INTRAOCULAR AND INTRACORNEAL REFRACTIVE LENSES

BACKGROUND OF THE INVENTION

[0001] The present invention generally relates to intraocular and intracorneal refractive lenses, and to methods for correcting vision by insertion of an intraocular or intracorneal refractive lens in an eye of a patient.

[0002] Intraocular or intracorneal refractive lenses provide a viable alternative to spectacles and extra-ocular contact lenses for correcting deficiencies in visual acuity. Intraocular lenses (IOLs) of the prior art typically comprise an optical portion for refraction and a haptic portion for supporting the IOL in the anterior or posterior chamber of the eye. All or part of an IOL may be constructed from a deformable or flexible material. A deformable IOL has the advantage that it can be inserted in the eye via a smaller incision than an incision required to insert a non-deformable or rigid IOL of comparable dimensions. Larger incisions in the eye have many disadvantages, including longer patient recovery times, and increased risk of infection. However, the flexible nature of deformable IOLs typically present problems both in maneuvering the IOL during an insertion procedure, and in retaining the IOL in the correct position within the eye. To prevent the risk of damage or necrosis of ocular tissue following contact with, or penetration by, a portion of an IOL, rigid and/or pointed structures should be avoided.

[0003] Nevertheless, in an attempt to anchor the IOL in place within the eye, prior art IOLs have used clasps, pointed tips, and the like which penetrate iris tissue. For example, US Patent No. 6,755,859 B2 to Hoffmann *et al.* discloses an intraocular lens having an optical portion and two or more haptic elements for supporting the optic portion in the eye via a tissue clasp on each haptic element. US Patent Application Publication No. US 2002/0103537 A1 (Willis *et al.*) discloses an intraocular lens having an optic and a haptic, wherein the distal end of the haptic includes a pointed tip constructed and arranged to

penetrate the iris. In a second embodiment of Willis *et al.*, the intraocular lens is attached to the iris by a staple.

[0004] US Patent Application Publication No. US 2004/0085511 A1 (Uno *et al.*) discloses an intraocular lens having at least one pore near the center of the optical part of the lens, and a plurality of grooves in the back surface of the lens in a region that will make contact with the crystalline lens. The grooves allow fluid to flow towards the pores, and the pores allow fluid to flow through the lens. The intraocular lens of Uno *et al.* may also have circumferentially spaced protrusions, arranged in the boundary between the optical part and the support part of the lens, in an attempt to separate the optical part of the IOL from the crystalline lens. The diameter of the pores is restricted by potential deterioration in optical characteristics of the optical portion, e.g., reflection of light incident on the periphery of the pores. The location of the protrusions is limited by their potential to interfere with or restrict deformability of the lens for insertion in the eye.

[0005] US Patent No. 6,106,553 to Feingold discloses an intraocular lens having a shape that is predetermined with respect to a shape of the crystalline lens to form a spacing between at least part of the IOL and the crystalline lens. For example, the radius of arc of the posterior surface of an optic portion of the IOL may be smaller than the radius of arc of the posterior surface of a body portion of the IOL, so that the optic portion has a vaulted relationship to the anterior surface of the crystalline lens in the location of the pupil. In this relationship (e.g., Figure 28 of the '553 patent), the body portion of the IOL is in contact with the crystalline lens at a position radially outward from the pupil. The IOL may have a circular groove that allows circulation of fluid in the eye (Figures 20 and 21 of the '553 patent).

[0006] As can be seen, there is a need for an intraocular lens which may be positioned in the eye, and held at a desired intraocular location, without penetrating or damaging the iris or other ocular tissue. There is a further need for an intraocular lens which allows the passage of aqueous humor

therethrough without compromising the optical characteristics or performance of the IOL. There is a still further need for an intraocular lens which may be positioned in the posterior chamber of the eye such that the IOL does not contact the crystalline lens, and wherein the IOL is readily deformable for insertion in the eye.

SUMMARY OF THE INVENTION

[0007] In one aspect of the present invention, there is provided an intraocular lens which comprises an optical portion; and a haptic portion surrounding said optical portion, wherein the haptic portion is corrugated.

[0008] In another aspect of the present invention, an intraocular lens comprises an inner domed portion; and an outer portion having a plurality of tabs disposed peripherally on the outer portion, wherein the domed portion is spaced axially from the plurality of tabs.

[0009] In still another aspect of the present invention, an intraocular lens comprises a central optical portion; and an outer haptic portion, wherein the haptic portion includes an annular portion disposed adjacent to, and radially outward from, the optical portion; a pair of inner arcuate corrugations disposed adjacent to, and radially outward from, the annular portion, the pair of inner arcuate corrugations disposed on opposite sides of the optical portion; and a pair of outer arcuate corrugations disposed adjacent to, and radially outward from, the pair of inner arcuate corrugations.

[0010] In yet another aspect of the present invention, there is provided an intraocular lens comprising an optical portion including a peripheral optic zone, and an inner non-optic zone surrounded by the peripheral optic zone, wherein the peripheral optic zone has optical power, and the inner non-optic zone has no optical power.

[0011] In a further aspect of the present invention, there is provided a haptic for an intraocular lens, the intraocular lens including an optical portion,

and the haptic comprising an annular portion encircling the optical portion; and at least one arcuate corrugation disposed adjacent to, and radially outward from, the optical portion.

[0012] In still a further aspect of the present invention, there is provided a method for correcting vision of a patient, comprising providing a refractive intraocular lens, wherein the intraocular lens comprises an optical portion and a haptic portion, and wherein the haptic portion is corrugated; forming an incision in an eye of the patient; and inserting the intraocular lens in the eye.

[0013] In yet a further aspect of the present invention, a method for correcting vision of a patient comprises the steps of providing a refractive intraocular lens, wherein the intraocular lens comprises an optical portion and a haptic portion, and wherein the haptic portion is corrugated; forming an incision in an eye of the patient; and inserting the intraocular lens in the eye, wherein the eye includes an iris, and the haptic portion is disposed posterior to the iris.

[0014] In still another aspect of the present invention, there is provided a method for inserting a refractive intraocular lens in an eye of a patient, the eye including a crystalline lens and an iris, wherein the method comprises deforming a refractive intraocular lens from an extended configuration to a deformed configuration, wherein the intraocular lens comprises an optical portion and a haptic portion, and wherein the haptic portion is corrugated; forming an incision in the eye; introducing the intraocular lens, in the deformed configuration, into the eye via the incision; and positioning the intraocular lens in the eye such that the optical portion is anteriorly spaced from the crystalline lens, and the haptic portion is disposed posterior to the iris.

[0015] In yet another aspect of the present invention, there is provided a method for correcting vision of a patient comprising providing a refractive intraocular lens; forming an incision in a cornea of the patient; and inserting the intraocular lens in the cornea, wherein the intraocular lens may comprise an optical portion including a peripheral optic zone having optical power, and an inner non-optic zone surrounded by the peripheral optic zone, wherein the inner

non-optic zone has no optical power.

