

B&L Aspheric Lenses- the next step in IOL evolution

Bausch & Lomb Advanced Optics aspheric lenses SofPort™ and Akreos™ represent an important step in the evolution of IOL technology, offering aberration free optics and uniform power. The result is better vision for a far wider range of patients than has been possible before.

The new B&L Advanced Optic lenses take into account both advanced optical theory and the practical anatomic realities of the human eye. Most IOLs today have a design that actually induces positive spherical aberration. As a result, cataract patients who undergo IOL implantation end up with positive spherical aberration that has a significant effect on quality of vision. Patients experience this as a decline in contrast sensitivity, making it hard to discern subtle visual differences especially at night.

More recently, intraocular lenses have been designed with a negative spherical aberration designed to compensate for positive spherical aberration found in the cornea of the typical cataract patient. However, these lenses depend on precise positioning. A small offset in centration may result in significant higher order aberrations such as coma, along with significant visual impairment. These negative spherical aberration IOLs are contra-indicated in situations where you may expect less than perfect IOL centration.

B&L's Advanced Optic IOLs solve the problems of both the conventional positive spherical aberrations lenses and the more recent IOLs that attempt to compensate for natural positive spherical aberration in the cornea. Simply put, these new lenses create no additional spherical aberration.

The lenses have aspheric anterior and posterior surfaces. This design means that no new aberrations are introduced into the patients' eyes after implantation. Since they are independent of corneal shape, the lenses are suitable for all patients, including those who have had previous laser refractive surgery, as well as those with keratoconus or other pre-existing corneal aberrations.

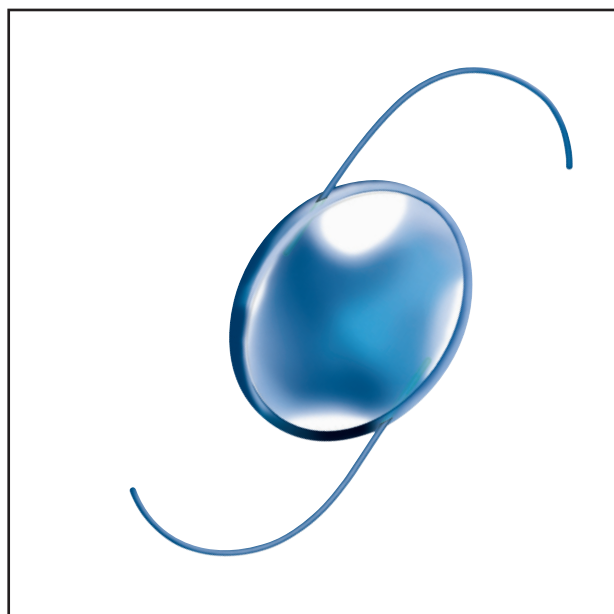
Another important design feature of the new B&L Advanced Optic IOLs is that they provide uniform power from the centre to the edge of the lens. The lenses are not dependent on the eyes optical alignment, increasing the predictability of visual acuity outcomes. This is true even for patients with zonular weakness or decentered pupils.

The aspheric lenses closely follow the optics of the phakic eye. . In the natural phakic eye the optics are not perfectly aligned- the pupil is not centered on the optical axis and the visual axis does not pass through the centre of the pupil or the lens.

No two eyes are exactly alike in terms of alignment or sphericity. The constant power of the new IOL design does not worsen visual defects resulting from the imperfect shape and alignment of the eye. This is particularly important when the IOL is not perfectly positioned.



Akreos Advanced Optics acrylic lens



Sofport Advanced Optics silicone lens

The natural phakic eye provides a generous amount of depth of field. This is lost when patients receive a conventional positive spherical aberration IOL. However, the aberration free IOL was designed to leave the eye with its natural positive spherical aberration, and the associated depth of field.

The new lenses are also designed to reduce another complaint common with conventional IOLs, glare. Conventional IOLs produce glare symptoms when light reflects from the anterior surface of the IOL back towards the retina. The new lenses include Antiglare Technology that reduces this glare. The design includes a lens material with a moderate refractive index, and the anterior surface has a steeper curvature- both features that reduce glare symptoms.



“As we continue to include patients, we observe a clinical benefit in terms of improvement of mesopic contrast sensitivity, as well as a lower rate of higher-order aberrations.”

DAMIEN GATINEL MD

Rothschild Foundation
Paris, France

French Experience with Akreos AO

Damien Gatinel MD (Paris) has been implanting the Akreos lens routinely since its appearance on the market in (2000). He emphasised that he particularly appreciates the stability of the lens once implanted in the bag, and its resistance to anterior vaulting. For this reason, the Akreos has become his lens of choice when doing combined cataract and glaucoma surgery.

