MUSCULOSKELETAL DISORDERS (MSDS)-
CONSEQUENCES OF PROLONGED
STATIC POSTURES

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SUMMARY:
Musculoskeletal disorders (MSDs) are progressively installed. In dentistry prolonged static postures, repetitive movements, excessive contraction of short muscles could cause musculoskeletal disorders. Even when the sitting posture is the one recommended by ISO 11226 – Ergonomics-Evaluation of static working postures, there is a high risk of developing musculoskeletal disorders. Each member of the dental team is predisposed to pain or injury in different areas of the body, depending on their tasks and position in relation to the patient. This presentation shows the causes and the mechanisms that lead to musculoskeletal disorders and some methods for prevention.

Key Words: dentists, musculoskeletal disorders, static working postures

AFECTIUNI MUSCULO-SCHELETALE – CONSECINTE ALE POSTURII ORTOSTATICE PRELUNGITE

REZUMAT:
Afectiunile musculo-scheletale se instaleaza progresiv. In stomatologie cele mai frecvente cauze sunt reprezentate de posturi statice prelungite, miscari repetitive, folosirea in exces a muschilor scurti. Chiar daca poziția zezandă este cea recomandată de ISO 11226 – Evaluarea ergonomică a pozițiilor statice de munca, există un risc crescut de aparitie a acestor afecțiuni. Fiecare membru al echipei stomatologice este predispus la dureri si leziuni in diferite zone ale corpului in functie de posturile pe care le adopta la locul de munca. Aceasta lucrare prezinta cauzele si mecanismele ce conduc la afectiunile musculo-scheletale si citeva metode pentru prevenirea lor.

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Introduction

The World Health Organization defines MSD as “a disorder of the muscles, tendons, joints, intervertebral discs, peripheral nerves and vascular system, not directly resulting from an acute or instantaneous event but installing gradually and chronically”.

There are many types of factors responsible for MSD: occupational factors, medical factors (physical disorders, genetic predisposition, and age) and life style factors. Usually two or more factors trigger MSD. Work in dentistry is characterized by some body postures with different degrees of distortion. In this case the professional factors are represented by: prolonged static postures, repetitive movements, inadequate lighting, the excessive exertion of the small muscles, and the instrument tight grip, raised arms, static exertion of the muscles on long term, vibrations.

Working tasks in dentistry have an intellectual and a physical component - the result of the muscular effort. The muscular effort can be either static – the length of the
muscle remains unchanged (isometric contraction) or
dynamic - rhythmic changes of alternations and
shortenings of the muscles (isotonic contraction). The
physical expressions of the muscles are characterized by
gesture - the direct relation between man and working
means by repeated movements and posture – the static
posture.

The posture is the complex term used as reference for
a number of movements and posture concepts. The
posture was defined in various ways: a posture or a body
position, the relative postures of the body parts for a
specific activity.

The static posture implies the followings:
- isometric muscular contractions with acid
lactic accumulation,
- compression of the blood vessels,
- vicious static postures and non physiological
moments: of the spine (resulting in
discopathia) and of the arms (resulting in
tendinitis, epicondylitis).
- repetitive disorders – that have a cumulative
effect, affecting the joints, ligaments and
tendons.

All these factors contribute to the occurrence of MSDs
and affect the personnel involved in static activities
(dentists, PC operators, tailors). Pain, fatigue and
disorders of the musculoskeletal system may result from
sustained inadequate working postures and poor
working conditions. Musculoskeletal pain and fatigue
may influence posture control which can increase the
risk of errors and may result in low work efficiency. Good

Working posture in the dental surgery

Despite that since 1958 (as the result of the study
“Time and Motion”) the sitting postures have been
recommended as the healthiest and the most correct
ones, the findings of a research done in Timisoara proved
that more than 50% of the dentists that are over 45 work
in dental surgery in orthostatic postures, while those

Fig. 1 Sample

Fig. 2 Orthostatic posture
-aged between 24 and 35 exclusively prefer the sitting postures. The aim of the survey, performed with the help of Medical Informatics, is to show to what extent the dentists’ working manner (posture, habits, schedule etc) affects their health. 70 dentists were selected (figure 1) out of 850, women and men and all age categories (between 24 and 75 years old). Most of them had an upright working posture and those adopting sitting postures chose wrong, incorrect postures. A questionnaire with several topics was filled in and the data analysis used SPSS v. 13. The results proved that 60% of the dentists worked in orthostatic position.

Orthostatics. Although there is manual work that can be performed only in orthostatic posture (the determination of occlusion, some extractions), but still the inconveniences of this posture should be mentioned (fig. 2):
- it is more tiring due to a heavier blood flow
- the body weight is distributed on a smaller surface, fact that negatively influences the equilibrium,
- when the pedal is used, the support is only on one leg,
- movements accuracy is diminished.

