

Supplement to

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# CRST

EUROPE

Cataract & Refractive Surgery Today

## BI? TRI? MULTI?

Varifocality Is the  
Way to Go!



The Acunex is a unique IOL family with true varifocality on a most common platform.

# The Unique Acunex Family of IOLs

Three lenses, same great platform for brilliant visual results.

**A**cunex (Teleon Surgical) is a family of one-piece posterior chamber IOLs that are based on a proven hybrid biomaterial platform that is hydrophobic and FDA certified as glistening-free. The Acunex lenses have flexible handling and high surface quality. The availability of three different versions make the Acunex the perfect family of IOLs to meet patients' individual needs.

This supplement discusses each lens in length and reviews recent study results. A brief introduction to each lens follows here.

**Acunex.** This standard aspheric IOL with a blue-light filter meets all the considerable requirements of a modern monofocal IOL, including the highest optical quality, high stability in the capsular bag, excellent refractive outcomes, easy handling and implantation, and enduring optical clarity. Due to its excellent surface quality, the lens is resistant to scratches. It has a C-loop lens design and a continuously sharp 360° edge at the posterior optic to prevent posterior capsular opacification. The step-vaulted haptics ensure optimal positioning in the capsular bag, preventing the development of striae. The Acunex can be implanted through a 2.2-mm incision, and unfolding of the IOL is achieved in a controlled fashion. All




other Acunex IOL models are based on this standard aspheric monofocal IOL.

**Acunex Vario.** This IOL incorporates extended depth of focus (EDOF) comfort optics, which applies continuous transmission technology. This optical system extends visual comfort and provides patients with a varifocal EDOF power, producing a true intermediate range up to 60 cm. Compared with other EDOF IOL technologies, the Acunex Vario provides an extended range of vision without the usual side effects.<sup>1</sup> The lens behaves like a monofocal IOL for distance but with EDOF and no dysphotopsias.

**Acunex VarioMax.** This IOL is suitable for presbyopia correction and is the first IOL intended for this purpose with varifocal effect and a continuous surface profile, thus creating homogenous light distribution. The Acunex VarioMax IOL combines a coherent aspheric distance part with a segmental zone, providing varifocality for consistent high-quality vision over distances from far to near. Advantages with this IOL include minimal photic phenomena, excellent contrast sensitivity in bright and dim light conditions, and a high rate of spectacle independence and patient satisfaction. ■

1. Versace P. Paper presented at the: 2018 ESCRS Annual Meeting; September 22–26, 2018; Vienna, Austria.

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# Acunex: An Aspheric Monofocal IOL for All Cataract Surgery Patients

The benefits of an IOL with hydrophobic glistening-free material and refractive stability and predictability.

BY MANFRED R. TETZ, MD



The Acunex aspheric IOL (Teleon Surgical) is made with the first hydrophobic IOL material derived from a material developed by Advanced Vision Science and certified by the US FDA, in 2012, as glistening-free.\* This lens is the

backbone of the Acunex IOL family, and all three Acunex IOLs are designed with the same overarching principles. Therefore, it is important that this lens meet the strictest requirements in optical clarity after implantation as well as in refractive stability and predictability.

We recently conducted a study to determine the refractive stability and predictability of the Acunex IOL over time, and in this article I present the results.

## THE IMPORTANCE OF IOL MATERIAL

Glistenings are microvacuoles in IOL polymers that are influenced by intraocular hydration and preexisting conditions and diseases. With some other hydrophobic lens materials, glistenings can be a significant source of clinical concern because of the associated unwanted visual side effects.<sup>1</sup> Evidence has shown that IOL material, together with lens geometry, has great

impact on the development of posterior capsular opacification (PCO), anterior capsular opacification, and glistening formation.<sup>2</sup>

In contrast to its precursors, the new hybrid glistening-free material used in the Acunex (Figure 1) now also contains a blue-light filter. This gives the lens a yellow tint and reduces the amount of UV and hard blue light that enter the macula and contribute to macular degenerative changes. The Acunex also has a high refractive index (1.54), which helps to shape a thin lens optic that contributes to its ease in handling.

We recently examined the hydrophobic glistening-free acrylate material of the Acunex IOL under clinical conditions in 48 eyes of 26 patients. We used standardized pre- and postoperative slit-lamp imaging to look for glistenings within the IOL body and the IOL material and for the presence of any major refractive changes at 1 week, 6 to 8 weeks, 6 months, and 12 months postoperative. We also looked at the lens platform's stability for future optical development, the PCO rate, presence of striae, subjective refraction, and distance UCVA and distance BCVA.

## STUDY RESULTS

Preoperatively, the mean distance UCVA and binocular

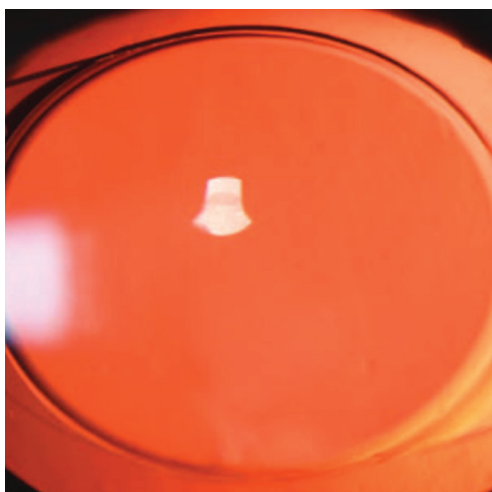


Figure 1. The Acunex is made from a glistening-free IOL material.

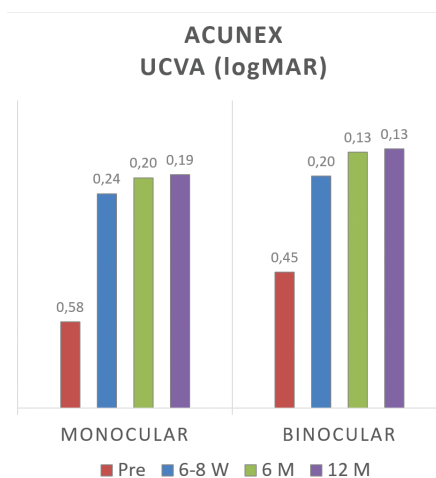


Figure 2. Mean distance UCVA and binocular distance UCVA with the Acunex.