[0016] These and other features, aspects, and advantages of the present invention will become better understood with reference to the following drawings, description, and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Figure 1A is a plan view of a corrugated IOL, according to the present invention;

[0018] Figure 1B is a plan view of an optical portion of an IOL, according to another embodiment of the present invention;

[0019] Figure 2A is another plan view of a corrugated IOL, according to an embodiment of the present invention;

[0020] Figure 2B is a perspective view of the corrugated IOL of Figure 2A;

[0021] Figure 2C is a side view of the corrugated IOL of Figures 2A-B as taken along the line 2C-2C of Figure 2A;

[0022] Figure 3A is a plan view of a corrugated IOL in a relaxed configuration, according to another embodiment of the present invention;

[0023] Figure 3B is a sectional view of the corrugated IOL of Figure 3A as seen along the line 3B-3B of Figure 3A;

[0024] Figure 3C is a sectional view of the corrugated IOL of Figure 3A as seen along the line 3C-3C of Figure 3A;

[0025] Figure 3D is a sectional view of the corrugated IOL of Figure 3A, as may be seen along the line 3C-3C of Figure 3A, when the IOL adopts a flexed configuration;

[0026] Figure 3E schematically represents a corrugated IOL in a deformed configuration, according to one aspect of the present invention;

[0027] Figure 4A is a plan view of a corrugated IOL, according to another embodiment of the present invention;

[0028] Figure 4B is a sectional view of the corrugated IOL of Figure 4A taken along the line 4B-4B of Figure 4A;

[0029] Figure 5A is a sectional view of the anterior portion of an eye;

[0030] Figure 5B is a sectional view of the anterior portion of an eye having a corrugated IOL disposed in the eye, according to another embodiment of the invention;

[0031] Figure 5C is an enlarged view showing a gap between an optical portion of the IOL and the crystalline lens of the eye of Figure 5B;

[0032] Figure 6A is a sectional view of an eye having a corrugated IOL disposed in the eye, according to another embodiment of the invention;

[0033] Figure 6B is a sectional view of an eye having a corrugated IOL disposed within the capsule of the crystalline lens, according to another embodiment of the invention;

[0034] Figure 6C is a sectional view of the anterior portion of an eye having a corrugated IOL disposed within the cornea of the eye, according to another embodiment of the invention;

[0035] Figure 6D is a sectional view of the anterior portion of an eye having an IOL disposed within the cornea of the eye, according to another embodiment of the invention;

[0036] Figure 6E is a sectional view of the anterior portion of an eye having a corrugated IOL disposed within the anterior chamber of the eye, according to another embodiment of the invention;

[0037] Figure 7A schematically represents a series of steps involved in a method for correcting vision in a patient, according to another embodiment of the invention;

[0038] Figure 7B schematically represents a series of steps involved in a method for inserting a corrugated, deformable IOL in the eye of a patient, according to another embodiment of the invention; and

[0039] Figure 7C schematically represents a series of steps involved in a method for inserting an IOL in the cornea of a patient, according to another

embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0040] The following detailed description is of the best currently contemplated modes of carrying out the invention. The description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention, since the scope of the invention is best defined by the appended claims.

[0041] Broadly, the present invention relates to refractive intraocular lenses (IOLs) for insertion in an eye and to methods for correction of a visual deficiency of a patient. The present invention also relates to a method for inserting a deformable IOL in a patient's eye via a small incision in the eye.

[0042] Unlike prior art IOLs, which are retained against the anterior of the iris by structures that penetrate or grasp the iris tissue, IOLs of the present invention may comprise a corrugated haptic portion for facilitating positioning and retention of the IOL at various locations within the eye. In further contrast to prior art IOLs that have protrusions for spacing the prior art IOL from the crystalline lens, wherein the protrusions may interfere with or restrict deformability of the lens, the IOL of the present invention lacks such protrusions. Instead, IOLs of the present invention may have a domed portion and/or a corrugated haptic portion, such that an optical portion of the IOL is anteriorly spaced from the crystalline lens when the IOL is disposed behind the iris in the posterior chamber of the eye.

[0043] In further contrast to the prior art, in some embodiments of the present invention, an IOL optical portion may have a doughnut-like configuration including a peripheral optic-zone and an inner non-optic zone. In alternative embodiments of the present invention, the doughnut-like optical portion may either lack a haptic portion, or may be surrounded by a haptic portion.

[0044] In still further contrast to prior art IOLs that have one or more

openings for fluid flow within the optical portion, and which may interfere with the optical characteristics of the prior art IOL, IOLs of the present invention may include at least one irrigation channel disposed entirely within the haptic portion to allow passage of aqueous humor therethrough.

[0045] Figure 1A is a plan view of an IOL 10, according to the present invention. IOL 10 may comprise an optic or optical portion 20. Optical portion 20 may be disposed at a central or inner location of IOL 10. Optical portion 20 is not restricted to the configuration shown in the drawings, but may have various shapes, such as circular or oval, wherein optical portion 20 may be elongated in the horizontal direction or x axis (or shortened in the vertical direction or y axis). In some embodiments, optical portion 20 may have a doughnut-like configuration (see, for example, Figure 1B).

[0046] The optical characteristics of optical portion 20 may be selected for correcting various visual deficiencies, including without limitation: myopia (short sightedness, hypermetropia (long sightedness), and astigmatism. As an example, optical portion 20 may have a diopter power or value in the range of from +15 to -30. Optical portion 20 may be customized for a particular patient to provide optical characteristics to correct a specific visual defect of a patient. Optical portion 20 may be multi-focal. IOL 10 may also be provided as an off-the-shelf unit with pre-determined optical characteristics.

[0047] Again with reference to Figure 1A, IOL 10 may further comprise a haptic or haptic portion 30. Haptic portion 30 may surround optical portion 20. Haptic portion 30 may be corrugated. Haptic portion 30 may vary in the number and configuration of corrugations (see, for example, Figures 2A-4B). Haptic portion 30 may be adapted for supporting optical portion 20, and for holding IOL 10 in a desired position in the eye. For example, haptic portion 30 may be adapted for holding IOL 10 behind, or posterior to, the iris of the eye, such that optical portion 20 is spaced anteriorly from the crystalline lens of the eye (see, for example, Figures 5A-B, -6). Following insertion of IOL in an eye of a patient, the periphery of haptic portion 30 may contact the perimeter of the posterior

chamber 116 (see, e.g., Figures 5A-B) of the eye. The periphery of haptic portion 30 may be entire, as shown in Figure 1A, or in alternative embodiments, haptic portion 30 may have peripheral tabs 38a-d (see, for example, Figures 2A-C). IOL 10 may further include a tapered portion 12 of haptic portion 30 at a location adjacent to optical portion 20. Haptic portion 30 may have an overall length (x axis), L, in the range of from about 10 to 12 mm, and a height (y axis) at tapered portion 12, H_t, in the range of from about 5 to 6.5 mm. The ratio of length, L to height, Ht may typically be in the range of from about 1.5 to about 2.5

[0048] Haptic portion 30 may be pigmented. The pigment may be applied to the surface of haptic portion 30 after formation of haptic portion 30. Alternatively, a pigment may be incorporated into a material from which haptic portion 30 is to be formed, e.g., a molten polymer precursor material, such that the pigment is incorporated within haptic portion 30. Haptic portion 30 may be opaque to visible light and/or ultraviolet light. Haptic portion 30 may include an ultraviolet (UV) blocker. UV blockers are well known in the art. In some embodiments, haptic portion 30 may be non-pigmented, and may be transparent or translucent to visible light. Optical portion 20 may be transparent to visible light and may be non-pigmented.

