

Intraocular Lenses for Cataract Surgery: Advances in the New Millennium

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Intraocular lenses (IOLs) are artificial lenses used to replace the eye's natural lens that is removed during cataract surgery. The first IOL was implanted in England in the early 1950s and the United States FDA approval for use of intraocular lens implants occurred in 1981. Prior to that time, patients who had cataract surgery without IOLs required either thick glasses that resulted in significant magnification and distortion of vision or contact lenses that were associated with the wear-and-tear of daily application and removal. IOL implantation has been a tremendous advance which enables restoration of nearly normal vision and greatly reduces problems associated with thick cataract spectacles and contact lenses. In the past, only a few options were available for the patient and surgeon, but now a host of options are available that allow us to personalize the care for each individual patient and further define excellence in eye surgery. If you or someone you know will be undergoing cataract surgery, it is important to be aware of these options. Dr. Shingleton uses all of the different IOLs and techniques described in this information pamphlet. As a result, he can design the best surgical procedure for each cataract patient. The following information is designed to help you become more knowledgeable about cataract surgery and the choices associated with it. After reading these materials, you should feel free to ask questions of Dr. Shingleton or any member of our staff.



Traditional Monofocal IOLs and Blended / Monovision

Traditional IOLs are single focus (monofocal). This means that they offer vision at one distance (far, intermediate or near). They represent state-of-the-art technology and provide the **clearest and sharpest vision of all the implants**. For this important reason, monofocal IOLs are the most commonly used implants today. However, they are limited by their one focal distance. As a result, glasses are generally needed for focus zones not corrected by the IOL. With monofocal IOLs, “**blended or monovision**” can be utilized to enable patients to function reasonably well without glasses. This involves implanting an IOL in one eye that provides near or intermediate vision and an IOL in the other eye that provides distance vision. This is particularly well suited to people who have enjoyed monovision with contact lenses in the past. However, for people who have not previously experienced monovision, it does involve adjustment because of the change in depth perception that occurs. Since one eye is focused for near and the other eye focused for distance, the eyes do not work together and this can affect depth perception. Most patients adjust to this change and blended/ monovision is a very effective way of minimizing dependence on glasses.

Accommodating and Multifocal IOLs- Premium Lenses

In 2003, the Accommodating IOL was FDA approved for use in the United States and in 2005, new generation Multifocal Lenses became FDA approved. These IOLs improve both distance and near vision without glasses and do not require the reduction in depth perception associated with monovision. However, they have their own disadvantages and no IOL eliminates the need for glasses.

Accommodating IOL – Crystalens



The Crystalens, manufactured by Bausch and Lomb, gained FDA approval in the fall of 2003. It was designed to restore some of the eye's natural accommodation ability. In all of us, with the passage of time, the eye's ability to accommodate is reduced. Presbyopia results and many people start needing reading glasses when they reach the age of 40 to 50. Accommodation refers to the ability of the eye to change focus from near to far and back again with all distances in-between. The ciliary muscle contracts to enable this accommodative mechanism to occur. When the intraocular lens is removed, the ciliary muscle still retains its ability to contract and relax and the Crystalens utilizes this normal physiologic mechanism. The Crystalens has hinges on the sides of the implant theoretically permitting it to move with contraction and relaxation of the ciliary muscle. As a result, focusing is enabled from far to intermediate to near range. The Crystalens is the only accommodating IOL that has been approved in the United States, however, many other accommodating IOLs are in the research and development stage. The Crystalens provides reasonable distance and intermediate vision. Patients commonly require a blended/ monovision approach to reduce the need for reading glasses. Focal length predictability is less precise with the Crystalens and long term refraction changes are more common. These factors limit applicability of this IOL for many patients.

Multifocal lenses - ReSTOR and Tecnis



ReSTOR Multifocal IOL



Tecnis Multifocal IOL

The ReSTOR Multifocal IOLs are manufactured by Alcon and work by combining the strengths of apodized diffractive and refractive technologies to provide focus at multiple ranges. The lens has concentric circular ridges that are exceedingly small and permit the eye to change its range of focus.

The Tecnis Multifocal Diffractive IOL is manufactured by Abbott Medical Optics. This IOL has multiple zones to provide near, intermediate and distance vision.

Both types of multifocal lenses come with aspheric optics and provide good distance and near vision that is more predictable than the Crystalens. However, the vision associated with each IOL varies based on lighting circumstances. The vision is sometimes described as "waxy" and is less clear and sharp than with monofocal implants. Glare or halos around lights are commonly noted after surgery.