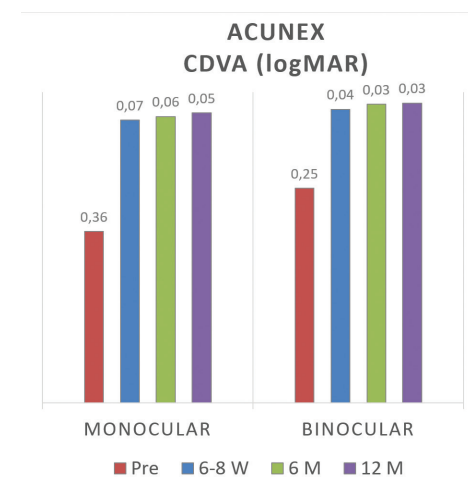


Figure 3. Mean distance BCVA and binocular distance BCVA with the Acunex.

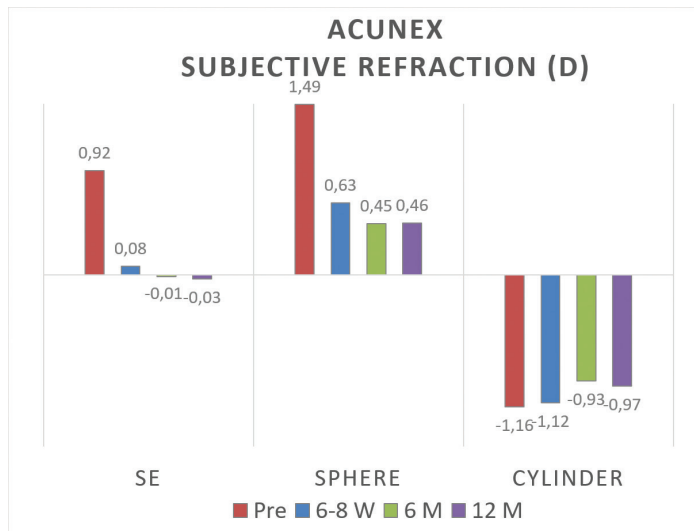


Figure 4. Subjective refraction with the Acunex.

distance UCVA was  $0.58 \pm 0.29$  and  $0.45 \pm 0.20$ , respectively (Figure 2). By 6 to 8 weeks postoperative, that had improved to  $0.24 \pm 0.18$  and  $0.20 \pm 0.16$ , respectively, and by 12 months to  $0.19 \pm 0.20$  and  $0.13 \pm 0.14$ , respectively. A similar but more pronounced change was seen in mean distance BCVA and binocular BCVA, as would be expected. When we looked at those changes from preoperative ( $0.36 \pm 0.24$  and  $0.25 \pm 0.11$ , respectively), at 6 to 8 weeks postoperative mean distance BCVA and binocular distance BCVA improved to  $0.07 \pm 0.13$  and  $0.04 \pm 0.10$ , respectively. At 6 and 12 months, the improvement in distance BCVA and binocular distance BCVA continued or remained stable at  $0.06 \pm 0.11$  and  $0.05 \pm 0.11$  for distance BCVA

TABLE. POSTOPERATIVE RESULTS WITH THE ACUNEX IOL				
Variable	Preoperative	6 to 8 weeks	6 months	12 months
UDVA (logMAR)	0.58 (0.29)	0.24 (0.18)	0.20 (0.20)	0.19 (0.20)
Binocular UDVA (logMAR)	0.45 (0.20)	0.20 (0.16)	0.13 (0.11)	0.13 (0.14)
SE (D)	0.92 (1.54)	0.08 (0.42)	-0.01 (0.55)	-0.03 (0.40)
Sphere (D)	1.49 (1.51)	0.63 (0.59)	0.45 (0.67)	0.46 (0.50)
Cylinder (D)	-1.16 (1.10)	-1.12 (0.71)	-0.93 (0.89)	-0.97 (0.49)
CDVA (logMAR)	0.36 (0.24)	0.07 (0.13)	0.06 (0.11)	0.05 (0.11)
Binocular CDVA (logMAR)	0.25 (0.11)	0.04 (0.10)	0.03 (0.06)	0.03 (0.09)

Abbreviations: D = diopters; UDVA = uncorrected distance visual acuity; CDVA = corrected distance visual acuity; SE = spherical equivalent  
Values reported as mean (SD)

and  $0.03 \pm 0.06$  and  $0.03 \pm 0.09$ , respectively, for binocular distance BCVA (Figure 3). Improvements in spherical equivalent, sphere, and cylinder were also seen (Table and Figure 4).

On slit-lamp examination, we looked for the presence of glistenings, PCO, and striae through 12 months postoperative. An overwhelming number of eyes did not experience any of these visual phenomena. In total, 99.2% of eyes had no glistenings, 69.7% had no PCO, and 70% had no striae and no eye experienced severe visual phenomena (Figure 5).

## CONCLUSION

The Acunex IOL, with its novel hydrophobic glistening-free acrylate material, meets the strictest requirements in optical clarity, refractive stability, and predictability. In our experience, the lens remained clear through 12 months postoperative, and outcomes were stable. This aspheric monofocal IOL is appropriate for all cataract surgery patients and can help them to achieve excellent, stable refractive results postoperatively. ■

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## MANFRED R. TETZ, MD

- Director, Eye Center-Spreebogen, Berlin
- Scientific Director, Berlin Eye Research Institute
- manfred.tetz@atk-spreebogen.de
- Financial disclosure: None acknowledged

