Supplement to

Produced under an educational grant from Oculentis and Topcon

Cataract & Refractive Surgery TODAY

EUROPE

May 2010

LENTIS® Mplus

The Only Presbyopia Lens With HD-Vision

European expert roundtable uncovers clinical experience and insight.

LENTIS® Mplus

The Only Presbyopia Lens With HD-Vision

MODERATOR

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Oculentis Mplus Design

The Lentis Mplus IOL (manufactured and distributed by Oculentis GmbH, Berlin, and Topcon, Rotterdam, Netherlands; Figure 1) is a new approach to multifocal correction and the only presbyopia-correcting lens with HD-vision. The Mplus is a nonrotational symmetric multifocal IOL that is designed to provide high contrast sensitivity and minimize halos and glare. This lens has a refractive design, combining an aspheric, asymmetric distance-vision zone with a sector-shaped, near-vision zone. This blend allows seamless transition between the zones, ensuring excellent near and far vision.

The Mplus is pupil independent, offering a 3.00 D addition and ensuring minimal loss of light. It has a true 360º continuous barrier effect for enhanced posterior capsular opacification prophylaxis and is aberration neutral for increased depth of focus.

Figure 1. The Lentis Mplus (A) plate-haptic and (B) C-loop designs.

The Mplus is available in both plate-haptic (Figure 1A) and C-loop (Figure 1B) designs. Both are one-piece multifocal acrylic IOLs with a biconvex, 6-mm, aspherical surface (posterior) optic that provides a sector-shaped addition of 3.00 D.

The C-loop design (LS-312 MF) has an overall length of 12 mm and is available from 5.00 to 36.00 D in 0.50 D steps. The plate-haptic design (LS-313 MF) has an overall length of 11 mm and is available from 10.00 to 30.00 D in 0.50 D steps. The recommended incision size for the C-loop design is 2.6 mm and for the plate-haptic design is 2.2 mm with a 1.8-mm wound-assisted technique.

At the Winter European Society of Cataract and Refractive Surgeons (ESCRS) meeting in Budapest, Hungary, six surgeons convened to discuss the Lentis Mplus. Below is a transcription of their conversation, highlighting the unique design of this new multifocal lens. For more information on this technology, please visit the Oculentis Web site at www.oculentis.com.

CLINICAL EXPERIENCE

Mertens: We're here to discuss the innovative design of the Lentis Mplus multifocal IOL (manufactured and distributed by Oculentis GmbH, Berlin, and Topcon, Rotterdam, Netherlands; Figures 1 and 2). This lens takes a completely new approach to multifocality in that it combines an aspheric, asymmetric distance-vision zone with a 3.00 D sector-shaped, near-vision zone to provide seamless transition between optical zones. (See *Oculentis Mplus Design* for more information.) Let's start by sharing your experiences with the Oculentis Mplus.

Tetz: I was asked to try this Conformité Europeenné (CE)-certified lens last year. Since I have the opening remarks in this roundtable discussion, I would like to start with a statement about the lens: When I first heard of the principle of the Mplus, I was skeptical because it incorporates what I would expect in glasses or contact lenses, but not in optics that are situated behind the pupil. However, when I conducted a brief trial with the Mplus, I was positively surprised with the results that patients were rendering.

We started with careful patient selection in a limited number of cases and used the Mplus with 3.00 D add the majority of the time. Overall, patients were quite satisfied, and there were no problems with the lens. I was familiar with the monofocal Mplus, and implantation and all other aspects were similar. There is a little difficulty in positioning the multifocal Mplus, because

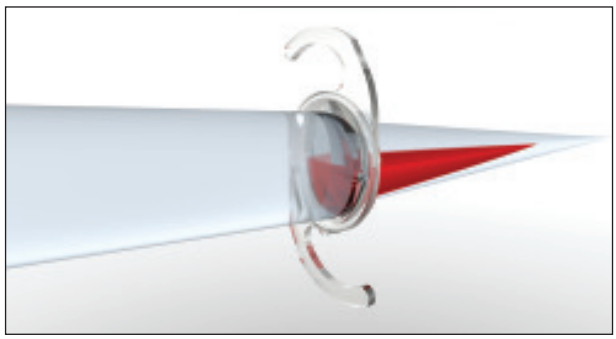


Figure 2. The Mplus provides seamless transition between optical zones.

the near part must be placed inferiorly. However, the lens has a mark that indicates the horizontal position as well as the location of the inferior part.

Mertens: Gerd, what are your remarks about the Mplus?

Auffarth: I started with the Oculentis toric IOL first, which is a nice lens to work with. Once I saw the design of the multifocal Mplus and reviewed the preliminary results from other surgeons, I wanted to try it. We entered the multicenter trial almost 1 year ago. Now, our study center includes three sites and has gathered data from more than 130 IOL implantations. We are currently seeing patients with 1-year follow-up.

We had the same initial doubts as Manfred mentioned, but results were very good at 6 months. Furthermore, it appears that the lens has the same excellent performance in the eye at 1 year. We are now starting to perform contrast measurements and compare them with the other type of IOLs. So far, the Oculentis Mplus lens looks very good. We are now starting to perform contrast measurements and stray light analysis with the Oculus C-Quant (Oculus Optikgeräte, Wetzlar, Germany) and compare them.

Shah: I started a small British trial in September 2009, and thus far we have implanted about 30 lenses in the trial and a few more that weren't included in the trial results. I have had the same type of results as Manfred and Gerd, very positive with very few problems. We have looked at the Mplus results with my research optometry group, and they are finding good results. Contrast is very good, and glare is very minimal.

Mertens: Thank you, Sunil. In your clinic, what are the indications for this lens?

Shah: This IOL may move to the top of my list very soon as the premium lens choice. Up to now, if using a multifocal, I mix and match with the Tecnis and ReZoom (both Abbott Medical Optics Inc., Santa Ana, California). Everybody knows the limitations of that technology, and results with the Mplus appear to be going in the right direction.

Mertens: Are you still using the other IOLs?

Shah: I am, but that is partly to do with not having an extended lens bank. A lot of my work is clear lens extraction, and once the lens bank has extended, then we will move into using the Mplus in those cases as well.

