

Case Studies: Presbyopia- Correcting IOLs

With the diversity of IOLs available to aid in the correction of presbyopia, it is often difficult to decide which IOL is the ideal option for each patient. This panel of thought leaders reviewed several common scenarios in order to ascertain which of the currently available IOLs were best in certain situations.

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FIRST CASE

Dr. Braga-Mele: A 68-year-old hyperope with cataract uses the computer at work for most of the day. What are his options?

Dr. Holladay: I would choose the Rezoom IOL (Advanced Medical Optics, Inc., Santa Ana, CA). It works well at computer distance, and he will have good middle and distance vision. If he works at the computer all day, he will not need glasses. The Rezoom also offers minimal halos at night.

Dr. Rowen: I would choose either the Rezoom or the Crystalens accommodating IOL (Eyeonics, Inc., Aliso Viejo, CA). The Crystalens provides patients with excellent computer vision. Of course, lens selection would be preceded by an evaluation of the patient's personal needs and lifestyle. At 68, the patient presumably drives a lot at night, so that is a consideration when choosing a lens.

Dr. Slade: This case looks like a sweet spot for the Crystalens, because the IOL offers excellent intermediate vision for the vast majority of patients and also because this is an older patient. I am assuming that a 68-year-old person who spends most of his day at a computer is most likely an engineer or an architect and will, therefore, have a greater demand for quality vision.

Dr. Donnenfeld: I believe this patient will do well no matter what you offer him. Regarding his individual needs, I would probably steer him toward the quality of vision he desires. I agree that the Crystalens is the optimal choice.

Dr. Braga-Mele: Dr. Doane, do you take pupil size into consideration when you opt to use a multifocal versus a single-piece accommodative lens?

Dr. Doane: Diffractive IOLs are independent of the pupil, whereas refractive multifocals tend to depend on pupil size. So, I do believe pupil size is an issue. Kerry Assil, MD, told me in December 2005 that 10% of his patients would not be good candidates for the Rezoom, based upon pupil size. I have not yet [at the time of this discussion] implanted the Rezoom, but I am excited to do so. I would first ask my patients what their occupation is. If they are retired, then you have to ask what they do in their spare time. If you fail to follow this line of questioning, you are potentially setting yourself up for postoperative issues with the patient.

Dr. Braga-Mele: It is also important to ask if they mind wearing glasses. If they do not, you might not go down the path of multifocal IOL implantation. What about monovision in this patient?

Dr. Doane: Absolutely. Prior to the development of multifocals and the Crystalens, the only thing you could have given to this patient if he wanted to be spectacle independent was monovision. Most monovision patients do well with refractions of -1.50 to $-2.00D$.

Dr. Nordan: I do not think monovision patients do very well in general, so I do not think that monovision is an adequate general solution for presbyopia. First, I would evaluate this patient using the Dell Index.¹ If it were a hyperopic advertising executive or an engineer who was rather compulsive, I would consider a monofocal IOL with glasses for reading. An easygoing individual whose Dell Index value is rather low would be a good candidate for a bifocal IOL.

Dr. Dell: This type of refraction is usually a slam-dunk for the Crystalens, but I think multifocal technologies would work as well.

“Diffractive IOLs are independent of the pupil, whereas refractive multifocals tend to depend on pupil size.”

—John F. Doane, MD, FACS

Dr. Doane: I encountered a problem in one patient, a retiree who enjoyed woodworking. I gave him an Acrysof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX) in his first eye, and he was pretty happy. Postoperatively, however, he told me, “By the way, I forgot to tell you I sit on several corporate boards. I am in New York one week, Miami the next, and then San Francisco.” He stated that he needed to be able to transition easily from viewing a projected Powerpoint slide (Microsoft Corporation, Redmond, WA) to handouts to his laptop computer's screen during board meetings. Although it was a perfect outcome with the Acrysof Restor IOL, he said he could not see his computer screen. I had to give him an enhancement of $+1.00D$.

SECOND CASE

Dr. Braga-Mele: A 42-year-old emmetrope may be entering presbyopia with a monocular cataract. His other eye is 20/20 with no cataractous changes.