[0049] Optical portion 20 and haptic portion 30 may each comprise a flexible material. IOL 10 may be adapted to be reversibly deformed from an extended configuration, for example, as shown in Figures 1A-2C, to a deformed configuration (see Figure 3E). For example, IOL may be adapted to be deformed by rolling or folding for insertion into the eye of a patient via an incision in the eye. Optical portion 20 and haptic portion 30 may each comprise a biocompatible material such as a silicone, a hydrogel, a urethane, or an acrylic, and the like, or other suitable biocompatible material. Materials which may be used in forming intraocular lenses are generally known in the art, as disclosed, for example, in US Patent No. 5,217,491, the disclosure of which is incorporated by reference herein.

[0050] Figure 1B is a plan view of an optical portion 20' for an IOL 10/10", according to another embodiment of the present invention. Optical portion 20' may have a doughnut-like configuration, wherein optical portion 20' may include a peripheral optic zone 22 having optical power. Peripheral optic zone 22 may surround an inner non-optic zone 24 having no optical power. In various embodiments of the present invention, optical portion 20' may be used in combination with various types of haptic portion 30, for example, as described herein with reference to Figures 1A, and 2A-4B. As an example, optical portion 20' may be combined with, or surrounded by, a haptic portion 30 having one or more corrugations 34.

[0051] Again with reference to Figure 1B, in alternative embodiments of the present invention, optical portion 20' may be used without a haptic portion (not shown in Figure 1B). That is to say, an IOL 10" may consist of, or consist essentially of, optical portion 20'. As an example, an IOL 10" lacking a haptic portion may be inserted within the cornea of a patient for vision correction of the patient (see, for example, Figure 6D). IOL 10/10" including optical portion 20' may be deformable for facile insertion in an eye of the patient, e.g., within a corneal pocket or beneath a corneal flap.

[0052] Figure 2A is a plan view of a corrugated IOL 10, according to an embodiment of the present invention. With reference to Figures 2A-C, IOL 10 may include optical portion 20, which may be centrally located within IOL 10, essentially as described with reference to Figure 1A. IOL 10 may further include an annular portion 32 disposed adjacent to, and radially outward from, optical portion 20. Annular portion 32 may encircle optical portion 20. Annular portion 32 may support optical portion 20 such that optical portion 20 is axially spaced from radially outer regions of haptic portion 30, e.g., tabs 38a-d. Annular portion 32 may be receded at first and second receded portions 33a, 33b, which may be disposed diametrically opposite each other. First and second receded portions 33a, 33b may partially define tapered portion 12 (Figure 1A).

[0053] IOL 10 may further include a first inner arcuate corrugation 34a and a second inner arcuate corrugation 34b disposed adjacent to, and radially outward from, annular portion 32. As shown in Figure 2C, haptic portion 30 may have an anterior (or upper) surface 14 and a posterior (or lower) surface 16. First inner arcuate corrugation 34a and second inner arcuate corrugation 34b may jointly form an inner partial annulus 34'. IOL 10 may still further include a first outer arcuate corrugation 36a and a second outer arcuate corrugation 36b disposed adjacent to, and radially outward from, inner partial annulus 34'. Both anterior surface 14 and posterior surface 16 of haptic portion 30 may be corrugated, for example, due to first outer arcuate corrugation 36a and second outer arcuate corrugation 36b.

[0054] First outer arcuate corrugation 36a and second outer arcuate corrugation 36b may jointly form an outer partial annulus 36'. First and second inner arcuate corrugations 34a, 34b and first and second outer arcuate corrugations 36a, 36b may be concentric with optical portion 20. Other numbers of corrugations for haptic portion 30 are also within the scope of the invention. Typically, the number of corrugations within haptic portion 30 may be in the range of from 1 to about 5. In general, a larger number of corrugations of haptic portion 30 may lead to increased flexibility and increased deformability in the horizontal direction (x axis). Further, haptic portion 30 may have corrugations (e.g., corrugations 34a', 36a', see Figure 4A) oriented in directions other than those shown in Figures 2A-C.

[0055] Corrugation of haptic portion 30 may provide increased rigidity of IOL 30, particularly in the z direction (Figure 2C), for a given material of a particular thickness and flexibility. Corrugations 34a-b, 36a-b may be grasped by the surgeon during insertion of IOL in an eye of a patient, and may allow improved maneuverability during positioning of IOL 10 in the eye. Haptic portion 30 may deform, or fold, along one or more corrugations during manipulation of IOL 10 during insertion of IOL 10 in the eye. Increased rigidity of haptic portion 30 may provide improved retention of IOL 10 in a desired

intraocular location, and may promote maintenance of a gap, D_L (Figure 5B) between IOL 10 and crystalline lens 102. Deformation of IOL 10 allows insertion of IOL 10 into the eye of a patient via a small (e.g., about 3 mm) incision. Corrugation of haptic portion 30 may cause IOL 10 to behave like a spring when distorted, for example, from a relaxed configuration (see, for example, Figures 2A-C, 3A-C) to a flexed configuration (e.g., Figure 3D). Flexure of IOL 10 may be caused by forces applied in the x direction, and towards the center of IOL 10, e.g., due to contact of the periphery of haptic portion 30 with the perimeter of the posterior chamber 116 of the eye (e.g., Figure 6A) or other intraocular structures. Corrugation of haptic portion 30 and its ability to flex may allow IOL 10 to be provided in a single size that fits at least 90% of all human patients. The term "size" as used here may denote a length and height of haptic portion 30. For an IOL 10 of a given size, the amount or degree of flexure of IOL 10, when inserted in the eye, may decrease with increasing size of the eye. Typically, IOL 10 may be sized so as to undergo at least some degree of flexure when inserted in the eye of a patient. Such flexure may promote retention of IOL 10 at a particular intraocular location. In contrast to prior art or conventional IOLs having a planar or non-corrugated haptic, IOL 10 of the invention does not rely on hardware to grasp or penetrate ocular tissues at a particular location in relation to the crystalline lens.

[0056] IOL 10 may still further include a plurality of tabs 38a-d. Tabs 38a-d may be disposed peripherally on haptic portion 30. Each of tabs 38a-d may be adapted for being bent with respect to regions of haptic portion 30 located radially inward from tabs 38a-d. For example, each of tabs 38a-d may be bent when IOL 10 is inserted in the posterior chamber of the eye (see, for example, Figure 5). Each of tabs 38a-d may have a rounded or curvilinear periphery or tab edge 39.

[0057] Figure 2B is a perspective view of corrugated IOL 10 of Figure 2A, indicating an axis A, which may correspond to an optical axis of IOL 10 or to a central point of optical portion 20. Optical portion 20 and annular portion 32

may jointly define a domed portion 31. Domed portion 31 may be axially spaced from inner partial annulus 34', which in turn may be axially spaced from outer partial annulus 36', which in turn may be axially spaced from tabs 38a-d.

[0058] Figure 2C is a side view of the corrugated IOL 10 of Figures 2A-B, showing the contours of haptic portion 30 along the line 2C-2C of Figure 2A, including first and second inner arcuate corrugations 34a, 34b disposed adjacent to, and radially outward from, annular portion 32; as well as first and second outer arcuate corrugations 36a, 36b disposed adjacent to, and radially outward from first and second inner arcuate corrugations 34a, 34b; and tabs 38a-d disposed adjacent to, and radially outward from, first and second outer arcuate corrugations 36a, 36b. Haptic portion 30 may have a thickness (z axis), T, typically in the range of from about 50 to 200 microns, usually from about 75 to 200 microns, and often from about 75 to 150 microns. When IOL 10 is in the relaxed state, first and second inner arcuate corrugations 34a, 34b may have an axial distance (or height) typically in the range of from about 400 to 1000 microns, usually from about 500 to 900 microns, and often from about 700 to 800 microns; while first and second outer arcuate corrugations 36a, 36b may have an axial distance (or height) typically in the range of from about 250 to 700 microns, usually from about 300 to 550 microns, and often from about 300 to 400 microns. IOL 10 may have an overall axial distance, or height, from optical portion 20 to tabs 38a-d, typically in the range of from about 1700 to 2100 microns, usually from about 1800 to 2000 microns, and often about 1900 microns.

