Five-Year Changes in Axial Length after Iris-Fixated Phakic Intraocular Lens Implantation

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Purpose

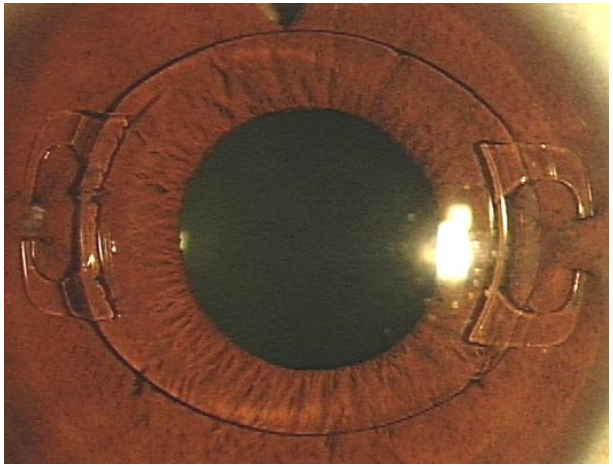
- To evaluate retrospectively axial elongation after implantation of an iris-fixated phakic intraocular lens (pIOL) (Artiflex, Ophtec BV) in Japanese eyes.

Patients

- 16 eyes of 8 patients

(mean age, 36.1 ± 5.9 [standard deviation] years)

- Myopia > -7.00 diopters (D)
- 3.2-mm incision without sutures
- 1 surgeon



Artiflex, Ophtec BV

Inclusion and Exclusion Criteria

Inclusion Criteria

- ✓ Minimal age, 20 years
- ✓ Anterior chamber depth (ACD) ≧ 3.2 mm
- ✓ Endothelial cell density (CEC) ≧ 2,000 cells/mm^2
- ✓ Preoperative best-corrected visual acuity (BCVA) ≧ 20/40
- ✓ No previous ocular surgery
- ✓ No history of ocular trauma
- ✓ No enhancements

Exclusion Criteria

- ✓ History of corneal diseases, cataracts, uveitis, diabetic retinopathy, glaucoma, pathologic myopic macular degeneration, or anterior-segment anatomic changes
- ✓ Active ocular or systemic disease
- ✓ Intraoperative or postoperative complications
- ✓ Pregnant and nursing mothers

Methods

Main outcome: Axial elongation over 5 years
Determined by subtracting the axial length 5 years postoperatively from the preoperative value

- Clinical Evaluation

- Uncorrected visual acuity (UCVA), spherical equivalent (SE), keratometric (K) value, intraocular pressure (IOP)

  Preoperatively and annually for 5 years postoperatively

- Axial length (IOLMaster (Carl Zeiss Meditec AG) phakic mode
  Preoperatively and 5 years postoperatively

- Ocular higher order aberrations (HOAs) to the sixth order (φ = 4 mm, ARK 10000, Nidek) Preoperatively and 6 months postoperatively

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Patient Characteristics and Mean Preoperative and Postoperative Data

	Preoperative	5 Years	*P* Value*
SE (D)	-10.94 ± 1.87	-0.91 ± 0.29	<0.001
Target refraction (D)	-0.09 ± 0.22	-	-
Axial length (mm)	28.10 ± 1.73	28.13 ± 1.73	0.485
Axial elongation over 5 years (mm)	0.03 ± 0.17		
ACD (mm)	3.4 ± 0.2	-	-
Mesopic pupillary size (mm)	5.82 ± 0.74	-	-
UCVA (logMAR)	1.54 ± 0.19	-0.13 ± 0.11	<0.001
BCVA (logMAR)	-0.11 ± 0.12	-0.25 ± 0.07	0.001
IOP (mmHg)	13.3 ± 2.6	11.9 ± 2.6	0.005
CEC (cells/mm^2)	3,005 ± 232	2,689 ± 194	0.001

*Wilcoxon signed-rank test.
Values are expressed as the mean ± standard deviation.
logMAR = logarithm of the minimum angle of resolution.

