

THE GUIDELINE FOR ERGONOMIC WORKING POSTURE IN DENTAL CARE

INTRODUCTION:

The aim of this review is to explain the way in which different dental procedures can be carried out in the mouth of the patient whilst maintaining a healthy sitting posture.

This posture prevents the high percentage of musculo-skeletal complaints which are known to affect about 65 % of dentists and are also the cause of a high percentage of disability. The result is that about 64 % complain of backache and 42 % of posture-related headaches. (According to a study by the Freier Verband Deutscher Zahnärzte (Free Association of German Dentists).

These physical stresses could be avoided by using the ergonomic concept, also sometimes known as the “12-hour treatment” concept (Fig 1), which has been practiced successfully in Japan since the 1950s. This concept is based primarily on a natural, stable posture in which only the forearms are active. [\[1\]](#)

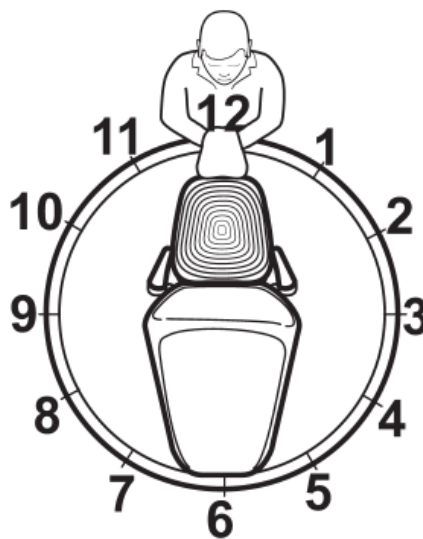


Fig. 1 Position of operator relative to chair

Definition of ergonomics:

Ergonomics is defined as ‘the study of man in relation to his working environment: the adaptation of machines and general conditions to fit the individual so that he may work at maximum efficiency’.

Ergonomic conditions are simply the safest, most efficient, and easiest way to work. Improving the ergonomic delivery of dental services and accounting for working conditions in dental offices enhance the well-being and safety of patients, staff, and practitioners.

ERGONOMIC CONCEPT:

The basic principle for ergonomic concept of working in a stable, active sitting posture is to sit in a relaxed, symmetrical posture upright with the focuses on determining the initial reference point, i.e. the treatment point from which the dentist can move smoothly in three directions during treatment (forward – back, right – left and up – down). Once this point is determined, the dentist can incorporate kin-aesthesia in the dental treatment and in this way control movement of the fingers.

The initial reference point is in the median sagittal plane of the dentist, level with the heart and at a width of two fists from the body (Fig. 2).

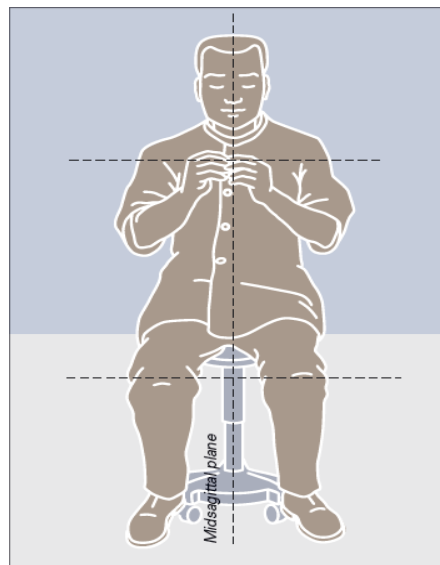


Fig. 2 Finger movement can be optimally controlled when the fingers are in the median sagittal plane.

With the ergonomic concept the dentist does not bend – with a twisted back – over the patient (fig. 3 and 4).