He is currently investigating the benefit of the new aspheric Akreos AO lens as part of a multicentre randomized prospective study. That study involves patients with bilateral symmetric cataracts. One eye receives an Akreos spherical lens, and the contralateral eye receives a new aspheric Akreos IOL. The two-year study is ongoing in six centres around Europe. The study will track the high order aberrations using wavefront sensing, and will

measure both photopic and mesopic contrast sensitivity before and after surgery.

“As we continue to include patients, we observe a clinical benefit in terms of improvement of mesopic contrast sensitivity, as well as a lower rate of higher-order aberrations. This is direct evidence of the validity of the concept, which is aimed at improving the quality of vision in dim light conditions, when the pupil diameter reaches 4.0 mm or more.”

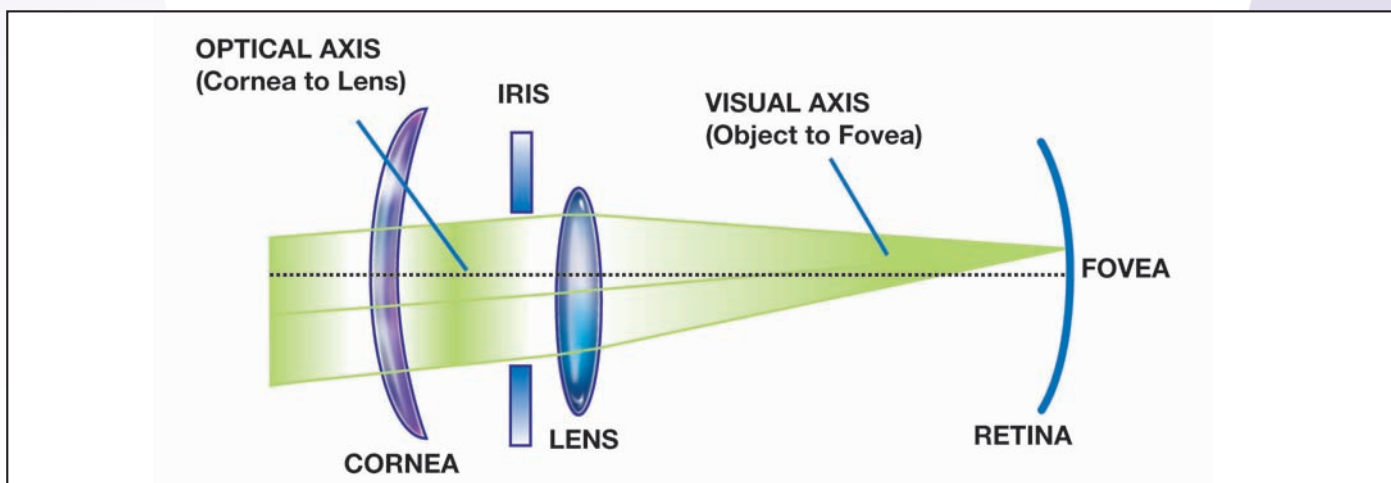
Dr Gatinel reports that he too has seen a very good correlation between intended and achieved refractive results, both in terms of predictability of the refraction and unaided visual acuity. He observed a very low incidence of dysphotopsia or glare, which he attributed to the moderate refractive index of the lens. The moderate refractive index generates very little lens reflectivity and less multiple internal reflections, as opposed to higher refractive lens materials.

He added that he has seen no reports of glare in patients implanted with the new aspheric Akreos. That lens is made of the same acrylic material and has the same refractive index as the earlier spherical Akreos IOL.

He said that the Akreos IOL is the first choice for nearly 100% of the cataract patients in his practice, since its optical efficiency does not depend on the corneal aberration profile, as it induces no high order aberrations. Possible exceptions would be a patient having a lot of preoperative corneal negative aberrations following hyperopic LASIK, or a myopic LASIK patient who is left with a significant increased amount of positive spherical aberration.

“The ultimate potential benefit of this lens will be seen in cases where the pupil dilation extends beyond 4mm, which is the case of most of the cataract patients after some adaptation to dark luminance conditions. In the case of patient presenting with a permanent senile miosis however, if there is no obvious optical benefit, there is no drawback in putting an aberration free lens either. This is why I would still use this lens in patients having small pupils whenever possible.”

He uses the HydroPort injector to implant the IOL through a 3.00 mm clear corneal incision preferably located on the steepest meridian. He notes that attention must be given to the anterior/posterior orientation of the Aspheric Akreos AO IOL, since it features a posterior 360° anti-PCO ring. The aspherisation of the optic makes it thinner, so there is no need to modify the characteristics of the incision.