HOAs Preoperatively and 6 Months Postoperatively (φ = 4 mm)

	Preoperative	6 Months	*P* Value*
SA (μm)	0.02 ± 0.03	0.02 ± 0.06	0.730
S3 (μm)	0.12 ± 0.05	0.15 ± 0.06	0.221
S4 (μm)	0.06 ± 0.03	0.09 ± 0.08	0.433
HOAs (μm)	0.15 ± 0.05	0.19 ± 0.11	0.433

*Wilcoxon signed-rank test.
Values are expressed as the mean ± standard deviation.
SA = spherical aberration (Z_4^0); S3 = coma-like aberration, root mean square (RMS) of the third-order coefficients; S4 = spherical-like aberration, RMS of the fourth-order coefficients; HOAs = third- to sixth-order Zernike coefficients.

➢No significant correlations are seen between axial elongation over 5 years and the preoperative SA, S3, S4, and HOAs.

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Multiple Regression Analysis
(stepwise variable selection for regression)

- Outcome: axial elongation over 5 years
- Covariates: age, sex, target refraction, preoperative mesopic pupillary diameter, K value, ACD, axial length, SA, and HOAs

- Multiple regression analysis showed that only the preoperative ACD was associated significantly (P = 0.012) with axial elongation over 5 years (R^2 = 0.419).

Axial elongation = -2.190 + 0.580 × preoperative ACD

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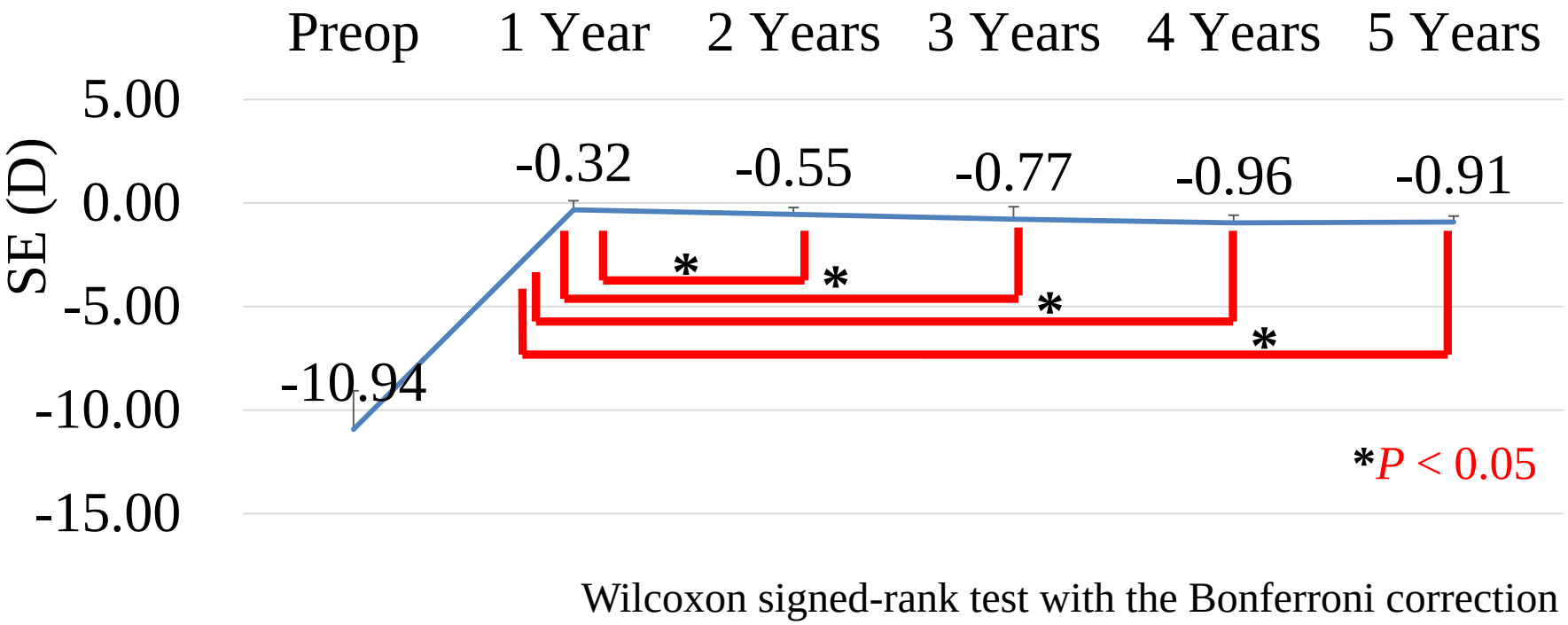
Fig. 1. Changes in SE over 5 Years



Wilcoxon signed-rank test with the Bonferroni correction

➢Though there were significant differences in SE between 1 year postoperatively and all postoperative time points, the mean myopic regression was low (within -0.2 D/year).