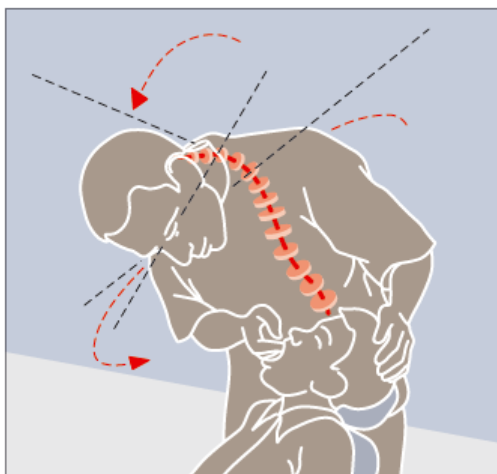


Fig. 3 This bend posture also places too much strain on the back and causes premature wear and tear

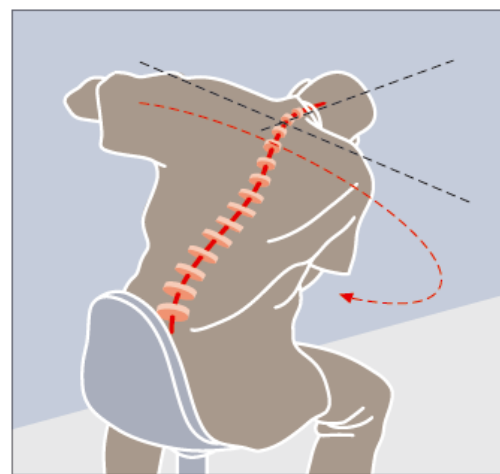


Fig. 4 Back problems are inevitable if this unnatural posture is maintained for a long time

Instead the patient lies relaxed in a specially contoured dental chair and the patient's head is turned so that it is in the correct position.

This allows the dentist to maintain a natural posture as:

- Stresses on the dentist caused by an unnatural, incorrect posture and the associated physical wear and tear are reduced to a minimum.
- There is no longer a problem with back pain or headaches.
- Natural, efficient movements during treatment allow the dentist to work more precisely and safely, even in areas difficult to access.
- A balanced, natural posture ensures maximum concentration and precision.
- Smooth movements by the dentist promote a more relaxed, stress free atmosphere.

I. HOW TO FIND THE CORRECT WORKING POSTURE

A. Adopting a stable and active sitting posture:

For adopting a stable, active sitting posture, from which movements can easily be carried out, the operator sits:

- Symmetrically upright (Fig. 5).
- The breastbone pushed slightly forwards and upwards.
- The abdominal muscles strained slightly.
- The shoulders are above the hip joints and the line of gravity runs through the lumbar vertebrae and pelvis in the direction of the seat.
- This posture facilitates good breathing.



Fig. 5 Stable and Active posture and Symmetrically upright sitting

B. Conditions for Obtaining an Optimal Working Posture:

Conditions for obtaining an optimal, stable working posture are the following:

1. Sit in a stable upright working posture (Fig. 5 and 6).



Fig. 6 stable upright working posture

2. Place the working field in the mouth straight before the upper body in the symmetrical plane. *This is the mid-sagittal plane that divides the body vertically in 2 equal parts (Fig. 7).*
3. Look as much as possible, perpendicularly upon the working field (Fig. 7).



Fig. 7 Working field straight before the upper body, in the symmetrical plane.

If this does not happen the eye balls steer the head until it reaches this position and then the body posture changes automatically (Fig. 4). In this way the eye balls come into the position of looking perpendicularly upon the working field as much as possible. This results in an unfavourable bent posture that is asymmetrical whenever the working field lies outside the symmetrical plane; this frequently happens (Fig. 8).



Fig. 8 An un-favorable posture arises spontaneously when the working field is placed outside the symmetrical plane.

You may compare the position of the working field in the mouth of the patient with the position in which you hold an apple when peeling it or a needle when preparing to thread it or like reading a book (Fig. 9) you will hold these straight before your upper body without bending your head.



Fig. 9 Looking about perpendicularly upon the working field or mirror is like reading a book.