Lapid: I also started with the Mplus in September. We knew the concept of the multifocal Mplus from contact lenses, and we thought it was quite logical to do the same thing behind the pupil. I do not yet have as extensive experience as some of the others in this room, but what we have seen is patients are very happy, most with a plano refraction.

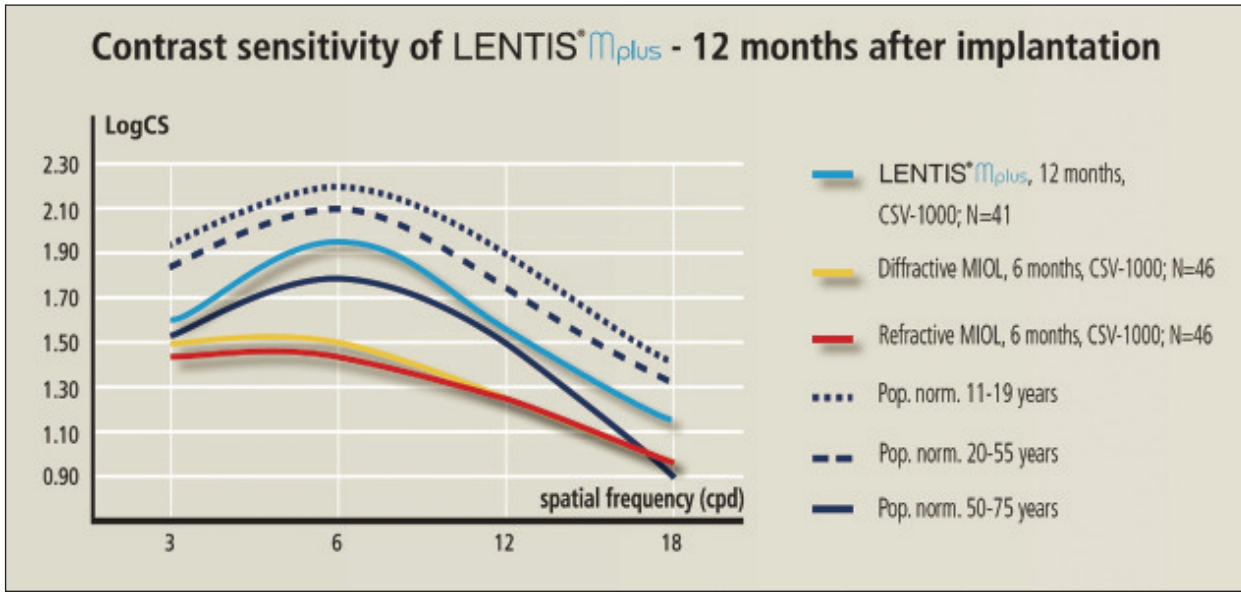
This IOL may move to the top of my list very soon as the premium lens choice.

- Sunil Shah, FRCOphth, FRCS(Ed), FBCLA

One nice thing about the Mplus is that it is pupil independent, and on day 1 most patients can read the newspaper without spectacles. The same does not happen with diffractive IOLs. I have also done a couple of multifocal Mplus implants after LASIK or in patients with past retinal detachments. Although these are a little more difficult cases, the results are still good. Patients are happy; halos occur in approximately 30% of cases but tend to disappear quickly. Halos occur less frequently than with diffractive lenses, but dysphotopsia should be expected with any lens technology.

Alió: We started implanting this lens in June 2009 in patients who already have a different lens in their other eye as well as in monocular cataract patients with traumatic cataract. This lens was well tolerated in both sets of patients. My results were so good that I moved to implanting only this lens, without particular discrimination in terms of patient selection. I implant the Mplus in any patient I would normally implant with multifocal lenses, which are cases with low astigmatism and low aberrations. My initial experience was good, and it has been confirmed by my later results in approximately 50 cases. I reported results from 42 cases at this meeting. (Please see *Professor Alió's Initial Experience in 42 Cases* for more information.)

The concept is brilliant, and it is probably worth men-



Courtesy of Oculentis/Topcon

Figure 3. Contrast sensitivity 12 months postoperative.

tioning that I have changed the implantation indications because 1.50 D near vision has proven to be very successful, at least in my hands, in patients who are demanding but not in the need of strong near vision.

Mertens: My experience is actually different from my colleagues here. I first heard about the multifocal Mplus in September 2009, during a dinner meeting with Julian Stevens, MD, of London. He was enthusiastic about the results he had with the lens and asked me to try it.

I started implanting the Mplus multifocal in November 2009 and have implanted more than 80 lenses thus far. During my first bilateral case, I used two high-addition lenses (3.00 D), and I was surprised with the quality of the intermediate vision. It was much better than the other multifocal technologies. I then refined my strategy to satisfy the individual needs, hobbies, and lifestyle of patients by implanting a high addition (3.00 D) in one eye and a low addition (1.50 D) in the other eye. Contrary to what the company advises, I implanted the high add in the dominant eye and the low in the nondominant eye. I have had good results.

I used to tell my patients about the potential need postoperatively for an additional 1.00 or 1.50 D of correction when looking at their computer screen or reading price tags in the supermarket. But it was a surprise with the Mplus that, in most cases, patients were absolutely spectacle free.

Tetz: As Gerd mentioned, this lens is part of a platform design. As far back as 2 years ago, we determined the rotational stability of this one-piece–lens platform by placing markings on the lens to see if it would rotate in the capsular bag. It remained remarkably stable—the average rotation postoperatively was less than 3.5°, which I think encouraged Oculentis to design a toric model.

Mertens: Did you take pictures?

Tetz: Yes, we took photographs at 1 week, 1 month, and 3 months postoperatively and compared them with photographs from several other IOLs. It was one of the most stable lenses, even though some believe that hydrophilic lenses are prone to instability in the capsular bag.

The other thing that we looked at in the photographs was the edges associated with two lens materials (hydrophilic and hydrophobic). As a platform, this lens design has some of the squarest edges of hydrophilic lenses.[1] We confirmed results with environmental electron scanning microscopy. It is too early to make a final statement, but I am encouraged that this lens has good features for reducing posterior capsular opacification (PCO).

