Posterior Capsule Opacification (PCO) in Three Modern Single Piece Foldable Intraocular Lenses (IOLs):

A Clinicopathological Study.

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Précis

Posterior capsule opacification (PCO) scores of three single piece foldable IOLs (Rayner Centerflex™, Alcon AcrySof™ and Staar AA-4203VF™ large hole silicone plate), were assessed. The two acrylic designs had a lower PCO rate, than the Silicone plate (p<0.05).
ABSTRACT

Purpose: To assess the development of Posterior Capsule Opacification on three single-piece foldable intraocular lenses, and to compare the preventive effect of IOL design and material.

Setting: Center for Research on Ocular Therapeutics and Biodevices, Storm Eye Institute, Medical University of South Carolina, Charleston, South Carolina, USA.

Methods: Thirty-one rabbit eyes were randomly operated with phacoemulsification and IOL implantation with three different single piece foldable lenses: Rayner Centerflex™ (n=11), Alcon AcrySof™ (n=10) or Staar (AA-4203VF™) large hole silicone plate (n=10). Central PCO, peripheral PCO and Soemmering’s ring formation were evaluated by Miyake-Apple posterior view technique three weeks after surgery. Histological sections from each eye were made.

Results: The acrylic IOLs (Rayner Centerflex™ and Alcon AcrySof™) had lower central and peripheral PCO scores than the Staar (AA-4203VF™) silicone plate IOL (p<0.05). There was no significant difference in Soemmering’s ring formation comparing the three IOL models. Pathological evaluations revealed effective blockage of migrating lens epithelial cells (LECs) at the truncated optic edge of the Rayner Centerflex™ and Alcon AcrySof™ IOLs, even in the presence of large amounts of retained/regenerative cortical material.

Conclusions: One of the acrylic IOLs studied here had a hydrophobic surface and the other one had a hydrophilic surface. In this study one can not generalize
on their efficacy when comparing only the biomaterials. However, both acrylic lenses have square truncated edges, which appeared successful in blocking ingrowth of migrating LECs at the outer edge of the optic, then leaving clear posterior capsules. This study confirms the assumption that a square optic edge appears to be optimal in creating a barrier effect.
INTRODUCTION

Modern small incision cataract surgery has evolved toward almost perfect visual rehabilitation. Reduced post-operative recovery time, less inflammation, and less induced astigmatism are a few of many benefits. (1-5) The surgery can also act as refractive procedure, correcting any previous ametropia. The development of posterior capsule opacification (PCO) still is the most common complication following IOL implantation. The PCO treatment (Nd:YAG laser secondary posterior capsulotomy) is a procedure with a few but serious complications such as potential damage to the IOL, transient intraocular pressure elevation, retinal detachment, cystoid macular edema and IOL luxation. (6-13)

In a 1992 review, Apple et al(1) addressed the multifactor pathogenesis of PCO, and later(14-17) defined two major principles that may apply to the prevention of PCO. They are:

1. To minimize the number of retained/regenerated lens epithelial cells (LEC), especially equatorial LECs, and cortex remaining in the capsular bag following incomplete cortical cleanup.

2. If unwanted proliferative cells do remain, one can create a secondary line of defense by erecting a barrier to block growth of LECs from the equatorial region toward the center of the visual axis.

From these two principles, Apple and associates identified six factors that play a crucial role in preventing or at least delaying this complication: three IOL-
related (biocompatibility of IOL material to reduce stimulation of cellular proliferation, square optic geometry of the IOL and maximal optic-capsule contact) and three surgical related factors (hydrodissection-enhanced cortical cleanup, small continuous curvilinear capsulorhexis with the edge on IOL optic and In-the-bag fixation).(15-18)

The most commonly implanted foldable IOLs have shown different influences on development of PCO, depending on their biomaterials and designs. The AcrySof™ (Alcon Laboratories, Ft Worth, TX, USA) IOL with a hydrophobic acrylic optic and PMMA haptic revealed the least PCO formation, with the lowest Nd:YAG laser posterior capsulotomy rate.(19)

Development of 1-piece foldable IOL designs began in the 1970s and early 1980s.(3) The early silicone plate IOL designs had been replaced by the Staar model AA-4203 VF™ (Staar Surgical Company, Monrovia, California) and Bausch and Lomb model C11 UB (Bausch & Lomb Surgical, Rochester, New York) 1-piece silicone plate with large positioning holes IOLs, which in general fixate securely in the capsular bag with lower incidence of long-term IOL rotation, decentration and dislocation.(20,21,34-36) This lens also has low PCO rates(31), probably attributed to its thickness which creates a tight contact of the posterior IOL optic against the posterior capsule creating a barrier effect. The large hole helps establish this tight fit.