All axes in the eye are not perfectly aligned and no two eyes are the same shape

Pre- and/or postoperative astigmatism management is similar to that employed when implanting a spherical IOL. For example, combined astigmatic surgery by arcuate incisions can be planned concomitant to the cataract surgery.

Finding the centre

Dr Gatinel commented that it is really impossible for the surgeon to fully control the optical centration of the optic of the IOL, because of the absence of alignment of the cornea and the lens, and the slight amount of pupil decentration in relation to the limbus.

“To reference the centering of the optic of the IOL, it makes sense to use the center of the pupil perimeter, since any other defined optical axis would be difficult to determine. The choice of this reference point is not only advisable for convenience, but also because the high order aberrations are referred to the center of the pupil.”

He notes that the human pupil is always slightly offset nasally and superiorly to the limbus. Its center may shift with pupil constriction and dilation. Thus, despite perfect anatomical centering in the capsular bag, one may observe imperfect optical centering with regards to the center of the pupil.

The aspheric lenses inducing negative amounts of spherical aberration have been designed as if the eye was perfectly rotationally symmetrical with a pupil center aligned with that of the optic of the lens. Those lenses work well in reducing the spherical aberration in an eye that would have slight amount of positive spherical aberration, but their performance could become deleterious after 0.4 mm of decentration, because they would then induce coma and astigmatism.

The new aspheric Akreos has been designed to induce no spherical aberration. Parallel incoming light rays refracted by the lens would focus into one single point, even if the lens were slightly decentered with regards to the pupil center. The aspheric lenses induce neither spherical aberration nor coma-like aberrations from variations of lens positioning.

“One may argue that the eye would be left with some moderate amounts of positive corneal spherical aberration, which may impair the quality of the eye. In fact, moderate amounts of spherical aberration may not be detrimental for the visual system, since it will cause minor loss of contrast sensitivity for distant vision but result in a greater depth of field as if no spherical aberration was present.”

He reiterated that the aspheric Akreos IOL has several features that contribute to its optical quality. The moderate refractive index and the lathing technique warrant overall excellent manufacturing quality that may also keep the lens from inducing higher order aberrations. The haptics and their junction with the optic not only help to prevent axial vaulting but also lateral shifting. The overall diameter of the lens is slightly greater for low dioptric power ranges, to help maintain a good stability in myopic eyes. Moreover, the full continuous 360° square edge keeps PCO to a minimum.

“Unlike many other foldable IOLs, it is ready for implantation a few seconds after it has been taken out of its package, even if you implant it by injector,”

GIORGIO LOFOCO

San Pietro Hospital
Rome, Italy

Italian experience

Giorgio Lofoco MD, of the San Pietro Hospital in Rome, also reports very good results with the Akreos IOL.

“Since we introduced it in our practice, the Akreos Adapt has become our IOL of choice. I am personally implanting the Akreos Adapt in 90% of my patients, so I may say I know this lens very well.

He notes that since he started implanting the Akreos Adapt IOL he has seen a dramatic decrease in the need for YAG laser capsulotomy for treatment of PCO. Dr. Lofoco has planted more than 700 Akreos IOLs to date. He also reports receiving no complaints of dysphotopsia symptoms after implantation of those lenses.

He emphasised that the Akreos Adapt was very surgeon-friendly, noting that it had quickly become the IOL of choice among his younger colleagues. When implanted with forceps, a 3.8 mm incision is enough. When using an injector, the incision can be as small as 3.1 mm.

“Another feature of the Akreos Adapt that I like a lot is that, unlike many other foldable IOLs, it is ready for implantation a few seconds after it has been taken out of its package, even if you implant it by injector,” he said.

Dr Lofoco is also participating in the European Multicentre Study on the new aspheric Akreos Advance Optics IOL. Patients taking part in that study receive an Akreos Adapt AO in one eye and a conventional Akreos Adapt in the fellow eye. They do not know which eye received the aspheric lens, in order not to influence both their answers about which eye has better sight and their performance at postoperative contrast sensitivity testing.

“I have implanted a few of the Akreos Advance Optics aspheric IOLs as part of the trial. My personal data are too few to draw significant conclusions, nonetheless I have observed that patients tend either to have no preference or to prefer the eye where the aspheric IOL is implanted.”

Based on his experience, Dr Lofoco believes that most patients are ideal candidates for these lenses. One exception would be cases where implantation in the capsular bag is not possible. The other exception would be patients who have undergone excimer refractive surgery for hyperopic defects.

“These patients have a negative corneal spherical aberration. Therefore would probably benefit more from having a traditional intraocular lens carrying a positive spherical aberration that may compensate the secondary negative corneal aberration,” he explained.

Dr Lofoco noted that in theory the Adapt AO might be more forgiving in cases of slight IOL decentration and tilt. Moreover, since it leaves the eye with a small amount of positive spherical aberration, it may allow for a better depth of field, something that would be much appreciated by patients in real life situations.



