to adopt unhealthy postures which depend mainly on factors related to the working conditions. Also, they are exposed to biomechanical risk factors, which indicates that work forced postures, would imply more risk of soreness and presence of skeletal-muscle lesions. These problems could begin to appear at the beginning of the students learning period, by acquiring inadequate postures and working habits that will accompany them for the rest of their professional life, acquiring an unhealthy lifestyle in their work environment. This can ultimately lead to musculoskeletal disorder (MSD). To protect their own health, dentists should seek out and receive education about musculoskeletal health, and injury prevention during work, by relaxation techniques, breathing and stretching exercises, etc. Very little attention is given on impact of dental work on the development of nerve and muscle pathologies. Therefore, the aim of this review was to critically analyze the literature on the prevalence of musculoskeletal pain and possible aetiology of this problem in dental professionals, and the various postural strategies and stretching and strengthening techniques during breaks to ensure long term comfort, efficiency and ease in dental practice.

Key words: Dentistry, musculoskeletal disorders, posture, stress management, breathing exercise, meditation.

INTRODUCTION

The term work-related musculoskeletal disorders (MSDs) refers to the disorders to which the work environment contributes significantly to musculoskeletal disorders that are made worse or longer lasting by work conditions or workplace risk factors. Some of the examples of such workplace risk factors include jobs requiring repetitive, forceful or prolonged exertions of the hands, frequent or heavy lifting, pushing or pulling, or carrying of heavy

objects and prolonged awkward postures. The level of risk depends on the intensity, frequency and duration of the exposure to these conditions. A WMSD can be defined as a condition wherein work-related tasks affect the nerves, tendons, muscles and supporting structures. Conditions can vary from mild recurrent symptoms to severe and incapacitating. Early symptoms of WMSDs include pain, swelling, tenderness, numbness, tingling

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sensation and loss of strength.

STUDY REVIEW

Several studies have shown that back, neck and shoulder pain are a major problem among dentists. Some studies, which were conducted over a period of 1 to 5 years found that over half of the participating dentists experienced musculoskeletal pain: Shugars et al. (1984) reported 60%, Rundcrantz et al. (1990) cited 72%, Augustson and Morken (1996) reported 81%, Finsen et al. (1997) reported 65% and Chowanadisai et al. (2000) reported 78%. Sixty-two percent of dentists reported at least one musculoskeletal complaint (Rundcrantz et al., 1990). Prevalence of general musculoskeletal pain ranges between 64 and 93%. The highest frequency of lower back pain was experienced by the 30- to 40-year-old age group (Augustson and Morken, 1996). In dentistry, overstrained and awkward back postures are responsible for back pain, repetitiveness for neck and shoulder disorders and psychosocial stressors for back, neck and shoulder complaints. Slight hand neuropathy has also been reportedly to be caused by exposure to high frequency vibration tools. Dental operators often cannot avoid prolonged static postures. Even in optimal seated postures, more than one half of the body muscles are contracted statically, and there is little movement of the vertebral joints. This may result in damaging physiological changes that can lead to back, neck or shoulders pain or musculoskeletal disorders. Therefore, this article provides a brief review of literature on musculoskeletal disorders in clinical dentistry and various methods of prevention with a special emphasis on different techniques for the clinicians and dental operators with an aim that it should help the dental operators to prevent these injuries and to work effectively and efficiently.

PREVALENCE OF MUSCULOSKELETAL DISORDERS IN DENTISTRY

There are many studies regarding musculoskeletal disorders experienced by persons working in the dental field that have used surveys to assess pain perception. Literature reviews across the world have shown a high prevalence of MSD among dentists (Lehto et al., 1991; Lindfors et al., 2006; Hayes et al., 2009; Morse et al., 2010). Dentists assume static postures at work which require more than 50% of the body's muscle to contract while resisting gravity (Valachi and Valachi, 2003). When the body is repeatedly subjected to such prolonged static postures (PSP), it results in pain, injury, or career ending MSD. MSD has an impact not only on the physical but also on the psychological and social aspects of the practitioners (Leggat et al., 2007; Alexopoulos et al.,

2004). Work-related MSD in severe cases results in frequent absences and finally to early retirement. Although they vary in scope and objective, a targeted look at the upper back, neck, shoulders and wrists is common in all of the studies.