Dr. Holladay: You first must find out what caused the monocular cataract. In this case, it is probably due to trauma, but it may also have been caused by a congenital cataract or amblyopia. To proceed without determining the

visual potential is incorrect! I would take a potential acuity meter reading. If the patient's potential vision is 20/200 and will not improve with cataract removal, do nothing at this time. Always be suspicious of 42-year-old patients who present with a monocular cataract. In this case, I would apply the Dell Index and choose the lens best suited to his needs.

“Always be suspicious of 42-year-old patients who present with a monocular cataract.”
—Jack T. Holladay, MD, MSEE, FACS

Dr. Nordan: Although patients can accept slightly reduced sensitivity in both eyes, they have trouble tolerating any visual difference between their two eyes. This patient could be unhappy with his postoperative vision if he receives a bifocal IOL in one eye and has clear vision and good contrast sensitivity in the other. I would select a monofocal IOL and treat his presbyopia at another time, symmetrically.

Dr. Rowen: I have already treated a couple of these patients in my practice. My choice, without a doubt, has been a Crystalens, because it simulates the function of the natural lens and is, in effect, a monofocal lens. What Dr. Nordan said is absolutely correct. By putting a bifocal lens in one eye, you might induce nighttime glare and halos as well as reduce contrast sensitivity. The Crystalens will be more similar to the natural lens. I have implanted the Crystalens in a patient who had a monofocal lens implant from a prior cataract surgery and in someone who had just a monocular cataract. They both had satisfactory functional vision for daily tasks without these other problems.

Dr. Donnenfeld: I had this exact patient approximately 1 month ago. It is imperative to determine whether the cataract is in his dominant or nondominant eye. If it is in the dominant eye, he needs the best distance vision possible, meaning an aspheric or negative-aspheric lens. If the cataract is in the nondominant eye, a multifocal IOL is appropriate. My patient had a cataract in his nondominant eye. I explained that he would probably have intermediate vision until he reached his early 50s and he would probably lose his reading vision 2 or 3 years after that. He did not want to lose his reading vision or wear glasses, so we decided on a multifocal IOL. I put an Acrysof Restor lens in his eye, and he is absolutely ecstatic. He knows he probably will not need glasses for reading and will most likely have good distance vision for the rest of his life.

Dr. Doane: I, too, have had young patients who experienced unilateral traumatic cataracts. Would anyone under 40 choose 30 or 40 years of presbyopia if they did not have to endure 1 year of it? For that reason, the Crystalens was my automatic choice in those patients. At worst, you have left them with a monofocal IOL. If it works, you have given them accommodation for the rest of their lives.

Dr. Braga-Mele: Dr. Slade, would you implant the Crystalens or a multifocal IOL?

Dr. Slade: I echo Dr. Donnenfeld's primary point regarding dominance versus nondominance. I would use a Crystalens or one of the improved-optic IOLs.

Dr. Braga-Mele: The Acrysof Restor IOL has a yellow chromophore. I would be concerned about decreased contrast sensitivity and a noticeable difference in color perception. What about the rest of you?

Dr. Holladay: That is a simple question for me. Of roughly 64 clinical and epidemiological studies, not one showed any relationship between blue light and age-related macular degeneration. In fact, studies² show blue light as possibly protective. Randall Olson, MD, and Greg Jackson, PhD, have demonstrated a loss of color vision with blue filtering as well as problems in low-light levels that have been raised by Martin Mainster, MD, PhD.³ Unquestionably, the patient will get used to his acquired color deficiency and scotopic vision loss. Over time, his retinal sensitivity will increase if a yellow lens is implanted, but, during the first 6 weeks, he will see a difference in his color vision. For me, that would be a big deterrent with no benefit.

Dr. Rowen: I think the yellow lens is going to be a big problem. If we consider mixing and matching lenses, we are potentially going to have a yellow lens in one eye and a clear lens in the other, and the difference will impair some patients' ability to adequately discern color differences. One of my patients is a dentist who received a blue-blocking lens, and he can no longer whiten teeth properly. Everything looks yellow to him.

