Iris Fluttering Detected by Anterior Segment Optical Coherence Tomography in Eyes with Intrasccleral Fixation of Intraocular Lens

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Research Article

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Abstract

The iris fluttering after eye movements was quantified by anterior segment optical coherence tomography (AS-OCT) in 29 eyes that had undergone pars plana vitrectomy (PPV) and intrascleral fixation of an intraocular lens (IOL, ISF group) and 15 eyes with PPV and an IOL implantation into lens capsule (control group). The iris fluttering was recorded every 0.2 seconds by AS-OCT after the eye had moved from a temporal to the primary position (time 0). The iris height from the iris plane (line between the anterior chamber angles) were compared between the groups. The height of the nasal sector in the ISF group decreased to -0.68 ± 0.43 mm at 0 sec ($P < 0.0001$) and returned to -0.06 ± 0.23 mm at 0.2 sec ($P = 0.14$). The height of the nasal sector at 0 sec was significantly lower than that of control (-0.05 ± 0.09 mm, $P < 0.0001$). The height of the temporal sector increased to 0.45 ± 0.31 mm at 0 sec ($P < 0.0001$) and returned to -0.06 ± 0.18 mm at 0.2 sec ($P = 0.15$). The height of the temporal sector at 0 sec was significantly higher than that of the control (0.03 ± 0.06 mm, $P < 0.0001$). Large amplitude iris fluttering leading to reverse pupillary block can be detected and quantified by consecutive AS-OCT images.

Full Text

Intrascleral fixation or ciliary suturing of an intraocular lens (IOLs) has been used on eyes without adequate support by the lens capsule.¹⁻⁸ Because there is no lens capsule behind the iris, a fluttering of the iris can be seen through the slit-lamp microscope when the patient blinks. The flow of the aqueous and vitreous humor through the gap around the optics of the IOL during eye movements is the cause of the iris to oscillate back and forth, i.e., flutter. This is important because excessive iris movements can lead to a pupillary capture by the intraocular lens causing a reverse pupillary block, one of major complications after intrascleral fixation and ciliary sulcus fixation of an IOL.⁹⁻¹² Pupillary capture by the IOL can cause an increase of the intraocular pressure and mild eye pain and discomfort. In addition, the capture by the IOL can deform the pupil which can reduce the visual acuity by decreasing the depth of focus and increasing the ocular aberrations.

The eye is filled with fluid, and saccadic eye movements and body motions cause a movement of the intraocular fluids which generates shear stress on the ocular tissues in contact with the fluids.¹³ The movement of the aqueous humor and vitreous humor during eye movements have been analyzed with a computational model because it is difficult to observe and measure them *in situ* in alive human eyes.¹³⁻¹⁷

The anterior segment optical coherence tomographic (AS-OCT) devices were designed to record cross-sectional images of the anterior segment of the eye.^{18,19} Swept source AS-OCT uses a longer wavelength light source of 1310 nm which enables the scanning of the anterior and posterior surface of an IOL. It also enables high-speed scanning leading to images of the entire anterior chamber angle, and the repetitive imaging of the same section of the anterior chamber will appear similar to a continuous movie scan.^{18,19}

We present a novel use of AS-OCT which allowed us to evaluate and quantify the degree of iris fluttering produced by eye movements in eyes with an intrasclerally fixed IOL. The purpose of this study was to determine whether iris flutter immediately after a saccadic eye movement can be detected and quantified. Another purpose was to determine whether the movement of the iris can lead to a pupillary capture by the IOL after intrascleral fixation.

