

CLAIMS

1. A method for predicting the post-operative position of a replacement intraocular lens in an eye of a patient, the method comprising the steps of:
 - (i) determining the position of the existing crystalline lens in the pre-operative eye of the patient;
 - (ii) determining the thickness of the crystalline lens in the pre-operative eye of the patient; and
 - (iii) predicting the post-operative position of the intraocular lens relative to the position of the crystalline lens in the pre-operative eye of the patient, as a proportion of the thickness of the crystalline lens in the pre-operative eye of the patient,

wherein the proportion is defined by a single numerical constant (C) which is determined by the intraocular lens type.
2. The method according to Claim 1 wherein step (i) comprises determining the axial position of the crystalline lens in the pre-operative eye of the patient.
3. The method according to Claim 1 or 2 wherein the numerical constant (C) is further determined by the patient type.
4. The method according to any of Claims 1-3 wherein the numerical constant (C) is further determined by the approach used to implant the intraocular lens in the eye.
5. The method according to any of Claims 1-4 wherein the numerical constant (C) defines the relationship between the post-operative position of the intraocular lens in the eye of one or more eye-operated individuals, relative to the position and thickness of the crystalline lens in the pre-operative eye of the one or more eye-operated individuals.
6. The method according to any of Claims 1-5 wherein the numerical constant (C) is calculated using data obtained from the two or more eye-operated individual to

whom that intraocular lens type has been implanted into the eye using that implantation approach.

- 5 7. The method according to any of Claims 1-6 wherein the numerical constant (C) defines a fraction of the thickness of the crystalline lens in the pre-operative eye of the two or more eye-operated individuals.
- 10 8. The method according to any of Claims 1-7 wherein the intraocular lens type is adapted for implantation into the capsular bag in the eye.
9. The method according to any of Claims 1-8 wherein the implantation approach is implantation of the intraocular lens into the capsular bag in the eye.
- 15 10. The method according to any of Claims 1-9 wherein the numerical constant (C) is calculated from data obtained from the two or more eye-operated individuals using the following formula:

$$C = (IOL_{\text{measured}} - ACD_{\text{pre}}) / LT$$

20 wherein:

IOL_{measured} is the measured position of the intraocular lens in the eye-operated individual after surgery;

ACD_{pre} is the position of the crystalline lens in the eye of the eye-operated individual before surgery; and

25 LT is the thickness of the crystalline lens in the eye of the eye-operated individual before surgery.

11. The method according to Claim 10 wherein IOL_{measured} is determined by measuring the Anterior Chamber Depth in the eye of the eye-operated individual after surgery.

30

12. The method according to Claim 10 wherein ACD_{pre} is determined by measuring the Anterior Chamber Depth in the eye of the eye-operated individual before surgery.

35

13. The method according to any of Claims 10-12 wherein the numerical constant (C) is an average value obtained from the two or more eye-operated individuals.

14. The method according to any of Claims 1-13 wherein the numerical constant (C) is between about 0.0 and about 1.0; for example, wherein the numerical constant (C) is, or is about: 0.1 or 0.2 or 0.3, or 0.4 or 0.5 or 0.6 or 0.7 or 0.8 or 0.9 or 1.0.
15. The method according to any of Claims 1-14 wherein the numerical constant (C) is typically about 0.4, for example, 0.387.
16. The method according to any of Claims 1-15 wherein step (i) comprises measuring the Anterior Chamber Depth of the pre-operative eye of the patient.
17. The method according to Claim 16 wherein measuring the Anterior Chamber Depth of the pre-operative eye of the patient comprises the use of ultrasound.
18. The method according to Claim 16 wherein measuring the Anterior Chamber Depth of the pre-operative eye of the patient comprises the use of an optical technique selected from the group consisting of: visible depth measurement; interferometry; partial interferometry; low coherence interferometry; Scheimpflug imaging; laser interferometry; laser biometry.
19. The method according to any of Claims 1-18 wherein determining the thickness of the crystalline lens in the pre-operative eye of the patient in step (ii) comprises the use of ultrasound.
20. The method according to any of Claims 1-18 wherein determining the thickness of the crystalline lens in the pre-operative eye of the patient in step (ii) comprises laser interferometry or laser biometry.
21. The method according to any of Claims 1-20 wherein predicting the post-operative position of the intraocular lens in step (iii) comprises the use of the formula:

$$IOL_{\text{predicted}} = ACD_{\text{pre}} + C \times LT$$

wherein:

$IOL_{\text{predicted}}$ is the predicted post-operative position of the intraocular lens in the eye of the patient;

ACD_{pre} is the pre-operative Anterior Chamber Depth of the eye of the patient;
C is a numerical constant, as discussed above; and
LT is the thickness of the crystalline lens in the pre-operative eye of the patient.