THIRD CASE

Dr. Braga-Mele: An emmetropic engineer with bilateral cataracts drives a lot at night and hates his glasses.

Dr. Holladay: This patient is the ideal candidate for an aspheric lens, because he will see better than ever. You measure his corneal spherical aberration and choose the best lens. The average positive spherical aberration in the human cornea over a 6-mm zone is +0.27 μ m. The Tecnis

IOL (Advanced Medical Optics, Inc.) is $-0.27\mu\text{m}$, the Acrysof IQ lens (Alcon Laboratories, Inc.) is $-0.15\mu\text{m}$, and the Bausch & Lomb (Rochester, NY) Sofport AO is $0\mu\text{m}$. These are the only three aspheric lenses available today.

Dr. Donnenfeld: I took part in the Tecnis Multifocal (Advanced Medical Optics, Inc.) study. After its completion, an engineer who had participated returned with complaints about aberrations. The kicker is that he was in the control group and had received the aspheric lens, the exact lens he should have. He would have been unhappy no matter what I had done. One should be prepared for this type of reaction.

Dr. Braga-Mele: This patient is still going to be wearing glasses with an aspheric monofocal lens, right? Would the Crystalens work? There are not really any glare or halo issues with it.

Dr. Rowen: There are some.

Dr. Nordan: This situation is much more frequent in refractive surgery than cataract surgery. You try to cater to patients' needs, but, if it becomes a choice between their desire and what you think is the best solution, you had better go with the latter and not let the patient drive your actions.

Dr. Slade: The key is that this patient refuses to wear or hates glasses. You would never perform LASIK on this patient, and I would not operate on his cataracts if he had this type of mentality and were refusing to wear glasses postoperatively.

Dr. Rowen: You must advise all patients of that possibility preoperatively, because everybody will have some small chance of needing to wear glasses. In this case, I agree that one of the aspheric lenses would be proper, but you could, theoretically, try a Crystalens. It is not the best option, but it is a possibility if the patient really wants some accommodation. Most of my patients do not have night issues, but a few do.

FOURTH CASE

Dr. Braga-Mele: A 70-year-old, 12.00D myope has had monovision with rigid gas permeable (RGP) lenses for 30 years. He presents with 1.50D of cylinder by keratometry after the RGPs have been out for at least 3 weeks.

Dr. Dell: With some patients who have been wearing hard lenses for decades, it can take months for their corneas to normalize. Sometimes, if they refuse to wear glasses, you

have to give them soft lenses for a while. Once the patient has achieved a stable keratometric condition, I would probably implant aspheric IOLs aiming for monovision. You could use the Crystalens, but, if the patient has habitually tolerated monovision for so long, it would be optimal to insert a standard aspheric IOL for distance in one eye and one for near in the other and then use a limbal relaxing incision (LRI) for his astigmatism.

Dr. Nordan: I agree.

Dr. Donnenfeld: This would be a perfect case for monovision. Again, the aspheric or negative-aspheric IOL lenses would be a good choice. This is also an appropriate case for a toric PCIOL, which is probably what I would implant. The patient should be informed of his risk of retinal detachment.

“You try to cater to patients' needs, but, if it becomes a choice between their desire and what you think is the best solution, you had better go with the latter and not let the patient drive your actions.”

—Lee T. Nordan, MD

Dr. Rowen: I, too, would choose a toric IOL and maintain his monovision. Without the near vision he has grown accustomed to, he would be incredibly unhappy. You cannot simulate near vision with any other technology.

Dr. Slade: I would like to make a patient-prep point. It can take 1 to 4 months after the RGPs' removal for refractive stability. You do not then have to perform the surgery immediately. Patients can wear soft contact lenses, and you can schedule their procedure at your leisure. They will neither need to go back to their RGPs, nor must they commit to surgery.

Dr. Holladay: The only thing on which I disagree pertains to the 1.50D of cylinder. Remember, toric IOLs are usually only manufactured in two sizes. This patient needs 2.12D toricity on his IOL, a power that is not available. Your choice becomes either a 2.50D or a 4.00D, so the patient will have 0.50 to 0.75D of residual astigmatism because of the step sizes of toric IOLs. For me, treating the 1.50D of cylinder with two small LRIs will get him to the same level achievable with a toric IOL, and the LRIs can be touched up easily. From a practical standpoint, the LRI would be my choice for this patient.