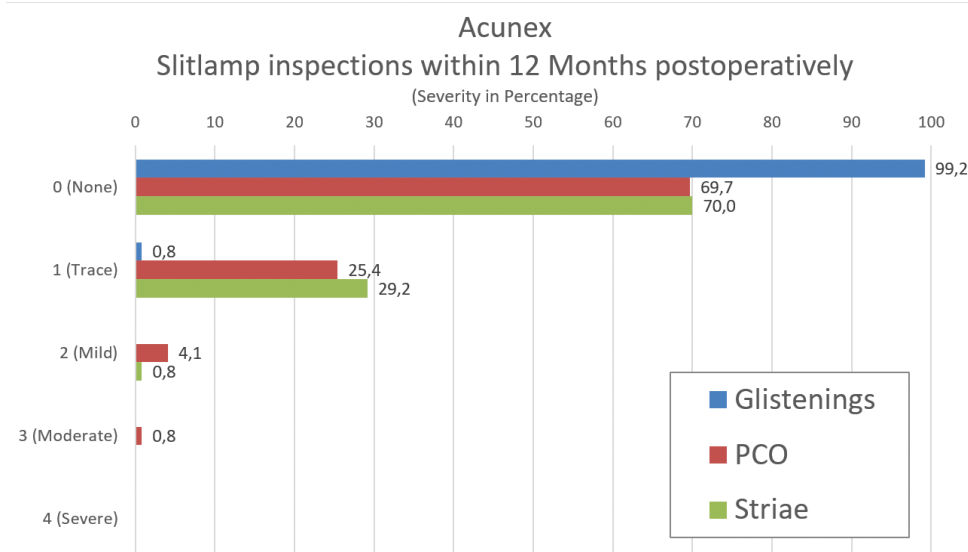


Figure 5. Severity of visual phenomena with the Acunex.



# Acunex Vario: The New Standard — EDOF IOL for Every Patient

Study shows excellent visual acuity at far and intermediate distances up to 60 cm and high level of spectacle independence.

BY HARVEY S. UY, MD; TOBIAS H. NEUHANN, MD; MATTHIAS MÜLLER-HOLZ, MD; AND DETLEV R.H. BREYER, MD

*With its unique optic design, the Acunex Vario IOL (Teleon Surgical) extends visual comfort and provides excellent vision at far and intermediate distances up to 60 cm. It is a true varifocal IOL with extended depth of focus (EDOF) power. In this article, surgeons share their personal experience with the lens and detail recent study results.*



## Results of a First-in-Man Study

By Harvey S. Uy, MD

I was fortunate to be one of the first surgeons worldwide to implant the Acunex Vario IOL. Over the course of my experience, the lens qualities, ease of use, and postoperative results have continued to be impressive. I currently recommend this EDOF lens to many of my patients, as it seems to fit their active lifestyles and answers their visual needs.

## STUDY RESULTS

We conducted the first-in-man study of the Acunex Vario in 20 patients who underwent bilateral implantation. Distance, intermediate, and near visual acuity; defocus; the presence of dysphotopsia; and the rate of spectacle independence were measured preoperatively and at 3, 6, and 12 months postoperatively to determine the visual and refractive outcomes and rate of visual disturbances with the Acunex Vario EDOF IOL.

**Visual outcomes.** All patients manifested with excellent distance and intermediate visual acuity. Mean uncorrected monocular distance VA improved from 0.45 preoperatively to 0.04 at 12 months postoperatively while mean uncorrected intermediate VA remained stable from 0.18 at 3 months postoperative to 0.16 at 12 months postoperative. Also, for an EDOF lens with only 1.50 D add, patients had surprisingly good uncorrected near VA (Figure 1).

Monocular distance, intermediate, and near BCVA also improved from preoperative measurements and remained stable through the 12-month follow-up (Figure 2).

**Defocus.** Figure 3 shows the defocus curve at 12 months postoperative. The Acunex Vario lens demonstrated the expected EDOF curve, which helped to provide continuous vision at different distances.

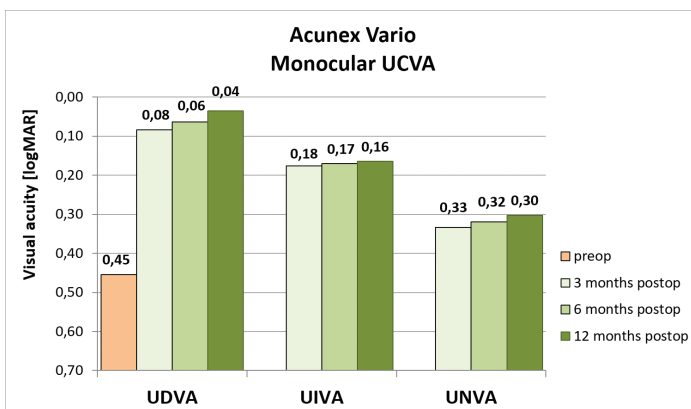


Figure 1. Monocular UCVA with the Acunex Vario.

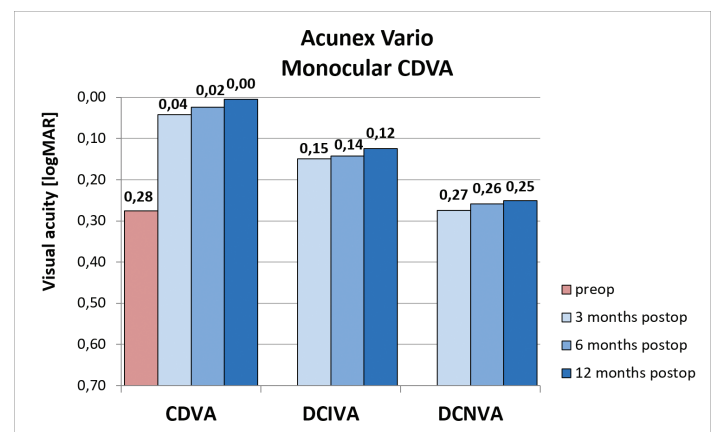


Figure 2. Monocular distance BCVA with the Acunex Vario.