The Centerflex™ (Rayner Intraocular Lenses Ltd., East Sussex, England) is a newly developed 1-piece, hydrophilic acrylic IOL. Instead of using a traditional plate haptic design, this lens has extended loops that resemble three-
piece closed loop IOL designs. This specially designed haptic allows an appropriate compression of the IOL sufficient to maintain the IOL “fit” and centration in the capsular bag.

Another recently developed 1-piece foldable IOL is the AcrySof™ SA30AL, a hydrophobic acrylic lens manufactured by Alcon Laboratories, Ft Worth, TX, USA. This IOL has solid extended haptics that are made of the same material as the optic. The design allows the haptics to be more flexible than traditional 3-piece foldables IOLs, but is able to retain the same good memory as the 3-piece foldable design does.

The purpose of the study is to assess the development of PCO occurring with these three 1-piece foldable IOLs using a rabbit model.
MATERIALS AND METHODS

Sixteen Dutch belted serum Pasterella-free rabbits of the same age and sex underwent phacoemulsification and posterior chamber intraocular lens (IOL) implantation. All rabbits were treated in accordance with the guidelines set by the Association for Research in Vision and Ophthalmology (ARVO), and the Division of Laboratory Animal Resources (DLAR), Medical University of South Carolina.

In a randomized way, 11 Rayner Centerflex™, 10 Alcon AcrySof™ SA 30AL and 10 Staar™ 4203 VF were implanted in for a total of 31 eyes. The same surgeon (LGV) performed all the surgeries, and the surgeon was masked to IOL selection at the beginning of each procedure for all rabbits.

Surgical Procedure

Phacoemulsification and posterior chamber intraocular lens implantation were performed in all cases; continuous curvilinear capsulorhexis, hydrodissection and removal of lens nucleus and cortical material followed a 3.2-mm clear cornea incision. 0.5 ml of epinephrine 1:1000 and 0.5 ml Heparin (10000 USP units/ml) were added to each 500 ml of irrigation solution to maintain pupil dilatation during surgery as well as to diminish inflammation. Then the capsular bag was filled with viscoelastic material and a +21.0 D IOL was inserted into the capsular bag using the IOL-manufacturer’s recommended lens injector system.
At the closure of the procedure, each rabbit received subconjunctival dexamethasone 0.25 cc and gentamicine 0.25 cc; postoperatively, 1% Atropine Sulfate 1 eyedrop twice daily, and Neomycin Sulfate - Polimixin B Sulfate and Dexametasone ophthalmic ointment twice daily for three weeks. Each implant procedure was documented in an implantation record. One eye, which suffered posterior capsule tearing with vitreous loss, was excluded.

**Slit Lamp Examination**

All rabbits were evaluated by slit lamp examination and scored for ocular response at one day, one week, two weeks and three weeks post-operatively. Slit lamp photographs with the pupil fully dilated were taken in the first and third postoperative weeks.

**Gross Examination and PCO scoring**

The animals were anesthetized using a 2cc intramuscularly injection of a 1:1 mixture of Ketaset® (Ketamine HCL, Fort Dodge Laboratories, Fort Dodge, Iowa, USA) and Rompum® (Xylazine 20mg/ml, Bayer Corporation, Shawnee Mission, Kansas, USA), and then humanely euthanized with a 2 cc intravenous injection of Sleepaway® (Sodium Pentobarbital euthanasia solution, Fort Dodge Laboratories, Fort Dodge, Iowa, USA). The globes were enucleated and fixated in 10% neutral buffered formalin solution for twenty-four hours. The globes were then bisected coronally just anterior to the equator. Gross examination and photographs from behind (Miyake-Apple posterior view technique\(^{(22)}\)) were
performed to assess PCO development, using a camera (Nikon N905 AF, Nikon Corporation, Tokyo, Japan) fitted to an operating microscope (Leica/Wild MZ-8 Zoom Stereomicroscope, Vashaw Scientific, Inc., Norcross, GA, USA). The extent and severity of PCO were scored from 1 to 4 according to methods established in our laboratory(37).