“I use the SofPort AO Aspheric IOL as my primary IOL in 90% of my patients.”

UDAY DEVGAN, MD, FACS

Asst. Clinical Professor,
Jules Stein Eye Institute,
UCLA School of Medicine,
Los Angeles, California, USA

Attending Surgeon,
Olive View - UCLA Medical Center,
Sylmar, California, USA

One surgeon's experience with the Sofport AO IOL

Uday Devgan MD (Los Angeles, California) has been implanting the SofPort IOLs for more than five years, during which time he has implanted thousands of the lenses. This includes many hundreds of the latest SofPort AO (Advanced Optics) Aspheric IOL. Since April of this year he has been using the Easy Load injector system when implanting the SofPort AO IOLs.

“I use the SofPort AO Aspheric IOL as my primary IOL in 90% of my patients. The advantage of the truly aspheric, aberration-free design is better optic performance and increased image quality compared to a traditional IOL in nearly all patients. Because of the uniform edge-to-edge power of the IOL and the lack of aberrations, this IOL is minimally affected by decentration, making it especially good for cases such as pseudexfoliation.”

He notes that the new lens design produces very good results in terms of the achieved versus intended refraction. Moreover, patients can tell the difference with the new lenses.

“In patients where one eye has a traditional IOL (B&L SofPort Li61SE) and the other eye has the aspheric IOL (B&L SofPort Li61AO), you find patients who clearly note a difference between the two eyes. Particularly in younger patients, who tend to have larger pupils and more demands of their vision in mesopic and scotopic situations, a benefit from the aspheric IOL is noted. I even have one patient who is scheduled for an IOL exchange in order to remove the traditional IOL and replace it with an aspheric IOL so that it matches his fellow eye.”

He stressed that the aberration-free aspheric IOLs are minimally affected by decentration. In fact, they are clearly advantageous in situations where IOL centration may be an issue. In addition, these IOLs will not add to, or subtract from, any of the cornea's natural qualities.

“For these reasons, the SofPort AO is my primary IOL choice in nearly all patients. I cannot think of a patient that would be adversely affected by having a truly aspheric, aberration-free IOL implanted instead of a traditional IOL. Perhaps one exception would be a patient who has previously undergone hyperopic LASIK with an older excimer laser platform and has significant amounts of induced negative spherical aberration in their corneas.”

The SofPort Easy Load injector is the latest addition to the product platform. The IOL is placed into the injector system without the need to ever touch the IOL optics or haptics with forceps or other instruments. This system allows consistent and

reliable loading of the IOL into the injector even by those with significant presbyopia.

Dr Devgan said that in his experience the SofPort Easy Load injector allows him to inject through an unenlarged 2.8mm diamond clear corneal incision with room to spare. More importantly, it allows IOL loading and insertion without any direct contact with the IOL optic or haptics. This prevents marring or marking of the optic surface and perhaps may contribute to a lower risk of endophthalmitis given the closed system.

The unique SofPort Easy Load injector is a one-handed injector system that delivers the IOL in a completely flat, uni-planar manner, without any haptic sweep and without the need for intra-ocular gymnastics. The IOL can be placed completely flat, and completely within the capsular bag with just one hand and no need for a second instrument to place the haptics.

“The pearl for implanting this IOL is to aim it deep into the capsular bag, since the IOL will come out exactly where you point the injector. Given my 2.8mm incision size and the relatively long tunnel length of about 2.2 to 2.4mm, my incisions seal very well and induce minimal astigmatic flattening at the incision site.”

Dr Devgan's practice includes a lot of patients with advanced cataracts. Therefore he uses A-scan ultrasound over the Zeiss IOL Master for pre-operative biometry. He recommended that any surgeon implanting this lens should track his cases in order to perform A-constant personalization, as with any lens.

He now implants these lenses in almost all of his patients. While they are certainly suitable for patients with 'average' corneas that have average amounts of positive spherical aberration, and where you can ensure great centration of the IOL with respect to the visual axis of the eye (secure IOL positioning, good capsulorhexis, good zonular support, minimal shrink-wrap shifting of the IOL when the capsule contracts with time, small angle kappa, visual axis that is nearly the same as the anatomic axis), they are an especially good choice for patients in whom these conditions cannot be guaranteed.

Dr Devgan predicts that aspheric IOLs eventually will account for 90% or more of all IOL implantations. He notes that for 99% of the patients, there is no reason to implant a traditional IOL that induces more positive spherical aberration into the optical system of the eye. In the same way that virtually all IOLs now have UV coatings, in the future 99% of IOLs will have aspheric optics, he said.

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