Personal Experience With Presbyopic Correction

A refractive surgeon describes undergoing the implantation of AcrySof Restor Aspheric IOLs and his postoperative results.

BY DANIEL VOS, MD

With regard to my thoughts surrounding my own refractive surgery, I—a 53-year-old, -2.50 D myope—considered LASIK a trade-off of distance spectacles for reading glasses. Moreover, I was doing well with bifocal contact lenses. Although these lenses preserved my stereopsis, the combination of a 1.00 D myopic shift and progressively dryer eyes reduced the quality of my daytime vision. My BCVA was still 20/20, but early nuclear sclerosis and cortical opalization reduced my night driving with 20/50 glare OD and 20/100 OS.

In addition to being an ophthalmologist, my hobbies include the construction of model railroads and water skiing, both of which require excellent depth perception at near and at distance. Although, in my practice, I offer monovision and accommodating lenses, I would not like to give up the quality of near vision or stereopsis that I need to work or participate in sports, as I like neither for myself. After implanting the AcrySof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX) in the eyes of approximately 90 patients, I was impressed with their spectacle independence and aware of their postoperative issues with night glare and intermediate vision.

I decided to undergo refractive lens exchange with the AcrySof Restor Aspheric IOL, and one of my partners, James Davison, MD, agreed to perform the surgery. To facilitate neuroadaptation, I received the lens implant in my dominant right eye on a Monday. My left eye received the lens on Wednesday, and I was back to work in the OR that Friday with better distance vision and microscope view than I had ever experienced. Near vision rivaled my -3.50 D uncorrected vision preoperatively. My postoperative experience brought me a new understanding of refractive lens exchange.

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DISTANCE AND READING VISION

Immediately after surgery, my distance vision had less intense colors (like being dilated but a little worse), and my reading vision was frightful; I saw watery images where the print should have been. The degree of my monocular diplopia surprised me. All of this resolved as the operative cycloplegia wore off.

On postoperative day 1, after the cycloplegia subsided, my reading vision improved. My depth of field was shallow, and there was still a faint ghost image. My distance vision seemed clear, but, oddly, brightly lit high-contrast Snellen letters were harder to read than letters of the same size on a different sign and at the same distance. My visual acuity was 20/40 but improved to 20/15 with a refraction of +0.75 D sphere. Wearing a bifocal contact lens in my untreated eye helped my operated eye significantly.

Monocular implantation was not an option for me because of my critical need for stereopsis. In addition, visual summation seemed to be a great advantage in the second eye. Infections are rare but still enough of a concern that I usually do not operate on a patient's second eye earlier than 1 week after the first eye. My surgeries were performed 2 days apart because I was anxious to get back to work. My experience was so excellent that I now offer an abbreviated timeframe in between procedures to my patients. My second eye had exactly the same recovery as my first, but the clarity was slightly worse. I required a refraction of +1.00 D sphere to see 20/15 on postoperative day 1. By postoperative day 2, I saw 20/15 OD and 20/25 OS. Both of my eyes were correctable to 20/15 with refractions of +0.25 D sphere OD and +0.50 D sphere OS. I could read comfortably at 15 inches, and I experienced an increase in depth of field. At arm's length, however, my vision was hit or miss and was often plagued with a blurred ghost image.

NIGHT VISION

My night glare on the day of surgery resembled something like a twirling fourth-of-July sparkler at arm's length around oncoming headlights until cycloplegia lessened. During the first 3 weeks postoperatively, the halos around headlights were exactly like the Holladay IOL Consultant (Holladay Consulting, Inc., Bellaire, TX) night driving slides. Concentric monochromatic halos were only present for some rare lights with totally dark backgrounds, and they were all distance dependent. They were absent beyond a mile, most prominent at half a mile, and absent again within one-quarter mile. There was no glare and my halos decreased steadily. Once the cycloplegia wore off at 30 hours postoperatively, night driving was never even a mild concern. The halos were distinct and intermittently present but always easily distinguishable as artifact. At 3 weeks postoperatively, I believed that even if my vision did not continue to improve, I would still be happy with the lens.

NEAR VISION

Lighting and background make a difference in my near vision, especially at arm's length. More light usually helps. At 3 weeks postoperatively while soldering wires with a bright light, at 20 inches, however, I had to move a light-colored background behind the wires to decrease the reflections or diffuse or decrease the light to a moderate level.

COLORS

The yellow tint to the AcrySof Restor Aspheric IOL may have matched my preoperative nuclear sclerosis exactly, as I have not noticed any change in my perception of colors.

ACCOMMODATION

As a pseudophake, I am not supposed to have accommodation. My near point of accommodation, as measured by how close I can read J1 print, moves out a couple of inches when I am tired, and my reading vision at arm's length gets worse.

Astigmatism is two focal points in the same lens. From basic optics, when the object of regard is in the zone between the focal points' it is clearest, and that is called the *circle of least confusion*. The AcrySof Restor Aspheric IOL also has two focal points in one lens, which are the clearest when the object of regard is anywhere but in the zone between the focal points. As the object of regard approaches the midpoint between the focal points (24 inches for an emmetropic AcrySof Restor Aspheric IOL patient), it is equally blurred and is even double until neural adaptation occurs. Part of the neural adaptation is suppressing the blurred image. If one starts at the shifting point between the focals, therefore, they are equally blurred. Also, accommodation works against one if he is at the distal part of his near range, so it takes practice to relax accommodation, which improves if one mentally focus on the image and push it away repeatedly. Conversely, accommodation can help if one is capable of staying focused on the distance focal image as it approaches the circle of most confusion. It is challenging to motivate patients to do this because some expect it to be instant and automatic.