- 5 22. A method for selecting a replacement intraocular lens required to provide a
desired optical property in a post-operative eye of a patient, the method
comprising the steps of:
- 10 (a) predicting the post-operative position of a replacement intraocular
lens in the eye of the patient using a method as defined in any of
Claims 1 to 21;
- 15 (b) predicting the optical properties of the post-operative eye of the
patient in which an intraocular lens of known power and geometry
is positioned as predicted in step (a); and
- 20 (c) selecting an intraocular lens having a power and geometry
required to provide the desired optical property in the post-
operative eye of the patient.
23. The method according to Claim 22 wherein step (b) comprises establishing an
optical model of the post-operative eye of the patient.
- 25 24. The method according to Claim 23 wherein establishing an optical model of the
post-operative eye of the patient comprises measuring one or more property of
the pre-operative eye of the eye of the patient, selected from the group consisting
of: the optics of the cornea; the corneal radius; the length of the eye; the axial
length; the anterior chamber depth; the crystalline lens thickness.
- 30 25. The method according to Claim 23 or 24 wherein step (b) further comprises
analysing the optical properties of the optical model of the post-operative eye of
the patient.
- 35 26. The method according to Claim 25 wherein analysing the optical properties of the
optical model of the post-operative eye of the patient comprises the use of exact
ray tracing analysis.

27. The method according to Claim 25 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of paraxial ray tracing analysis.
- 5 28. A method for designing a replacement intraocular lens required to provide a desired optical property in the post-operative eye of the patient, the method comprising the steps of:
- 10 (a1) predicting the post-operative position of an intraocular lens in the eye of the patient using a method as defined in any of Claims 1 to 21;
- 15 (b1) predicting the optical properties of the post-operative eye of the patient in which an intraocular lens of known power and geometry is positioned as predicted in step (a);
- 20 (c1) designing an intraocular lens having a power and geometry required to provide the desired optical property in the post-operative eye of the patient;
- (d1) optionally, manufacturing the intraocular lens designed in step (c1).
- 25 29. The method according to Claim 28 wherein step (b1) comprises establishing an optical model of the post-operative eye of the patient.
- 30 30. The method according to Claim 29 wherein establishing an optical model of the post-operative eye of the patient comprises measuring one or more property of the pre-operative eye of the eye of the patient, selected from the group consisting of: the optics of the cornea; the corneal radius; the length of the eye; the axial length; the anterior chamber depth; the crystalline lens thickness.
- 35 31. The method according to Claim 29 or 30 wherein step (b1) further comprises analysing the optical properties of the optical model of the post-operative eye of the patient.

32. The method according to Claim 31 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of exact ray tracing analysis.
- 5 33. The method according to Claim 32 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of paraxial ray tracing analysis.
- 10 ~~34. A method for implanting a replacement intraocular lens into an eye of a patient, the method comprising the steps of:~~
- ~~(a2) predicting the post-operative position of the intraocular lens in the eye of the patient using a method as defined in any of Claims 1 to 21;~~
- 15 ~~(b2) optionally, removing the crystalline lens from the pre-operative eye of the patient;~~
- ~~(c2) providing an intraocular lens;~~
- 20 ~~(d2) implanting the intraocular lens into the eye of the patient.~~
- ~~35. The method according to Claim 34 wherein the intraocular lens provided in step (c2) is selected using a method as defined in any of Claims 22-27.~~
- 25 ~~36. The method according to Claim 34 wherein the intraocular lens provided in step (c2) is designed, and optionally manufactured, using a method as defined in any of Claims 28-33.~~
- 30 ~~37. The method according to Claim any of Claims 34-36 wherein implanting the intraocular lens into the eye of the patient in step (d2) comprises implanting the intraocular lens into the capsular bag in the eye of the patient.~~
- 35 ~~38. A method for treating and/or preventing and/or reducing a disease or disorder in the eye of a patient, the method comprising the steps of:~~