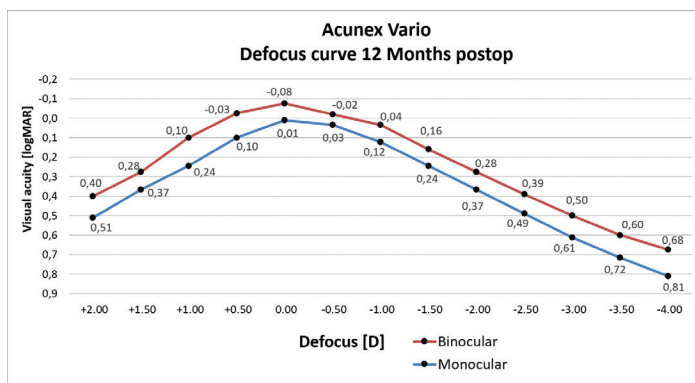


Figure 3. Defocus curve with the Acunex Vario at 12 months postoperative.

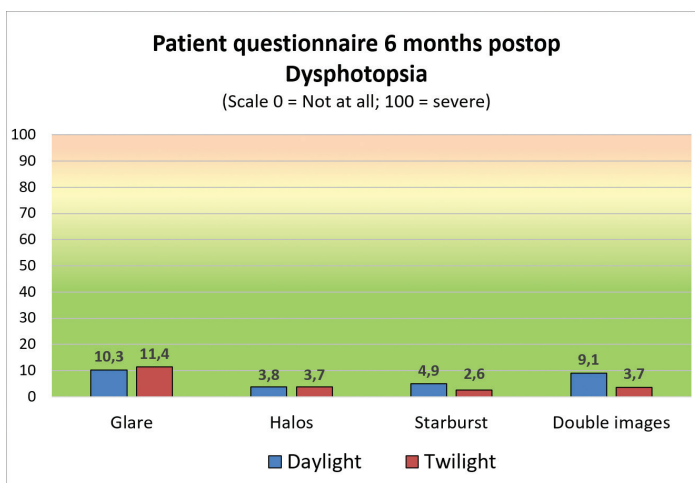


Figure 4. Presence of dysphotopsias with the Acunex Vario at 6 months postoperative.

**Dysphotopsias.** Dysphotopsias are one main reason for IOL dissatisfaction and the low uptake of multifocal implants. At the 6-month visit, our patients were specifically asked to evaluate the degree of postoperative glare, halos, starbursts, or double images in daylight and twilight (grading scale: 0, no dysphotopsias; 100, severe dysphotopsias). Overall, the patients reported extremely low levels of dysphotopsia (Figure 4), suggesting that the Acunex

## Used correction 6 months postop

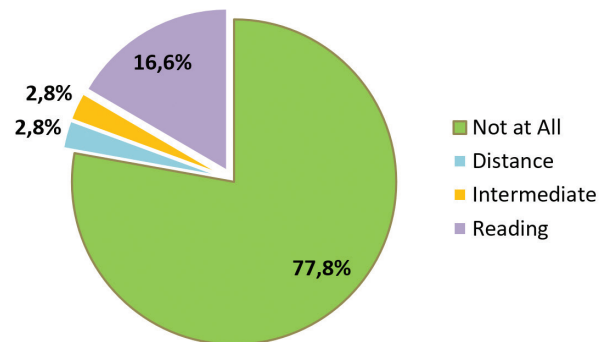


Figure 5. The need for spectacle correction at different distances with the Acunex Vario at 6 months postoperative.

Vario achieves high levels of postoperative satisfaction and may be a good alternative for patients who are at higher risk for visual disturbances.

**Spectacle independence.** Also at the 6-month postoperative visit, 77.8% of patients did not need spectacle correction at all, 2.8% needed correction for distance, 2.8% for intermediate, and 16.6% for near vision (Figure 5). When questioned directly, the patients reported that they were very happy with the results.

## CONCLUSION

Our study showed that patients experienced a wide range of vision with the Acunex Vario IOL and an insignificant amount of visual disturbances. We believe that this lens is suitable for all types of cataract surgery patients and produces high levels of postoperative satisfaction.

When my patients want to be able to see flawlessly at distance and intermediate and they want to have an active lifestyle, I now select the Acunex Vario. It provides consistent, robust, and continuous range of vision. Post-LASIK and post-refractive surgery patients may also benefit from this lens because of the very small amount of visual disturbances.



## Cumulative Visual Acuity, Contrast Sensitivity With the Acunex Vario

By Tobias H. Neuhann, MD; and Matthias Müller-Holz, MD

The advanced segmented optics of the Acunex Vario have proven to be a success, as more than 800,000 IOLs with this optic design have been implanted to date. The Acunex Vario provides patients with significantly more vision from infinity to 0.40 m than a standard monofocal IOL or a monofocal EDOF IOL (Figure 6). This is due to the lens' true varifocal EDOF design, featuring a 1.50 D add in an asymmetric near segment.

In our experience, the Acunex Vario can be folded easily, and placement in the injector is achieved smoothly. The lens unfolds in

a controlled manner in the capsular bag, and it maintains proper stability. Our patients have been extremely satisfied with this lens, and they seem to respond positively to the small degree of multifocality (ie, EDOF), which helps to provide excellent quality of vision at intermediate and distance vision.

## STUDY RESULTS

We recently conducted a study to assess cumulative distance, intermediate, and near visual acuities and contrast

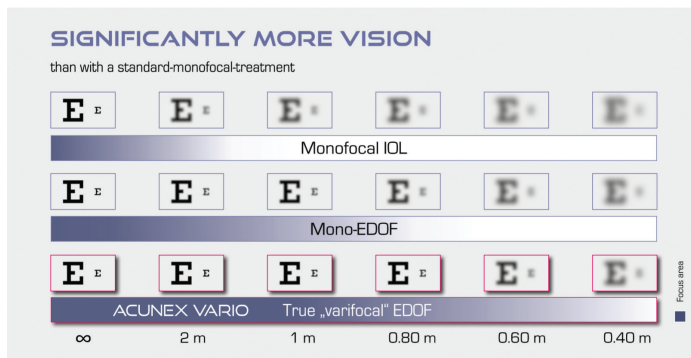


Figure 6. Range of vision with a monofocal IOL, a monofocal EDOF IOL, and the Acunex Vario IOL.

sensitivity at 6 months postoperative. This article reviews the results.