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Fig. 2. Correlations between Preoperative ACD and Axial Elongation

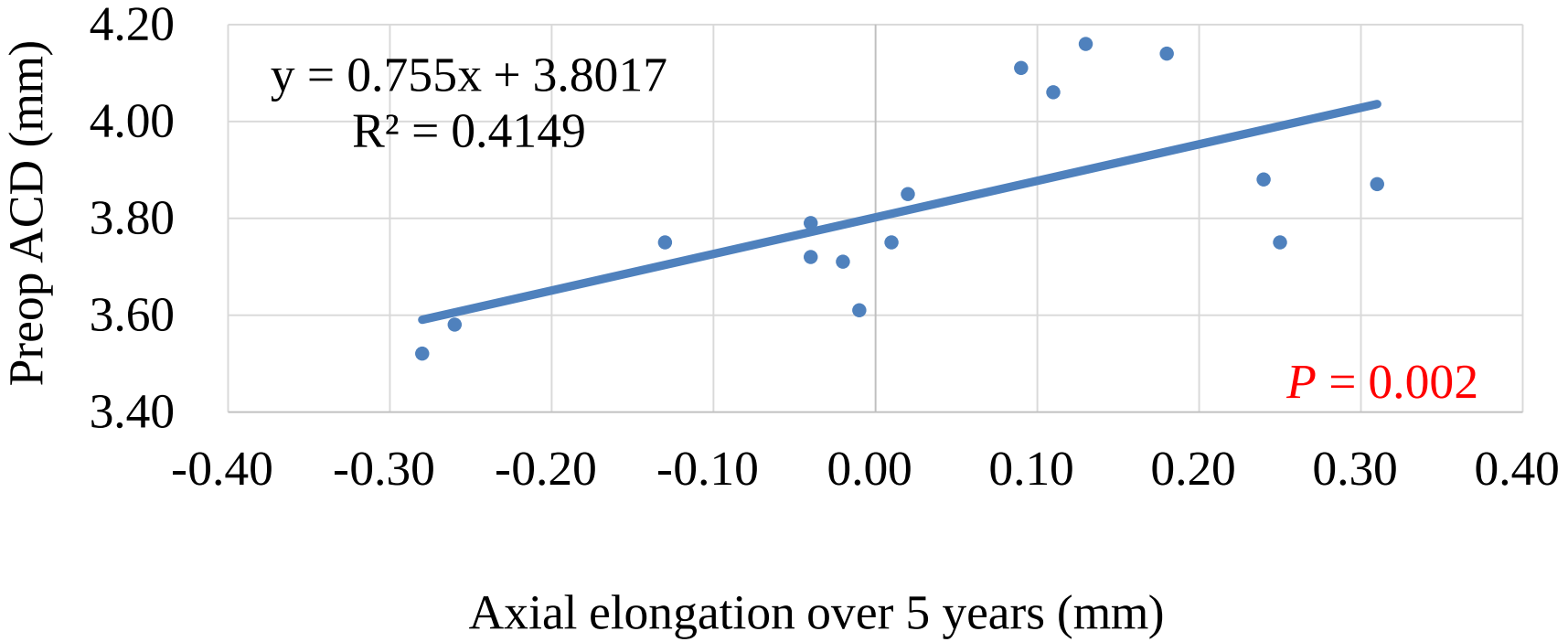

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Fig. 3A: Correlations between Preoperative ACD and Age