Since Dr. Shingleton has a referral practice specializing in cataract surgery, he utilizes monofocal IOLs, blended/ monovision, accommodating and multifocal IOLs. Effort is made to choose the approach and IOL that is best suited for a given patient. Each approach and IOL has its own pros and cons and not all patients are candidates for new technology lens implantation. It is important to appreciate that **none** of the approaches or IOLs provide total freedom from the use of glasses for distance or near vision and all patients must understand that they may need glasses after cataract surgery. However, blended / monovision and accommodating / multifocal IOLs provide an opportunity for patients to have reduced dependence on glasses. Specific visual needs, desire for clarity of vision and sensitivity to glare and halos help direct which IOL is best for a given patient.

Astigmatic Keratotomies and Toric IOLs for treatment of Astigmatism

Astigmatism occurs when the front surface of the eye (cornea) has a different surface curvature in one direction compared to the other. Astigmatism can blur vision at all distances. It is often present at birth and may occur in combination with nearsightedness or farsightedness. Astigmatism is common and affects most people to some degree. The traditional IOL inserted at the time of cataract extraction will correct nearsightedness or farsightedness but it will not correct astigmatism.

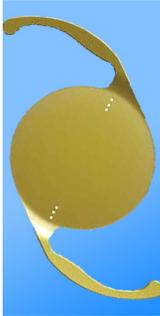
Dr. Shingleton will often help reduce the astigmatism of the eye to improve the quality of vision without glasses after cataract surgery. One successful way to reduce astigmatism is to make small incisions in the cornea called astigmatic keratotomies. Another method employs implantation of a "Toric" IOL. Both methods are typically used for people who have a significant amount of astigmatism and will require surgery in both eyes. Both techniques are meant to reduce astigmatism to an acceptable level that increases spectacle independence for either far or near, **but not both**. Eyeglasses will still be needed for the focal length option not chosen by the patient and may be required for activities that call for the most precise vision. Blended / monovision approaches can be incorporated to minimize spectacle dependence.

Cost and availability

Dr. Shingleton has performed over 50,000 eye surgical procedures and has experience with all the approaches and IOLs included in this review. Each approach and IOL has its own pros and cons and Dr. Shingleton strives to choose the option that will maximize the benefits for each patient. Your input is important in the decision making process. The correct lens for you will depend upon the health status of your eyes, visual needs, and how strongly you desire to be independent of glasses. You should feel free to ask any member of the Shingleton Cataract Team about your options. Cost is also an important issue. Cataract surgery is covered by Medicare, Medicaid, and virtually all health insurance plans. The traditional, state-of-the-art, monofocal lens is covered as well as the surgeon's fee, surgical center fee and anesthesiologist fee. However, the costs of the newer accommodating, multifocal and toric IOLs are not covered by Medicare or most private insurance companies. In addition, certain tests required for the implantation of these IOLs and associated procedures, such as astigmatic keratotomies, are not covered by insurance. As a result, patients are required to pay for the costs associated with these IOLs, tests, and special surgical techniques. It is also important to appreciate that postoperative laser or surgical procedures are occasionally used to fine-tune refractive outcomes.

We hope this review has been helpful to you. All patients should know that one approach or IOL is not better than another, they are just different. Dr. Shingleton's goal is to provide the safest and most effective cataract surgery for each one of his patients. He is a leader in the use of new technology and is involved in research looking toward improvements in the future. All efforts will be made to personalize the cataract surgery approach and IOL choice for you so that you will be able to enjoy improved vision for years to come.

Premium IOL's

	Crystalens	Tecnis	ReSTOR	AcrySof Toric / Tecnis Toric
				
Focusing Mechanism	Implant moves back and forth (autofocuses), enabled by eye muscles	Light focused through separate zones for far, arm's length, and near vision	Light focused through "apodized" lens, giving far and near focusing	Astigmatism correcting implant
Advantages	Reasonable distance and arms length vision. Marginal near vision – often requires blended or monovision. Least glare	Good results for distance, arm's length, and near vision	Best for fine print at near. Good distance vision. Intermediate vision improved with ReSTOR 3.	Reduces spectacle dependence – either near or far, not both unless blended/ monovision approach used.
Disadvantages	Some "learning curve" in re-training muscles to focus. Time and effort required. Potential variability over time. Least predictable. Often need "readers".	Potential glare problems and "waxy" vision. May need glasses for fine print especially in bright light	Potential glare issues, "waxy" vision and reduced near vision in dim lighting.	Monofocal implant; Requires the use of reading glasses if distance focus chosen. May require glasses for sharpest vision in tasks such as driving or computer work