All globes were analyzed using the Miyake-Apple posterior view technique for the following (figure 1):

- Central PCO: scoring from 0 to 4 (table 1), corresponding to the area that including the optic of the IOL within the pupilary area.
- Peripheral PCO: scoring from 0 to 4 (table 2), corresponding to the area that including the optic of the IOL outside the pupilary area.
- Soemmering’s Ring: area outside the optic of the IOL and inside the capsular bag; graded from 0 to 4 in intensity and area, (table 3). All capsular bags were divided in four areas, grading the intensity of each area, calculating as a result the average in all four areas.

**Histology**

All globes were prepared for serial paraffin sections and were evaluated with hematoxylin and eosin (H & E) and periodic acid-Schiff (PAS) stains. The PAS stain highlights basement membrane material, including the lens capsule, under a light microscope (Olympus. Optical Co. Ltd., Japan). Features such as cell type, extent of growth and route of growth were documented by serial photomicrographs taken by a 35 mm camera (Olympus SC35 Type 12, Optical
Co. Ltd, Japan) attached to the light microscope. The capsular bag status and the performance of IOL geometry were also documented. All IOL biomaterials dissolve out of the specimen during tissue processing. Therefore, the site of each IOL component (optic and haptic) appeared as an empty space surrounded by material corresponding to the lens capsule, cortical material and fibrotic tissue.

Scanning electron microscopy (SEM) was performed on selected cases.

Data analysis

Statistical analysis was performed with a Kruskal–Wallis One Way Analysis of Variance (ANOVA) for nonparametric measurements, and all pairwise measurements with a Multiple Comparison Procedure by Turkey Test, using the Sigma Stat Software (version 2.0, SPSS inc., Chicago, IL).
RESULTS

Sixteen rabbits, thirty-two eyes underwent phacoemulsification and IOL implantation. From them, 31 eyes were suitable for the study (IOL implanted in-the-bag). One eye was excluded because of posterior capsule rupture. From the 31 eyes included, the Centerflex™ IOL was implanted in the capsular bag in 11 eyes, the AcrySof™ IOL in 10 eyes, and the Staar 4203 VF™ Silicone Plate Large Hole in 10 eyes.

The Centerflex™ IOL performed well in surgery, with easy, controlled and predictable unfolding, and one-step in-the-bag implantation.

A slightly bigger learning curve was experienced with Alcon Monarch® II injecting system. Two IOL haptic damages occurred during the injection, and it resulted in the exchange of IOLs.

All IOL groups revealed minimal intraocular inflammatory reaction and IOL surface deposition during the three week postoperative follow up.

Pathological evaluation of PCO formation is summarized here.

Central PCO: (CPCO)

Low central PCO scores were obtained in all 3 groups. The Centerflex™ IOL group showed the lowest rate (0.09 ± 0.12) of CPCO compared with AcrySof™ IOL group (0.5 ± 0.47) and Staar™ 4203 VF Silicone Plate IOL group (1.1 ± 0.60) (Figure 2). There was no statistically significant difference between Centerflex™ and AcrySof™ IOL groups (p>0.05). However, the Staar™ 4203 VF Silicone Plate IOL group revealed a higher grade of CPCO than the other two
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groups, showing a statistically significant difference (p<0.05) between them. **Figure 4 (A through C)** are examples of the three different designs in when comparing CPCO.

*Peripheral PCO: (PPCO)*

The scores of the PPCO was very similar to the CPCO, but with higher values. The Rayner Centerflex™ IOL group showed the lowest rate (0.45 ± 0.52) of CPCO compared with Alcon AcrySof™ IOL group (1.1 ± 0.60) and Staar™ 4203 VF plate IOL group (1.87 ± 0.89) (Figure 3). There was no statistically significant difference between Centerflex™ and AcrySof™ IOL groups, but we also found statistically significant difference between these two IOL groups and the Staar 4203 VF™ silicone plate IOL group (p<0.05).

*Soemmering’s Ring Intensity / Soemmering’s Ring Area (SRI/SRA):*

Most eyes included in the study developed some degree of Soemmering’s Ring (Figures 4 to 7). The Staar 4203 VF™ silicone plate IOL group had the lowest grade of SRI / SRA, but we didn’t find any statistically significant difference between the three groups (figures 4C and 7A).