[0059] Figure 3A is a plan view of a corrugated IOL 10, according to another embodiment of the present invention. Figure 3B is a sectional view of IOL 10 as seen along the line 3B-3B of Figure 3A, and Figure 3C is a sectional view of IOL 10 as seen along the line 3C-3C of Figure 3A. With reference to Figures 3A-C, IOL 10 may include various elements, features, and characteristics as described hereinabove with reference to Figures 1A-2C. For example, IOL 10 of Figures 3A-C may include an inner optical portion 20 and an

outer haptic portion 30.

[0060] Each of optical portion 20 and haptic portion 30 may comprise a flexible material, and IOL 10 may be readily deformable, e.g., for insertion through an incision in an eye. Haptic portion 30 may encircle optical portion 20, and haptic portion 30 may support IOL 10 when positioned in an eye of a patient during a surgical procedure for the correction of a visual deficiency (see, for example, Figures 5A-B, 6, 7A-B).

[0061] IOL 10 may be seen in Figures 3A-C in a relaxed configuration. With reference to Figures 3B and 3C, it can be readily appreciated that, when IOL 10 is in the relaxed (e.g., non-deformed) configuration, optical portion 20 may be axially spaced (relative to axis A, Figure 2B) from structures of haptic portion 30, such as tabs 38a-d.

[0062] IOL 10 may be flexible and may also temporarily and reversibly adopt a deformed configuration (see Figure 3E), for example, by folding or rolling IOL 10, for insertion through an incision in the eye of a patient, wherein the size of the incision may be minimized, e.g., to a length typically in the range of from about 2.8 to 3.2 mm.

[0063] IOL 10 may still further adopt a flexed configuration, for example, when positioned behind (posterior to) the iris of an eye (see Figure 5), wherein flexure of haptic portion 30 caused, for example by positioning IOL 10 between intraocular structures, may cause haptic portion 30 to exert a force against an intraocular structure, such as the posterior surface of the iris. The rigidity of haptic portion 30, and hence the force exerted thereby, may be increased by first and second inner arcuate corrugations 34a, 34b and first and second outer arcuate corrugations 36a, 36b, as compared with a non-corrugated haptic of similar composition and dimensions. Accordingly, in the flexed configuration of IOL 10, haptic portion 30 may exert a greater force against an intraocular structure, and have improved retention within an intraocular location, as compared with a conventional, non-corrugated IOL.

[0064] With reference to Figure 3A, haptic portion 30 may have a width at

tapered portion 12, H_t, typically in the range of from about 5 to 6.5 mm, usually from about 5.2 to 6.0 mm, and often from about 5.5 to 5.9 mm. IOL 10 may have a first edge 30a and a second edge 30b. Each of first edge 30a and second edge 30b may have an arcuate shape in plan view (e.g., Figure 3A), having a radius of curvature R_h. The value of R_h may be typically in the range of from about 15 to 20 mm, usually from about 16 to 19 mm, and often from about 17 to 18 mm. Haptic portion 30 may have an overall diameter, D_h, as measured diametrically from an edge of tab 38a to an edge of tab 38c, typically in the range of from about 11.5 to 14.5 mm, usually from about 12 to 14 mm, and often from about 12.5 to 13.5 mm. Optical portion 20 may have a diameter, D_o, typically in the range of from about 4 to 5 mm, usually from about 4.2 to 4.9 mm, and often from about 4.5 to 4.7 mm.

[0065] Again with reference to Figures 3A-C, IOL 10 may further include at least one irrigation channel 40. Each irrigation channel 40 may be adapted to allow the passage of a fluid therethrough. For example, following insertion of IOL 10 in an eye of a patient, each irrigation channel 40 may allow the passage of aqueous humor therethrough. In some embodiments, IOL 10 may have at least two irrigation channels 40. Irrigation channels 40 may be radially disposed with respect to optical portion 20. Irrigation channels 40 may be disposed diametrically opposite each other with respect to optical portion 20. Irrigation channels 40 may be elongate, and may have a width, W_c, typically in the range of from about 0.2 to 0.5 mm, usually from about 0.25 to 0.45 mm, and often from about 0.3 to 0.4 mm. Irrigation channels 40 may be disposed entirely within haptic portion 30. That is to say, optical portion 20 may be free from irrigation channels 40. As a non-limiting example, irrigation channels 40 may extend radially outward from annular portion 32 to outer partial annulus 36'. As shown in Figure 3A, a total of six (6) irrigation channels 40 may be disposed radially with respect to optical portion 20; however, other numbers and arrangements for irrigation channels 40 are also within the scope of the invention.

[0066] IOL 10 may further include at least one orientation label for indicating an orientation of IOL 10. As a result, orientation of I0L 10 may be readily discerned during insertion of IOL 10 in the eye of a patient. As shown in Figure 3A, IOL 10 may include a pair of orientation labels 42a, 42b, wherein orientation labels 42a, 42b may be disposed diametrically opposite each other. Orientation labels 42a, 42b may be disposed within tabs 38b, 38d. Orientation labels 42a, 42b may be in the form of an indented region of haptic portion 30, a colored region of haptic portion 30, and the like, which may be readily visualized, e.g., by a surgeon. Thus, if the surgeon turns IOL 10 over, i.e., changes the orientation of IOL 10, orientation labels 42a, 42b "shift" from, e.g., upper left and lower right portions of IOL 10 to upper right and lower left portions of IOL 10, thereby indicating the changed orientation of IOL 10.

[0067] Figure 3D is a sectional view of IOL 10 of Figure 3A, as may be seen along the line 3C-3C of Figure 3A, when the IOL adopts a flexed configuration. The elements shown in Figure 3D correspond to those shown and described with respect to Figures 3A-C, although the configuration of the various elements, including domed portion 31; first and second inner arcuate corrugations 34a, 34b; first and second outer arcuate corrugations 36a, 36b; and tabs 38a-d, with respect to each other may be changed. In the flexed configuration, IOL 10 may act as a spring to facilitate its retention at a given intraocular location. IOL 10 may adopt a range of flexed configurations, for example, depending on the direction and magnitude of forces applied to haptic portion. Such forces may depend on the geometry of an eye in which IOL 10 may be inserted, as well as the geometry and composition of IOL 10. Accordingly, the invention is by no means limited to flexure in configurations shown in the drawings.

[0068] With reference to Figure 3E, IOL 10 may adopt a deformed configuration. Deformation of IOL 10 is schematically represented in Figure 3E. It is to be understood that other deformed configurations are also possible for IOL 10 under the invention. For example, IOL 10 may adopt a folded

configuration, a rolled configuration, or a partly rolled and partly folded configuration. Various deformed configurations of an intraocular lens are disclosed by Mazzocco in US Patent No. 4,573,998, the disclosure of which is incorporated by reference herein in its entirety. In some embodiments of the invention, IOL 10 may be deformed during passage through a small incision (e.g., having a length of from about 2.8 to 3.3 mm) in a procedure for insertion of IOL 10 in an eye of a patient.

