# 11 Anisometropia and aniseikonia calculation in aphakic eye

11.1 Introduction

Currently we solve aphakic states with implantation of posterior intraocular lens or anterior IOL or the lens is implanted in eye lens capsule. Earlier we don't use any IOLs so patients had induces high anisometropia and resulted aniseikonia. Sometimes when surgery is complicated we have to use aphakia these days.
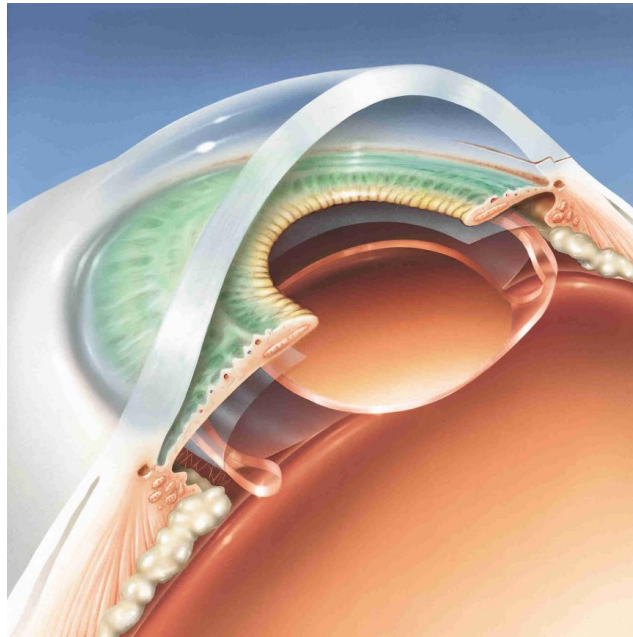
Picture 11.1: Current correction of aphakia (Eyesitemd 2013).

11.2 Goals

- Calculate axial refraction of the aphakic eye
- Calculate adequate spectacle correction of the aphakic eye
- Calculate anisometropia in aphakia
- Calculate size of the aniseikonia in monocular aphakia
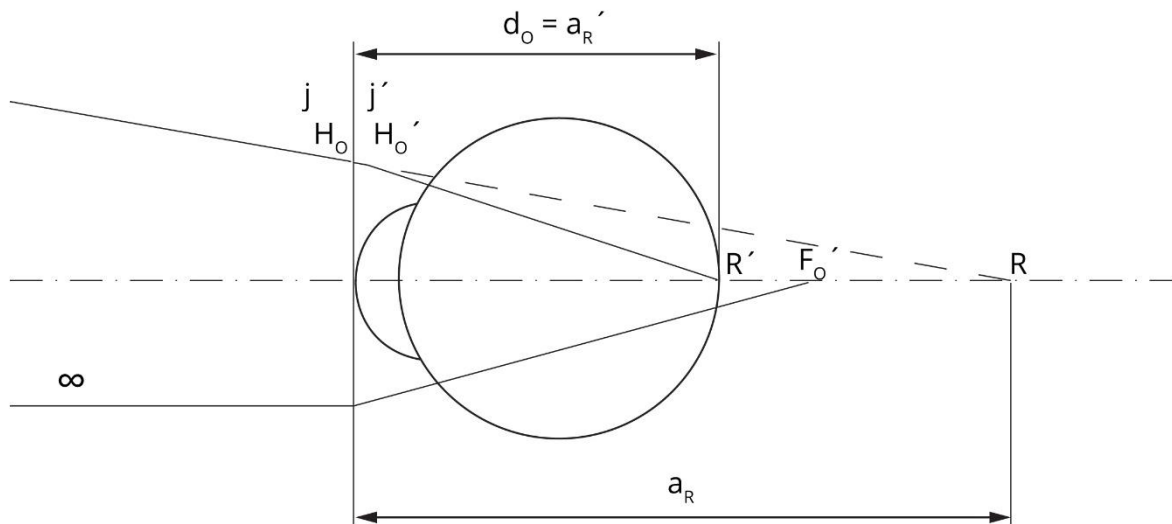
11.3 Equipment

Writing equipment, calculator.

11.4 Methods

Calculate axial refraction of the aphakic eye

$$A_R = \frac{n'}{a'_R} - \varphi'_R \qquad\qquad \text{A}_R,\ \boldsymbol{\varphi}'\ [\text{D}],\ \text{a}'_R\ [\text{m}] \qquad\qquad (9)$$

Axial eye refraction is calculated from modified imaging formula on the base of knowledge refractive index of intraocular fluid (n'), corneal refractive power (φ'_R) and axial length of the eye ($a'_R = d_O$).

Picture 11.2: Axial refraction of the aphakic eye (H_O – main focusing level, d_O – axial length of the eye, a'_R – image focusing distance of the distance point, a_R – objective focusing distance of the distance point, R – distance point, F'_O – image eye focus, Rutrle 1993).

Calculate adequate spectacle correction of the aphakic eye

$$S'_B = \frac{A_R}{1+0,012.A_R} \qquad\qquad \text{S}'_B,\ \text{A}_R\ [\text{D}] \qquad\qquad (10)$$

For calculation of adequate spectacle correction of the aphakic eye we need to know vertex distance of the spectacle lens (measure it from the frame) and axial refraction of the aphakic eye.

Calculate anisometropia in aphakia

For optical power of the aphakic eye we need to know Gullstrand formula. Difference between total optical power of the aphakic eye and emmetropic eye show us level of anisometropia.

Calculate size of the aniseikonia in monocular aphakia

Ratio between total refractive power expressed in percent of aphakic and emmetropic eye show us aniseikonia.

11.5 Results

Calculate axial refraction of the aphakic eye

$A_R =$

Calculate adequate spectacle correction of the aphakic eye

$S´_B =$

Calculate anisometropia in aphakia

$\varphi´_{em} = 58,64$ D

$\varphi´_{af} =$

$\Delta \varphi´ =$

Calculate size of the aniseikonia in monocular aphakia

$\beta_{em/af} =$

11.6 Discussion

If we correct aphakia with spectacle lens we try to increase visual acuity and decrease aniseikonia. If we correct aphakia with spectacle lens we usually induce anisometropia 10 D, i.e. 20 % of aniseikonia. From eye physiology we know that patients are able to fuse 5 % of aniseikonia. If the anisometropia is present in patient from childhood he is able to fuse aniseikonia around 14 %.

In adults aphakia usually is very sudden and leads to diplopia if is corrected with glasses. If we use contact lenses we can decrease the aniseikonia. Currently most of aphakic eyes are corrected with intraocular lens (IOL).

11.7 Conclusion, notes, comments

Calculate size of anisometropia and aniseikonia in aphakia corrected with contact lens. Will be successfully accepted by patient?