46. ~~A method for designing a replacement intraocular lens required to provide a desired optical property in the post-operative eye of the patient substantially as described herein, with reference to the accompanying description and drawings.~~
- 5 47. ~~A method for implanting a replacement intraocular lens into an eye of a patient substantially as described herein, with reference to the accompanying description and drawings.~~
- 10 48. ~~A computer program substantially as described herein, with reference to the accompanying description and drawings.~~

CLAIMS

1. A method for predicting the post-operative position of a replacement intraocular lens in an eye of a patient, the method comprising the steps of:
 - (i) determining the position of the existing crystalline lens in the pre-operative eye of the patient;
 - (ii) determining the thickness of the crystalline lens in the pre-operative eye of the patient; and
 - (iii) predicting the post-operative position of the intraocular lens relative to the position of the crystalline lens in the pre-operative eye of the patient, as a proportion of the thickness of the crystalline lens in the pre-operative eye of the patient,

wherein the proportion is defined by a single numerical constant (C) which is determined by the intraocular lens type.
2. The method according to Claim 1 wherein step (i) comprises determining the axial position of the crystalline lens in the pre-operative eye of the patient.
3. The method according to Claim 1 or 2 wherein the numerical constant (C) is further determined by the patient type.
4. The method according to any of Claims 1-3 wherein the numerical constant (C) is further determined by the approach used to implant the intraocular lens in the eye.
5. The method according to any of Claims 1-4 wherein the numerical constant (C) defines the relationship between the post-operative position of the intraocular lens in the eye of one or more eye-operated individuals, relative to the position and thickness of the crystalline lens in the pre-operative eye of the one or more eye-operated individuals.
6. The method according to any of Claims 1-5 wherein the numerical constant (C) is calculated using data obtained from the two or more eye-operated individual to

whom that intraocular lens type has been implanted into the eye using that implantation approach.

- 5 7. The method according to any of Claims 1-6 wherein the numerical constant (C) defines a fraction of the thickness of the crystalline lens in the pre-operative eye of the two or more eye-operated individuals.
- 10 8. The method according to any of Claims 1-7 wherein the intraocular lens type is adapted for implantation into the capsular bag in the eye.
9. The method according to any of Claims 1-8 wherein the implantation approach is implantation of the intraocular lens into the capsular bag in the eye.
- 15 10. The method according to any of Claims 1-9 wherein the numerical constant (C) is calculated from data obtained from the two or more eye-operated individuals using the following formula:

$$C = (IOL_{\text{measured}} - ACD_{\text{pre}}) / LT$$

20 wherein:

IOL_{measured} is the measured position of the intraocular lens in the eye-operated individual after surgery;

ACD_{pre} is the position of the crystalline lens in the eye of the eye-operated individual before surgery; and

25 LT is the thickness of the crystalline lens in the eye of the eye-operated individual before surgery.

30 11. The method according to Claim 10 wherein IOL_{measured} is determined by measuring the Anterior Chamber Depth in the eye of the eye-operated individual after surgery.

12. The method according to Claim 10 wherein ACD_{pre} is determined by measuring the Anterior Chamber Depth in the eye of the eye-operated individual before surgery.

35 13. The method according to any of Claims 10-12 wherein the numerical constant (C) is an average value obtained from the two or more eye-operated individuals.