[0069] Figure 4A is a plan view of a corrugated IOL 10', according to another embodiment of the present invention, and Figure 4B is a sectional view of the corrugated IOL 10' of Figure 4A taken along the line 4B-4B of Figure 4A. With reference to Figures 4A-B, IOL 10' may include haptic portion 30 and optical portion 20, which may be centrally located within IOL 10', essentially as described hereinabove, e.g., with reference to Figures 1A and 2A-C. IOL 10' may further include first inner linear corrugation 44a and second inner linear corrugation 44b, wherein first and second inner linear corrugations 44a-b are oriented in the vertical direction (y axis). IOL 10' may still further include first and second outer linear corrugations 46a-b, also oriented in the vertical direction, and disposed distal to first and second inner linear corrugations 44a-b with respect to an optical axis of IOL 10' (corresponding to axis A, Figure 2B). However, the invention is not limited to the number or arrangement of corrugations shown in the drawings, but rather, other numbers and arrangements for corrugations of haptic portion 30 are also within the scope of the invention.

[0070] With reference to Figures 5A-B, Figure 5A is a sectional view of the anterior portion of an eye 100, which includes a natural crystalline lens 102 suspended from a ciliary body 104 via zonular fibers 106. The eye 100 further includes an iris 108 located anterior to crystalline lens 102, and a cornea 110 located anterior to iris 108. The crystalline lens 102 is encased within a capsule 103. The iris 108 is an annular structure that defines an aperture or pupil 112. The iris 108 has a posterior surface 108a. Eye 100 further includes an anterior

chamber 114 located anterior to iris 108, and a posterior chamber 116 located posterior to iris 108. Anterior chamber 114 and posterior chamber 116 may each contain aqueous humor (not shown).

[0071] Figure 5B is a sectional view of the anterior portion of an eye 100' having a corrugated IOL 10 disposed in the eye, according to an embodiment of the present invention. IOL 10 shown in Figure 5B may have various features, characteristics, and elements in common with embodiments described with reference to Figures 1A-3C. Thus, IOL 10 may have a central optical portion 20 and an outer haptic portion 30. IOL 10 may be disposed in posterior chamber 116. Haptic portion 30 may be disposed adjacent, and posterior, to iris 108. One or more corrugations of haptic portion 30 may be adapted for contacting a posterior surface 108a of iris 108. IOL 10 may be in a flexed configuration when disposed in posterior chamber 116. The flexed configuration may promote retention of IOL 10 in eye 100, e.g., by contact between haptic portion 30 and one or more intraocular structures, such as one or more of the iris 108, the ciliary body 104, a peripheral (non-optical) region of the crystalline lens 102, and the zonular fibers 106.

[0072] Figure 5C is an enlarged view showing a gap between an optical portion of the IOL and the crystalline lens of the eye of Figure 5B. IOL 10 may be disposed in posterior chamber 116 such that optical portion 20 is spaced anteriorly from crystalline lens 102, by a gap or distance, D_L, wherein D_L may typically be in the range of from about 50 to 500 microns, usually from about 100 to 350 microns, and often from about 10 to 200 microns. Optical portion 30 may have optical characteristics that provide correction of a deficiency, such as myopia (short sightedness), hypermetropia (long sightedness), or astigmatism of eye 100'. It is to be understood that the present invention is not limited to treatment of these defects, and that treatment of other eye conditions is also within the scope of the invention. In alternative embodiments of the present invention (not shown), IOL 10 may be disposed in anterior chamber 114 of eye 100/100'.

[0073] Figure 6A is a sectional view of an eye 100' having a corrugated IOL 10 disposed therein, according to another embodiment of the invention. IOL 10 shown in Figure 6A may also have various features, characteristics, and elements in common with embodiments described with reference to Figures 1A-3C. Thus, IOL 10 may include optical portion 20 and haptic portion 30. IOL 10 may be disposed posterior to iris 108. Haptic portion 30 may include one or more corrugations 34 which may be disposed adjacent posterior surface 108a of iris 108. As shown, IOL 10 may be disposed in eye 100' such that IOL 10 avoids contact with crystalline lens 102, thereby avoiding damage to crystalline lens 102. Spacing of optical portion 20 anterior to crystalline lens 102 may be facilitated by corrugation of haptic portion 30 and by axial displacement of domed portion 31 from outer portions, e.g., tabs 38a-d, of haptic portion 30 (see, for example, Figure 2B). Tabs 38a-d may provide four-point contact at the perimeter of the posterior chamber 116, and may help to retain optical portion 20 in a central location anterior to the central, optical portion of the crystalline lens 102. Contact between tabs 38a-d, or other point(s) of contact of haptic portion 30, and the perimeter of the posterior chamber 116 of eye 100' may cause flexure of IOL 10, leading to corrugations 34 being pushed against the posterior surface of the iris 108. It should be understood, however, that the invention is not limited to a haptic portion 30 having tabs 38a-d. For example, in some embodiments, haptic portion 30 may lack tabs (see Figure 1A).

[0074] Figure 6B is a sectional view of an eye 100" having a corrugated IOL 10 disposed therein, according to another embodiment of the invention. In the embodiment of the invention shown in Figure 6B, IOL 10 may be disposed within capsule 103 of crystalline lens 102. As an example, IOL 10 may be inserted within crystalline lens 102 following capsulorrhexis, in which a continuous circular incision may be formed in the anterior of capsule 103 of crystalline lens 102. The capsulorrhexis technique is well known in the art, for example, with respect to cataract surgery. IOL 10 shown in Figure 6B may also have various features, characteristics, and elements in common with

embodiments described hereinabove, e.g., with reference to Figures 1A-3C.

[0075] Figure 6C is a sectional view of the anterior portion of an eye 100''' having a corrugated IOL 10 disposed therein, according to another embodiment of the invention. In the embodiment of the invention shown in Figure 6C, IOL 10 may be disposed within cornea 110 of crystalline lens 102. As an example, IOL 10 may be inserted within cornea 110 following formation of a corneal flap or a corneal pocket, which may be formed, e.g., using a corneal-pocket keratome device as disclosed in US Patent No. 6,599,305, the disclosure of which is incorporated by reference herein in its entirety. For insertion in cornea 110, IOL 10 may have an opaque haptic portion 30, and/or haptic portion 30 may be located outside the optical zone of the eye 100''', whereby interference with the vision of the patient by haptic portion 30 may be avoided. In an alternative embodiment, the haptic portion may be eliminated, whereby IOL 10/10'' may consist essentially of optical portion 20/20' (see, e.g., Figure 6D). IOL 10 shown in Figure 6C may also have various features, characteristics, and elements in common with embodiments described hereinabove, e.g., with reference to Figures 1A-3C.

[0076] Figure 6D is a sectional view of the anterior portion of an eye 100''' having an IOL 10'' disposed therein, according to another embodiment of the invention. IOL 10'' may comprise an optical portion 20/20'. At least a portion of haptic portion 30 (e.g., Figure 6C) may be missing or removed in IOL 10''. As an example, IOL 10'' may have either no haptic portion, or a vestigial haptic portion 30 (Figure 6C). IOL 10'' may be inserted within cornea 110 following formation of a corneal flap or a corneal pocket, for example, as described with reference to Figure 6C. Optical portion 20/20' in the embodiment of Figure 6D may have various features, characteristics, and elements in common with other embodiments of the present invention as described hereinabove. For example, an optical portion 20/20' for insertion in cornea 110 may have a doughnut-like configuration comprising a peripheral optic zone 22 having optical power and an inner non-optic zone 24 having no

optical power (see, e.g., Figure 1B).