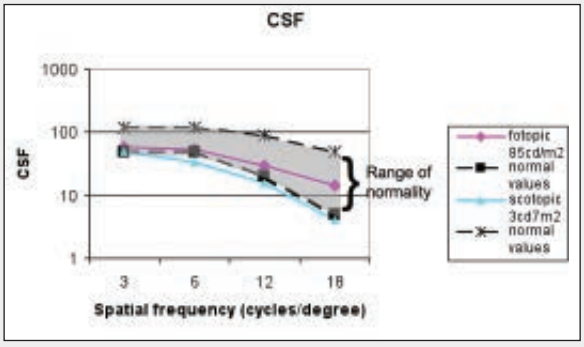
HIGHLIGHTS

Mertens: Manfred, what can you tell us about the Mplus in terms of contrast sensitivity (Figure 3), defocus, intermediate vision, and other highlights?

Tetz: This lens is not as pupil dependent as others, especially if the patient has smaller pupils. When the IOL is centered, it performs well at distance and near, regardless of pupil size. We know there are some lens designs that have problems with this. We have not yet closely studied intermediate visual acuity, but when we corrected for some distance residual refractive errors, the intermediate visual acuity was at least in

Professor Alió's Initial Experience in 42 Cases

- The Mplus +3.00 provides better contrast sensitivity function (Figure 1) compared with other lenses. It does not affect the contrast sensitivity function in the average middle-aged patient, which is one of the reasons for its success.
- The lens provides very good intermediate vision because of the optical profile of its design.
- Neural adaptation to this lens is improved because of the far-vision–dominant characteristic that this optical design provides.
- Unilateral implants with this lens are successful, even in young patients.
- Even though some night halos exist, they are not comparable to other lenses and seldom cause any patient complaints.



Courtesy of Jorge L. Alió, MD, PhD

Figure 1. Contrast sensitivity with the Lentis Mplus is better than with other IOLs.

* Editor's Note: At the ASCRS film festival, Jorge L. Alió, MD, PhD, won the Runner-Up award in the category INSTRUMENTS & DEVICES/IOLs for the LENTIS Mplus introducing short film, *A brand new multifocal IOL technology: Benjamin Franklin's idea from past to present.*

the same range the as commonly used multifocal designs. I am careful with my phrasing because our total evaluation of this only includes 16 eyes; however, it looks quite good.

The other thing that I would like to mention is that patients react well to the Mplus design, but I get a much bigger smile once this lens is placed in the second eye. I therefore prefer bilateral implantation, with a short interval between procedures. I would be curious to know whether there has been similar experience around the table.

> My results were so good that I moved to implanting only this lens, without particular discrimination in terms of patient selection.
>
> - Jorge L. Alió, MD, PhD

Lapid: The second eye does seem to improve near vision as well as the quality of vision that patients experience. They are much happier after bilateral implantation; however, they were happy after the first IOL was implanted.

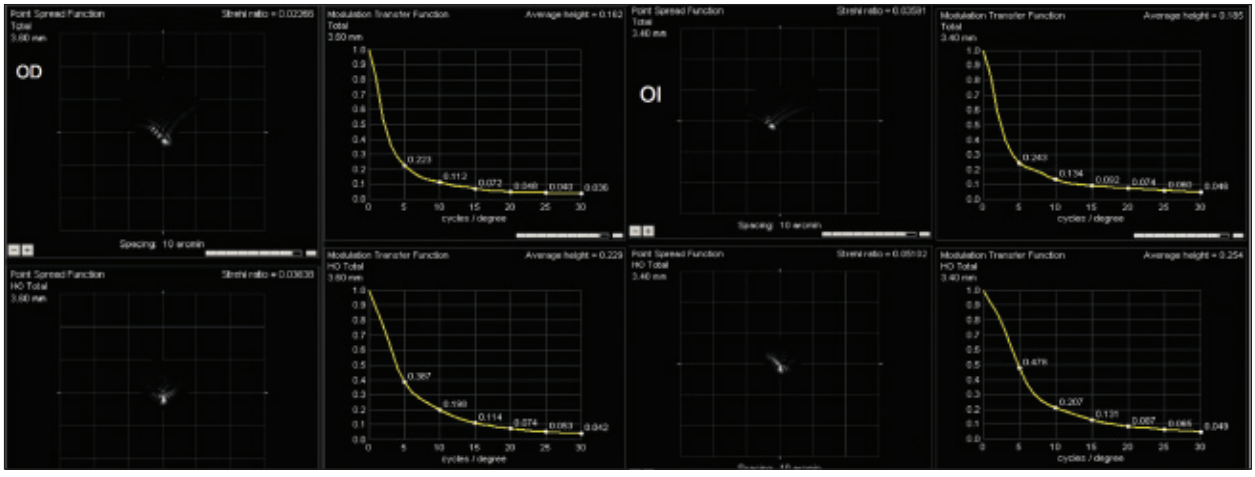
Mertens: I agree. I tell my patients that in this case, one plus one equals three. After the first eye, I tell them do not attempt to read and do not be disappointed with the results. I inform patients that they will only have an excellent result after the second IOL is implanted.

Gerd, would you like to comment on glare and contrast sensitivity?

Auffarth: Only 10% to 20% of patients treated in our clinic have reported problems with glare and contrast sensitivity, but these issues were more or less spontaneous and are very low when compared with similar studies we have done with diffractive and refractive designs. In those patients, 60% to 70% had problems with halos or contrast sensitivity. Some of our colleagues in Poland have also studied contrast sensitivity with the Mplus and found values better than with monofocal lenses in patients of the same age group (personal communication, Ryszard Philips, MD, PhD).

We are currently working with objective measurements of stray light with the Mplus and comparing them with other multifocal IOL designs. The first few patients are quite clear, and we will present these results at the next ESCRS meeting in Paris. I think one of the biggest positive take-home messages is that disadvantages of multifocal IOLs, in terms of glare and halos, are close to being solved or at least minimized.

