Editorial

Refractive Surgery for the High Myope: Controversy and Concern

Approximately 0.3% to 0.5% of the population, or nearly one million Americans, suffers from myopia that is severe enough to cause visual disability while wearing spectacle lenses, which is similar to the disability encountered by the aphakic patient. This disability is no less real to the afflicted patient than the disability that we have come to appreciate in our aphakic patients who are not afforded the benefits of intraocular lenses. While many of these patients adapt well to a contact lens, others find this optical correction outside of their reach because of excess cost, ocular intolerance, or work environment-related problems.

Advances in refractive surgery now give the ophthalmologist several surgical alternatives for helping the myopic patient overcome the visual disability associated with spectacle wear. Unfortunately, each of these modalities, as is the case with all surgical procedures, exposes the patient to some risk. It is especially important for the patient and surgeon to carefully weigh each of these alternatives with regard to their safety, because many patients in the highly myopic group are significantly younger than the older aphakic patient we are more accustomed to counseling.

Analysis of the currently available surgical procedures for the correction of high myopia, including:

- Hydrogel, polysulfone, or polycarbonate intracorneal lenses;
- Excimer corneal lathing;
- Freeze or nonfreeze epikeratophakia;
- Anterior chamber lens implantation in phakic eyes;
- Consideration of clear lens extraction with or without a low-powered posterior chamber lens;
- Myopic keratomileusis, while having the longest track record and a confirmed record of efficacy, is a significant surgical undertaking and a nonreversible procedure. While a small number of surgeons have adopted this technique with good result, most have found the microkeratome section, lathing requirements, and nonreversibility to be a significant drawback decreasing the application of this technique to a small number of patients.

The concept of hydrogel keratophakia, while showing promise in the laboratory, suffers from the same requirement for a microkeratome section. Excimer laser surface lathing is in its infancy and not yet available.

In answer to these concerns, development is progressing with high refractive index synthetic intracorneal lenses made of material such as polysulfone and polycarbonate. These high refractive index materials are capable of correcting a significant amount (up to 20 diopters) of myopia without the need for a microkeratome section. The safety of this technology appears to be advancing through the utilization of microfenestration of the materials and the procedure is technically less formidable and more reversible than the procedures that require a microkeratome section. Nonetheless, this technology is still appropriately several years away from broad application.

Myopic epikeratophakia, either using prepared lathed and lyophilized tissue or nonfreeze tissue lathed by the surgeon in the operating room, has proven efficacious for high myopia. While this technique is relatively safe and reversible, there have been significant problems with abnormal re-epithelialization, irregular astigmatism, delayed visual rehabilitation, and, especially, inaccurate correction with significant over- or undercorrection. New advances in donor lenticule design and surgical technique are likely to overcome these problems. This operation, because of its relative surgical ease and reversibility, will probably become the procedure of choice for the highly myopic patient in the next year. Still, after some experience, I find myself counseling most patients to "wait another year or so" as this technique evolves.

Two other techniques that are currently being reinvestigated deserve special care and research.
prior to their application. These two techniques are the placement of an anterior chamber lens in the phakic eye and the removal of the clear lens with or without placement of a low-powered posterior chamber lens. Each of these techniques has a history of prior application with eventual abandonment due to an unacceptable complication rate.

Anterior chamber lenses were placed in phakic eyes in significant numbers in the 1950s. The results were extraordinarily bad; most of the lenses needed to be removed and several eyes were lost. Nonetheless, current advocates appropriately argue that lens implant technology has advanced and the failed implants were of extremely poor quality and, therefore, doomed to failure. It is, however, my concern that while it may be possible to design an anterior chamber lens that would be reasonably well tolerated in the phakic eye, there are significant potential problems that are unlikely to be overcome. I am certain that the patient will face a risk of pupillary block, secondary glaucoma, and iritis in a relatively similar proportion to what we observe currently in our aphakic patients implanted with anterior chamber lenses.

In addition, the inflammation associated with an incision, iridectomy, and placement of the anterior chamber lens will lead almost undoubtedly to a significant incidence of secondary cataract in the decades following anterior chamber lens placement. Certainly, this has been observed following more simple procedures such as surgical iridectomy or paracentesis.

It will be extremely difficult to accumulate satisfactory data in an animal model, because complications such as secondary cataract may not develop for 20 or 30 years. As we struggle to develop an anterior chamber lens that can achieve satisfactory results for elderly patients for five or ten years, it is almost inconceivable that we can pursue successfully a similar approach in young phakic myopes with a 50-year or greater life expectancy.

With regard to clear lens extraction, with or without implantation of a low-powered posterior chamber lens, one can certainly appreciate why this is an attractive alternative in many ophthalmologists' minds. Here is a procedure that has advanced to a high level of success, especially through the use of current techniques of extracapsular cataract extraction and in-the-bag implantation of a modern posterior chamber lens implant. It can even be argued that the younger patients do better with posterior chamber lens implantation, and series obtaining as many as 98% of patients with a visual acuity of 20/40 or better are obtainable.

There is, however, a baseline incidence of complications including cystoid macular edema, iritis, late corneal dystrophy, and subluxation or decentration of a posterior chamber lens. The cumulative incidence of these complications by five years in good hands is at least 1% to 2% and may approach 5% in some series. In addition, there is the occasional endophthalmitis or choroidal hemorrhage, the second of these complications being more common in the axial myope.

The main concern, however, is that retinal detachment appears to be more common in the axial myope than in the normal patient. Several recent reviews, including my own, have found the incidence of retinal detachment in the axial myope in spite of the maintenance of an intact capsule and placement of a posterior chamber lens to approach 5% at five years. It must be remembered that while 75% or so of retinal detachments might be expected to occur within three years of lens removal, detachments have been reported later than 20 years following cataract extraction in children or young adults. In addition, retinal detachment repair is in many cases more complicated in the axial myope, and recovery of vision is far from certain. Finally, the posterior capsules of many of these young patients will opacify and the required discission or repolishing will magnify the risk.

I estimate that the axial myope who selects clear lens extraction with or without a posterior chamber lens implant for the correction of their refractive error will face up to a 10% incidence of significant complication by five years following surgery. It may be possible with extremely careful surgery, close follow-up, and the use of specially designed lens implants to reduce this risk to 5%, but in other situations where ideal care is not available it may rise to as high as 15%. In addition, young myopes will find that they will lose their ability to accommodate, suffering an iatrogenic presbyopia. Bifocal intraocular lenses may become available or one eye may be left mildly myopic creating a monovision situation; but most young patients will find these unsatisfactory in comparison to normal accommodation. For these reasons I feel that clear lens extraction with or without a low-powered posterior chamber lens implant will not gain broad acceptance with ophthalmic surgeons or patients.

Unfortunately, it does not appear that we currently have the ideal procedure for correction of the highly myopic patient. The ideal procedure should have a very high safety factor considering the young age of these patients; it should be very predictable, or as an alternative easily adjusted; and it should be reversible as the patients' needs or desires change with time. The current potpourri of techniques do not as yet provide an appropriate risk/benefit ratio to recommend broad application. We should be cautious in our application of these procedures until technology develops further to prevent this potpourri from developing into a Pandora's box.

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