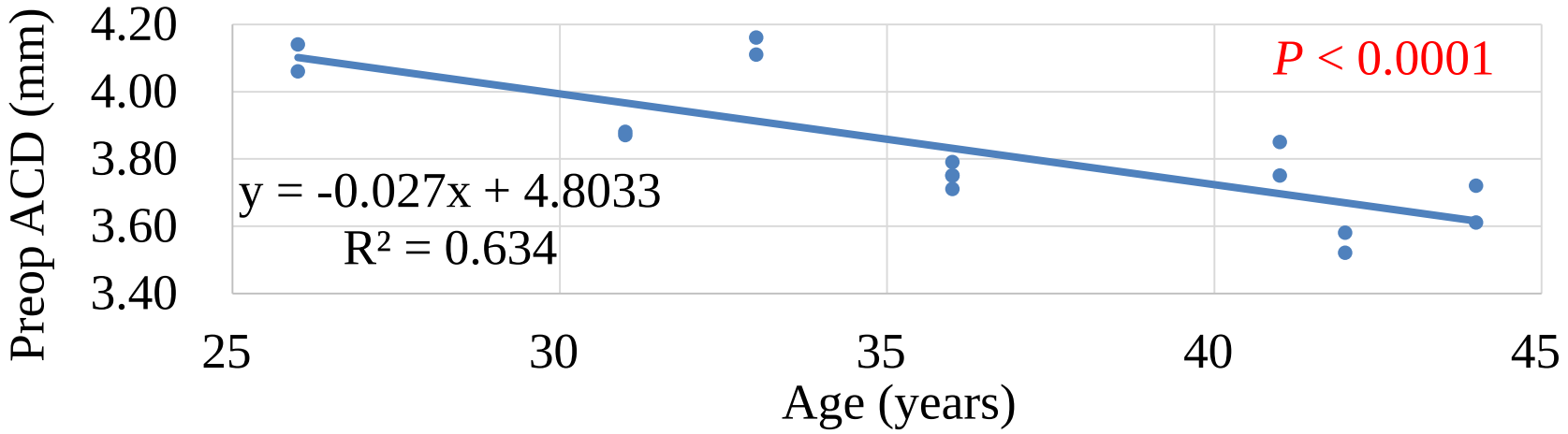
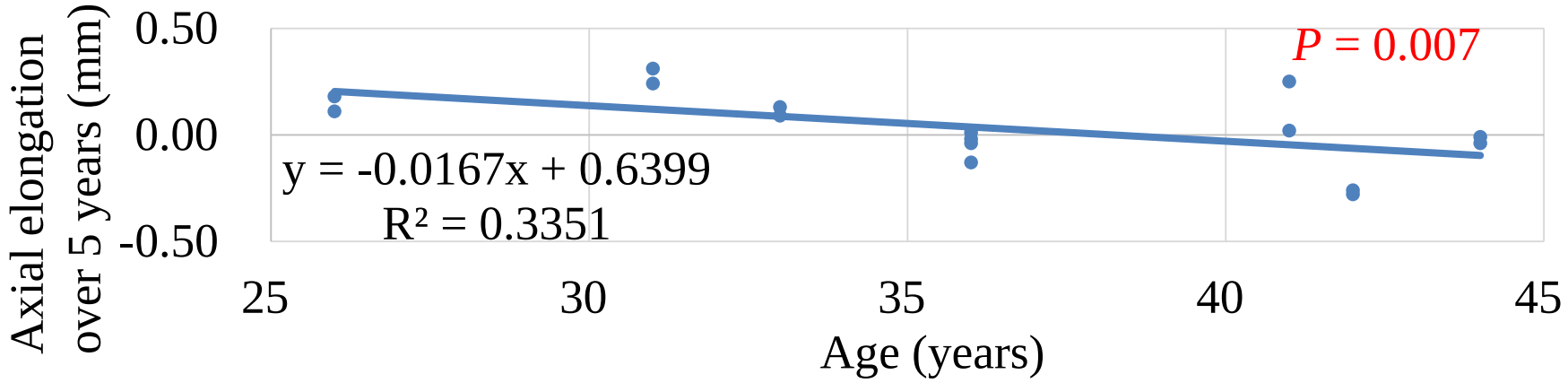


Fig. 3B: Correlations between Age and Axial Elongation



Discussion

- To the best of our knowledge, this is the first long-term follow-up study of axial elongation (evaluated using the IOLMaster preoperatively and postoperatively) after implantation of an Artiflex pIOL.

- There was a significant ($P = 0.002$) correlation between axial elongation over 5 years and ACD (Fig. 2). This result may have reflected the younger patient age, i.e., there was more axial elongation because there was a significant correlation between ACD and age ($P < 0.0001$) (Fig. 3A) and axial elongation and age ($P = 0.007$) (Fig. 3B).

- The small number of eyes was a limitation of this study. More eyes should be evaluated in future studies.

Conclusions

- There was no significant difference in the axial length between preoperatively and 5 years postoperatively.

- Our results suggested that the greater the preoperative ACD the more axial elongation occurs after Artiflex implantation.