

# Sit up and take note!

**Professor Oene Hokwerda** discusses how dental equipment can be designed to prevent (and not cause) chronic pain for dentists.

In May 2006 the European Society of Dental Ergonomics (ESDE) published a document titled, "Ergonomic requirements for dental equipment". Compiled by leading experts, the paper outlines the principles for posture, movement and visual perception as they relate to the ergonomic requirements for dental equipment. The comprehensive document is based on up-to-date industry knowledge, research and practical experience. It offers dental manufacturers a completely new

approach to the basic rules of dental ergonomics. Requirements in the five key areas are highlighted as follows:

### Comfortable seating

The operator stool must allow the user to sit upright in a stable posture, such that the sitting bones of the pelvis rest on a horizontal surface and the thighs slope downwards on the front oblique surface. When adjusting chair height, there should always be a minimum angle of 110° between the lower and upper legs. This in turn, will create a hollow in the back, comparable to a healthy standing posture.

To facilitate the correct posture and improve breathing, the

breastbone should be pushed out. This places the dentist's centre of gravity above the sitting bones, minimizing the load on the spine and supporting muscles. Backrests are that it should only touch the upper back of the pelvis to avoid unfavourable backward bending when the back muscles tire.

### Headrest design

The patient's head and neck support should allow the head to be turned in three different directions: so the dentist can see and access the different working fields in the mouth while sitting upright. For this, it must be possible to turn the patient's head consequently forwards/backwards, obliquely sideways and rotating around the length axis of the head.

Conventional headrest designs generally restrict these movements, forcing dentists to unnecessarily bend and rotate their heads and bodies towards the working field. This happens because the eyes steer the posture in a particular direction to look perpendicularly onto a working field (a position held when reading a book).

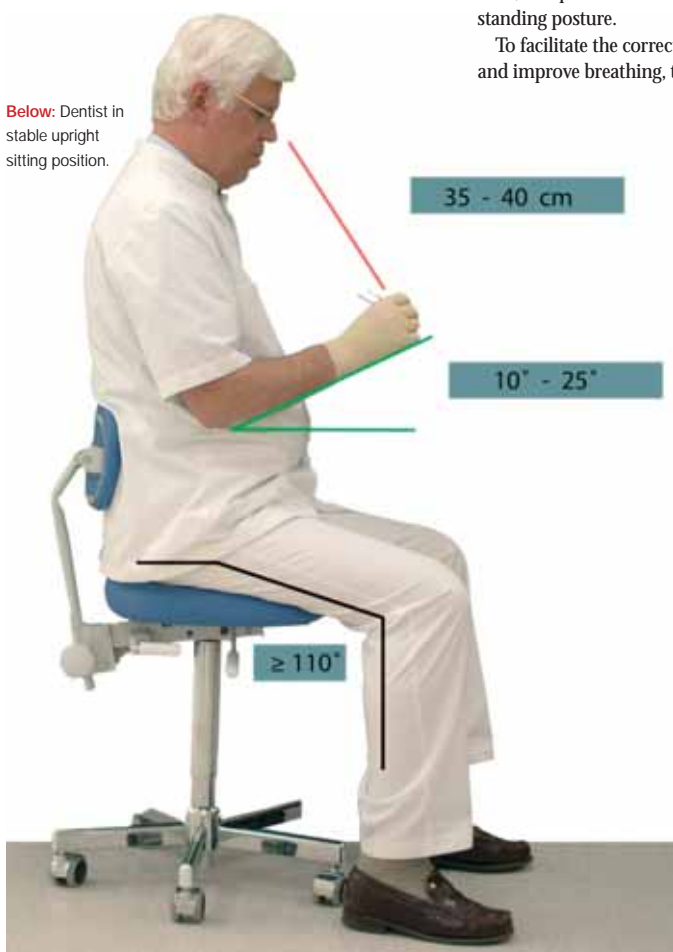
### Optimal lighting

Dental operating light should arrive from three orthogonal axes and light sources should be supported by sufficiently long arms. Light on the working field will therefore be parallel to the viewing direction of the dentist, resulting in even and shadow-free lighting in the mouth. This cannot be achieved using a lamp with only two axes as the lighting rectangle would run obliquely over the patient's face, shining in the patient's eyes and producing unwanted reflections of the skin.