[0077] Figure 6E is a sectional view of the anterior portion of an eye 101 having a corrugated IOL 10 disposed within the anterior chamber 114 of the eye 101, according to another embodiment of the invention. IOL 10 may be disposed in the anterior chamber 114 such that corrugations 34 of haptic portion 30 contact the anterior surface of the iris 108. IOL 10 may also be positioned in the anterior chamber 114 of the eye 101 such that peripheral portions (e.g., tabs 38a-d, Figure 2A) of IOL 10 are disposed in the iridocorneal angle 115. Flexure of IOL 10 (see, for example, Figures 3B, 3D) may promote retention of IOL 10 in relation to iris 108 as shown in Figure 6E.

[0078] Figure 7A schematically represents a series of steps involved in a method 200 for correcting vision in a patient, according to another embodiment of the invention. Methods and injector apparatus for inserting a deformable intraocular lens in an eye of a patient are disclosed in US Patent Nos. 4,573,998 and 4,702,244 both to Mazzocco, and US Patent No. 6,106,553 to Feingold, the disclosures of each of which is incorporated by reference herein in their entirety.

[0079] Step 202 of method 200 may involve providing an IOL of the present invention. The IOL provided in step 202 may have various features, characteristics, and elements as described for various embodiments of the invention, for example, as described with reference to Figures 1A-3C, *supra*. The IOL may have an optical portion for correcting a particular visual defect in a patient. Such visual defects may include, without limitation, myopia (short sightedness), hypermetropia (long sightedness), and astigmatism. The IOL may have an optical portion having optical characteristics tailored for a particular patient. In some embodiments, the optical portion may comprise an inner non-optic zone with no optical power, and a peripheral optic zone having optical power. In some embodiments, the IOL may further have a haptic portion surrounding the optical portion, wherein the haptic portion may be corrugated (see, e.g., Figures 2B-C, 4B, and 5).

[0080] Step 204 may involve forming an incision in the eye of the patient for inserting the IOL therethrough. The incision may typically have a length in the range of from about 2.8 to 3.2 mm. The incision may be made in the vicinity of the limbus, or margin, of the cornea.

[0081] Step 206 may involve inserting the IOL in the eye. The IOL may be temporarily and reversibly deformed (see, for example, step 302 of method 300) into a deformed or compact configuration prior to step 206. The IOL may be inserted in the eye using an injector, as is known in the art.

[0082] Prior to step 206, the iris may be dilated to enlarge the pupil of the eye. The lens may be inserted in step 206 under a suitable viscoelastic material, such as a derivative of methyl cellulose, sodium hyaluronate, and the like. Such viscoelastics may be used to maintain the volume of the posterior or anterior chamber of the eye and for mechanical protection of the endothelium of the cornea during the procedure.

[0083] Step 208 may involve maneuvering the IOL in the eye, for example, such that the IOL may be placed in the posterior chamber between the iris and the crystalline lens of the eye, and wherein the optical portion of the IOL is axially aligned with the crystalline lens. Corrugations of the haptic portion of the IOL may facilitate maneuvering the IOL during step 208 by providing rigidity to the IOL, and by allowing the surgeon to grasp the haptic portion by the corrugations.

[0084] Step 208 may further involve maneuvering the IOL in the anterior chamber of the eye such that a first side of the haptic portion is deformed to place the first side of the haptic portion posterior to the iris, and thereafter a second side of the haptic portion is deformed to place the second side of the haptic portion posterior to the iris, such that the IOL is disposed in the posterior chamber of the eye. Step 208 may still further involve maneuvering the IOL in the eye such that the IOL adopts a flexed configuration, for example, wherein the periphery of the haptic portion contacts the perimeter of the posterior chamber of the eye. After step 208, the pupil may be contracted, and the

viscoelastic material may be removed by suction, as is well known in the art, and thereafter physiological (normal) saline may be added to the posterior and anterior chambers of the eye. In alternative embodiments, the IOL may be inserted in the cornea, within the capsule of the crystalline lens, or in the anterior chamber of the eye (see, for example, Figures 6A-E).

[0085] Figure 7B schematically represents a series of steps involved in a method 300 for inserting a corrugated, deformable IOL in the eye of a patient, according to another embodiment of the invention, wherein step 302 may involve temporarily deforming the IOL preparatory to introducing the IOL into the eye. The IOL may be deformed by rolling, folding, and the like. The IOL of the invention may have prescribed memory characteristics that allow the IOL to return to its original size and configuration after insertion in the eye, while retaining the optical characteristics of the optical portion. Deformation of intraocular lenses is described in US Patent No. 6,106,553 to Feingold, and US Patent Nos. 4,573,998 and 4,702,244 both to Mazzocco, the disclosures of each of which is incorporated by reference herein in their entirety. The IOL may be deformed prior to insertion into an IOL injector apparatus, as referred to hereinabove with reference to method 200, Figure 7A.

[0086] Step 304 may involve forming an incision in the eye for introduction of the deformed IOL therethrough. The incision may be formed generally as described hereinabove for step 204 of method 200, with reference to Figure 7A. By deforming the IOL, the length of the incision may be kept to a length typically in the range of from about 2.8 to 3.2 mm. Step 306 may involve introducing the deformed IOL into the eye, via the incision, using a suitable injector device, e.g., as referred to hereinabove. Injector devices for inserting IOLs in the eye of a patient are generally known in the art. In some embodiments, step 306 may be performed before step 304, and step 304 may involve deforming the IOL as the IOL is inserted through the incision in the eye.

[0087] Step 308 may involve positioning the IOL in the eye. The IOL may be positioned in the posterior chamber, generally as described hereinabove with

reference to Figure 7A. For example, the IOL may be positioned such that the haptic portion of the IOL is disposed adjacent the posterior surface of the iris, and the optic portion of the IOL is spaced anteriorly from the crystalline lens. Irrigation channels and/or orientation markers disposed within the haptic portion (see, for example, Figure 3A) may facilitate positioning the IOL in the eye during step 308.

[0088] In alternative embodiments, step 308 may involve positioning the IOL in the eye at locations other than the posterior chamber anterior to the crystalline lens. For example, the IOL may be positioned within the capsule of the crystalline lens (see, e.g., Figure 6B), in the cornea (see, e.g., Figures 6C-D), or in the anterior chamber of the eye (see, e.g., Figure 6E). In embodiments wherein step 308 involves positioning the IOL in the anterior chamber of the eye, the IOL may be disposed such that corrugations of the IOL contact the anterior surface of the iris. The IOL may also be positioned in the anterior chamber of the eye such that peripheral portions (e.g., tabs 38a-d, Figure 2A) of the IOL are disposed in the iridocorneal angle.

[0089] Figure 7C schematically represents a series of steps involved in a method 400 for inserting an IOL in the cornea of a patient, according to another embodiment of the invention, wherein step 402 may involve providing an IOL. The acronym IOL may be used here and in Figure 7C in a generic sense to include an intracorneal lens of the present invention. The IOL, e.g., an intracorneal lens provided in step 402, may have features generally as described hereinabove, for example, with reference to step 202 (Figure 7A). As an example, the IOL provided in step 402 may include an optical portion having a peripheral optic zone having optical power, and an inner non-optic zone having no optical power. In some embodiments, the IOL provided in step 402 may lack a haptic portion, e.g., the IOL may consist essentially of an optical portion. The IOL may be inserted in the cornea for correcting vision of the patient. The IOL provided in step 402 may be adapted to be deformable in order to facilitate insertion of the IOL in the cornea.