The effects of a prolonged orthostatic posture upon health are the followings:
- the energy consumption is 10% higher than in sitting postures,
- the heart rate gets higher,
- the static effort is higher than sitting effort,
- the osteoarticular system is affected,
- the peripheral venous circulation is affected
- pains in the lower members occur associated with the feeling of burden and cramps of the calf.

The sitting postures. The correct working postures in the dental surgery are the sitting postures that conform to the following requirements:
- symmetrical postures (fig.3),
- all horizontal axes should be parallel,
- the legs should be slightly apart (a 30°-45° angle),
- the shank should be perpendicular on the floor,
- the upper part of the body should be perpendicular on the chair – forward movements should be made without curving the spine,
- the head could bend 20°-25°
- the arms should be close to the body
- the forearms should be nearly horizontal (max. 25% raised)
- the shank / thigh should be at 115°
- the soles should be on the floor (fig.4)

When working in sitting postures a chair is required to support the seat and back (fig.5). In this situation one should alternate active and passive sitting postures.

The active posture (figure 6) could be defined as the correct body posture that is maintained by the muscles of the back, the back being leaned forward. This posture can not be maintained for a very long time. The passive posture is the one in which the back is sustained by the dentists’ back of the chair. There are certain moments when the wrong postures can not be avoided. In wrong postures the oxygen supply in muscles is altered and it is essential to maintain it for a very short time. The supply is determined by the alternative contraction of the muscles, while the blood with residue is removed the muscles relax, and are supplied with oxygenated blood. The muscular pump can function at its best if there is a continuous movement of the muscles that consists in contractions and relaxations. The static postures do not allow consecutive contractions and relaxations. That is why in correct static postures various posture movements should be made in order to determine alternative contraction and relaxation of different muscular groups. If a wrong posture is adopted sooner than 3 or 4 seconds the muscular pump will start its restrictions so that the muscles could not be supplied with the optimum amount of oxygenated blood. This stress can result in ischemia and pain in the overexerted
muscles and that is why at that specific moment an adequate muscular relaxation is necessary for the normal functioning of the muscles (figure 7).

It is a fact that in time, the wrong working habits of the dentist lead to an accumulation of traumas that cause physical stress and MSDs.

**MSDs ONSET AND DEVELOPMENT**

MSDs occur due to the biomechanical and physiological changes happened in time. Prolonged static postures trigger this mechanism, which induces these biomechanical and physiological modifications. Due to non physiological and non balanced postures, bending and rotations of the head, neck or body muscles there is a lack of balance. In this case, the muscles responsible for these movements get stronger and shorter and exert asymmetrical forces while the opposite muscles relax and get weaker. During the static muscular effort the isometric contraction of the muscles is being exerted and thus, the unchanged length of muscles induces a higher tension and vessels compression. As a result the blood flow decreases and implicitly the amount of oxygen and nutrient contribution is diminished and ischemia occurs, the lactic acid accumulates in muscles and causes muscular pains and fatigue. If muscles relax on these specific moments, the affected tissue is recovered; but necrosis still occurs if the recovery extent is smaller than the affected one. To counterbalance the function of the affected muscles that are out of use, other muscles take over their function and thus the muscular substitution takes place.

The result of all these processes is deterioration of joints, ligaments and tendons, accompanied by joint hypermobility, nerve compression and damage of intervertebral discs.

**MSDs CLASSIFICATION**

1. Nerve Entrapment Disorders: *carpal tunnel syndrome, ulnar neuropathy*.
2. Occupational Disorders of the Neck and Brachial Plexus (figure 8): *tension neck syndrome, cervical spondylosis, cervical disc disease, brachial plexus compression*.
3. Shoulder disorders (figure 9): *trapezius myalgia, rotator cuff tendonitis, rotator cuff tears, and adhesive capsulitis*.
4. Tendonitis of the Elbow, Forearm and Wrist: *de Quervain’s disease, tendonitis, tenosynovitis, epicondyritis*.
6. Low Back Disorders: *chronic low back pain*.

In conclusion, pain, injury or MSDs are consequences of the working process in dentistry and represent important causes of morbidity and work inefficiency. Research put into evidence the high incidence of disorders resulted from wrong postures. Thus in a survey of 1200 patients, 38% had disorders of the hands, 14% had disorders of the arms, 44% had disorders of the shoulder, 61% had disorders of the neck and cervical
spine, 43% had disorders of the thoraces spine, 61% had disorders of the lumbar spine and 10% had disorders of the legs.

MSDs reduce work capacity; patients need recovery, which is often expensive, and sometimes patients can not fully recover and have to end up their professional career. Dentistry is a profession with high risk of developing MSDs.

Prevention methods
1. Adopting a correct working posture
2. Use of adequate light
3. Good planning of dental care sessions
4. Alternative planning of long and short sessions
5. Alternating the body postures – sitting and upright
6. Having short breaks after each care session and long coffee or lunch breaks, the sink should be installed at distance.
7. The working day should not be longer than 7 hours.
8. Every 6 weeks a journey should be planned.
9. Sports activities should be practised for about 45 minutes three times a week.

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