C. Features of an Optimal, Healthy Posture:

- Sitting as far back as possible in the seat to obtain a stable posture, symmetrically upright in (Fig. 5).
- Upper arms alongside the upper body to support the arms whilst carrying out treatment.

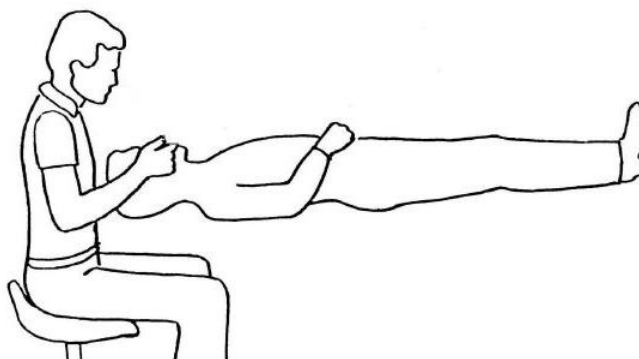


Fig. 10 Upper arms alongside the upper body

- Angle between lower and upper legs of about 110° or a little more, with the legs slightly spread.



Fig. 11 Angle between lower and upper legs of about 110° or a little more

- Working height adjusted properly, with the lower arms lifted a little from about 10° to a maximum of 25°
- Distance between working field in the mouth and eyes or spectacles normally between 35–40 cm.

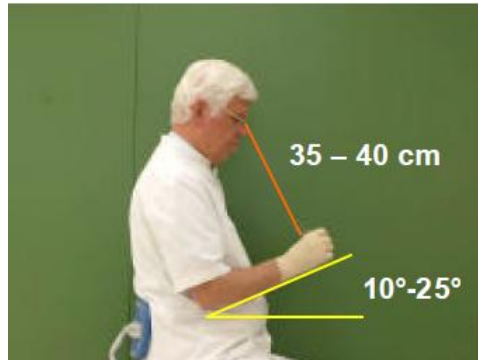


Fig. 12 Distance between working field and eyes normally between 35–40 cm

- The back must be supported at the upper/backside of the pelvis so that as soon as the muscles become too fatigued to maintain an upright position of the back, the back-rest ensures that the desired upright posture can be maintained. This supporting has to occur without pressure against the muscles below and above this point. Because the posture becomes unfavorably influenced by this and a reduction of movements takes place.

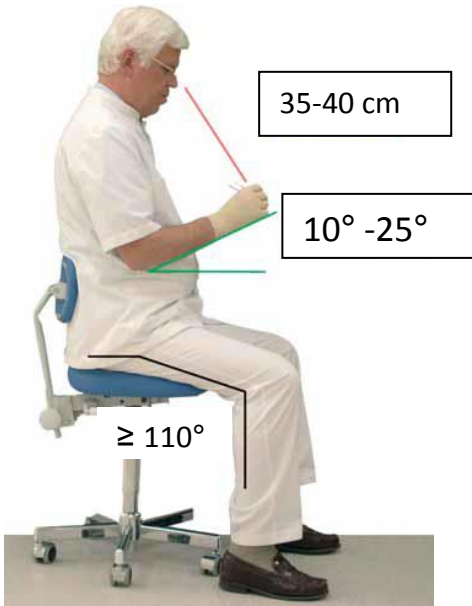


Fig. 13 Sitting posture whilst leaning against back-rest. A natural curvature of the back is also realized here.

- In order to support the horizontally positioned bottom and the obliquely sloping down thighs equally, when sitting with an angle of 110° between upper and lower legs.
- Instruments are handled with the modified pen grip: with the first 3 finger bent in a round form around the instrument and the last 2 fingers resting on a firm basis in or outside the mouth (Fig, 14).



