

PREOPERATIVE EVALUATION OF HYPEROPIC EYES FOR CATARACT SURGERY

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Abstract: Hyperopic eyes have specific particularities that require a special attention in the preoperative evaluation. The depth of the anterior chamber in correlation with other conditions can dictate the behaviour during the surgery. Biometry must be very accurate to respond to the expectations of the patient.

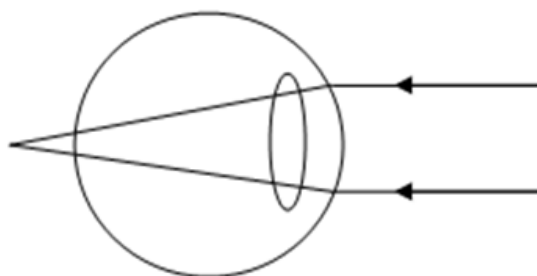
INTRODUCTION

Hyperopia is a refractive disorder characterized by a deficiency of convergence of the light rays. The focus of the rays is punctual and located behind the retina (figure no. 1).(1,2)

About 20% of the general population above 20 years old has a higher refraction than +1 spherical Diopters. Most of the newborns are hyperopic, but this is reduced during the first years of life.(3,4)

Hyperopic patients use the accommodation permanently, their accommodative effort being equal to the value of the defect.(5)

Figure no. 1. Refraction in hyperopic eye



The real hyperopia consists of the latent hyperopia plus the manifest hyperopia.

With increasing age and decreasing of the lens elasticity the latent hyperopia decreases in the detriment of the manifest one, so that after the age of 60-65 years old, the manifest hyperopia becomes equal to the total one.(6,7)

Hyperopia can be dependent on: axis, index, curvature.

- **Short anterior-posterior axis, small anterior chamber**

- simple microphthalmia (nanofthalmia)
 - § short anterior-posterior Ax
 - § small corneal diameter
 - § small AC
 - § iris with a marked convexity
 - § normal or thicker lens
 - § medium or high axial hypermetropia
 - § narrow chamber angle - risk of acute

- glaucoma
- increased risk of a retinal detachment coloboma related microphthalmia
 - § iris defect
 - § choroidal defect
 - § scleral defects
- complex microphthalmia
 - § combination with other birth defects (cataract, retinal, optic nerve changes, etc.
- **Normal anterior-posterior axis, low anterior chamber - AC** (relative anterior microphthalmia)
 - No other malformations
 - Narrow Angle - predisposition for acute glaucoma
- **Short anterior-posterior axis, normal anterior chamber** (high axial hyperopia)
 - no complications related to small AC.(8,9,10)

CATARACT IN HYPEROPIC EYES

Cataract in hyperopic eyes has few particularities, but the cataract surgery raises special problems.

First of all, the artificial lens, by modifying the ocular refraction, has a special effect on the former eyeglasses wearer.

The dioptric value of the implant must be very well balanced.

The surgery itself is particular due to the small anterior chamber.

Preoperative ophthalmological exam history must establish the presence of any local disease and chronic treatments (glaucoma, refractive surgery, retinal detachment, trauma etc.) or general (diabetes, hypertension, chronic treatments with antiagregants/ anticoagulants etc.).

Amblyopia is more frequent in hyperopic eyes. This condition should be recognized and discussed with the patient in order to anticipate the post op visual acuity.(11,12)

Functional examination

Visual function should be evaluated as accurate as possible to determine the functional prognosis after surgery.

If the opacities of the lens allow, visual acuity will be measured with optimal correction and also the visual field could be useful. If the opacity of the lens is too dense, electroretinogram (ERG) and electrooculogram (EOG) could be useful. Preoperative contrast sensitivity can be modified either due to the cataract or because of macular disorders.(10,12)

Local examination

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CLINICAL ASPECTS

Slit lamp examination of the anterior pole, after mydriasis, should reveal the type and location of the opacities, the density of the nucleus, the presence of any zonular defects and the depth of the anterior chamber (figure no. 2).

Figure no. 2. Dense cataract with small anterior chamber



The exam of the pupil will observe the presence or absence of any pupillary defect that would indicate a deterioration of the optic nerve.

The presence of the exfoliation syndrome may further complicate hyperopic eye surgery.(14)

Insufficient dilation of the pupil may require the use of special devices. This could be problematic when the chamber is too small (figure no. 3).

Figure no. 3. White cataract, small anterior chamber, insufficient pupil dilatation



Fundus examination should reveal the possible association of macular, retinal or optic nerve disorders, which could compromise the functional outcome after the surgery.

Corneal refraction will be determined by corneal topography or keratometry. The presence of corneal astigmatism will determine the choice of a toric implant with correct positioning of the incisions.

Corneal endothelium will be evaluated by specular microscopy. Endothelial cell number and shape will draw the attention on the behaviour during the surgery. A deficiency of the endothelial layer could be very problematic in eyes with small anterior chamber because of the use of the ultrasonic energy close to the endothelium.

Corneal thickness (which can be higher in hyperopic eyes) should be correlated with the values of the intraocular pressure.(15)

The evaluation of the anterior chamber depth and of the cameral angle is a priority in hyperopic eyes: biomicroscopy, gonioscopy, ultrasound biomicroscopy (UBM), optical coherence tomography (OCT). Pressure changes

associated with narrowing of the angle may require glaucoma medications prior to the lens surgery.(5,10,12)

Biometry and the choice of the implant

Establishing the postoperative refractive target in hyperopic eyes before the cataract surgery is a real challenge.

Biometry can be performed by interferometry or by contact techniques. Measuring the anterior-posterior axis is important. For short axis the use the SRK-T formula for the intraocular lens (IOL) calculation can be effective, but the recommendation is to compare several formulas.(10,12)

CONCLUSIONS

- Due to the particularities of the hyperopic eye the preoperative evaluation requires special attention;
- The history should identify pre-existing local or general conditions;
- Local examination will reveal the depth of the anterior chamber and other condition that could impair the surgery (exfoliation syndrome, zonular defects etc.);
- The calculation of the IOL should consider all possible parameters in order to obtain a good visual acuity in postop.

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