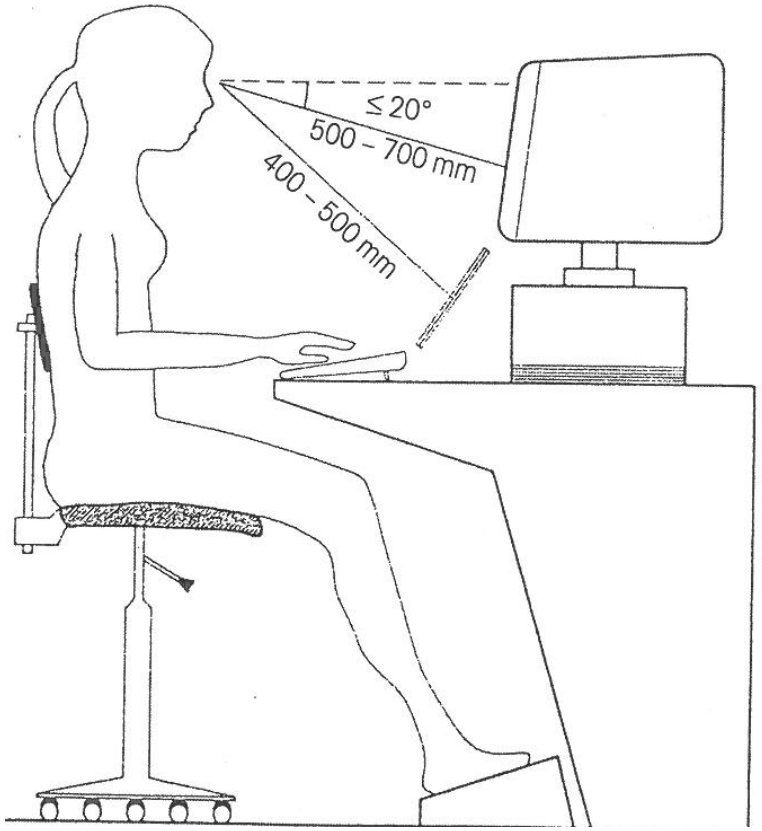
8 Trifocal lens centering

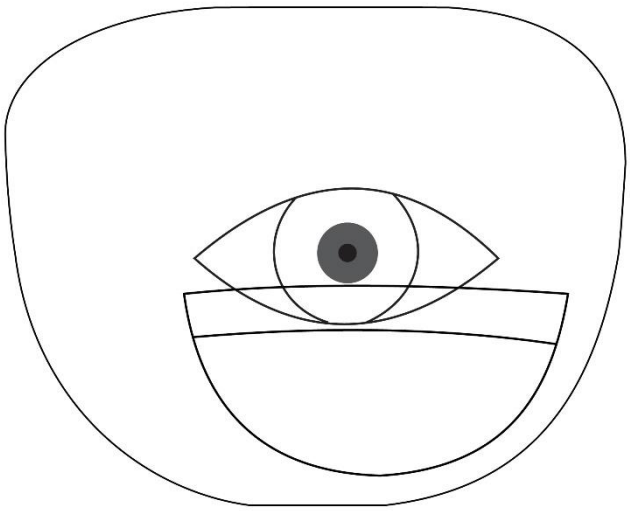
8.1 Introduction

Trifocal lenses are used in patients with presbyopia. During decrease of accommodation amplitude decreases also accommodation intervals. So we cannot use bifocal lenses anymore. If we use bifocal lenses patient can see so called death areas, i.e. areas which are not covered by patient's accommodation.



Picture 8.1: Trifocal lens enables PC working (Rutrle 2001).

Visual field of the trifocal spectacle lens is divided into 3 correction areas. We can use special segment which is designed for middle distance, e.g. PC working. Addition of this middle distance equals half of measured patient's addition. Height of the trifocal lens' centration is individual but in practice is recommended to put upper middle segment's edge on lower part of the pupil. It is done during natural distance gaze.



Picture 8.2: View over trifocal spectacle lens (Rutrle 2001, adapted).

8.2 Goals

- Measure height of trifocal lens centration
- Calculate middle distance addition value
- Calculate accommodation intervals with trifocal lens

8.3 Equipment

Trifocal lens, spectacle frame, handy PD ruler, special pencil on demo-foil.

8.4 Methods

Measure height of trifocal lens centration

Patient wears spectacle frame. Measure distance from bottom part of the frame eye to bottom part of the pupil (y_R, y_L). Further measure height of the eye frame. Finally measure and calculate vertical decentration of the lens on both eyes (v_R, v_L).

Calculate middle distance addition value

You have reading addition 3 D. Calculate the middle distance addition of use bifocal lens.

Calculate accommodation intervals (AI) with trifocal lens

Example 1: Patient with hyperopia +5 D has accommodation amplitude (AA) 2 D. Near add was set on 2 D (add_N). Calculate middle distance addition (add_M) and accommodation intervals on middle distance in meters (AI_M).

$$add_M = \frac{1}{2} add_N$$

add_M = 1 D

$$AI_D = R; P$$

$$AI_D = \infty; P + \frac{1}{AA}$$

$$AI_D = \infty\ m; 0.5\ m$$

AI_D (distance accommodation interval) = from infinity to 0.5 m

$$AI_M = \frac{1}{add_M}; \frac{1}{add_M} + \frac{1}{AA}$$

$$AI_M = \frac{1}{1}; \frac{1}{1} + \frac{1}{2}$$

$$AI_M = 1\ m; 0.33\ m$$

AI_M (middle distance accommodation interval) = from 1 m to 0.33 m

$$AI_N = \frac{1}{add_N}; \frac{1}{add_N} + \frac{1}{AA}$$

$$AI_N = \frac{1}{2}; \frac{1}{2} + \frac{1}{2}$$

$$AI_N = 0.5\ m; 0.25\ m$$

AI_N (near accommodation interval) = from 0.5 m to 0.25 m

Conclusion: In this case we don't have any death zones without accommodation.

Example 2: Hyperop 5 D has accommodation amplitude 1 D. Near add (add_N) is 4 D. Calculate middle distance add (add_M) and accommodation intervals on middle distance and near in meters.

Example 3: Hyperop 5 D has accommodation amplitude 1 D. Near add (add_N) is 2 D. Calculate middle distance add (add_M) and accommodation intervals on middle distance and near in meters.

8.5 Results

Measure height of trifocal lens centration

y_R =

y_L =

v_R =

v_L =

Calculate middle distance addition value

add_M =

Calculate accommodation intervals with trifocal lens

Example 2:

add_M =

AI_M =

AI_N =

Example 3:

add_M =

AI_M =

AI_N =

8.6 Discussion

Trifocal spectacle lens is alternative lens to modern progressive spectacle lens. They are not so often used in practice. Trifocal lenses are recommended to use in patients with low accommodation amplitude. We can offer better and fluent transmission between each segment in comparison with bifocal lenses.

8.7 Conclusion, notes, comments

Conclude in which cases we will not find so called accommodation death zones in trifocal lenses?

Would you recommend trifocal lens rather than progressive lens? Why?