DIFFERENT MECHANISMS IN THE GENERATION OF PAINS AND SORENESS IN DENTISTS

Lake in 1995 implicates several mechanisms involved in the occurrence of pains and soreness in dentists:

- (1) Elevated work area with permanent static positions of more than 30°, which would produce a reduction of blood flow in the supra spine tendon and would also originate high muscle tension on the trapezoids (Valachi and Valachi, 2003).
- (2) Lack of support of the forearms during repetitive holding of instruments which would compromise different body segments such as spine, shoulder, and wrists (Alexopoulos et al., 2004). The precision required forces the dentist to maintain forced wrist postures which might produce tendinitis or carpal tunnel syndrome (Dong et al., 2007).
- (3) The handling of vibrating instruments is associated with specific lesions such as nerve trapping, early arthrosis and even, with Raynaud syndrome (Dong et al., 2007).
- (4) Forced cervical static postures. In order to obtain a good vision of the mouth, dentists frequently adopt cervical torsions and flexions which end up in pain (Bramson et al., 1998).
- (5) Poor posture when seating. The flexion of the lumbar spine, when seating forward, produces marked pressure increments between the interdiscal spaces (Michalak-Turcotte, 2000).
- (6) Lighting at the work place: the lack or excess of light can generate myopia and irreversible retinal lesions, among others (Unthank and True, 1999).
- (7) Temperature, ventilation and humidity at the work place: If the temperature is high and the air is saturated with humidity, there is exhaustion, increased body temperature and, respiratory and circulatory disorders (Bare and Dundes, 2004).
- (8) Noise at the work place: Intermittent and continuous noise produced by high and low speed instruments is, according to many professionals, the biggest responsible for auditive alterations as years go by (Hyson, 2002; Park, 1978).
- (9) Equipment: Present dental chairs allow adaptation of the patient's position in height, inclination of the torso, flexion or hyper extension of the head of the patient. On the other side, both the dentist's chair as well as the dental assistant's must permit height regulation; allow controlling the height of the back of the chair and even,

regulate the lumbar-dorsal support in an anterior-posterior position and, the padding must be thin and permanent (Finkbeiner, 2001; National Institute for Occupational Safety and Health (NIOSH), 1997).

IMPACTS OF FAULTY POSTURES

All faulty postures will subsequently result in the following (Morse et al., 2010):

Neck and shoulder disorders

- (1) Myofascial pain disorder,
- (2) Cervical spondylosis,
- (3) Thoracic outlet syndrome,
- (4) Rotator cuff tendinitis/tears.

Back disorders

- (1) Herniated spinal disc,
- (2) Lower back pain,
- (3) Sciatica.

Hand and wrist disorders

- (1) DeQuervains disease,
- (2) Trigger finger,
- (3) Carpel tunnel syndrome,
- (4) Guyons syndrome,
- (5) Cubital tunnel syndrome,
- (6) Hand-arm vibration syndrome,
- (7) Raynauds phenomenon.

There are other factors related with the appearance of pain and muscular lesions such as gender, being higher in female dentists, and age, although this is controversial. Ratzon et al. (2000) reported a high prevalence of non-specific lower back and cervical (55 and 38.3%, respectively) WMSDs amongst dentists, which were well correlated with the time spent sitting. Another study reported a 58% rate of upper segment (neck, shoulder, backbone and upper limb) musculoskeletal pain amongst dentists, with 26% of respondents reporting daily pain and 40% moderate/strong pain (Santos and Barreto, 2001). Moimaz et al. (2003) found that 50.5% of the female dentist respondents reported some problem related to professional performance, most commonly columnar pain. Because the development of WMSD symptoms affects productivity, adaptation strategies for occupationally dangerous tasks must be adopted (Michalak-Turcotte, 2000).

