

Comparison of Wavefront Aberrations, Depth of Focus and Pseudo Accommodation in Patients with Spherical and Aspheric Intraocular Lenses

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Received: February 12, 2017; **Published:** December 06, 2017

Abstract

Introduction and Objectives: Cataract surgery has changed from a sight saving procedure to a refractive surgery and has led to an increased visual quality and visual outcome. Intraocular lenses are medical instruments that could replace eye's normal lens. Nowadays there are different types of intraocular lenses in order to compensate for the refractive power of the normal lens of the eye and the surgeon should decide the lens type considering multiple factors. Some studies have concluded that spherical and aspheric lenses do not differ in the aspect of depth of focus and just focus clearance is different. The goal of our study is to evaluate the preferred intraocular lens type in patients undergone cataract surgery.

Methods and Materials: In this study, we have divided the patients into 2 groups of 25 patients, after considering inclusion and exclusion criteria. One group named aspheric and the other group named spherical. Spherical aberration, pseudo accommodation and depth of focus evaluated after cataract surgery with phacoemulsification and intraocular lens implantation. Results analyzed and evaluated with statistical methods.

Results: Pseudo accommodation in the aspheric and spherical group respectively is 1.53 ± 0.01 and 1.97 ± 0.01 . The depth of focus is 1.38 ± 0.01 in the aspheric group and 1.57 ± 0.01 in the spherical group. Spherical aberration respectively is -0.02 ± 0.04 and 0.14 ± 0.07 .

Conclusions: Spherical aberration is higher in a spherical group than the aspheric group. Pseudo accommodation and depth of focus were higher in a spherical group than the aspheric group. Spherical lens implantation could induce some degrees of depth of focus and pseudo-accommodation and improve near vision.

Keywords: Phacoemulsification; Spherical Lens; Aspheric Lens; Depth of Focus; Pseudo-Accommodation; Spherical Aberration

Introduction

Cataract surgery has changed from a sight-saving procedure to a refractive procedure in which quality of vision and optical outcomes are of crucial importance and visual acuity alone cannot be considered to be the sole criterion of surgical success. Intraocular lenses are medical instruments that could replace eye's normal lens. Nowadays there are different types of intraocular lenses in order to compensate for the refractive power of the normal lens of the eye and the surgeon should decide the lens type considering multiple factors. Some studies have concluded that spherical and aspheric lenses do not differ in the aspect of depth of focus and just focus clearance is different. The goal of our study is to evaluate the preferred intraocular lens type in patients undergone cataract surgery [1-23].

Methods and Materials

In this study, we have divided the patients into 2 groups of 25 patients, after considering inclusion and exclusion criteria. In fact, there were 4 inclusion criteria (1. Age between 40 and 70 years old, 2. Senile cataract, 3. Informed consent and 4. More than 5/10 postoperative visual acuity) and 5 exclusion ones (1. Prior surgery, 2. Diabetes Mellitus, 3. Glaucoma, 4. Aphasia and 5. Intraoperative complications).

One group named aspheric and the other group named spherical. Spherical aberration, pseudo-accommodation and depth of focus evaluated after cataract surgery with phacoemulsification and intraocular lens implantation. Results analyzed and evaluated with statistical methods.

Results

Pseudo accommodation in the aspheric and spherical group respectively is 1.53 ± 0.01 and 1.97 ± 0.01 . The depth of focus is 1.38 ± 0.01 in the aspheric group and 1.57 ± 0.01 in the spherical group. Spherical aberration respectively is -0.02 ± 0.04 and 0.14 ± 0.07 .

	Aspheric	Spheric
Female/male	12/13	11/14
Age (year)	64	62
IOP (mmHg)	15	15
Fundus exam	No pathologic finding	No pathologic finding

Table 1: General variables of study groups.

	Aspheric	Spheric
Pre op ref. error	-1.30	-1.5
UDVA	2/10	2/10
UNVA	5.40	5.48
CDVA	3/10	3/10
CNVA	5.3	5.31

Table 2: Preoperative refractive items.

	Aspheric	Spheric	P- value
Post op ref	-.51	-.51	.996
UDVA	7/10	7/10	.858
UNVA	3.2	3.02	.001>
CDVA	8/10	8/10	.925
CNVA	2.1	1.7	.001 >

Table 3: Postoperative refractive items.

