PC-IOLs and Patients

With AMD on the rise, many options are studied.

BY JAY S. PEPOSE, MD, PHD

The present and future impact of age-related macular degeneration in the United States is staggering. It is estimated that AMD is the cause of 54.4% of overall visual impairment and 23% of blindness among Caucasians. The Beaver Dam Eye Study revealed that drusen is present in 2% of people 43 to 54 years of age and in 24% of those over 75 years of age in the United States. Data from a number of large epidemiological studies indicate that almost one in three people over the age of 70 have early stages of AMD and that the incidence of the more severe forms of the disease increases from less than 1% in people under 65 years of age to more than 25% in the 90 plus age group.

Thus, the impact of AMD on quality of life is profound, with moderate AMD showing a reduction in utility values similar to that associated with severe angina or permanent renal dialysis. Very severe AMD is associated with a quality of life score similar to someone with uncontrolled pain from prostatic cancer. These latter individuals with end-stage AMD are so impaired that they indicate that they would be willing to give up half of their remaining life if they could regain normal vision.

The Age-related Eye Disease Study found that 20.2% of individuals with early stage AMD progressed to advanced disease over a five-year period, a rate of 4.0% per year. The prevalence of AMD and its resultant morbidity is likely to increase as the U.S. population ages because the annual incidence of AMD increases with age from less than 1% for those younger than 60 years to greater than 5% for people aged 80 years and older. By 2050, the number of people in the United States aged 65 years and older is expected to grow to nearly the current number of people older than 65 years.

The Presbyopia-Correcting IOL Option

Given this background and the collective graying of the baby boomers, is it advisable to implant a presbyopia-correcting IOL in a patient with AMD? Most patients who pay out of pocket for a premium IOL have high expectations of achieving excellent uncorrected distance, intermediate and near vision. Sometimes what may look like minimal dry AMD can have a profound impact on potential vision, and the
With Macular Issues

The possibility of the condition advancing is not negligible. Patients with AMD often have reduced levels of contrast sensitivity. Therefore, these patients may not be ideal candidates for either accommodating or multifocal IOLs, but may be better suited for aspheric monofocal IOLs with the goal of maximizing image contrast.

If the cataract patient with mild, dry AMD (Figures 1 and 2) — or other mild macular issues (Figure 3) — and average mesopic pupil size is highly motivated to undergo implantation of a presbyopia-correcting IOL, Crystalens (Bausch & Lomb) may be the preferred choice following extensive discussion of the potential limitations in refractive outcome related to AMD, along with the possibility of the AMD advancing.

Most surgeons, but not all, veer away from implanting a multifocal IOL in these patients, as these lenses (including the aspheric versions) have been labeled by the FDA with a warning to exercise caution when driving at night or under low visibility conditions. This is because some patients with multifocal IOLs may have reduced contrast sensitivity compared with those with monofocal IOLs under these conditions. Using a multifocal IOL in someone with already decreased contrast sensitivity due to AMD and age could potentially compound this phenomenon.

However, a few surgeons have anecdotally reported implanting Alcon’s apodized diffractive ReStor IOL in patients with advanced AMD, with a target of -2 D and the goal of achieving an add of +5.2 D. It will be of great interest to learn about the follow-up of these patients in the peer-reviewed literature. Interestingly, diffractive optics can also be used to create high magnification readers for low-vision patients, which obviates the “coke bottle” appearance or heavy weight of refractive lenses of similar power. Eschenbach Optik makes a binocular version of these in powers up to +10 D and a monocular version up to +24 D.

Telescopic IOLs and Future Options

Under evaluation are Implantable Miniature Telescope (IMT) prostheses (VisionCare Ophthalmic Technologies) for patients with bilateral end-stage AMD that magnify the retinal image sufficiently to minimize the scotoma and project the image extrafoveally over a relatively wide 52-degree diameter of the central and peripheral retina (Figure 4).

The 3x model, implanted in one eye, showed a mean BCVA improvement of 3.6 lines at two years. There is an initial substantial drop in corneal endothelial cell count, which then stabilizes over the next two years with endothelial remodeling. The field of view with the IMT is limited to the central 20-degree angle and so the prosthesis is only implanted unilaterally and the contralateral eye is used for peripheral vision.

A newer device, the Lipshitz macular implant (LMI) (Optolight Vision Technology) magnifies the image on the retina using a...
shown to significantly improve vision. The mirror telescope.12 This device was designed to magnify the central image 2.5 times, while providing a non-magnified view of the periphery and maintaining orientation in space due to normal non-magnified peripheral vision. The LMI lens can be bilaterally implanted as it allows both enlarged central vision and normal peripheral vision.

As AMD advances, many patients develop one or more preferred extrafoveal fixation points or preferred retinal location (PRL) of eccentric fixation, which can vary at certain time points in the disease and also for different illuminations.

For example, early in AMD when there is still some remaining foveal function with a surrounding ring scotoma, the patient may use the functional fovea for high spatial acuity tasks and also use an eccentric fixation outside of the scotoma for other tasks.13 Once the macula and fovea, which has the highest density of cones, has degenerated to the degree that precludes high spatial resolution, most patients develop a single PRL, often near the edge of the scotoma in an adjacent area of functioning retina. A large part of the human brain is dedicated to visual processing (more than all of the other senses combined). Visual processing is organized topographically in the primary visual cortex and input from the macula and fovea are represented on the posterior aspect of the calcarine sulcus (i.e., the foveal confluence). With advanced AMD and central scotoma, these patients are therefore left with a large part of deafferented visual cortex deprived of central visual input. Functional MRI studies have shown that the human brain in some AMD patients is capable of widespread cortical reorganization, allowing new neuronal connections to be made originating from an eccentric preferred retinal location to the deafferented region of visual cortex previously driven by central visual input.14 It is possible that this reorganization can be facilitated by utilizing vision training or rehabilitation programs, leveraging knowledge about how cortical reorganization develops. Thus, the approach to AMD in the future for the anterior segment surgeon is likely to be multifaceted. OM

References


Dr. Pepose is Medical Director of Pepose Vision Institute and professor of Clinical Ophthalmology at Washington University in St. Louis. He is a subspecialist in corneal and refractive surgery and has participated in many clinical trials, including the first excimer laser phase 3 study in the United States in 1988. He has published over 150 peer-reviewed articles and is an executive editor of The American Journal of Ophthalmology.