The Ergonomic Standard mandated by the

Occupational Safety and Health Administration (OSHA) recommended that the most efficient and effective way to remedy 'ergonomic hazards' causing musculoskeletal strain should be through engineering improvements in the workstation (Table 1).

PREVENTION OF NECK, SHOULDER AND BACK PROBLEMS

- (1) Sitting and standing posture should alternate in between the work to reduce postural fatigue and maximize postural variety (OSHA, 2000; Ariens et al., 2001).
- (2) Always try to maintain erect posture with feet flat on the floor
- (3) Sitting posture should be straight or recline slightly in a chair with good back support, and use a good footrest if necessary (Murphy, 1998). Tilt the seat angle slightly forward 5 to 15° to increase the low back curve. This will place your hips slightly higher than your knees and increase the hip angle to greater than 90°, which may allow for closer positioning to the patient (Harrison et al., 1999; Chaffin et al., 1999).
- (4) When positioning patients, make sure your shoulders are relaxed and the forearms approximately parallel with the floor. Patients should be placed in a semi-supine position for mandibular procedures and a supine position for maxillary procedures.
- (5) Use light weighted equipment that is comfortable to use.
- (6) Adjust armrests to support elbows in the neutral shoulder position. Keep elbows and upper arms close to the body and do not raise and tense the shoulders while working. Also, ensure that hand postures are not deviated because this could lead to wrist problems (Milerad and Ekenvall, 1990).
- (7) Avoid long appointments as far as possible, so that you can change posture and relax the upper extremities.
- (8) Directional stretching involves a rotation, side bending or extension component that generally is in the opposite direction of that which the operator frequently works.
- (9) Aerobic exercise should be performed three to four times a week for at least 20 min. Aerobic exercise increases blood flow to all of the tissues in the body and improves their ability to use oxygen, improves cardiovascular and cardiorespiratory functions (Marshall et al., 1997).

Neck, hand and finger stretching

Figure 1 shows the neck, hand and finger stretching pattern.

Table 1. Symptoms of different types of MSD.

Type of musculoskeletal disorders	Symptoms
Neck and Shoulder disorders	
Myofascial pain disorder	Pain and tenderness in the neck, shoulder and arm muscle. Painful trigger points upon touch.
Cervical spondylosis	Intermittent/chronic neck and shoulder pain or stiffness, headache, hand and arm pain, numbness, tingling and clumsiness.
Thoracic outlet syndrome	Pain in shoulder, arm or hand, numbness, tingling of fingers, muscle weakness/fatigue, cold arm or hand.
Rotatory cuff tendinitis/tears	Pain and stiffness in shoulders associated with backward and upward arm movements. Weakness of rotator cuff muscle.
Hand and wrist disorders	
DeQuervain's disease	Pain in thumb and wrist area when grasping, pinching, twisting.
Carpal tunnel syndrome	Hand or finger numbness, pain, tingling, burning, clumpiness. Eventual muscle weakness and atrophy. Symptoms often worse with increased activity.
Guyon's syndrome	Symptoms begin with feeling of pins and needles in ring and index fingers.
Back disorders	
Herniated spinal disk	Back and leg numbness, tingling pain, weakness. Worsens with coughing, sneezing, sitting, driving, bending forward.
Lower back pain	Pain, stiffness in lower spine and surrounding tissues.
Sciatica	Pain from lower back or hip radiating to the buttocks and legs. Leg weakness, numbness or tingling. Possible causes are prolapsed intervertebral disc pressuring the sciatic nerve, worsened with prolonged sitting or excessive bending/lifting.

Stress management

Operators may use various stress-reduction techniques to decrease stress-related muscular tension. These include breathing techniques, progressive relaxation, visualization, massage, aerobic exercise, meditation or yoga (Hanten et al., 2000).

Find a quiet place, make sure you will not be disturbed for 5 or 10 min, and take these five steps:

- (1) Sit in a comfortable chair with your spine upright and with your palms on your abdomen.
- (2) Make your breath conscious. Breathe through your nose, with complete awareness of your inhalation and exhalation.
- (3) Make your breath complete, with the assistance of your abdominal muscles. Inhale completely and balloon your abdomen out, then exhale and squeeze your abdomen toward your spine. Repeat this cycle 10 times.