A total of 33 patients (66 eyes) were enrolled in the study. All patients received the Acunex Vario in at least one eye, and all procedures were performed by the same surgeon (THN). All results of the study are for monocular vision in the Acunex Vario eye enrolled in the study.

Preoperatively, the mean UCVA was 0.59 logMAR. The cumulative percentage of eyes that achieved a cumulative

UCVA of 0.1 logMAR by 6 months postoperative was 100%, and this remained stable through our last assessment at 6 months postoperative. Also at 6 months postoperative, 83% of eyes had achieved 0.0 logMAR and 22% had achieved -0.1 logMAR (Figure 7).

The results for cumulative intermediate UCVA (Figure 8) and cumulative near UCVA (Figure 9) were also impressive. By 6 months postoperative, 100% of eyes achieved 0.3 logMAR or better cumulative near UCVA, 83% achieved 0.2 or better, 56% achieved 0.1 or better, 22% achieved 0.0 or better, and 6% achieved -0.1 or better. These results were stable from 1 month postoperative in all acuities. At that same time point, 100% of eyes achieved a cumulative near UCVA of 0.5 or better, 94% of 0.4 or better, 56% of 0.3 or better, 28% of 0.2 or better, and 6% of 0.1 or better. In all cases, the results were stable from 1 month postoperative.

When we looked at cumulative distance-corrected vision (Figures 10–12), again the results were excellent. By 6 months postoperative, 100% of patients had achieved 0.1 logMAR and 94% had achieved 0.0 cumulative distance BCVA. The results were either stable or had improved from 1 month postoperative (Figure 10). Regarding distance-corrected intermediate visual acuity, 88% of patients had achieved 0.1 logMAR by 6 months

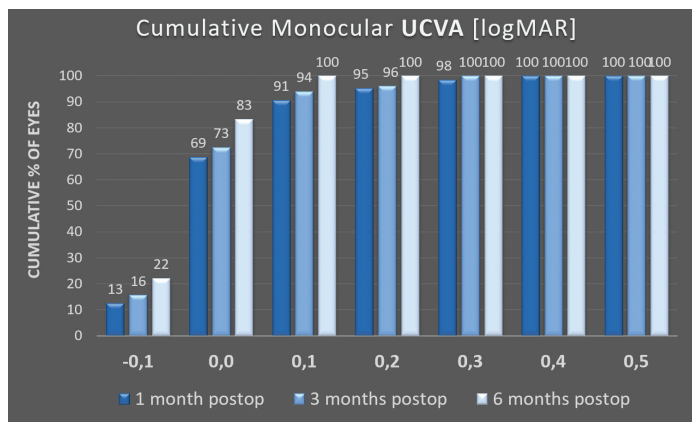


Figure 7. Cumulative monocular UCVA.

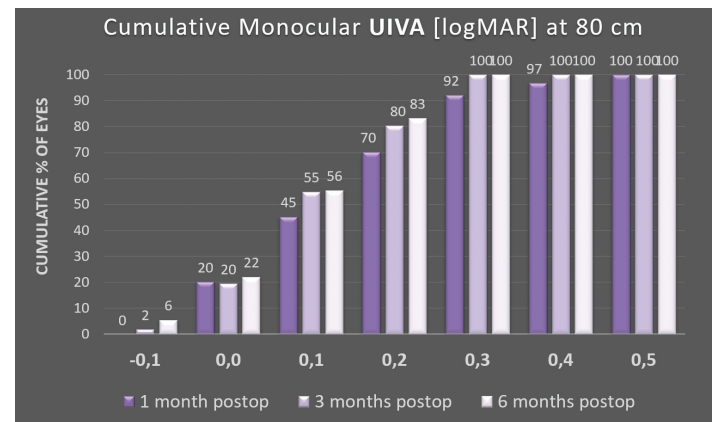


Figure 8. Cumulative monocular intermediate UCVA.

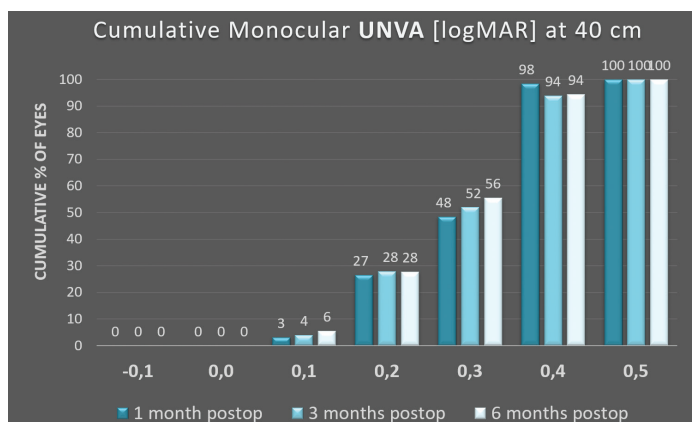


Figure 9. Cumulative monocular near UCVA.

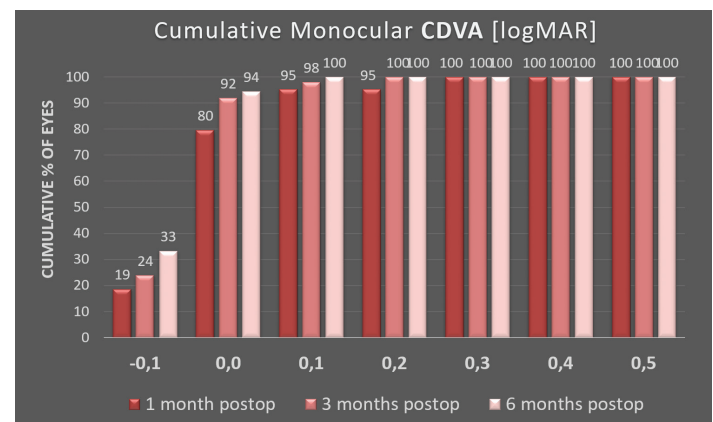


Figure 10. Cumulative monocular distance-corrected BCVA.

