A comparative clinical study between the outcomes of the AcrySof Toric intraocular lens and peripheral corneal relaxing incisions in the management of patients with both cataract and astigmatism.

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ABSTRACT:

The overwhelming success of cataract surgery and increased patients expectations are the main drive for the phaco-surgeon to achieve emmetropia after lens surgery.

Removal of the crystalline lens (whether cataractous or not) with proper IOL implantation combined with other procedures to correct preoperative astigmatism to achieve full emmetropia is now the main target for all phaco-surgeons.

There are several approaches for reducing preexisting astigmatism during cataract surgery.

KEYWORDS: ASTIGMATISM-CATARACT-TORIC-INTRAOCULAR LENSES-PHACOEMULSIFICATION-LRI.

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List of Abbreviations

AK	Astigmatic Keratotomy
ATR	Against-The-Rule
BCVA	Best Corrected Visual Acuity
CCI	Clear Corneal Incision
CTR	Capsule Tension Ring
D	Diopter
FDA	Food and Drug Administration
IOL	Intraocular Lens
ISV	Inferior-Superior Value
KPI	Keratoconus Prediction Index
LASIK	Laser In Situ Keratomeleusis
Log MAR	Logarithm of minimal angle reduction
LRIs	Limbal Relaxing Incisions
OCCIs	Opposite Clear Corneal Incisions
PCRIs	Peripheral Corneal Relaxing Incisions
PEA	Pre-Existing Astigmatism
PMMA	Poly Methyl Methacrylate
PVA	Potential Visual Acuity
RK	Radial Keratotomy
SAI	Surface Asymmetry Index
SD	Standard Deviation
SEP	Sphero-Equivalent Power
SIA	Surgically Induced Astigmatism
Sim K	Simulated Keratometry
SRI	Surface Regularity Index
UCVA	Un Corrected Visual Acuity
WTR	With-The-Rule
YAG	Yttrium-Aluminum-Garnet

Introduction

As advances in keratorefractive surgery make the treatment of refractive errors increasingly effective, patients expectations for unaided visual acuity at the time of cataract surgery are increasing. In practice, refractive and cataract surgery techniques are used almost interchangeably at present.[1]

Refractive cataract surgery is defined as the uncomplicated removal of cataract while minimizing postoperative spectacle dependence. Achieving the desired postoperative spherical correction and reducing or eliminating the preoperative astigmatism in each patient accomplishes this goal.[2]

Approximately 15-29% of patients with cataracts have more than 1.5 diopters(D)of preexisting astigmatism.[3]

Corneal astigmatism can be managed by the use of peripheral corneal relaxing incisions , but the recent introduction of toric intraocular lenses has provided an opportunity to more precisely reduce or eliminate a patient's preexisting astigmatism.[4]

The AcrySof SA60TTtoric series of IOLs is made of hydrophobic Acrylate and shares the same biconvex single-piece design as the AcrySof SA60AT monofocal IOL. The toric IOL has atoric component located on the posterior surface of the lens optic. The optic is marked with 3 peripheral dots that indicate the cylindrical axis of the lens and so enables its correct alignment with the steepest axis of the corneal astigmatism during surgery.[5]

Aim Of Work

This is a prospective randomized study to compare the safety and efficacy of the toric AcrySof IOLs in the management of preexisting astigmatism in cataract surgery as opposed to the AcrySof monofocal IOLs combined with peripheral corneal relaxing incisions.

REVIEW OF LITERATURE

Astigmatism

Astigmatism is defined as a condition of refraction where in a point focus of light cannot be formed upon the retina. Theoretically, no eye is "stigmatic"(***figure 1)***[6].

The major cause of astigmatism is usually the cornea, but astigmatism of the lens can also occur.[7]