In the clinicopathological analysis, **figures 5 and 6** show how the Soemmering’s Ring stops at the square edge of the IOL optic in the acrylic designs. The central posterior capsule is clear. On the contrary, **Figures 7A and B** show the capsular bag filled with the Staar 4203 VF™ silicone plate lens. The
IOL overfills the bag, with less Soemmering’s ring. However, there was no barrier effect, and the cells continued growing toward the visual axis.

Table 4 summarizes the PCO scores of all three groups.

Figure 8 shows one eye from the AcrySof™ group, in which the outer Soemmering’s ring compressed the IOL haptics, bringing them toward, and indeed overlapping the IOL optic. Figure 8B shows a scanning electron microscopic image of the same IOL from the figure 8A, where the end portion of the haptic is out of the bag. The strong adhesion between IOL optic and the capsulorhexis edge is maintained. Figure 9 is another example of this phenomenon showing an IOL haptic bending towards the optic and occupying the space between the optic and lens capsule.
DISCUSSION

Modern cataract surgery is approaching the realm of refractive surgery. The published data from our laboratory show that with modern techniques and new IOLs (designs and materials), PCO incidence is decreasing to a rate of single digits.\(^{(14-19)}\)

IOL design and materials have evolved toward foldable materials, single piece construction and truncated optic edge to achieve a better biocompatibility with advantages like better IOL centration\(^{(21)}\), less anterior capsule opacification\(^{(22)}\) and less posterior capsule opacification\(^{(14-19,24-26,31)}\). Until recently, the most commonly used single piece foldable IOL is the Silicone Plate IOL with large positioning holes (Staar 4203 VF\(^{TM}\)), which has shown low PCO rates with less complications (decentration/dislocation) than its precursor, the small hole silicone plate IOL \(^{(14)}\). The incidence of PCO with acrylic IOLs is reported significantly lower than other foldable and rigid IOLs. Apple, Peng and associates have found very low PCO rates with the 3-piece AcrySoft\(^{TM}\) in human cadaver eyes\(^{(14,17,19,31)}\). One of the most notable characteristics of this IOL is the apparent lack of postoperative LEC proliferation around the IOL optic, namely, a biocompatible lens.

We have identified in our previous studies, six factors to reduce the incidence of PCO: hydrodissection – enhanced cortical clean-up, in-the-bag (capsular) IOL fixation, capsulorhexis edge on IOL surface (small capsulorhexis), biocompatible IOL (to reduce stimulation of cellular proliferation), maximal IOL
optic – posterior capsule contact (“no space, no cells” concept) and the IOL optic barrier effect (square or truncated edge). With all of above in mind, we conduct the current study in order to evaluate two newly developed 1-piece acrylic IOLs.

The findings in our study confirm the IOL barrier effect (17,19,26); in cases where retained/regenerative LECs created a Soemmering’s ring. The square-truncated edge of the Centerflex™ and the AcrySof™ IOLs showed an abrupt termination of cell migration, occurring precisely where the peripheral edge of the optic contacted the posterior capsule (Figures 5 and 6). The posterior capsule subtending the entire optic zone was therefore relatively or totally cell free. With the Staar 4203 VF™ silicone plate, which has an almost-square edge, there was an ingrowth of cells and cortical material (Soemmering’s Ring) towards the direction of the central visual axis. We believe this is the explanation of higher central and peripheral PCO scores obtained in this group (P = 0.005), even though this IOL had the lowest Soemmering’s Ring scores. In-the-bag fixation functions primarily to enhance the IOL-optic barrier effect. The barrier effect is functional and maximized when the lens optic is fully in-the-bag with direct contact with the posterior capsule. When one or both haptics are out of the bag, a potential space exists where the lens epithelial cells can grow toward the visual axis.

The Centerflex™ IOL showed the lowest rate of central and peripheral PCO, with good centration, low inflammation and accurate results. The injection system was easy to use, with controlled and predictable unfolding; the trailing haptic can be easily placed into the capsular bag with the tip of the plunger.
An unexpected additional finding with the AcrySof™ in this study was the phenomenon of the haptics overlapping the IOL optic (figures 8 and 9). In this scenario, the haptic can create a space, which prevents the IOL from adhering to the capsule (a remarkable characteristic of this hydrophobic acrylic IOL). Without the direct contact between IOL optic and posterior capsule, ingrowth of LECs from the equatorial region onto the central posterior capsule will be promoted. We postulate that the relatively less rigidity of the haptic materials that the lens was made from might somewhat play a role on the memory and performance of the haptic. Since there has not been any similar clinical or experimental observation to date, it would be worthwhile to encourage clinicians and researchers to document their findings in order to further confirm our hypothesis.