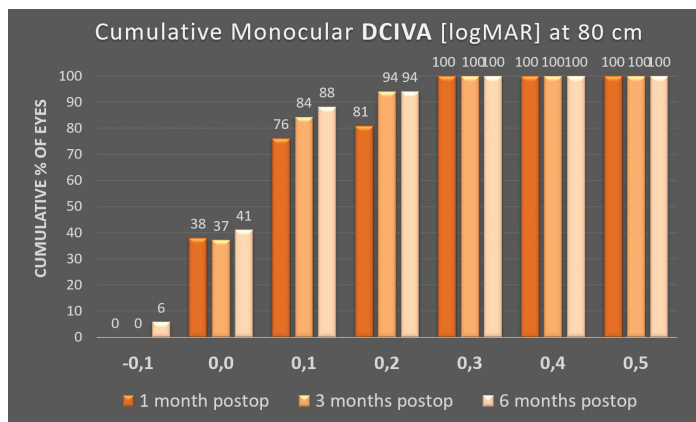


Figure 11. Cumulative monocular distance-corrected intermediate BCVA.

postoperative, compared with 76% at 1 month, and 94% achieved 0.2 logMAR, compared with 81% at 1 month (Figure 11). Results were stable over the 6-month period. Lastly, regarding cumulative distance-corrected near visual acuity, 100% of patients achieved 0.4 logMAR or better at 6 months postoperatively, 81% achieved 0.3 logMAR or better, and 50% achieved 0.2 logMAR or better. The trend showed that the results at 0.2 and 0.3 increased over the 6-month period (Figure 12).

We also tested contrast sensitivity in photopic and mesopic conditions with and without glare and at different spacial frequencies (Figure 13). Results were fairly consistent at spacial frequencies of 1.5, 3, 6, 12, and 18 cycles per degree in photopic conditions with and without glare and in mesopic conditions with and without glare.

## CONCLUSION

The results of our study clearly showed that the Acunex Vario provides stable refractive cumulative visual acuity and excellent contrast sensitivity in photopic and mesopic conditions with and without glare. The combination of the study results, our positive

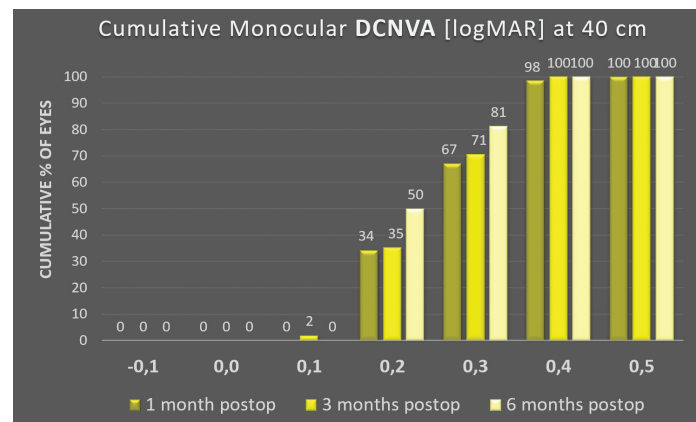


Figure 12. Cumulative monocular distance-corrected near BCVA.

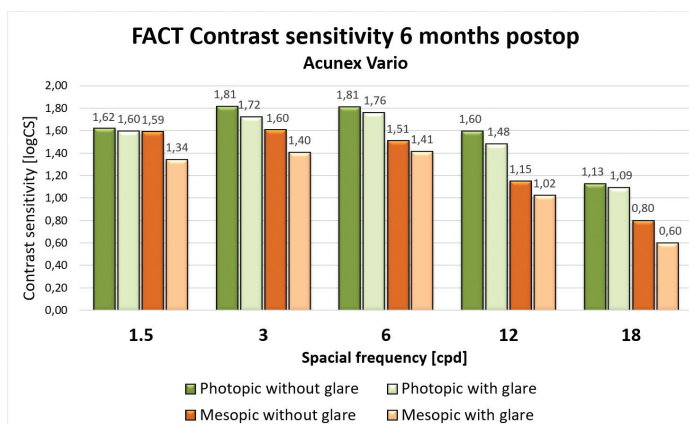


Figure 13. Contrast sensitivity in photopic and mesopic conditions.

experience with the handling of the IOL, and our patients' high satisfaction rate has positively influenced us to implant the Acunex Vario in an increasing number of patients. It is an excellent varifocal IOL to add to our armamentarium of lens options.



## Complementing the Blended Vision Strategy With the Acunex Vario

By Detlev R.H. Breyer, MD

The concepts of mini-monovision and blended vision are not new. In fact, they were created as a way for surgeons to sidestep the visual compromises associated with the use of monofocal IOLs, helping patients to achieve an acceptable level of vision at all distances. I used a blended vision strategy for many years with excellent results; however, I recently began implanting a varifocal EDOF IOL, the Acunex Vario, with even better results. This lens provides patients with the vision they have always wanted and that I could not provide with blended vision.

With the Acunex Vario, a lens that I believe represents the new standard of care for routine cataract treatment, patients

can experience the benefits of a varifocal EDOF IOL, providing an extended range of vision and reducing the unwanted visual phenomena associated with multifocal lenses, including halos, glare, and dysphotopsia.

## MONOVISION VERSUS BLENDED VISION

Studies have shown that only between 59% to 67% of patients tolerate monovision, compared to 97% who tolerate blended vision.<sup>1-3</sup> In a classic monovision strategy, the dominant eye is targeted for emmetropia and the nondominant eye for up to -3.00 D. This strategy creates a large blur zone in



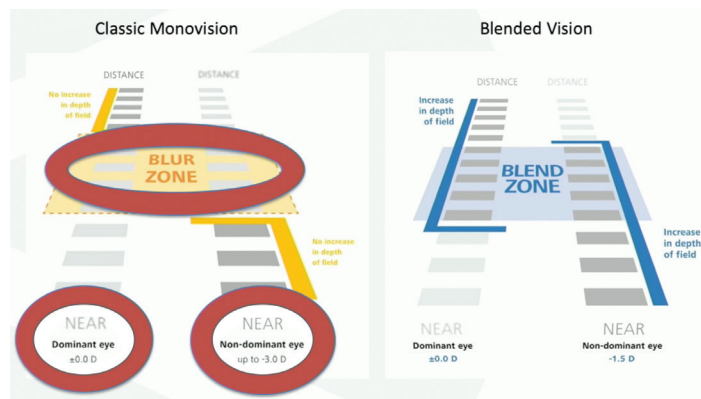


Figure 14. Visual dominance with a monofocal IOL and a blended vision strategy.

intermediate vision and does nothing to increase the depth of field in the distance zone in one eye and the near zone in the other eye. Alternatively, in a blended vision strategy, the dominant eye is still targeted for emmetropia, but the nondominant eye is targeted for -1.50 D. This creates a blended zone of vision in the intermediate range (Figure 14).