[0090] Step 404 may involve forming an incision in the cornea of the eye. Step 404 may involve forming a corneal flap or a corneal pocket. The formation of corneal flaps and corneal pockets are known in the art of eye surgery. As an example, a corneal flap may be formed using a laser. The laser may be used and guided under computer control, as is well known in the art. A corneal flap may be formed by methods similar to those used during LASIK (laser-assisted *in-situ* keratomileusis) procedures. A corneal pocket may be formed by tunneling in the cornea, for example, using a microkeratome having an oscillating metal blade. A corneal-pocket keratome device was disclosed in US Patent No. 6,599,305, the disclosure of which is incorporated by reference herein in its entirety. In alternative embodiments, a corneal pocket may be formed by a laser. Alternatively, a corneal pocket may be formed manually by the surgeon using hand-held instruments.

[0091] Step 406 may involve inserting the IOL in the cornea (see, for example, Figure 6D). In alternative embodiments, step 406 may involve inserting the IOL beneath a corneal flap, or within a corneal pocket.

[0092] It should be understood, of course, that the foregoing relates to exemplary embodiments of the invention and that modifications may be made without departing from the spirit and scope of the invention as set forth in the following claims.

WE CLAIM:

1. An intraocular lens, comprising:
an optical portion; and
a haptic portion surrounding said optical portion, wherein said haptic portion is corrugated.

2. The intraocular lens of claim 1, wherein said haptic portion comprises an annular portion disposed radially outward from said optical portion.

3. The intraocular lens of claim 2, wherein said annular portion is disposed adjacent to said optical portion.

4. The intraocular lens of claim 2, wherein said annular portion and said optical portion jointly form a domed portion of said intraocular lens.

5. The intraocular lens of claim 1, wherein said haptic portion comprises at least one arcuate corrugation.

6. The intraocular lens of claim 5, wherein said at least one arcuate corrugation is concentric with said optical portion.

7. The intraocular lens of claim 5, wherein said at least one arcuate corrugation comprises a first inner arcuate corrugation and a second inner arcuate corrugation, said first inner arcuate corrugation and said second inner arcuate corrugation disposed adjacent to, and radially outward from, said domed portion.

8. The intraocular lens of claim 7, wherein said first inner arcuate

corrugation and said second inner arcuate corrugation jointly form an inner partial annulus.

9. The intraocular lens of claim 8, wherein said at least one arcuate corrugation further comprises a first outer arcuate corrugation and a second outer arcuate corrugation, said first outer arcuate corrugation and said second outer arcuate corrugation disposed adjacent to, and radially outward from, said inner partial annulus.

10. The intraocular lens of claim 9, wherein said first outer arcuate corrugation and said second outer arcuate corrugation jointly form an outer partial annulus.

11. The intraocular lens of claim 10, wherein each of said inner partial annulus and said outer partial annulus is concentric with said optical portion.

12. The intraocular lens of claim 9, wherein said first inner arcuate corrugation and said second inner arcuate corrugation are disposed on opposite sides of said optical portion.

13. The intraocular lens of claim 1, wherein said haptic portion further comprises:

a plurality of tabs, each of said tabs disposed peripherally on said haptic portion.

14. The intraocular lens of claim 13, wherein said haptic portion further comprises:

an inner partial annulus disposed radially outward from, and concentric with, said optical portion, and

an outer partial annulus disposed radially outward from, and

concentric with, said inner partial annulus, wherein each of said tabs extends radially outward from said second partial annulus.

15. The intraocular lens of claim 13, wherein said plurality of tabs comprise two pairs of diametrically opposed tabs.

16. The intraocular lens of claim 13, wherein:
each of said plurality of tabs comprises a tab edge, and
said tab edge is curvilinear.

17. The intraocular lens of claim 13, wherein:
said intraocular lens includes a domed portion, and
said domed portion is spaced axially from said plurality of tabs.

18. The intraocular lens of claim 1, further comprising at least one irrigation channel disposed within said haptic portion.

19. The intraocular lens of claim 18, wherein said at least one irrigation channel is elongate and radially disposed with respect to said optical portion.

20. The intraocular lens of claim 18, wherein said at least one irrigation channel comprises at least two diametrically opposed irrigation channels.

21. The intraocular lens of claim 18, wherein said at least one irrigation channel is disposed entirely within said haptic portion.

22. The intraocular lens of claim 18, wherein said at least one irrigation channel is adapted for passage of aqueous humor therethrough.

23. The intraocular lens of claim 1, further comprising a pair of orientation labels disposed within said haptic portion.

24. The intraocular lens of claim 23, wherein said pair of orientation labels are diametrically opposed.

25. The intraocular lens of claim 24, wherein each of said pair of orientation labels is disposed within a tab, said tab disposed peripherally on said haptic portion.

26. The intraocular lens of claim 1, wherein said haptic portion and said optical portion are of the same composition.

27. The intraocular lens of claim 1, wherein said haptic portion and said optical portion each comprise a flexible material.

28. The intraocular lens of claim 1, wherein said intraocular lens is adapted for deformation to a deformed configuration.

29. The intraocular lens of claim 1, wherein said haptic portion is opaque to visible light and ultraviolet light.

30. The intraocular lens of claim 1, wherein said haptic portion includes an ultraviolet blocker.

31. The intraocular lens of claim 1, wherein said haptic portion is pigmented.

32. The intraocular lens of claim 1, wherein said optical portion is

transparent to visible light and said optical portion is non-pigmented.

33. The intraocular lens of claim 1, wherein a single size of said intraocular lens fits at least 90% of all human patients.

34. The intraocular lens of claim 1, wherein said haptic portion comprises at least one linear corrugation.

35. The intraocular lens of claim 1, wherein said optical portion is customized for correction of a specific visual defect of a patient.

36. The intraocular lens of claim 1, wherein said haptic portion includes an anterior surface and a posterior surface, and wherein both said anterior surface and said posterior surface of said haptic portion are corrugated.

37. The intraocular lens of claim 1, wherein said optical portion includes a peripheral optic zone having optical power, and an inner non-optic zone having no optical power.

38. An intraocular lens, comprising:

a central optical portion; and

an outer haptic portion, wherein said haptic portion includes:

an annular portion disposed adjacent to, and radially outward from, said optical portion,

a pair of inner arcuate corrugations disposed adjacent to, and radially outward from, said annular portion, said pair of inner arcuate corrugations disposed on opposite sides of said optical portion, and

a pair of outer arcuate corrugations disposed adjacent to, and radially outward from, said pair of inner arcuate corrugations.

39. The intraocular lens of claim 38, further comprising at least one irrigation channel disposed within said haptic portion.

40. The intraocular lens of claim 38, further comprising a plurality of tabs, each of said tabs disposed peripherally on said haptic portion.

41. The intraocular lens of claim 40, wherein:

said optical portion is axially spaced from said plurality of tabs,

each of said optical portion and said haptic portion is deformable, and

said at least one irrigation channel is elongate and radially disposed with respect to said optical portion.