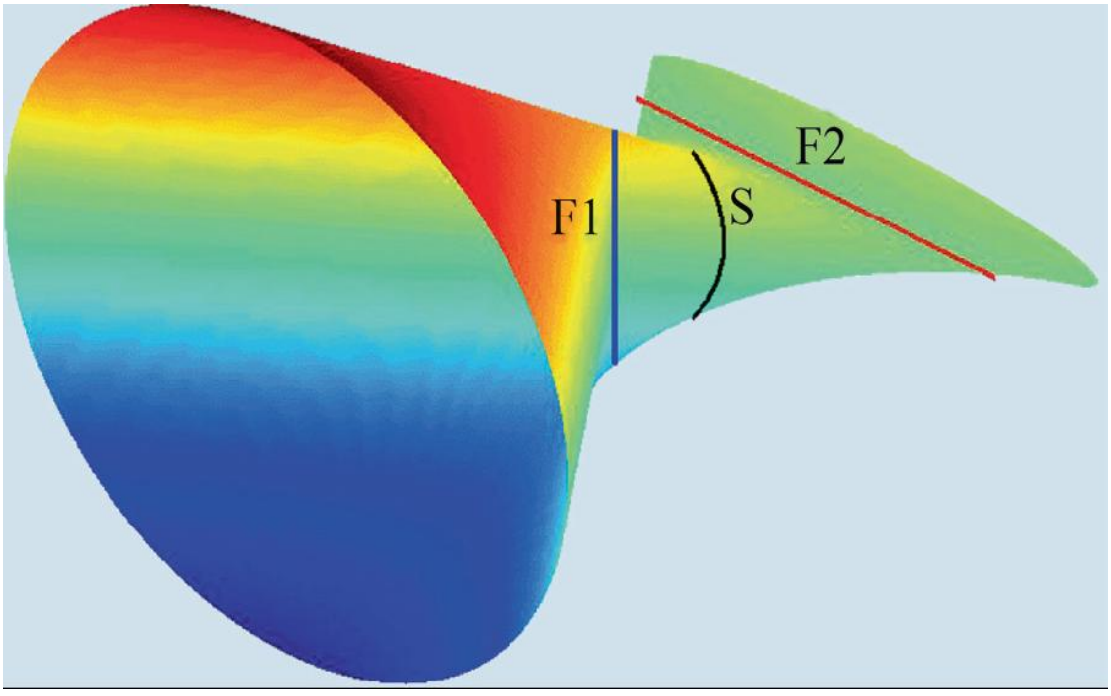

Figure1:*SturmConoid. A bundle of rays is focused by an astigmatic optical system to two focal lines (F1 and F2). Between the foci the circle of least confusion can be found.**[7]***

Incidence and prevalence:

Astigmatism has been reported to occur in 14–37% of adults. One largestudy of refractive errors measured a mean refractive cylinder of ≥0.75 D in 37% and ≥1.5 D in 13% of 3,654 individuals between 49 and 97 years old.[8]

However the incidence of regular astigmatism greater than 1.5D in cataractous patient is about 15-20% due to this high percentage it is obvious that astigmatism has to be taken into account to achieve good optical quality within majority of cataract patient[9]

Types of corneal astigmatism:

Corneal astigmatism may be regular or irregular ***(Table 1).***

Regular Astigmatism

When the astigmatism is regular, the maximal and minimal powers of the eye are 90^{o} apart.

An astigmatic cornea is a spherocylinderic lens that forms two focal lines, each parallel to a principal meridian and separated by a distance proportionate to the difference in power between the two meridians for a distant object. The three dimensional surface formed by the resulting cone of limiting rays is known as the ***conoid of sturm*** and the distance between the two principal focal lines as the ***interval of sturm.***

Regular astigmatism is termed with the rule when the steepest corneal meridian is close to 90º and against the rule when the steepest meridian is close to 180º. When the astigmatism is regular but the principal meridians do not lie close to 90º or 180º, the astigmatism is called oblique.

The image on the retina is determined by where the conoid intersects the retina, If the conoid is located in front of the retina**, *compound myopic*** astigmatism is present; if the conoid overlaps the retina, mixed astigmatism is present; if the conoid is behind the retina, ***compound hyperopic*** astigmatism is present.

Regular astigmatism may be corrected by spherocylinderic lens (or toric). The axis of the cylindrical component is oriented parallel to focal line of the eye that is to be moved onto the retina. Thus the cylindrical lens collapses the conoid of sturm. A plus cylinder lens will move the focal line from behind the retina anteriorly onto the retina, and a minus cylinder lens will move the focal line from in front of the retina posteriorly onto the retina.[7]

Irregular Astigmatism

Irregular astigmatism is any astigmatism that cannot be corrected with spherocylindrical spectacle lenses. There are three general types of irregular astigmatism: semimeridional, oblique, and diffusely irregular.

Semimeridional irregular astigmatism occurs when the power changes irregularly along both sides of a given meridian. ***Oblique*** astigmatism occurs when the steepest and flattest meridians are not perpendicular to each other. ***Diffusely irregular*** astigmatism is the catch all term used to describe anything else.[10]

Table 1: ***Classification of Astigmatism.[7]***

Regular Astigmatism	**Irregular Astigmatism**
Two identifiable principal meridians separated by 90º	Principal meridians separated by angle other than 90º
Excellent best spectacle corrected visual acuity	Best spectacle corrected visual acuity reduced
Distinct end point on keratometery	Keratometry mires can be superimposed but drum must be rotated
Symmetric bowtie pattern on corneal topography	Lack of symmetry or regularity on corneal topography
Congenital or acquired	Usually acquired

Symptoms of Astigmatism:

Patients with a the degree of astigmatism of appreciable size, since in no circumstances can the eye form a sharply defined image upon the retina, the diminution of visual acuity may be very considerable. Circles become elongated into ovals; a point of light appears tailed off; and a line, which consists of a series of points, appears as a succession of strokes fused into a blurred image (***figure2***).