In my preferred blended vision strategy, the Düsseldorf miLens strategy, we use an IOL with a low-add varifocal optic in one eye and an IOL with a higher add in the other eye. With the low-add IOL, reading small print is difficult. We compensate for this either with another low-add IOL targeted for slight myopia or a higher-add optic, which is ideal for reading small print, in the other eye.

With this strategy, what we have found is that you can create a very smooth, constant, and better defocus curve by combining low- and high-add IOL technologies. To date, our enhancement rate is low.

But the blended vision strategy using a high-add optic does also have several disadvantages, including:

- Poor mesopic vision and photopic phenomena in one eye if implanting a diffractive higher-add IOL; and
- One to 3 months of neural adaptation.

### BETTER VISION WITH THE ACUNEX VARIO

As an alternative to blended vision, I recently started using the Acunex Vario. The visual dynamics of the Acunex family of lenses is very different from other refractive progressive EDOF and multifocal IOLs, and the lens produces excellent visual quality.

Incorporating this low-add IOL into our armamentarium allows me to provide an ideal solution to patients who especially desire intermediate vision. This lens also reduces the presence of photopic phenomena including halos and glare, and it maintains a contrast sensitivity that is better compared to other EDOF and multifocal IOLs.

I believe that the Acunex Vario allows us to have the best chance for happy patients after surgery. And from the surgeon's

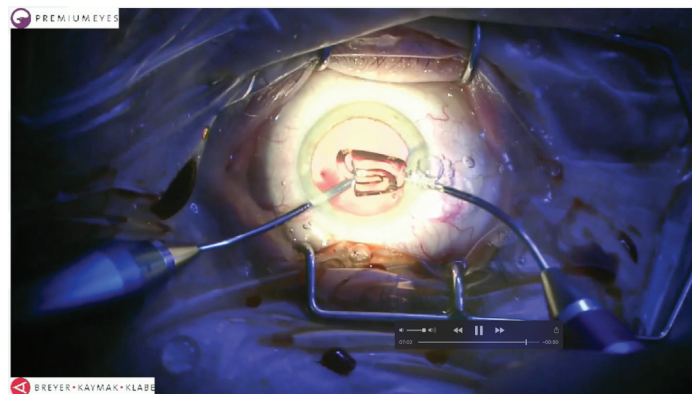


Figure 15. The Acunex Vario IOL unfolds smoothly in the capsular bag.

perspective, I especially like the segmental optic design because it's not as pupil-dependent as other rotational symmetric designs, even if it rotates postoperatively. It is also easy to handle and inject into the capsular bag, and the lens unfolds in a controlled manner (Figure 15). I can use a 2.2-mm incision, which I prefer.

### CONCLUSION

Customizing treatment strategies for our cataract surgery patients is integral to the success of our surgeries. Over time, I have found a variety of IOLs that help me to achieve these custom results, and today the Acunex Vario plays an important part in the success of my surgery. ■

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#### DETLEV R.H. BREYER, MD

- Owner, PremiumEyes and Breyer-Kaymak-Klabe Eye Surgery, Düsseldorf, Germany
- dr.detlev.breyer@gmail.com
- Financial disclosure: Consultant, speaker, travel grants (Teleon Surgical)

#### MATTHIAS MÜLLER-HOLZ, MD

- Ophthalmologikum Dr. Neuhann, Munich, Germany
- Financial disclosure: None acknowledged

#### TOBIAS H. NEUHANN, MD, FEBOS-CR

- Ophthalmologikum Dr. Neuhann, Munich, Germany
- tneuhann@web.de
- Financial disclosure: None

#### HARVEY S. UY, MD

- Medical Director, Peregrine Eye and Laser Institute, Makati City, Philippines
- Clinical Associate Professor, University of the Philippines
- harveyuy@gmail.com
- Financial disclosure: None acknowledged

# Acunex VarioMax: The Advantages of Varifocality

Brilliant vision without compromise.

BY JORGE L. ALIÓ, MD, PHD



Thanks to the unique optical design of the Acunex VarioMax (Teleon Surgical, Figure 1), which introduces the concept of varifocality into the Acunex family of lenses, patients can achieve truly natural unaided vision at all distances after cataract surgery. With 94% light transmission, the highest of any multifocal IOL, the presbyopia-correcting multifocal VarioMax helps patients to achieve brilliant vision without inducing the unwanted side effects of halos, glare, and dysphotopsia. It is the first IOL with a varifocal optical design and a continuous surface profile. In this article, I describe the concept of varifocality and its benefits.

## WHY THE VARIOMAX IS UNIQUE

Combining an aspherical, asymmetrical distance segment with a 3.00 D add sector-shaped near segment, the Acunex VarioMax uses the same functional design and working



Figure 1. The Acunex VarioMax IOL.

## WHAT IS VARIFOCALEITY?

Varifocality is an optical principle in which the power of the optic surface continuously changes in only one specific sector. In other words, the light is refracted to other foci only in a specific sector, and the rest of the lens behaves like a monofocal IOL. All multifocal lens systems, both IOLs and contact lenses, are based partly on the principle of varifocality. There are two different varifocal lens designs, one that includes a near add of 3.00 D (Acunex VarioMax) and one that includes an EDOF add of 1.50 D (Acunex Vario).

principle as the Lentis Mplus (Teleon Surgical) to create a continuous central distance area and smooth transmedial surface transitions between zones. Furthermore, the varifocal IOL design creates maximum light transmission for optimized focus across all distances and increased contrast sensitivity. Compared with diffractive multifocal IOLs, which have a diffractive ring design, the advantage of a multifocal segmented optic, or varifocality, is that it minimizes glare, halos, and other photic phenomena that are typical in twilight or dim light conditions (Figure 2).