42. The intraocular lens of claim 40, wherein said haptic portion further includes a pair of diametrically opposed orientation labels, wherein said pair of orientation labels are disposed within a corresponding diametrically opposed pair of said tabs.

43. An intraocular lens, comprising:

an inner domed portion; and

an outer portion having a plurality of tabs disposed peripherally on said outer portion, wherein said domed portion is spaced axially from said plurality of tabs.

44. The intraocular lens of claim 43, further comprising an optical portion disposed within said domed portion.

45. The intraocular lens of claim 44, wherein said domed portion comprises an annular portion disposed adjacent to, and radially outward from, said optical portion.

46. The intraocular lens of claim 44, wherein said outer portion comprises at least one arcuate corrugation disposed radially outward from, and concentric with, said optical portion.

47. An intraocular lens, comprising:

an optical portion including a peripheral optic zone, and an inner non-optic zone surrounded by said peripheral optic zone, wherein:

said peripheral optic zone has optical power, and

said inner non-optic zone has no optical power.

48. The intraocular lens of claim 47, wherein said intraocular lens consists essentially of said optical portion.

49. The intraocular lens of claim 48, wherein said lens is adapted for insertion within a cornea of a patient for vision correction of the patient.

50. The intraocular lens of claim 47, wherein said optical portion has a doughnut-like configuration.

51. The intraocular lens of claim 47, further comprising a haptic portion surrounding said optical portion.

52. The intraocular lens of claim 51, wherein said haptic portion is corrugated.

53. The intraocular lens of claim 47, wherein said optical portion is deformable.

54. A haptic for an intraocular lens, the intraocular lens including an optical portion, and said haptic comprising:

an annular portion encircling said optical portion; and

at least one arcuate corrugation disposed adjacent to, and radially outward from, said optical portion.

55. The haptic of claim 54, wherein said at least one arcuate corrugation is concentric with said annular portion.

56. The haptic of claim 54, wherein said at least one arcuate corrugation comprises at least two concentric arcuate corrugations.

57. The haptic of claim 54, further comprising at least one irrigation channel radially disposed within said haptic.

58. The haptic of claim 54, further comprising a plurality of tabs, each of said tabs disposed peripherally on said haptic.

59. The haptic of claim 58, further comprising:

at least two orientation labels, and

each of said orientation labels disposed within a corresponding one of said tabs.

60. A method for correcting vision of a patient, comprising:

a) providing a refractive intraocular lens, wherein said intraocular lens comprises an optical portion and a haptic portion, and wherein said haptic portion is corrugated;

b) forming an incision in an eye of the patient; and

c) inserting said intraocular lens in the eye.

61. The method of claim 60, wherein the eye includes a crystalline lens encased within a capsule, and said intraocular lens is disposed within said capsule of said crystalline lens.

62. The method of claim 60, wherein the eye includes a cornea, and said intraocular lens is disposed within said cornea.

63. The method of claim 60, wherein the eye includes an iris and a posterior chamber, and said haptic portion is disposed posterior to the iris within said posterior chamber.

64. The method of claim 60, wherein the eye includes an iris and an anterior chamber, and said intraocular lens is disposed anterior to the iris within said anterior chamber.

65. The method of claim 64, wherein said intraocular lens is disposed in contact with the anterior surface of the iris.

66. A method for correcting vision of a patient, comprising:

a) providing a refractive intraocular lens, wherein said intraocular lens comprises an optical portion and a haptic portion, and wherein said haptic portion is corrugated;

b) forming an incision in an eye of the patient; and

c) inserting said intraocular lens in the eye, wherein the eye includes an iris, and said haptic portion is disposed posterior to the iris.

67. The method of claim 66, wherein said haptic portion has an anterior surface and a posterior surface, and wherein both said anterior surface and said posterior surface are corrugated.

68. The method of claim 67, wherein said haptic portion includes at least one arcuate corrugation arranged concentrically with said optical portion.

69. The method of claim 68, wherein said at least one arcuate corrugation is adapted for contacting a posterior surface of the iris.

70. The method of claim 66, wherein the eye includes a crystalline lens, and said optical portion is spaced anteriorly from the crystalline lens.

71. The method of claim 70, further comprising:

d) maneuvering said intraocular lens with respect to a posterior surface of the iris.

72. The method of claim 71, wherein:

said intraocular lens includes a pair of orientation labels, and

said step d) comprises maneuvering said intraocular lens is according to a location of said pair of orientation labels.

73. A method for inserting a refractive intraocular lens in an eye of a patient, the eye including a crystalline lens and an iris, and the method comprising:

a) deforming a refractive intraocular lens from an extended configuration to a deformed configuration, wherein said intraocular lens comprises an optical portion and a haptic portion, and wherein said haptic portion is corrugated;

b) forming an incision in the eye;

c) introducing said intraocular lens, in said deformed configuration, into the eye via the incision; and

d) positioning said intraocular lens in the eye such that said optical portion is anteriorly spaced from the crystalline lens, and said haptic portion is

disposed posterior to the iris.

74. The method of claim 73, wherein:

said step d) comprises positioning said intraocular lens in the eye such that said haptic portion contacts an intraocular structure selected from the group consisting of at least one of a posterior surface of the iris, a zonular fiber, a perimeter of the posterior chamber, a peripheral region of a crystalline lens, and a ciliary body.

75. The method of claim 73, wherein:

said haptic portion includes a plurality of arcuate corrugations, and

said step d) comprises positioning said intraocular lens in the eye such that at least one of said arcuate corrugations contacts the posterior surface of the iris.

76. The method of claim 73, wherein the iris defines a pupil of the eye, and wherein:

said haptic portion includes a plurality of radially arranged elongate irrigation channels, and

said step d) comprises positioning said intraocular lens in the eye according to a location of said irrigation channels with respect to the pupil.

77. The method of claim 73, wherein said intraocular lens adopts a flexed configuration when positioned behind the iris of the eye, such that said haptic portion exerts a force against at least one of a posterior surface of the iris and a perimeter of the posterior chamber of the eye.

78. A method for correcting vision of a patient, comprising:

a) providing a refractive lens, wherein said lens comprises an optical portion including a peripheral optic zone having optical power, and an inner non-optic zone surrounded by said peripheral optic zone, wherein said inner non-optic zone has no optical power;

b) forming an incision in a cornea of the patient; and

c) inserting said lens in the cornea.

79. The method of claim 78, wherein said step b) comprises forming a corneal flap, and said step c) comprises inserting said lens beneath said corneal flap.

80. The method of claim 79, wherein said step b) comprises forming said corneal flap using a laser.

81. The method of claim 78, wherein said step b) comprises forming a corneal pocket, and said step c) comprises inserting said lens within said corneal pocket.

82. The method of claim 81, wherein said corneal pocket is formed by a laser or by a microkeratome.

83. The intraocular lens of claim 1, further comprising an irrigation channel disposed within said optical portion.

84. The intraocular lens of claim 83, wherein said irrigation channel comprises a hole.

85. The intraocular lens of claim 84, wherein said hole is circular in configuration.

86. The intraocular lens of claim 38, further comprising an irrigation channel disposed within said optical portion.

87. The intraocular lens of claim 86, wherein said irrigation channel comprises a circular hole.

88. The haptic of claim 54, further comprising an irrigation channel disposed within said optical portion.

89. The haptic of claim 88, wherein said irrigation channel comprises a circular hole substantially in a center of said optical portion.

90. The method of claim 60, wherein said lens further comprises a hole in said optical portion.