Alió: Regarding objective measurements, we studied the modular transfer function (MTF; Figure 4) of the Mplus. These images are very sharp, and the MTF is between 20 and 30, which is really very good. The mathematical reconstruction of the ray tracing and



Courtesy of Jorge L. Alió, MD, PhD

Figure 4. Professor Alió's modular transfer function measurements were between 20 and 30.

the MTF is approximately 20, which is acceptable to good. These results tell us that we can detect the segment; however, we do not have a relative input. This is virtually why scattering is not as bad with this lens compared with refractive and diffractive ones.

I think that there is still a lot we need to know a lot about this lens, but we are beginning to understand it better, and we are noticing a fantastic difference in the eye.

Mertens: The one-piece multifocal Mplus is now available with a C-loop or plate-haptic design. What model does everyone have experience with?

Auffarth: I only have experience with the C-loop design.

Tetz: My experience is also with the C-loop.

Shah: My experience is with the C-loop. In basic measures, visual acuity (Figure 5) is better than what I would expect with a multifocal lens, and certainly better than any monofocal lens. In our study, the mean distance UCVA was 1.0; BCVA was even better, at 1.2.

We have done three separate contrast sensitivity measurements, and they are all better than the other lenses we have tested. I have yet to test the Mplus against a monofocal design, but my impression is that it will be better. Defocus curves have shown that the Mplus has very little intermediate drop-off compared with other multifocal IOLs. My experience is only with the 3.00 D addition, and again the intermediate drop-off is much less. My results are for bilateral implantation of the high-addition Mplus, not mixing and matching with the low add.

LOW ADD

Mertens: Does anyone around the table have experience with the low add?

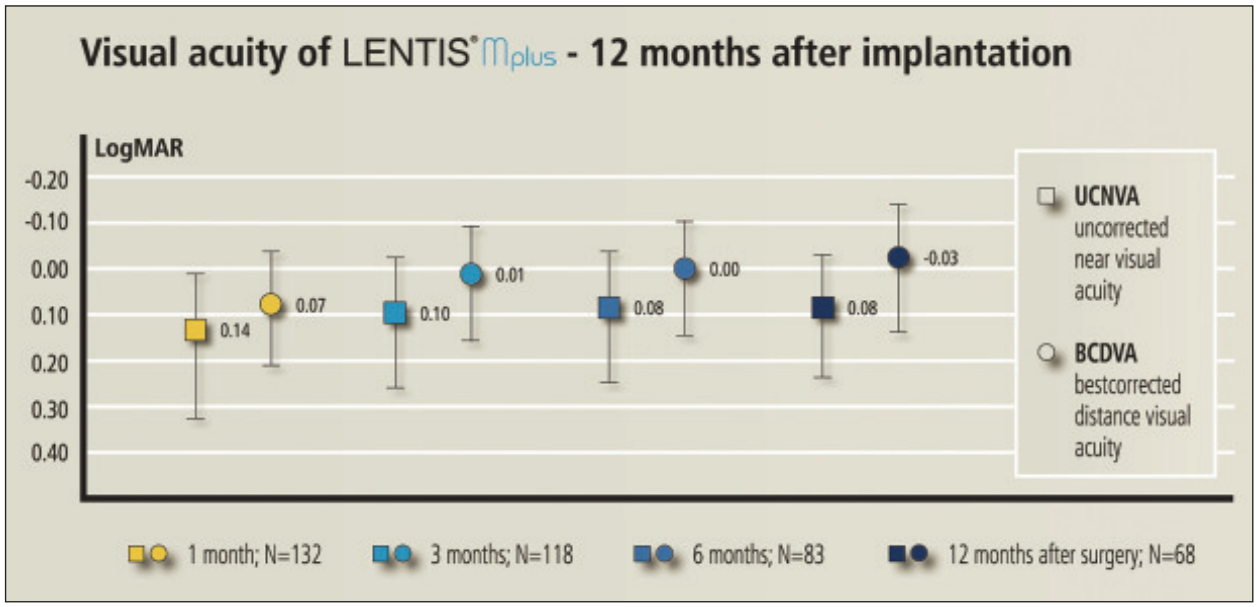
Tetz: I have three bilateral patients with a low-add Mplus and one patient with mix-and-match low- and high-add designs. I have the feeling that the bilateral 3.00 D patients are better off than the bilateral 1.50 D patients, in general. So mixing and matching these models could become popular in the future. Then we would determine the best strategy to use in dominant and nondominant eyes.

The one thing with the low add, if you listen to what other companies tell us in their warnings about low adds, is that the closer you move to foci, the more unwanted interference you get. Also, the more foci you use, the more chromatic aberration you may get. This information is for other lenses, and as far as I know there is no similar data on the Mplus yet. We will have to watch this.

Mertens: Thank you, Manfred. I have already done 12 cases of bilateral low-add/high-add implantation. I prefer to use the high add in the dominant eye so that the two foci are placed apart from each other; however, I recently performed my first bilateral implantation with the high add in the nondominant eye and low add in the dominant eye. It is too early to determine the effectiveness of this strategy.

I think this technology is so new that it is hard to tell what is the best solution for its use. We will have to find out by trial and error. Yes, we can discuss the theoretical issues and the optical physics, but the human brain interprets things differently than what we can see on an optical basis.

Lapid: I have not used the low add, and this is because it is not a distance that most of my patients use. I have gathered this from my experience with the low-add Restor (Alcon Laboratories, Inc., Fort Worth, Texas). If patients are going to be doing tasks that require good vision at 80 to 100 m, they move their head in or out, most without even knowing they are



Courtesy of Oculentis/Topcon

Figure 5. Near UCVA and distance BCVA 12 months postoperative.

> Handling the lens is very pleasant because it is not as sensitive to scratching as some of the other lenses I have worked with.
> - Ruth Lapid-Gortzak, MD

doing that. I prefer using an add of 3.00 D because it provides better result in terms of what patients need in their day-to-day life.

I have also studied near vision, from 30 to 70 cm at 10 cm intervals (Figure 6), and what I see is that the Mplus works best from 40 to 50 cm, but vision at 30, 60, and 70 cm is quite good as well. Patients are happy, and it gives them the *wow factor*; when they know what they can see at these distances, they are on top of the world.