Dr. Donnenfeld: It also comes down to where the positive cylinder is. If it is in the axis of the cataract incision, then, obviously, you make the incision there. But, if it is 90° away and you are going to end up with 2.00D of astigmatism, I would place a toric IOL.

“With some patients who have been wearing hard lenses for decades, it can take months for their corneas to normalize.”
—Steven J. Dell, MD

Dr. Holladay: Let me make one other point about toric IOLs. When we implant a toric IOL in the bag, it is along the optical axis and is tilted. As a result, the cornea is tilted 5°, the IOL is tilted 5°, and the surgeon is looking off at a 5° axis. Always correct the refractive error at the plane of the aberration. You should correct corneal aberration in the cornea, not the IOL. It is similar to laser surgery in that you do not correct trefoil in the lens on the cornea, because it is only aligned with one point like a star in space. This is true for astigmatism as well. Astigmatism is only true for one point, and you cannot line it up on the visual axis. This patient will have some secondary astigmatism from a toric IOL, which will be observable with an OPD Scan (Nidek Inc., Fremont, CA). You should not correct aberrations in the cornea if they are in the crystalline lens and vice versa.

FIFTH CASE

Dr. Braga-Mele: A 52-year-old, nearly emmetropic stockbroker plays golf, has clear lenses with no cataracts, and wants to be spectacle independent at all costs.

Dr. Nordan: Don't operate!

Dr. Rowen: Do not perform surgery on this patient. You can give him other options. I have a patient just like this one. We are conducting contact lens trials to see if he can at least get around during the day. He can read for monovision but may need glasses at night.

Dr. Dell: I agree. There are so many ways I could make this patient unhappy that I would pass.

Dr. Holladay: On February 15th, I performed my first three Acufocus Inlays (Acufocus, Inc., Irvine, CA). All three patients had 20/15 vision at distance and near with no

effect on visual fields or anything else. I made a 9-mm bed at a depth of 200µm and a 60° side cut temporally and inserted the 3.9-mm inlay with a 1.6-mm central aperture. There are 100 patients in Istanbul, Turkey, and Mexico City who have had the inlay for more than 1 year. Their contrast sensitivity and mesopic and photopic vision are normal. Their vision is remarkable. The Acufocus Inlay appears to be the presbyopic solution we have been looking for.

Dr. Nordan: With all due respect, I do not understand how you are going to put a pinhole in the cornea, compromise the patient's night vision, create asymmetrical vision, and then expect to end up with a satisfied patient in 99% of cases.

Dr. Holladay: Dr. Nordan, that is not true. It does not have any effect on night vision.

Dr. Nordan: I will remember you said that putting a pinhole in the cornea in one eye is not going to induce a difference between one eye and the other at night.

Dr. Holladay: Get a drop of Alphagan (Allergan, Inc., Irvine, CA) and put it one eye. As soon as you put the drop in, if you have an anisocoria, your retinal sensitivity gain goes up, and, within 5 minutes, you cannot tell the difference between each eye because your retinal sensitivity is balanced to match your pupil. It is all a feedback system.

Dr. Slade: Dr. Holladay brings up a good point about the value of keratophakia. It allows you to slide a lens under a LASIK flap, and, if you do not like it, you can take it off at the slit lamp. If a patient does not like an Acrysol Restor lens or a Crystalens, an IOL is much more difficult to remove. You do not get a fair trial with contact lenses, because they move around. We are starting the phase 3 study of the Anamed keratophakia lens (Anamed, Inc., Lake Forrest, CA) with the multifocal design. I think there might be a different way to do the surgery by injecting the lens in a prepared Intralase (Intralase Corp., Irvine, CA) pocket rather than a bifocal corneal ablation or by removing the patient's lens. In cases like this, I want to be able to remove the lens and get out.

QUESTIONS AND ANSWERS

Dr. Braga-Mele: I have a couple of questions from the audience. Would anyone implant a multifocal IOL in an ophthalmologist who uses a microscope to operate?