The varifocal optic platform has a proven rotationally asymmetric optic design and excellent visual outcomes, with more than 800,000 lenses implanted worldwide in the past 10 years. In addition to the benefits of the Mplus' high-add segment, the VarioMax is made of Acunex's novel glistening-free hydrophobic lens material, a technology that is described elsewhere in this supplement. In short, this material ensures that the optic stays clear without disturbing stray-light effects. With a 4% water content, the glistening-free material prevents microvacuoles from forming.

## EXCELLENT RESULTS, EASY TO USE

The Acunex VarioMax is my favorite lens for presbyopic patients because I know they will achieve maximal visual results at all distances. In one patient questionnaire after implantation of the VarioMax, 97.8%, 90.4%, and 92.4% of patients reported increased distance, intermediate, and near vision, respectively (data on file with Teleon Surgical). Further, the C-loop

## CONTINUOUS TRANSMISSION TECHNOLOGY

First IOL with varifocal effect and continuous surface profile for a homogeneous light distribution (high balanced effect)

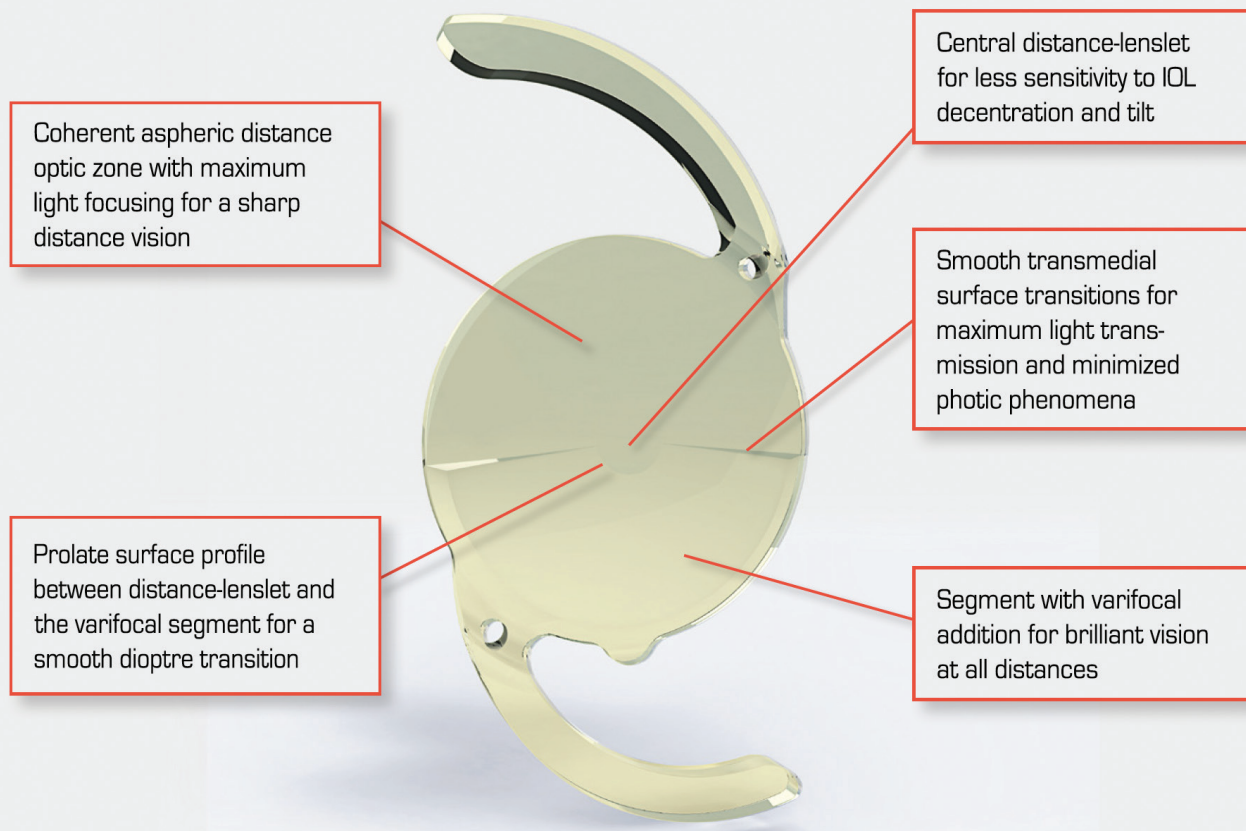


Figure 2. Design elements of the Acunex VarioMax IOL.

haptic design promotes excellent postoperative rotational stability, which helps to ensure the best possible visual results and refractive stability. The central distance-lenslet is also independent from decentration or tilt. My patients are free from unpleasant photic phenomena or blurred vision.

In addition to the superb postoperative outcomes with the Acunex VarioMax, I am drawn to this lens because of its ease of use. It's simple to handle, like a monofocal IOL, but it features all the advantages of varifocal premium IOL technology. The lens unfolds beautifully in the capsular bag and is nicely controlled inside the eye, which is due to the lens' thin optical geometry.

### CONCLUSION

The concept of varifocality, which is far more effective and consistent than the multifocal concept with two or three

discreet diffractive focal points, was first introduced with the Lentis Mplus IOL.

The advantages of this lens design, combined with the advantages of a novel glistening-free hydrophobic material, are now available in the Acunex VarioMax. In my experience to date, this lens does not disappoint, and it is now my go-to IOL in presbyopic patients. ■

#### JORGE L. ALÍO, MD, PHD, FEBOPHTH

- Professor and Chairman of Ophthalmology, Visum-Instituto Oftalmológico de Alicante, Miranza Group, Spain
- Miguel Hernandez University, Alicante, Spain
- [jlalio@visum.com](mailto:jlalio@visum.com)
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