Results

Patients

The findings in 29 eyes of 29 patients after pars plana vitrectomy (PPV) and intrascleral fixation of an IOL (ISF group) were compared to that in 15 eyes of 15 patients after PPV combined with cataract surgery with implantation of an IOL in the lens capsular bag (control group). In the ISF group, the surgery was performed on 21 eyes with IOL dislocation, 4 eyes with lens dislocation, and 4 eyes with aphakia. In the control group, there were 6 eyes with an epiretinal membrane, 6 eyes with a macular hole, one eye each with a lamellar macular hole, proliferative diabetic retinopathy, and rhegmatogenous retinal detachment. The eyes with a posterior synechia, impending reverse pupillary block, and intraoperative complications including posterior capsule rupture during cataract surgery in the control group were excluded. The age, sex, laterality, axial length, anterior chamber depth (ACD), and the presence of a peripheral iridectomy (PI) in the ISF group were compared to that without a PI.

The differences in the age, sex distribution, and axial length between the ISF and the control groups were not significant (Table 1). However, the ACD of the eyes at the baseline in the ISF group was significantly deeper, and the heights of the iris in the temporal and nasal sectors were significantly lower than that of the control group when the eye was in the primary position.

Table 1
Baseline characteristics between the eyes after intrascleral fixation and vitrectomy combined with cataract surgery.

	ISF	control	<i>P</i> -value
Eyes	29	15	
Age	66.2 ± 17.7	65.1 ± 8.0	0.221*
Sex (M/W)	22 / 7	7 / 8	0.056**
Laterality (R/L)	14 / 15	9 / 6	0.338**
Axial length (mm)	25.32 ± 1.73	24.75 ± 2.05	0.104*
Nasal height of iris (mm)	-0.20 ± 0.16	-0.06 ± 0.17	0.0036*
Temporal height of iris (mm)	-0.23 ± 0.13	-0.08 ± 0.16	0.0034*
ACD (mm)	5.82 ± 0.58	5.25 ± 0.31	0.0004*
Peripheral iridectomy	20	0	
ISF = intrascleral fixation, M = man, W = woman, R = right, L = left, ACD = anterior chamber depth, * = Mann-Whitney test, ** = Fisher's exact probability test			

Time course of changes in height of temporal and nasal sectors of iris after an eye movement

At the time when AS-OCT was used to evaluate iris fluttering at one month after the surgery to implant the IOL, no intravitreal gas bubbles were seen in any of the eyes that had undergone a gas tamponade in both groups.

After the eye moved from the lateral to the primary position, the height of the nasal sector of the iris in the ISF group decreased significantly from the baseline at -0.20 ± 0.16 mm to -0.88 ± 0.40 mm at 0 sec ($P < 0.0001$, Wilcoxon signed-rank test, Figs. 2 and 3, videoclips A). The height of the iris returned to -0.27 ± 0.29 mm at 0.2 sec ($P = 0.140$), to -0.24 ± 0.22 mm at 0.4 sec ($P = 0.397$), to -0.22 ± 0.17 mm at 0.6 sec ($P = 0.242$), and to -0.21 ± 0.17 mm at 0.8 sec ($P = 0.413$) while the eye remained in the primary position. The change in the height of the nasal sector of the iris from the baseline was significantly greater at 0 sec (-0.68 ± 0.43 mm) in the ISF group than in the control group (-0.05 ± 0.09 mm, $P < 0.0001$, Figs. 2 and 4, videoclips B). However, the height was not significantly different between these two groups at 0.2 sec ($P = 0.079$), 0.4 sec ($P = 0.472$), 0.6 sec ($P = 0.421$), and 0.8 sec ($P = 0.452$).

The direction of the changes in the height of the temporal sector of the iris was in the opposite direction from that of the nasal sector. Thus, the height of the temporal sector in the eyes of the ISF group increased significantly from the baseline (-0.23 ± 0.13 mm) to 0.22 ± 0.32 mm at 0 sec ($P < 0.0001$, Wilcoxon signed-rank test), and then returned to -0.29 ± 0.22 mm at 0.2 sec ($P = 0.145$), to -0.26 ± 0.18 mm at 0.4 sec ($P = 0.201$), to -0.25 ± 0.15 mm at 0.6 sec ($P = 0.036$), and to -0.23 ± 0.14 mm at 0.8 sec ($P = 0.119$). The amount of change of the height of the temporal sector from the baseline was significantly

