INTRAOCULAR LENS FOR CAPSULAR BAG IMPLANTATION

The present invention relates to intraocular lenses and, more particularly, to intraocular lenses implanted within the capsular bag.

Numerous intraocular lenses have been created within the past fifteen years and many types of these lenses are presently being actively implanted in patients who have undergone intracapsular and extracapsular cataract extractions. Certain of these lenses are intended for attachment within the anterior chamber while others are intended for attachment within the posterior chamber. A few of the prior art lenses may be implanted within either the anterior or the posterior chamber. Of the lenses to be encapsulated in the posterior chamber, many configurations of the supporting loop or loops, sometimes referred to as haptics, have been developed, depending upon the nature of the attachment to be effected.

Some of the problems attendant intraocular lenses for implantation in the posterior chamber of the eye include decentration and glare from light striking the edge of the lens and/or a positioning holes within the pupillary zone. Posterior iris chafing may be caused by haptics located in the ciliar sulcus and rubbing by the lens against the back of the iris. Moreover, none of the prior art lenses readily permit accommodation by the patient; that is, the focal power is essentially invariable and established by the configuration of the lens as manufactured.

The intraocular lens of the present invention includes a pair of haptics which, in combination, define a reversed S shape for retaining the lens within the capsular bag. The haptics, being angled anteriorly from the lens to their outermost extremity, cause the lens to exert a slight pressure against the posterior capsule to prevent both wrinkles and stress lines. Moreover, with the continuing retention of the lens adjacent the posterior capsule, there is the potential for accommodation. The lens is formed with a very thin, smooth, rounded perimeter edge to permit implantation of a greater than six (6) millimeter diameter lens optic without incurring the necessity for increasing the chord length of an incision necessary for a conventional six (6) millimeter diameter lens and to provide an unobstructed optical area of six (6) millimeters or more in diameter.

It is therefore a primary object of the present invention to provide an intraocular lens for implantation in the capsular bag.

Another object of the present invention is to provide a posterior chamber intraocular lens which provides the potential for the patient to alter the focal power of the eye.

Yet another object of the present invention is to provide a posterior chamber intraocular lens which precludes iris rubbing and chafing.

Still another object of the present invention is to provide an intraocular lens which exerts a slight pressure upon a posterior capsule to eliminate wrinkles and stress lines.

A further object of the present invention is to provide an enlarged intraocular lens having both the perimeter and positioning holes outside the optic zone to eliminate light reflection therefrom.

A yet further object of the present invention is to provide an extremely thin, rounded and smooth peripheral lens edge which permits insertion through an incision having a chord length the same as that necessary for smaller diameter conventional intraocular lenses.

A still further object of the present invention is to provide an intraocular lens having very flexible haptics with plastic memory capability.

These and other objects of the present invention will become apparent to those skilled in the art as the description thereof proceeds.

The present invention will be described with greater specificity and clarity with reference to the following drawings, in which:

FIG. **1** is a frontal view of an intraocular lens constructed in accordance with the present invention;

FIG. **2** is a partial posterior view of the intraocular lens illustrating certain features of the haptics;

FIG. **3** is a side view of the intraocular lens;

FIG. **4** is a frontal view illustrating an eye having the intraocular lens implanted; and

FIG. **5** is a partial cross-sectional view of an eye having the intraocular lens implanted.

Referring to FIG. **1**, there is shown an intraocular lens **10** having haptics **12** and **14** extending in opposed directions from optic **16**. The optic may include none or one or more positioning holes **18** dispersed adjacent peripheral edge **20**. The function and purpose of these holes are that of aiding the surgeon in manipulating the intraocular lens during implantation. Preferably, optic **16** is sized to provide a clear optic zone interior of the positioning holes with a diameter of approximately six (6) millimeters.

Haptics **12** and **14** may be formed integral with optic **16**. Alternatively, as illustrated, end **22** of haptic **12** may be inserted within an equivalent cross-section cavity **27** for retention therein. End **26** of haptic **14** may be similarly lodged within cavity **28**. In one embodiment, the cross-sectional diameter of the optic and the haptics is thirteen (13) millimeters with a tolerance of 0.25 millimeters. Prolene or polypropylene is a plastic often used for haptics attached to an optic manufactured of polymethylmethacrylate (PMMA) as it is readily flexible to accommodate pressures exerted by and upon the eye as a result of muscular contraction, eye movement or pressures (and blows) imposed upon the eye. However, prolene or polypropylene does not have significant plastic memory. For purposes of the present invention, it is preferable that haptics **12** and **14** be manufactured of PMMA in order to take advantage of the plastic memory capability of such material. It is contemplated that optic **16** will also be manufactured from PMMA.

Referring jointly to FIGS. **1**, **2** and **3**, further details of the haptic and optic construction and configuration will be discussed. Preferably, cavities **27** and **28** lie in the horizontal plane of the lens and at an angle of approximately 30° from a tangent at the point of attachment on edge **20** (or, from the plane of the sagital cross-section); this angle is represented by the letter alpha (α) in FIG. **2**. In the uncompressed or free standing state, each of haptics **12** and **14** present a curvature having a radius of approximately six (6) millimeters, as represented by haptic **12** in FIG. **2**. As particularly shown in FIG. **3**, each of haptics **12** and **14** is angled toward the anterior side of optic **16** at locations **30**, **32**, respectively, which locations are slightly beyond the point of protrusion of the haptics from the optic. Each haptic is angled at an angle of 7° from the horizontal plane of the lens, as represented by beta (β) in FIG. **3**. Each of the haptics is fabricated from PMMA to provide the plastic memory