Dr. Slade: That is a good question. The multifocals do have some reduced contrast as well as increased glare and halos, but most of those are measured at distance. I simply

do not know to what that correlates in a microscope, but I would want to know before I performed the procedure.

Dr. Holladay: Kevin Waltz, MD, an ophthalmic surgeon, has the Array lens (Advanced Medical Optics, Inc.) in both eyes. For the first 6 weeks, he had a little trouble with adjusting to the operating microscope in surgery, but after that he did great. The light level under the microscope is extremely bright, ranging from 2,000 to 5,000 foot candles. Your pupil size is approximately 2.5 to 3.0mm in these conditions, because you are looking at such bright light. As long as there is nothing in the center of that optic, it will not affect your performance at the operating microscope.

“Vision with multifocal lenses may degrade fairly rapidly when they are decentered. Unless it is a competent, intact capsular bag, trying to sew in one of the multifocal lenses is something I would definitely not want to try.”
—Stephen G. Slade, MD, FACS

Dr. Braga-Mele: If you had a unilateral traumatic cataract and zonular incompetence, would you sew in one of the multifocal IOLs?

Dr. Nordan: The chance of tilt would be very high, and you would probably have a lot of optical difficulty.

Dr. Dell: That is absolutely true. It has been suggested that, if you had a capsular rupture or a tear in the anterior capsule, you could still get away with implanting a three-piece multifocal lens. In my opinion, it is important to recognize the high risk of the long-term decentration of these optics. Small decentrations are tolerated with multifocals, but, in the presence of a capsular tear, the risk goes way up. A sulcus-placed IOL with the optic captured behind the rhexis may be an option here.

Dr. Slade: I completely agree. Vision with multifocal lenses may degrade fairly rapidly when they are decentered. Unless it is a competent, intact capsular bag, trying to sew in one of the multifocal lenses is something I would definitely not want to try.

Dr. Holladay: We know that, if there are zonular ruptures, then often a capsular tension ring (CTR) will provide stability. Do you implant a CTR in every patient, even those

with fairly stable capsules, or do you go right to the sulcus? If you think that the capsule has a quadrant of weak zonules because you see some phacodonesis, but you know a CTR will support it, then the CTR is the treatment of choice. If not, go to the sulcus.

Dr. Dell: If an eye had a few clock hours of zonular weakness and everything else looked okay, I would prefer a CTR and a lens in the bag rather than a sulcus-fixated lens.

Dr. Braga-Mele: Yes, definitely. I have been using CTRs for a long time. In those cases, I think it is essential to insert one. Some surgeons would even say that you should insert a CTR in every pseudoexfoliation case, because you want to minimize capsular contraction syndrome (in those cases where you are removing more zonules). Many ophthalmologists would say the same for high myopes, because it simply stabilizes the entire lens/iris diaphragm. If you have more than 50% zonular dehiscence, you should sew a CTR in place rather than the lens, because you will induce no shift or tilt. So, if you want to implant a multifocal lens, I would advise sewing in a CTR.

I will put in a regular CTR at the beginning of the case. Ike Ahmed, MD, a colleague of mine who has conducted a lot of studies with Alan Crandall, MD, has shown with Miyake views that, in fact, you are inducing a significant amount of zonular tension by implanting a CTR at the beginning of a surgery. They would advocate that you put it in at the end in order to induce less trauma to existing zonules. I think it is always better to sew in a CTR than a lens. You can always optic-fixate the lens if you do implant it in the sulcus. If you optic-fixate an IOL within a stable anterior capsulorhexis, then you will get the same result as if you put the lens in the bag.

CONCLUSION

Dr. Braga-Mele: Not every lens is for every patient. Patient selection is key in any refractive procedure and especially when deciding which IOL to implant. We need to ask our patients a lot of questions about their lifestyles and expectations before we move forward with IOL implantation. The purposes of this discussion were IOL education and the provision of additional information regarding the newer lenses. IOLs continue to be refined, new technologies continue to be developed, and equipment and procedures continue to advance as we pursue visual “perfection” for our patients. ■

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