	Aspheric	Spheric	P-value
Lower order aberration (micrometer)	.245	.257	.001 >
HOA (micrometer)	.261	.220	.001>
Spherical aberration (micrometer)	-.02	+.14	.001 >
coma (micrometer)	.15	.08	.001 >

Table 4: Aberration.

	Aspheric	Spheric	P-value
DOF (D)	1.38	1.57	.001 >
Pseudo accommodation (D)	1.53	1.97	.001 >

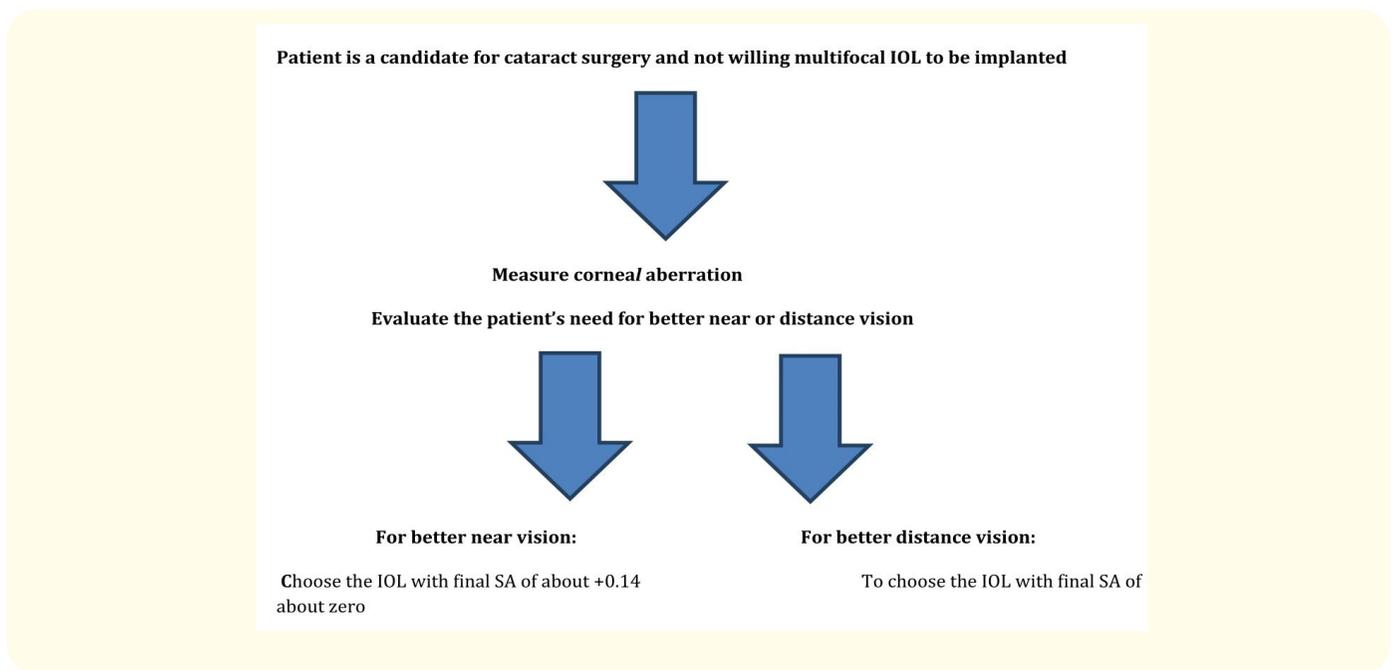
Table 5: Depth of focus and pseudo accommodation.

Discussion

Wavefront aberrations depth of focus and contrast sensitivity with aspheric and spherical intraocular lenses are similar. Comparison of wavefront aberrations and optical quality of eyes implanted with five different intraocular lenses shows better DCVA with Aspheric lenses and better contrast. Visual performance of aspheric and spherical intraocular lenses, comparison of visual acuity contrast sensitivity and higher order aberrations resulted in no difference in DCVA.

Spherical aberration is higher in a spherical group than the aspheric group. Pseudo accommodation and depth of focus were higher in a spherical group than the aspheric group. Spherical lens implantation could induce some degrees of depth of focus and pseudo-accommodation and improve near vision.

The final chart shows the conclusion of our study.



Conclusions

Spherical aberration is higher in a spherical group than the aspheric group. Pseudo accommodation and depth of focus were higher in a spherical group than the aspheric group. Spherical lens implantation could induce some degrees of depth of focus and pseudo-accommodation and improve near vision.

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Volume 8 Issue 4 December 2017

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