If necessary, a patient can use +1.50 D reading glasses when working on a computer, but I prefer to lean in toward the computer's screen a bit. Flat panel monitors have dramatically reduced the inconvenience of adjusting the viewing distance.

DR. VOS' SIMULATED POSTOPERATIVE REFRACTIONS AND OBSERVATIONS

- +0.50 D of sphere for distance vision of 20/25+ and near vision of J1 at 16 inches
- +0.25 D of sphere for distance vision of 20/15 and near vision of J1 at 15 inches
- Plano sphere for distance vision of 20/15 and near vision of J1 at 13 inches
- -0.25 D of sphere for distance vision of 20/15 and near vision of J1+ at 11 inches
- -0.50 D of sphere for distance vision of 20/20 and near vision of J1+ at 10 inches

LOW HYPEROPIA VERSUS LOW MYOPIA

Before my surgery I had the bias that a low hyperopic result would be better than a low myopic result, but it really depends on the distance at which the patient wants to work postoperatively. Fortunately, my surgeon delivered just what I thought I wanted: +0.25 D sphere in my right eye and +0.50 D sphere in my left. I simulated various residual refractions and used trial frames when reading fine print, computer screens at arm's length, and driving. Of course, my best distance vision was with -0.25 D sphere; plano sphere or +0.25 D sphere were 20/15. The myopic tests actually improved reading and the distant edge of the circle of most confusion (18 to 30 inches). The -0.25 D sphere or -0.50 D sphere residual refractive errors helped with the dashboard instruments while driving and when using the computer at arm's length distance. A myopic residual refractive error moves the near point closer but also moves the near capability of the distance part of the lens closer.

Tasks at arm's length surprised me the most. The car dashboard and the computer were significantly clearer at 27 to 30 inches with a residual refractive error of -0.25 D sphere and -0.50 D sphere. A little anisometropia can help my intermediate vision. With a plano sphere residual refractive error in one eye and -0.75 D sphere in the other, there is a seamless transition from 9 inches through distance. A plano sphere in one eye and -0.50 D sphere residual refractive error in the other provides clear vision at 10 to 14 inches, and a little blurred with small print from 14 to 22 inches, but it does improve significantly when moving the reading material out to 22 to 30 inches. Less than 1.00 D of anisometropia does not affect the threading a needle for me.

A plano sphere result in one eye and -0.75 D sphere in the other eye eliminated the circle of most confusion at arm's length without sacrificing needle threading or creating night glare in my simulation. The clinical pearl here is that a postoperative target of +0.25 D sphere in the dominant eye and -0.25 sphere in the nondominant eye is 20/15 in both eyes at distance, improves intermediate visual adaptation, and creates no glare or problem with stereopsis. Also patients that have "waxy" vision or trouble adapting have a dramatic improvement with temporary monofocal contacts if they have a residual error of +0.25 to +0.50 D sphere in one eye and -0.25 D sphere in the other. This is a good way help them adapt early, before LASIK can be performed.

DR. VOS' SIMULATION FOR DISTANCE

• Plano sphere	for distance vision of 20/15
• +0.25 -0.50 @ 90	for distance vision of 20/20+2
• +0.37 -0.75 @ 90	for distance vision of 20/25+
• +0.50 -1.00 @ 90	for distance vision of 20/25-
• +0.62 -1.25 @ 90	for distance vision of 20/40-
• +0.75 -1.50 @ 90	for distance vision of 20/60-

ASTIGMATISM

I am fortunate not to have astigmatism, but I wondered how much is tolerable.

Switching the axis to 180° had no effect on my results. There is a dramatic drop-off in acuity above 1.00 D of astigmatism. This was at least as bad for intermediate or near vision.

More than 1.00 D of residual astigmatism would certainly explain the "waxy vision" reported by some patients. More than 0.75 D of anisometropia might be another explanation. I cannot rule out a failure to adequately suppress the out-of-focus image for those who concentrate on it instead of the intended image. It is important to realize that the multifocal implants create monocular diplopia and patients must undergo neural adaptation to suppress one image. For me, the ghost image was prominent the first day. A week later, it would occasionally be seen as a "cartoon thought bubble" surrounding a line of white print on a black background, which was more noticeable in low-light conditions, but improved when I held the reading material closer.

IN SUMMARY

I have been happy with my results, and I would undergo refractive lens exchange with the AcrySof Restor Aspheric IOL again. The procedure, however, is not for everyone. Patience and optimism are rewarded with spectacle independence, although a temporary contact lens and or LASIK enhancement may be needed to fine-tune the results. I would still offer the Crystalens (Bausch & Lomb, Rochester, NY) to patients who convinced me that they have no patience for adaptation and rarely read closer than arm's length, but I worry that they will not know what they are giving up. ■

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