Mertens: I need to agree with you. We used to tell our patients, especially those with the Restor, that they had a fixed distance—let's say it was 35 to 40 cm. When they were used to reading at 50 cm, they were not pleased with the Restor or other technologies. Initially, we told our patients the same thing with the Mplus, but what we found is that they could read at 35 cm as well as at 50 and 60 cm, even on day 1. That was a big surprise and completely different than the other lenses that are now available.

STRENGTHS AND WEAKNESSES

Mertens: What are the strengths and weaknesses of the Mplus technology?

Lapid: We have already mentioned the main strengths of the lens—the fact that there are less halos, the fact that there is good reading vision from day 1, and the fact that it is less pupil dependent. The weakness is that it is still a new technology. We have to see what comes out of all of the studies.

I like that the Mplus has good centration. With diffractive lenses, the lens must be centered in the middle of the pupil; you have to keep track of the pupil center and be aware that you are putting the lens correctly in the bag and matching it to the posterior capsule. With the Mplus, I am not sure that they are all that well centered, but the lens always seems to function as if it is not decentered—that is a very nice thing about this lens.

I have a couple of additional comments. First, handling the lens is very pleasant because it is not as sensitive to scratching as some of the other lenses I have worked with. Second, I currently use a 2.2-mm incision, which I must enlarge to a 2.4 mm during implantation. I find that the 1.8-mm injector works nicely for the smaller lenses, and then I do not have to enlarge my incision. I have been warned that lenses over 23.00 D might tear the injector cartridge, so I do not do thicker lenses this way. This is off-label use.

Shah: I'd like to reiterate the lens' superiority to other multifocal IOLs available at the moment. The Mplus is my first choice. The downsides are related to what we do not know yet, because we are all in the early phases of study. I think results will come out quickly in the next few months, and this lens will continue to gain popularity.

Alió: I have similar comments as Ruth. First, in my

Courtesy of Ruth Lapid-Gorzlak, MD

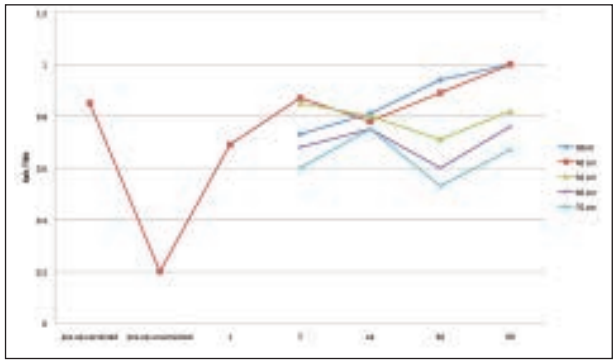


Figure 6. Near UCVA between 30 and 70 cm.

patients, their intermediate vision is excellent, and second, their quality of vision is better. Third, the majority of these patients are much less affected by glare and halos. These are the three main advantages. I could be biased, but in my opinion this lens is reliable, and patients seem to do better than those implanted with diffractive and refractive technologies in terms of contrast sensitivity function and in terms of having less night glare and night problems. The curious thing is that the color vision and the sharpness of the image, which tend to bother patients who are implanted with multifocal lenses, do not happen at all with the Mplus. My patients prefer this implant simply because their near vision is better.

Mertens: Have you done any mix-and-match implantations with high and low adds?

Alió: No, not yet. Patients who underwent unilateral Mplus implantation either had no implant in the contralateral eye or had a previous implantation with Restor, Tecnis, or ReZoom.

Mertens: Did you ask these patients which eye they favored?

Alió: They all preferred the Mplus. In one case, a patient previously implanted with the AcrySof IQ Restor +3.0 D could not see well enough to play golf, and she was also unable to drive at night. I implanted the Mplus 1.50 D to improve far vision without completely compromising near vision, and for the first time since her initial surgery, she was able to play golf. So the Mplus 1.50 D is a tremendous option for these patients who need something for near but do not want to sacrifice far vision. In this case, far vision as well as night vision completely improved.

Mertens: So you use the Mplus in monocular cataract patients? This is interesting, as some of us agreed earlier that results are much better when you implant it bilaterally.

Alió: If the patient is aged in their 40s, unilateral implantation will work well.

Tetz: Right, it is the age that makes the difference. If you use a standard multifocal lens in a younger traumatic cataract, you will find that most of these patients are quite happy with a multifocal monocular eye. They have a different outlook from the 50- or 55-year old patient.

Mertens: So, if they have accommodation in the other eye they will do well unilaterally?

Tetz: Yes.

Alió: The patients whom I treated were accommodated, and they were quite active in sports, which is why they had a traumatic cataract. These patients were extremely happy with their near vision but would complain about their other eye. These patients are very particular.

Auffarth: Since we have adequately outlined the strengths of the lens, I will discuss what could be seen as weaknesses. If you look at the patients in whom we encountered some problems, you will notice that they are all surgically related and not due to the lens itself. In one case, the lens was slightly decentered upward, and the patient looked through the near part in the distance. I had to explant the lens, but it was due to the off-centered rhexis.

I have a feeling that centration or rotation issue may not be a big problem over the long-term. We had a few lens rotations occur after 1 year, but it was slight and had no influence on the function and performance of the lens.

Lastly, it may be nice to have the Mplus, in the long run, available in a preloaded injector.

Mertens: Gerd, I also had issues with centration. In my first or second case with the C-loop design, I injected the lens, the distal loop got stuck in between the plunger and the edge of the cartridge, and the loop broke. I saw the patient postoperatively, and the lens had shifted upward. His distance BCVA was 20/25. In the other eye, the lens was centered perfectly, and he was 20/20 uncorrected. The patient is happy, so I will leave the lens in place for now and continue to monitor it.

In my experience, the loop breaks happened a couple of times. Now, I check it on the microscope first so the loop will not get stuck between the plunger and cartridge. When you have to take the lens out and replace it with another, it causes extra stress for the incision, for the surgeon, and for the endothelium. You don't want that.