To overcome these problems the lamp would be positioned in front of the dentist and above the patient's chest. This however, causes fatiguing shadows behind the teeth, lips, cheeks, hands of the dentist and approximately between the teeth. The patient's open mouth would then need to face towards the lamp and away from the correct posture for the dentist, making the dentist bend forwards to reach the patient.

### Patient comfort

To accommodate patients of 1.5 m-2.1m in height, a flat patient



**Below:** Dentist in stable upright sitting position.



**Above and right:** Example of successive movements of patient's head to orient the working field toward the viewing direction, in this case a preparation of the first molar buccal surface in the left upper jaw.

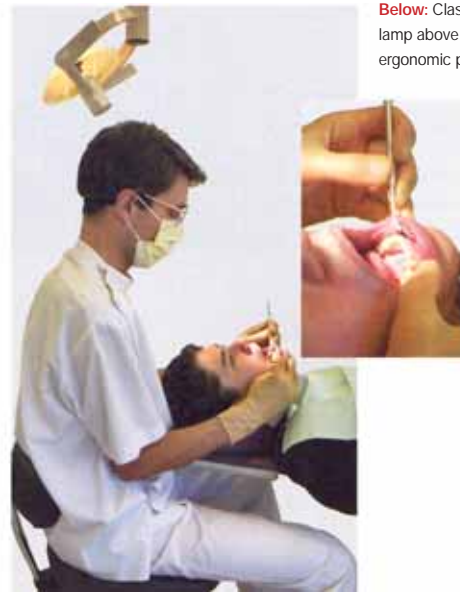


chair is required. When the lower part of the patient's legs hang down, circulation is affected and if the patient's knees are pulled upwards, the dentist is unable to sit upright during treatment. Another treatment chair requirement is that there should only be a small impression in the sitting area, otherwise patients can suffer an uncomfortable over-stretching of the back.

Arms, shoulders and the lower back must be supported comfortably, as well as the shoulders and lower part of the neck to avoid muscle strain in the the shoulders, neck and mouth. Failure to achieve this prevents a relaxed patient position, adequate mouth opening and head positioning. A well-supported and relaxed patient in a horizontal position is a prerequisite for correct ergonomic dental practices.

### Head position

Another recommendation is that dentists wear spectacles with prism segments that refract light emitted



Below: Classic position of the lamp above the chest and an ergonomic position.

### About the author



**Oene Hokwerda** is emeritus professor in dental ergonomics at the

University of Groningen, The Netherlands, where he was placed in charge of developing teaching dental ergonomics in 1965. He was also involved in designing a working stool for the dentist, which is still in use. He has been consultant of the Commission on Dental Practice of the FDI, chairman of the Dutch WG Dental Ergonomics and, from 1992, secretary general, vice-president and president of the European Society of Dental Ergonomics. Professor Hokwerda currently oversees the practical training of dental ergonomics as part of preclinical and clinical courses of dental and dental hygiene students.

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from the patient's mouth, making it possible to perform treatment in an upright posture without unfavourable forward bending of the head. The use of spectacles with prism segments improves the kinetic chain of hands, lower and upper arms, shoulders, neck and head of the dentist during treatment, thereby maintaining the head in an acceptable position.

These requirements for developing ergonomic equipment have been developed to prevent the chronic pain and physical disorders that occur in nearly 65% of dentists working in the Western industrialized world. These conditions can be reduced or even avoided using ergonomic equipment and adopting correct posture. ■

Copies of the "Ergonomic requirements for dental equipment" can be requested from Prof. Oene Hokwerda at [oene.hokwerda@home.nl](mailto:oene.hokwerda@home.nl)

Below: A sketch of a patient chair showing the requirements for the comfortable, horizontal positioning of patients of all lengths.



Below: Dentist with (left) and without (right) spectacles fitted with prism segments.