There are no reports comparing two single piece acrylics at this date. Several reports have evaluated the 3-piece AcrySof™ versus other IOL types (rigid and foldables) in human cadaver eyes (14-19, 31), animal models (27) and clinical evaluations (24-26).

Linnola et al (28, 32, 33), Bowlton et al (29) and Nagata et al (30) described the factors that justify the lower incidence of central PCO with the acrylic foldable lenses, all related with the barrier effect and IOL biocompatibility. First, based on its biochemical and biophysical characteristics, the acrylic material may enhance the adhesion between the capsule and the IOL, reducing migration from the equator of the capsular bag onto the posterior capsule. Second, the square edge profile of the optic also helps to reduce the migration of LECs toward the visual axis. Third, the greater fibronectin adhesion to hydrophobic acrylic IOLs; protein
adhesion is different between acrylic IOLs and silicone IOLs. The fibronectin is the major extracellular protein between the AcrySof™ and the capsular bag, and it is believed that acts as a bond between the IOL and the capsular bag.

Apple(31) evaluated 5,079 pseudophakic human globes obtained postmortem between 1988 and 1999; he included eight lens styles (two types of rigid IOL and six foldable lens designs), including 3-piece AcrySof™ and 1-piece Large Hole Silicone Plate™, both having lowest Nd:YAG capsulotomy rates (1.3% and 8.2% respectively).

Nishi(27) reported on the efficacy of the barrier created by a square edge optic in a rabbit model; compared the 3-piece silicone CeeOn 911™ IOL (Pharmacia Corp. Peapack, NJ, USA) and the 3-piece AcrySof™ IOL (Alcon Laboratories, Ft Worth, Tx, USA). They did not find any difference in PCO rates between them.

Hollick et al(24) compared polyacrylic, silicone and PMMA IOLs in visual outcome, neodymium:YAG (Nd:YAG) capsulotomy rates, and percentage of posterior capsular opacification (PCO). Three years after surgery, acrylic lenses were associated with less PCO (10%) than silicone (40%) and PMMA lenses (56%). The Nd:YAG rate was 0% for the AcrySof™ IOL, 14% for the Silicone and 26% for the PMMA. In this study they included only one square edge IOL (AcrySof) who showed the lowest PCO rate.

Figures 10A and B are schematic illustrations demonstrating the barrier effect of the IOL optic with a rounded edge versus a square truncated edge.
In conclusion, this study compared three single piece foldable IOLs, two new acrylic IOLs (Centerflex™ and AcrySof™) with a square edge optic and a silicone IOL with an almost square edge optic. Our findings showed a low PCO rate in all IOLs groups, especially in the Centerflex™ and the AcrySof™, confirming the barrier effect (square edge) as an effective measure of preventing PCO. The square truncated edge in these two lenses stopped retained/regenerative material from invading the visual axis, even in cases with a large amount of Soemmering’s Ring. In 30% of the new AcrySof™ IOL we observed haptic bending over the IOL optic. More studies are needed to assess the haptic memory of this IOL over a longer period of time.
REFERENCES


**Legends Tables**

**Table 1.** Scoring system to analyze central PCO.

**Table 2.** Scoring system to analyze peripheral PCO.

**Table 3.** Scoring system to analyze Soemmering’s ring formation.

**Table 4.** Miyake - Apple posterior view scoring of PCO.

* Statistically significant when compared with all groups.