(4) Put your right hand on your heart and consciously feel your breath moving through your heart.

(5) Using the rhythm of your heartbeat or pulse, whichever is easier for you to find, inhale and exhale the same count in and out whether four, six, or eight beats. Repeat this practice 10 times.

Breath meditation

Focused breathing meditation

The lack of sufficient oxygen can increase stress, making individuals feel anxious. Focused breathing focus their attention on the tip of the nostrils where air must enter and exit. They then feel the air as it moves into the body and out of the body, in a calm, relaxed manner. The increased oxygen helps to relax muscles and increases calming chemicals in the brain.



Figure 1. Neck, hand and finger stretching.

Gentle breath meditation: Technique

Sit in a chair with your back straight but supported and have your feet flat on the floor without crossing your legs. Rest your arms on top of your legs with your forearms facing up or slightly opened ensuring your arms are uncrossed. Let your hands find their own place. Do not worry too much about your posture just be in a position that is comfortable for you using this description as a guide. It is unnecessary to be sitting in any awkward cross-legged or lotus positions for your meditation to be effective. Once comfortable close your eyes with the intention of connecting to yourself (Most people close their eyes to shut out the world, distract or numb themselves, which is not the purpose of meditation) (www.universalmedicine.com.au).

Mechanically and intentionally begin by breathing in gently, focusing only on the in-breath. Breathe in your normal rhythm, the breath does not need to be slow or long and definitely not soft but gentle. Focus the mind on the gentle in-breath at the tip of your nose. Make each

and every in-breath gentle.

After a few breaths, you should feel a cool breeze at the tip of your nose towards the upper part of the nostril (If your breath is entering around the entire circumference or rim of the nostril you are breathing a soft breath not a gentle one).

Bring your awareness to the coolness at the tip of the nose during the in-breath. Should the mind get busy or begin to wander, simply bring the attention back to tip of the nose.

If you find yourself nodding off then simply take a longer, deeper but gentle in-breath. Whilst developing the gentle in-breath do not worry about the out-breath just allow it to take its own course.

Do not try and control your breath, just observe it, your breath will develop its own natural rhythm.

Once the in-breath is cool at the tip of the nose, the mind is focused and a natural rhythm has developed, begin to bring your attention to the out-breath.

Keeping the awareness on the cool, gentle in-breath bring your attention to the out-breath. Begin to mechanically

and intentionally breathe out with the same gentleness as the in-breath. As the out-breath becomes gentle, become aware of the warmth at the tip of your nose this time at the lower part of your nostril. As you breathe out, focus your attention on the warmth at the tip of the nose.

Continue to breathe with your natural rhythm do not try to control your breath. Continue observing and focusing your attention on the cool in-breath as you breathe in and warm out-breath as you breathe out.

Once both the in-breath and the out-breath feel gentle and your awareness is at the tip of the nose begin to release your body and allow it to also become gentle. With the next out-breath, release your body by depressing the chest and shoulders mechanically but gently. Consciously release the out breath instead of the body simply deflating.

Allow tightness or hardness in your body to release on the out-breath and let your body become gentle. This allows the fire energy of the soul to diffuse into your body and facilitate healing.

Continue to be aware of the gentle quality of the in- and out-breaths, let the mechanical aspect go and your natural rhythm to take over. Bring your attention back to the coolness at the tip of the nose should your mind wander. After 5 to 10 min of this, you are ready to end the meditation. Open your eyes and gently go about your business.

Square breathing

Imagine in your mind travelling round a square. Breathe in slowly over a count of 3, pause for a slow count of 3, breathe out slowly over a count of 3, pause for a count of 3, and repeat.

The aforementioned tip comes from Craigentiny's free Beat Your Dental Fear e-Course.

Belly breathing

When we panic, we often experience shortness of breath. Our first instinct is to inhale, to get our breath back. But this does not work, because in order to take a deep breath in, you have to first exhale all the air in your lungs. Otherwise, all you get is just another laboured, shallow breath from the chest. Belly breathing helps you with getting good deep breaths, and helps to relax and calm yourself.

