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PRESBYOPIA SURGERY INTRODUCTION

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One of the major challenges in refractive surgery over past years has been the restoration of near vision in individuals with presbyopia. Current surgical techniques targeted to offer functional unaided near and distance vision are based on 3 principal approaches. The first is to create acquired anisometropia, with one eye corrected for distance vision and the other for near (monovision); the second is to increase functional ocular depth of focus, by providing simultaneously satisfactory distance and near vision (multifocality); and the third is to surgically achieve real changes in ocular/lens power (accommodation). In practice, a combination of these approaches is often used.

The surgical establishment of multifocality and monovision can be achieved with both corneal and intraocular procedures (Table 15-1). Corneal procedures include corneal laser surgery, thermokeratoplasty, intracorneal photodisruption, and implantation of corneal inlays. Implantation of corneal inlays has the major advantage of being the only technique with almost fully reversible effect. Corneal surgery is more appropriate for young presbyopes (40 to 50 years of age) and patients with no signs of cataract formation.

In cataract surgery or refractive lens exchange, monovision is achieved with binocular implantation of monofocal lenses with proper power selection, whereas multifocality is achieved with implantation of a range of simultaneous-vision (ie, aspheric,

multifocal, and diffractive/annular bifocal) intraocular lenses (IOLs). Both techniques have been used for several years with satisfying results for the majority of patients. Light-adjustable lenses offer the opportunity to correct for small errors in the postoperative refractive outcome.

Concerning surgical restoration of dynamic change in focus (ie, restoration of true accommodation), several procedures are being developed that aim to partially or fully repair some of the properties of the accommodation system, which are lost in the presbyopic eye. Such treatments include scleral expansion, scleral microexcisions, femtosecond laser treatment of the crystalline lens, cataract surgery with lens refilling, and cataract surgery with implantation of “accommodative” IOLs (A-IOLs). A-IOLs may offer partial restoration of accommodation through their forward movement during accommodative effort, and more recently such implants have been combined with multifocal designs.

The efficacy of all of these methods to restore near vision depends on several characteristics of the individual patient such as his or her biometric parameters, age, and near-vision needs in everyday life. Even if the surgical procedure is properly undertaken, the result may be unsatisfactory if it fails to meet the patient’s needs and expectations. It is important to note that not all techniques are suitable for any individual

TABLE 15-1. A SUMMARY OF THE TECHNIQUES THAT ARE CURRENTLY USED IN PRESBYOPIA SURGERY

| CORNEAL PROCEDURES | | LENS PROCEDURES | | SCLERAL PROCEDURES |
|--------------------|--|------------------------|----------------------|-------------------------|
| PresbyLASIK | Monovision | Monofocal IOLs | | Expansion bands |
| | Multifocal | Multifocal IOLs | Diffractive | |
| Corneal inlays | Flexivue (Presbia, Amsterdam, Netherlands) | | Bifocal | |
| | | | Refractive | |
| | Kamra (Acufocus, Irvine, CA) | Accommodative (A-IOLs) | Sagittal-translating | |
| | | | Lateral-translating | |
| | | | Piston bulge | |
| | Vue+ (Revision Optics, Lake Forest, CA) | Multifocal/A-IOL combo | | Laser scleral incisions |
| Corneal onlays | | Lens photodisruption | | |
| Corneal shrinking | CK | Lens refilling | | |
| | Intracor (Intracor, Parramatta, New South Wales) | | | |

A-IOLs, accommodative intraocular lenses

patient and not all patients are suitable for any one technique. Consequently, eye specialists should keep in mind 3 main factors:

1. The need for continuous training and education in the latest subjective and objective techniques for the evaluation of visual performance to thoroughly understand the optical and functional status of the vision of each patient.
2. The importance of properly assessing the visual needs of the individual patient, whose expectations must also be guided by proper explanation and, if possible, demonstration of the expected results of any technique to give them a realistic view of the postoperative vision that might be achieved.
3. The necessity for expertise in a variety of techniques to be able to select that which is most suitable for each patient. Careful patient selection based on multiple factors is a key part of the process.

At present, the development of surgical procedures to restore accommodation is a continuously evolving field of modern refractive surgery that involves large amounts of investigation and ingenuity. The purpose is to offer the patient independence from spectacles for far and near vision without compromising functional visual performance. Currently available techniques have already demonstrated satisfactory results, indicating that the target of restoring accommodation to a level that adequately satisfies the near-vision needs of most presbyopes may be within our reach.

Subsequent chapters in this book deal in more detail with the various techniques outlined above. Because one problem in comparing the relative “success” of different techniques is that visual performance and patient satisfaction are often inadequately investigated, the surgical chapters are followed by discussions of decision making and evaluation of corrections.