- CPCO = Central Posterior Capsule Opacification (0 to 4).
- PPCO = Peripheral Posterior Capsule Opacification (0 to 4).
- SRI = Soemmering’s ring Intensity (0 to 4).
- SRA = Soemmering’s ring Area (0 to 4).
Legends Figures

**Figure 1.** Schematic illustration showing the intraocular lens biocompatibility, scoring the amount of PCO with the Miyake-Apple view technique. We measured the opacification behind the center of the optic (CPCO), behind the periphery of the optic (PPCO) and also scored the amount of Soemmering’s ring intensity (SRI) in each one of the four quadrants (SRA), having as a result the average SRI in all areas.

\[
\text{SRI/SRA} = \frac{(\text{SRI}_1 + \text{SRI}_2 + \text{SRI}_3 + \text{SRI}_4)}{4}
\]

**Figure 2.** Analysis of CPCO by Miyake-Apple technique. Scoring 0 to 4.

**Figure 3.** Analysis of PPCO by Miyake-Apple technique. Scoring 0 to 4.

**Figure 4.**

A. Gross photograph from behind (Miyake-Apple posterior photographic technique) showing a Rayner Centerflex™ IOL. Note the absence of growth across the posterior optic toward the visual axis, leaving a clear optical zone. The barrier effect formed by the square truncated edge of the optic helps protect against LEC ingrowth.  

B. Gross photograph from behind (Miyake-Apple posterior photographic technique) showing an Alcon AcrySof™ IOL. Note that the central optic is almost clear of cells, even in the presence of Soemmering’s ring.

C. Gross photograph from behind (Miyake-Apple posterior photographic technique) showing a Large Hole Silicone Plate™ with the “fibrous” form of PCO. Note the dense fibrous strands behind the optic.

**Figures 5-A and B.** Gross photographs from behind (Miyake-Apple posterior photographic technique) showing a Rayner Centerflex™ IOL. The Soemmering’s ring stops at the edge of the optic. Note the clear visual axis. The barrier effect formed by the square truncated edge of the optic prevents ingrowth of lens epithelial cells toward the visual axis.
**Figures 5 C and D.** Photomicrographs of the anterior segment of the eye showing the Centerflex™ IOL. Note the effective barrier created by the square truncated edge (arrow). The capsulorhexis edge rests on the IOL optic. The IOL haptic is embedded in the Soemmering’s ring. (Note that the IOL optic and haptics are dissolved out of the section, leaving a large space between anterior and posterior capsule). PAS stain, original magnification x10.

**Figure 6-A.** Gross photograph from behind (Miyake-Apple posterior photographic technique) showing an AcrySof™ IOL with some Soemmering’s ring formation but absent from the visual axis. The small capsulorhexis allows the anterior capsule to hug the anterior surface of the IOL optic closely (“shrink wrap” around the optic).

**Figure 6-B.** Photomicrograph showing the square truncated edge of the AcrySof™ clearly demonstrating the barrier effect. Note the interface between the Soemmering’s ring (pink - red material) and the IOL optic. Also note the clear posterior capsule. PAS stain, original magnification x40.

**Figure 7-A.** Gross photograph from behind (Miyake-Apple posterior photographic technique) showing a Large Hole Silicone Plate™ with evidence of “fibrous” PCO.

**Figure 7-B.** Photomicrograph of the Silicone Plate with Soemmering’s ring formation (pink - red material) over the posterior capsule. There is also a growth of a narrow rim of cells onto the peripheral posterior capsule toward the visual axis. PAS stain, original magnification x 20.

**Figure 8-A.** Gross photograph from behind (Miyake-Apple posterior photographic technique) showing a single piece AcrySof™ IOL with moderate Soemmering’s ring remnants. Note the haptic bending toward the IOL optic.
Figure 8-B. Scanning Electron Microscopy showing the adherence between the capsulorhexis edge and the IOL optic. The arrow indicates the last portion of the haptic out of the bag.

Figure 9. Gross photograph from behind (Miyake-Apple posterior photographic technique). Another AcrySof™ IOL with bending of the haptics toward the optic of the IOL. Note how the Soemmering’s ring (arrow) defeats the haptic resistance bending it over the anterior surface of the IOL optic.

Figure 10. Schematic illustration showing the differences regarding the barrier effect of an IOL optic with a rounded edge versus a square truncated edge. **A:** with a round edge, some cells may grow behind the posterior peripheral optic, creating a paracentral rim (arrows) of opacification. **B:** with a square - truncated IOL optic edge there is a barrier (arrows), leaving the entire region behind the optical zone free of cells.
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**Table 1**

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**Table 2**

**Table 3**
### PCO Rates and Biocompatibility Scores

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Table 4
Figure 1
Figure 2

Figure 3
Figure 4
Figure 6

AcrySof SA30AL
Figure 7