Alió: The new injector is much stronger and allows better injection. The incision is about 2 mm.

Tetz: I'd like to talk about how the Mplus avoids common weaknesses of other lenses. Currently, no multifocal IOL is replacing our 20-year-old crystalline lens—not yet. For now, multifocal or bifocal technologies are the best solutions, but there are undoubtedly unwanted effects that are based on the optical features of these lenses. All refractive and diffractive lenses are concentric designs, and any time you change between a near and a distance zone, even if it is just a step for diffraction, you get unwanted images. Refractive-concentric designs are the worst culprits of unwanted images, and it is important to note that the Mplus is a refractive design, but it is not a refractive concentric design.

The more transition zones the lens has, the more unwanted images the patient will notice. It is similar to corneal refractive surgery; if you have a corneal transition zone that is smaller than the pupil, unwanted effects such as halos and glare will appear. However, there is only one transition zone on the Mplus, which is in the midst of the pupil. The zone will also cause some unwanted effects, but a much smaller is covered, meaning fewer unwanted images. So, from an optical aspect, this lens design makes a lot of sense because it reduces some of the unwanted effects associated with multiple concentric zones and transitions. I think probably one of the biggest strengths of the lens is that it avoids some of the negative side of multifocality.

Alió: Another strength is the lens' contrast sensitivity. In the cases that I have implanted asymmetrically, patients notice that their vision is crisper in the Mplus-implanted eye than in the other multifocal eye. Contrast sensitivity is strong in scotopic, mesopic, and low photopic environments.

Mertens: How do you compare the contrast sensitivity of this lens with a monofocal?

Alió: The only monofocal lens that I have to compare it with is the natural crystalline lens in the second eye. But, it should behave like a monofocal for far.

SURGICAL PEARLS

Mertens: What are the surgical pearls in terms of incision size, incision location, capsulorrhexis size, and centration of the lens? Please share what you have learned so that surgeons who want to adopt this technology will share the same success that we have all had.

Alió: In my opinion, this is a premium lens, and therefore it is sensitive to centration and tilt. On the optical bench, we know that if the lens is tilted or decentered, the MTF is affected. In my opinion, the ideal capsulorrhexis is 5 to 5.5 mm, covering the edges of the optic. The lens must be well centered and stable in the capsular bag. You must make sure that the lens is centered for whatever capsular asymmetrical retraction is present. Another important thing is that this lens design should reduce PCO. I have had no problems with PCO so far, but we need more follow-up.

For a premium lens requiring premium surgery, the lens should be well placed, and the capsular bag should be perfectly clean. I clean the epithelial cells and the anterior capsular as well. I use a 2-mm incision, and I place an incision in the positive meridian just in case there is astigmatism. I prefer the plate-haptic design when using a small incision.

> Probably one of the biggest strengths of the lens is that it avoids the negative side of multifocality.
>
> - Manfred R. Tetz, MD

Mertens: What is the maximum amount of preexisting astigmatism you would allow with this lens?

Alió: Up to 1.50 D of astigmatism. I use limbal relaxing incisions (LRIs) or opposite clear corneal incisions depending on the amount of astigmatism. For up to 1.00 D, opposite clear corneal incisions work much better because they are easily controlled. I will use LRIs for any degree of astigmatism above that, but I will not try to correct more than 1.50 D of astigmatism. In cases with more astigmatism, I do not like LASIK, because corneal refractive surgery and multifocal lenses do not work well together at this time. Whatever aberration you use is going to be negative for the performance. Using the toric multifocal, it is up to 5.00 D.

Tetz: I agree with Jorge that the rhexis must be centered and smaller than the optic. This is crucial for this lens, and I am talking about the platform design. People have been cautious in how to deal with situations where you do not have full support of the capsular bag or a capsular break. If you use the three-piece design, you can still treat the young patient, even if he has a traumatized capsule. You can have a multifocal implanted in the sulcus, but that is a very rare situation.

Auffarth: I prefer to switch the incision from temporal to an incision placed at the 12-o'clock position or vice versa, depending on the amount of astigmatism. I aim to treat patients with no more than 1.00 D of astigmatism. I am looking forward to a toric multifocal that can cover patients with 1.50 D or more of

astigmatism. Otherwise, that much astigmatism could mean trouble in terms of surgery.

Shah: I treat this like a refractive procedure, meaning I always take the same care as I would with a refractive patient. One issue that has not been touched on yet is that the biometry has to be absolutely accurate. If the surgeon does not look at biometry, he will not achieve good results with this lens.

I have been implanting the Mplus in patients with up to 2.50 D of astigmatism. I think patients actually tolerate a little bit of residual astigmatism with the Mplus better than they do with other multifocal lenses. It gives you room to play with, if you need it.

Mertens: But what kind of error will this lens tolerate? With a multifocal design, it does not tolerate too much astigmatism or sphere.

Shah: I have not looked at the results in enough detail to give you a number. My comment was just a general impression. I put this lens into a couple of patients with high astigmatism, and they were left with about 1.00 D. Normally you would start with 1.00 D of astigmatism and get it as low as possible, but these patients are managing quite well.

Lapid: I agree that biometry is important. This lens is not for surgeons who do not look at their own outcomes. I think this is a refractive procedure.

> I prefer to switch the incision from temporal to an incision placed at the 12-o'clock position or vise versa, depending on the astigmatism.
>
> - Gerd U. Affarth, MD

Mertens: I would like to contribute a surgical pearl that I have discovered in my clinical experience with the Mplus, and that is using a capsular tension ring (CTR). I have a strong preference to place the CTR in every premium lens I use—I do it in my toric monofocal cases, in my multifocal cases, in my accommodative cases, and also I have done it from the beginning with this technology. What is your opinion? Is this something we should advise?

Alió: I really like the concept of the CTR, and I use it a lot. But, it is not systematic in these cases. I will use the CTR if the patient has pseudoexfoliation syndrome. I prefer to have a very stable capsular bag. Typically, I am implanting the Mplus in patients aged in their 60s, and when they are aged in their 80s, they will probably have zonular problems. In these cases, I always use the CTR.