Fig. 14 handling instruments with the modified pen grip



Side view working posture. **Frontal view working posture.**
Fig. 15 This posture is mandatory for a healthy way of working



Fig. 16 comparison between healthy and unhealthy sitting posture

II. How to Find the Optimum Position

Patient position:

Adoption of the supine patient position by most dental practitioners has focused attention on the optimal position of the patient's head in relation to the seated operator (Fig. 17 and 18).



**Fig. 17 The home position for upper teeth
Operator and nurse positions:**



Fig. 18 The home position for lower teeth.

The dentist will normally work within a range from the 12 o'clock to the 9 o'clock position relative to the patient's head. However, most operative procedures are completed from, at, or near, the 12 o'clock position (Fig.17 and 18).

The dental nurse will normally remain in a fixed position at 4 o'clock (Fig. 17, 18 and 19) but at a considerably higher position in order to look down or forward to the mouth. This height not only facilitates the different tasks, but enables the nurse to visualize the back of the mouth and remove any accumulation of debris or water.

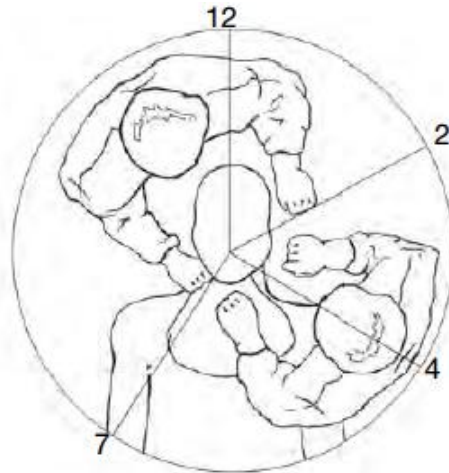


Fig. 19 Nurse will normally remain in a position at 4 o'clock at a considerably higher position in order to look down or forward to the mouth

Operator's vision:

There can be no doubt that any tooth is best visualized by direct vision (Fig. 20). However, the nature of operative dentistry demands that, whenever possible, the line of vision is perpendicular to the tooth surface.



Fig. 20 Direct vision

Clearly, those surfaces inaccessible by direct vision must be visualized indirectly through a mirror (Fig. 21). Nevertheless, it remains important, however difficult, to position the mirror and attempt a near perpendicular view.



Fig. 21 Visualization in mirror (indirect vision)

ESSENTIAL MOVEMENTS FOR MAINTAINING A STABLE REFERENCE POSTURE:

The position of the dentist or patient has to be adjusted slightly according to requirements so that a stable reference posture can be maintained regardless of the type of treatment. The dentist turns as required clockwise between 10 o'clock and 12 o'clock (Fig. 22).

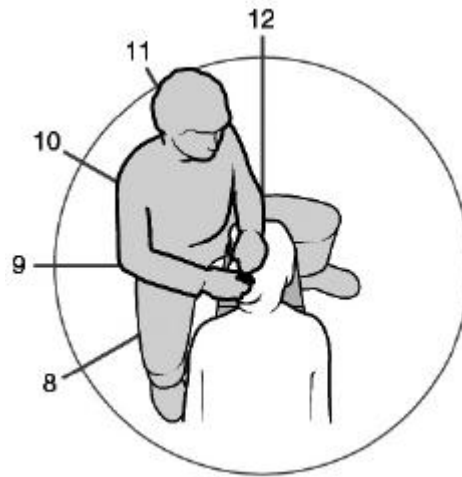


Fig. 22 Change of position by the dentist

References:

1. A.J.E. Qualtrough, J.D. Satterthwaite, L.A. Morrow, P.A. Brunton, © 2005, Principles of Operative Dentistry, , Ergonomics in dentistry, Basic principles page 1-7.
2. Prof. Oene Hokwerda, dentist and dental ergonomist (oene.hokwerda@home.nl), Rolf de Ruijter, dentist (r.a.g.de.ruijter@med.umcg.nl), Sandra Shaw, dentist (s.shaw@med.umcg.nl), 27 July 2006, Adopting A Healthy Sitting Working Posture During Patient Treatment.
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