

# Mechanisms leading to work related Musculoskeletal Disorders in Dental Professionals

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## Introduction

Dentists commonly experience musculoskeletal pain during the course of their careers. 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. 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. Biller<sup>[1]</sup> found that 65% of dentists complained of back pain. Even after the evolution to seated four-handed dentistry and ergonomic equipment, studies found back, neck, and shoulder or arm pain present in up to 81% of dentists<sup>[2-6]</sup>.

A number of studies have found that the mechanisms leading to work-related musculoskeletal pain are multifactorial<sup>[7,8]</sup>. This pain can be attributed to numerous risk factors, including prolonged static postures (PSPs); repetitive movements; suboptimal lighting; poor positioning; genetic predisposition; mental stress; physical conditioning; and age.

Each dental team member is predisposed to pain or injury in slightly different areas of the body, depending on his or her tasks and positioning in relation to the patient.

## Prolonged Static Postures

The human body was designed for movement and with the advent of computers and as the number of sedentary jobs have increased; the number of Musculo-Skeletal Disorders (MSDs) has risen dramatically. Dentists frequently assume static postures, which require more than 50% of the body's muscles to contract and hold the body motionless while resisting gravity. The static forces resulting from these postures have been shown much more taxing than dynamic (moving) forces.<sup>[7]</sup>

Muscle imbalances, ischemia, trigger points, joint hypomobility and spinal disk degeneration are some of the physiological consequences of PSPs.

## Muscle Imbalances

The delivery of modern clinical dentistry means that practitioners regularly maintain static postures. Even with the best ergonomic equipment, operators can find themselves in sustained awkward postures. These postures often consist of forward bending and repeated rotation of the head, neck and trunk to one side. One study, for example, showed that for a majority of dentists, neck rotation to the right with side bending to the left is a difficult movement to perform<sup>[4]</sup>. The muscle imbalance that tends to develop between the abdominal and low back muscles is especially problematic in seated-posture dentistry. This abnormal posture can lead to muscle necrosis, pain and protective muscle, leading to the development of an MSD.

## Muscle Ischemia and Necrosis

Low back strain is a common diagnosis among workers who must sit in a slightly flexed forward position. One study showed that static prolonged contractions of the low back extensor muscles (lumbar erector spinae), which occur while sitting, significantly decreased oxygenation levels in the muscle.<sup>[8]</sup> This occurred while people performed as little as 2% of the maximum voluntary contraction of the muscle. In dentistry, these muscles must maintain eccentric contractions (lengthening while under tension), which increases the susceptibility to tearing of muscle tissue.<sup>[3]</sup> Low back strain is a common diagnosis among workers who must sit in a slightly flexed forward position as shown in figure 1.

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**Figure 1: Showing working posture**

## Hypomobile Joints

During periods of PSPs or when joints are restricted due to muscle contractions, synovial fluid production is reduced dramatically, and joint hypomobility may result. Operators who continually lean forward toward patients may have excellent or excessive spinal flexion, but over time, the ability of the spine to extend is diminished. The loss of mobility can lead to early degenerative changes in the joint and put the operator at risk of experiencing further injury. Furthermore, flexed seated posture may cause increased forces in the lumbar facet joints, leading to degenerative changes in those joints. This can contribute to low back pain syndrome.<sup>[5]</sup>

## Spinal Disk Herniation And Degeneration :

In unsupported sitting, pressure in the lumbar spinal disks increases 40% over pressure from standing. During forward flexion and rotation, a position often assumed by dental operators, the pressure increases 400%<sup>[3]</sup>, making the structure vulnerable to injury. The posterior aspect of the annulus fibrosus is the thinnest,

and repeated forward flexion causes the nucleus pulposus to push against the posterior annulus, tearing away its layers. Eventually the annulus fibrosus can “give way”, resulting in a bulging, or herniated, disk, which can press on the spinal cord or peripheral nerves, causing low back, hip or leg pain.

## Musculoskeletal Disorders

The World Health Organization defines an MSD as “a disorder of the muscles, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event (e.g., slips or falls). The most common MSDs that result from Prolonged Static Postures in dentistry include the following:

### Chronic low back pain

pain in the low back, often referring into the hip, buttock or one leg. The cause may be muscle strains or trigger points, instability due to weak postural muscles, hypomobile spinal facet joints, or degeneration or herniation of spinal disks.

### Tension neck syndrome

pain, stiffness and muscle spasms in the cervical musculature, often referring pain between shoulder blades or the occiput, and sometimes numbness or tingling into one arm or hand. Forward head posture may precede this syndrome, precipitating muscle imbalances, ischemia, trigger points, or cervical disk degeneration or herniation.

### Trapezius myalgia

pain, tenderness and muscle spasms in the upper trapezius muscle. Operating with the elevated arm can predispose the operator to this syndrome, which often is seen in the trapezius muscle on the side on which the dentist holds the mirror.

### Rotator cuff impingement

Pain in the shoulder on overhead reaching, sustained arm elevation or sleeping on the affected arm. Incorrect body mechanics and rounded shoulder posture in the operatory can lead to the impingement.

**Conclusions:**

Prolonged Static Postures are inherent in dentistry. Serious detrimental physiological changes in the body can result from these abnormal postures, including muscle imbalances, muscle necrosis, trigger points, hypomobile joints, nerve compression, and spinal disk herniation or degeneration. These changes often result in pain, injury or MSDs.

Preventing chronic pain in dentistry may require a paradigm shift within the profession regarding clinical work habits, including proper use of ergonomic equipment, frequent short stretch breaks and regular strengthening exercise.

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