Thus far, I have not detected decentration or tilt induced with time. In other lenses that are more sensitive to these issues, we stabilize the capsular bag with a CTR because of its protective properties. CTRs seem to improve the performance of the lens, especially the induction of coma. But we do not have evidence thus far that suggests that the CTR is necessary with this lens.

Mertens: Have you seen any stress lines at the capsule due to insertion of the lens?

Alió: No, not in the postoperative. Perhaps during surgery, but not postoperatively.

Tetz: I have not either, not with the one-piece model.

Mertens: When a line in the posterior capsular is present with the Restor, the patient would complain. Ruth, you have had problems with the CTR. Would you care to share?

Lapid: I had seen the CTR cause the lens centration to be downwardly displaced when used with the Restor. This caused induced astigmatism. Several of my patients also had corneal astigmatism, which could have interfered with the advantages of the CTR.

Alió: The C-loop design is more tolerant to these problems because, by definition, the biomechanics of the lens can absorb some of the changes in the capsular bag. Did you use the plate-haptic design? This is my first choice if I have it available. The CTR could be more useful with this lens.

Lapid: For the long term, I am interested to see how a patient with a lot of capsular phimosis and fibrosis would fare. I am curious to see if the lens stays stable, because I know from earlier days when using the Hanita hydrophilic lenses (Kibutz, Israel) that sometimes they can decenter in cases of severe capsular phimosis.

Alió: You can make up another pupil, because we do not have contraindications with pupil size. These lenses behave really well independently from the pupil.

Mertens: That reminds me of a 32-year-old in whom I implanted a posterior chamber lens. He had acute angle-closure glaucoma with a semi mydriasis as a result. I explanted the ICL (STAAR Surgical, Monrovia, California), and he still ended up with high intraocular pressure that eventually settled down. Later, I performed cataract surgery on the same eye, replacing the

ICL with the Mplus. He is doing amazingly well. He still has the ICL in his other eye, and now he is asking me to replace it in that eye as well. Even with the semi mydriasis, he is reading from 30 to 70 cm comfortably, and his distance vision is very good. He has a pupil of 7.5 mm, and the lens stays fixed. I was a bit afraid to do it, and I would not have implanted this lens in someone with 7.5 mm mesopic pupils.

Lapid: Would you use it in patients with very small pupils?

Mertens: Yes.

Alió: Me too. Very small pupils are not frequent postoperatively, because of the different maneuvers you need to perform in these patients. Usually they dilate poorly, so you have to stress the pupil.

Lapid: Patients with Parkinson disease may get ocular apraxia and small pupils. I think this lens is the way to go because they will not experience problems from having a physiologically smaller pupil. I have already used this lens in a patient with Parkinson disease with success.

MPLUS TORIC

Mertens: Let's talk about the Mplus toric (Figure 7). I first performed bilateral Mplus toric implantation in early February 2010. Surgery is the same as with the Mplus, but the markings on the lens are not horizontal but in the axis. It was easy to put the lens in the right axis.

At 1 day, UCVA was 0.6 in the right eye and 0.5 in the left (OU, 0.9). Intermediate and near vision are perfect. I think this patient was a bit difficult to refract, but she is approximately at -0.50 or -0.75 D postoperatively. She missed her follow-up visit because of vacation, but she called me and complained that her distance vision was not as good as intermediate or near. At 1 month postoperatively, UCVA is 20/20 in the right eye and 20/25 in the left (20.20 cc -0.5) with J1+ for intermediate vision and J2 for near. But, combining Oculentis' toric and Mplus platforms will be very great.

Alió: So you have a mark for the cylinder but the sector is in the same position as it should be?

Mertens: Yes.

Alió: This is a customized lens, then. I have an interesting case involving a patient whose lens rotated in the capsular bag. The capsular bag was intact but needed to be replaced due to traumatic injury. One of my colleagues performed an iris extrusion and did not pay attention to the fact that this lens has two layers. The curious thing is that the sector is temporal, near vision is really good, there is no coma, and the patient has no complaints. So is it possible that just one cylinder can fit into any type of astigmatic eye, meaning that the sector does not need to be inferior?

Figure 7. The Mplus Toric.

Tetz: That is correct.

POSTOPERATIVE REFRACTION

Lapid: Does anyone have a pearl for postoperative refraction in these patients? The autorefractor does not give you good results. How does this panel refract them, just based on manifest? How do you know they did not slip in to the near vision parts when you refract them?

Mertens: When you notice the change to near vision, you must do a completely different refraction. When a patient has good or nearly good distance vision and the refraction is 1.50 or 2.00, you know you are not refracting distance vision.

Lapid: Of course, but what if he has a small cylinder? Then you do not know what distance you are refracting. When you refract for distance acuity, it is difficult to get the small refractive errors out of these patients.

Alió: So you have problems refracting these patient without refractometry. Subjective as well?

Lapid: Subjectively, sometimes it is difficult because it is based on the lens form. Subjective measurements are not for everyday use if you are not accustomed to it.

Alió: But that happens with every multifocal. I have not yet performed LASIK in these patients, but I have feedback from my optometrist that they do not have problems refracting patients with these lenses.

Lapid: I refract my own patients, and I find that they are more difficult than the other multifocal patients.

Tetz: This may be true, but refraction is only important to optimize during studies, when adjusting A constants, and in the learning phase with this lens. The only requirement for the multifocal patient is that he is 20/happy. I will tell you that the 1.50 D Mplus is a bit more difficult to refract compared with the 3.00 D Mplus when you have two distinct focal points.

One thing to caution is that autorefractors can be tricky devices in general. Autorefractors and multifocal IOLs never got married, because the technology was not designed for use with the multifocal lens. The older autorefractors, such as the Humphrey, use a modified Scheiner's principle and looks at the entire range of images. It selects the best image and the second best image and averages them. If the average is -1.50, you know you hit it with the 3.00 D add multifocal IOL. With the newer autorefractors, sometimes you get reasonable results and sometimes you get terrible results. Maybe wavefront is better in the refractive versus the diffractive designs, because in the diffractive design I have tested three machines and you get all different kinds of results.