(1) Place one hand so it straddles your belt line and the other on your chest, right over the breastbone. You can use your hands as a simple biofeedback device. They will tell you what part of your body, and what muscles, you are using to breathe.

(2) Open your mouth and sigh as if someone had just told

you something really annoying. As you do, let your shoulders and the muscles of your upper body relax downward with the exhalation. The point of the sigh is not to completely empty your lungs – but to relax the muscles of your upper body.

(3) Pause for a few seconds.

(4) Close your mouth. Inhale slowly through your nose by pushing your stomach out. That is right, push your belly out, just like newborn infants do. This is not a beauty contest. When you have inhaled as much air as you comfortably can, just stop. You are finished with that inhale.

(5) Pause briefly. How long you decide. Everybody has different size lungs and counts at a different rate. Pause for whatever time feels comfortable, and be aware that when you breathe this way, you are taking larger breaths than you are used to. For this reason, you should breathe more slowly than you are used to. If you breathe at the same rate you use with small, shallow breaths, you will probably get a little light headedness from over breathing. It is not harmful. Light headedness and yawning are simply signals to slow down as follows:

(a) Open your mouth. Exhale through your mouth by pulling your stomach in.

(b) Pause

(c) Close your mouth and go back to the inhale.

(d) Continue for a few minutes until you feel satisfied.

Once you can belly breathe comfortably, you should practice this technique every hour on the hour for a minute or so (you do not need to interrupt what you are doing). And obviously, only during waking hours at 1, 2, 3 pm and so on. Over time (a week's practice or thereabouts), it will become much easier to switch to belly breathing when you feel panic coming on. The following technique comes from Dave Carbonell's excellent "Panic Attacks Workbook".

Progressive muscle relaxation

This is another popular relaxation technique. It works by isolating one muscle group, making the muscles go tense for 8 to 10 s, and then letting the muscle relax and the tension go. This technique does not work so well in the dental context, because it takes quite a long time until you have gone through all the different muscle groups.

However, it really does help to relax your muscles. When we are anxious or when we anticipate pain, we tense our muscles (with many people literally "gripping the chair").

You may find out that making an active effort to relax your muscles can really help. Concentrate on finding areas of tension in your body and relaxing them, one after the other.

Common areas of tension include your hands (you may want to place them loosely on your belly, that way, you can check that you are breathing through your belly at the same time), the shoulders, the back, or indeed your whole body.

Perform exercises during short breaks

(1) With the elbow at shoulder height and at 90° angle, gently pull the arm across the front of the body with opposite arm. Look over the shoulder being stretched and hold for two to four breathing cycles. Repeat with the other side.

(2) With the knee wider than the shoulder width, bend to the left side, resting full body weight through the left elbows on the left knee. Stretch the right arm overhead and look towards the ceiling. Hold for two or four breath cycles. Repeat on the other side.

(3) Upper trapezius stretch-anchor the right hand behind the seat of the operator chair, gently bring the left ear towards the left armpit. Hold for a two to four breathing cycles. Repeat on other side.

(4) Assume a neutral head posture (ears over the shoulders) do not let the head move forward throughout the exercise.

(5) Lift the chest upwards, position the arms at sides with fingers pointing upwards and palms facing forwards. Roll the shoulders back and down squeezing the shoulder blades downward and together. Hold for long breathing cycle. Repeat five times (Nagpal, 2012).

CONCLUSION

This review clearly demonstrates that MSD represents a significant burden for the dental profession. Adopting adequate postures in clinical practice and having a favorable work environment could reduce the MSDs. Therefore, it is of vital importance to promote the occupational health and prevention programs regarding ergonomic postures which must be acquired by the dentists during their clinical practices.

Work related strain injuries are on the rise in dentistry. This problem can be managed by using a multi factorial approach that includes proper postural positioning, frequent breaks during work, stretching and breathing exercise, etc. 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 and following healthy practices to reduce the stress of dental work on the practitioner's body.

Conflict of interest

Author have none to declare.

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