14. The method according to any of Claims 1-13 wherein the numerical constant (C) is between about 0.0 and about 1.0; for example, wherein the numerical constant (C) is, or is about: 0.1 or 0.2 or 0.3, or 0.4 or 0.5 or 0.6 or 0.7 or 0.8 or 0.9 or 1.0.
15. The method according to any of Claims 1-14 wherein the numerical constant (C) is typically about 0.4, for example, 0.387.
16. The method according to any of Claims 1-15 wherein step (i) comprises measuring the Anterior Chamber Depth of the pre-operative eye of the patient.
17. The method according to Claim 16 wherein measuring the Anterior Chamber Depth of the pre-operative eye of the patient comprises the use of ultrasound.
18. The method according to Claim 16 wherein measuring the Anterior Chamber Depth of the pre-operative eye of the patient comprises the use of an optical technique selected from the group consisting of: visible depth measurement; interferometry; partial interferometry; low coherence interferometry; Scheimpflug imaging; laser interferometry; laser biometry.
19. The method according to any of Claims 1-18 wherein determining the thickness of the crystalline lens in the pre-operative eye of the patient in step (ii) comprises the use of ultrasound.
20. The method according to any of Claims 1-18 wherein determining the thickness of the crystalline lens in the pre-operative eye of the patient in step (ii) comprises laser interferometry or laser biometry.
21. The method according to any of Claims 1-20 wherein predicting the post-operative position of the intraocular lens in step (iii) comprises the use of the formula:

$$IOL_{\text{predicted}} = ACD_{\text{pre}} + C \times LT$$

wherein:

$IOL_{\text{predicted}}$ is the predicted post-operative position of the intraocular lens in the eye of the patient;

ACD_{pre} is the pre-operative Anterior Chamber Depth of the eye of the patient;
C is a numerical constant, as discussed above; and
LT is the thickness of the crystalline lens in the pre-operative eye of the patient.

- 5 22. A method for selecting a replacement intraocular lens required to provide a
desired optical property in a post-operative eye of a patient, the method
comprising the steps of:
- 10 (a) predicting the post-operative position of a replacement intraocular
lens in the eye of the patient using a method as defined in any of
Claims 1 to 21;
- 15 (b) predicting the optical properties of the post-operative eye of the
patient in which an intraocular lens of known power and geometry
is positioned as predicted in step (a); and
- 20 (c) selecting an intraocular lens having a power and geometry
required to provide the desired optical property in the post-
operative eye of the patient.
23. The method according to Claim 22 wherein step (b) comprises establishing an
optical model of the post-operative eye of the patient.
- 25 24. The method according to Claim 23 wherein establishing an optical model of the
post-operative eye of the patient comprises measuring one or more property of
the pre-operative eye of the eye of the patient, selected from the group consisting
of: the optics of the cornea; the corneal radius; the length of the eye; the axial
length; the anterior chamber depth; the crystalline lens thickness.
- 30 25. The method according to Claim 23 or 24 wherein step (b) further comprises
analysing the optical properties of the optical model of the post-operative eye of
the patient.
- 35 26. The method according to Claim 25 wherein analysing the optical properties of the
optical model of the post-operative eye of the patient comprises the use of exact
ray tracing analysis.

27. The method according to Claim 25 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of paraxial ray tracing analysis.
- 5 28. A method for designing a replacement intraocular lens required to provide a desired optical property in the post-operative eye of the patient, the method comprising the steps of:
- 10 (a1) predicting the post-operative position of an intraocular lens in the eye of the patient using a method as defined in any of Claims 1 to 21;
- 15 (b1) predicting the optical properties of the post-operative eye of the patient in which an intraocular lens of known power and geometry is positioned as predicted in step (a);
- 20 (c1) designing an intraocular lens having a power and geometry required to provide the desired optical property in the post-operative eye of the patient;
- (d1) optionally, manufacturing the intraocular lens designed in step (c1).
- 25 29. The method according to Claim 28 wherein step (b1) comprises establishing an optical model of the post-operative eye of the patient.
- 30 30. The method according to Claim 29 wherein establishing an optical model of the post-operative eye of the patient comprises measuring one or more property of the pre-operative eye of the eye of the patient, selected from the group consisting of: the optics of the cornea; the corneal radius; the length of the eye; the axial length; the anterior chamber depth; the crystalline lens thickness.
- 35 31. The method according to Claim 29 or 30 wherein step (b1) further comprises analysing the optical properties of the optical model of the post-operative eye of the patient.

32. The method according to Claim 31 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of exact ray tracing analysis.
- 5 33. The method according to Claim 32 wherein analysing the optical properties of the optical model of the post-operative eye of the patient comprises the use of paraxial ray tracing analysis.
- 10 34. A computer program for instructing a computer to perform the method defined any of Claims 1 to 33.

15