Alió: You make an important point. We can obtain a good global wavefront with the Mplus, something that is not possible with the Array and ReZoom (both by Abbott Medical Optics Inc., Santa Ana, California) in many cases. In every one of our Mplus cases, we have been able to achieve the total wavefront with Hartmann-Shack wavefront technology. It is important to note that every single one correlates well with the refraction.

Tetz: In this lens?

Alió: Yes, in the Mplus in the periphery. When the refraction matches well with the total aberrations, it means that you are dealing with the right measurement. This does not happen with the other multifocal lenses.

Tetz: Gerd, how are you taking measurements on these patients?

Auffarth: You should be using subjective manifest refraction. These patients, if they have a multizonal optic, can get any number of results when you refract them. If you put something in front of them, they will still be able to see it. If you have a reliable refraction in terms of a good IOL calculation, then these patients will get to a point at 0.8 or 1.0 for distance vision. Even with 0.50 D or 1.00 D of cylinder, these patients are sometimes still 20/25.

I tend to judge it by the patient's UCVA. Only if the patient has less than 20/40, then you can be sure there is a substantial refractive error. If you look at these patients binocularly, you sometimes get compensation through the defect in both eyes. Autorefractors make no sense; they only make the doctors or the optometrists crazy. This is the same with toric lenses.

CLOSING REMARKS

Mertens: Thank you all for this lively discussion. I would like to ask the panel to provide its closing remarks about the Mplus.

Alió: I prefer the Mplus with 1.50 D. In the beginning, I did not believe in this lens because I thought the disparity between foci would be problematic for the patient. I was anticipating some postoperative problems; however, problems were completely absent from the beginning.

It is surprising that a multifocal IOL could provide useful near vision without the cost of night vision problems and without any negative side effects. I am very happy with this design and very satisfied with the results that I have in these types of patients. The Mplus concept has never been tried with another lens, but it is brilliant.

Mertens: What are the indications for using only the low add?

Alió: I use the low add when I anticipate high patient expectations and I do not want to run the risk of a negative result. These lenses avoid the side effects of other multifocal IOLs, and the outcomes have been very good uniformly, as good as results with the AcrySof IQ Restor +3.0 D IOL. Evidence is not as strong with this IOL, but I think it will have tremendous impact on our practice who require a low-vision near add and in which a monofocal is not good enough.

Mertens: How many of those patients still need reading glasses?

Alió: This is a good question. They need about 1.00 to 1.50 D for J1 but they can read J3.

Mertens: So what do you tell those patients? Do you tell

them that they will be spectacle free 80% of their daily life?

Alió: These patients do not complain about near vision. I tell them that as far as intermediate vision for domestic and social life and issues related to computer use, this lens is good. I tell my patients that this lens is a good choice because it provides a distance that we cannot get with a monofocal lens; uniformly, patients have been extremely happy. Retired patients use intermediate vision more than near vision, and our society is evolving into an intermediate vision process. This lens will fill a huge market and a large number of indications.

> The [Mplus'] overwhelming strengths outweigh any weaknesses we have seen thus far.
> - Erik L. Mertens, MD, FEBOphth

Mertens: I will extrapolate: Are saying that you will stop using monofocals?

Alió: It could be that I move to multifocals instead of monofocals and leave the latter only for patients with complicated corneas who are not suitable for any diversity in vision.

Mertens: So, you would use a low add in a patient with macular degeneration?

Alió: If the patient has macular changes, yes, this lens could be used.

Tetz: Our discussion is veering toward the all-important question of patient selection. When you sit in on discussions like this one, we always end up discussing patient selection. What Professor Alió just pointed out, and what we have heard today, is that there is a common consensus that this lens is more forgiving than most other multifocal lens technologies. That means that we can probably use it with less problems, which we as surgeons are concerned about. Multifocal IOL technology—premium IOL technology—is a technology for the refractive patient. It would probably help the doctors to have that technology available to a wider range of patients. This is becoming more of a reality with designs like the Mplus. If this happens, the market would change again, because when you look at how many multifocal IOLs are sold on average, it is less than 5% of the entire IOL market.

Lapid: That is only for people who really are into doing refractive cataract surgery.

Tetz: Yes, because it is complicated and you do have extra worries. But lets assume the worries are less for doctors—that would probably change the whole dynamic of this technology.

Lapid: Agreed.

Tetz: Gerd, do you think this technology opens the door to more patients and that surgeons will have less to worry about in the future?

Auffarth: You will always have to consider patient selection for multifocal technology. The more types of multifocals you have, the more types of near or distance you have. It can complicate things. I am saying that this lens enlarges my ability to individualize the treatment to the patient. If a toric multifocal design is released, it will come to a point where there is no reason not to use a multifocal lens technology.

In addition to our initial findings with the Mplus, I recently did a study where we looked at patients who had an amblyopic eye. We put in a toric multifocal lens in the nondominant eye and a standard multifocal lens in the dominant. With this method, we were able to implant multifocals in patients who have amblyopia or decreased vision in one eye; we were able to provide them with the multifocal experience. Maybe this is also an indication for the addition of 1.50 D. If you put the toric multifocal in the amblyopic eye, it will reduce cylinder and help gain near vision. With all these possibilities, we have a better chance to find the right combination for multifocal lens patients. However, it will still increase chair time with patients. The surgeon must always explain to the patient what his best options or choices are.

Shah: I have a subgroup of Mplus patients who had some mild macular changes. It is difficult to quantify what their potential vision is, but they are doing better than I would have ever expected. We have about five now; I think it agrees with all the other comments that this lens is more forgiving.

Mertens: Indeed, indications for the Mplus are broader than indications for other multifocal IOLs. There is still the issue of diagnostics to resolve, because you need to do good keratometry readings, but overall results with the Mplus are promising. Its overwhelming strengths outweigh any weaknesses we have seen thus far. I'd like to thank the panelists for their time and answering questions about this technology. ■

1. Werner L, Tetz M, Feldmann I, Buecker M. Evaluating and defining the sharpness of intraocular lenses: Microedge structure of commercially available square-edged hydrophilic intraocular lenses. *J Cataract Refract Surg.* 2009;35:556-566.

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