greater at 0 sec (0.45 ± 0.31 mm, $P < 0.0001$), at 0.2 sec (-0.06 ± 0.18 mm, $P = 0.044$), at 0.6 sec (-0.02 ± 0.07 mm, $P = 0.010$), and at 0.8 sec (0.00 ± 0.05 mm, $P = 0.049$) in the ISF group than that in the control group (0.03 ± 0.06 mm at time 0, 0.01 ± 0.06 mm, 0.02 ± 0.03 mm, and 0.01 ± 0.02 mm, respectively). However, it was not significantly different at 0.4 sec (-0.04 ± 0.12 mm, $P = 0.125$) from that of control (0.00 ± 0.05 mm).

Changes of iris height in eyes with and without peripheral iridectomy (PI)

The age, sex distribution, axial length, and heights of temporal and nasal sectors of the iris were not significantly different between the eyes with and without a PI in the ISF group (Table 2). However, the ACD in eyes without a PI was significantly deeper than that in eyes with a PI. The height of the nasal sector in eyes with a PI decreased significantly to -0.88 ± 0.40 mm from the baseline (-0.24 ± 0.13 mm, $P = < 0.0001$, Wilcoxon signed-rank test) at 0 sec and returned to -0.32 ± 0.28 mm at 0.2 sec ($P = 0.067$), -0.29 ± 0.23 mm at 0.4 sec ($P = 0.059$), -0.25 ± 0.17 mm at 0.6 sec ($P = 0.341$), and -0.24 ± 0.16 mm at 0.8 sec ($P = 0.066$). The height of the nasal sector of the iris in eyes without a PI decreased significantly to -0.88 ± 0.42 mm at 0 sec from the baseline (-0.14 ± 0.20 mm, $P = 0.004$, Wilcoxon signed-rank test). Then, the height of the iris returned to -0.16 ± 0.30 mm at 0.2 sec ($P = 1.0$), -0.13 ± 0.17 mm at 0.4 sec ($P = 0.91$), -0.15 ± 0.17 mm at 0.6 sec ($P = 0.363$), and -0.13 ± 0.17 mm at 0.8 sec ($P = 0.933$, Fig. 5).

Table 2

Baseline characteristics between the eyes after intrascleral fixation with or without peripheral iridectomy

	PI (+)	PI (-)	P-value
Eyes	20	9	-
Age	66.9 ± 18.9	64.6 ± 15.4	0.302*
Sex (M/W)	16 / 4	7 / 2	0.625**
Axial length (mm)	25.52 ± 1.82	24.87 ± 1.48	0.192*
Nasal height of iris (mm)	-0.24 ± 0.13	-0.14 ± 0.20	0.156*
Temporal height of iris (mm)	-0.25 ± 0.11	-0.17 ± 0.15	0.057*
ACD (mm)	5.67 ± 0.46	6.17 ± 0.69	0.016*
PI = peripheral iridectomy, M = man, W = female, ACD = anterior chamber depth, * = Mann-Whitney test, ** = Fisher's exact probability test			

The height of the temporal sector of the iris in eyes with a PI increased to 0.20 ± 0.26 mm at 0 sec from the baseline (-0.25 ± 0.11 mm, $P < 0.0001$, Wilcoxon signed-rank test). The height then decreased significantly to -0.35 ± 0.22 mm at 0.2 sec ($P = 0.013$), -0.32 ± 0.18 mm at 0.4 sec ($P = 0.009$), -0.29 ± 0.15 mm at 0.6 sec ($P = 0.013$), and returned to -0.24 ± 0.16 mm at 0.8 sec ($P = 0.067$, Fig. 5). The height of the temporal sector in eyes without a PI increased significantly to 0.26 ± 0.43 mm from the baseline ($-0.17 \pm$

0.15 mm, $P = 0.004$, Wilcoxon signed-rank test) at 0 sec. The height then returned to -0.15 ± 0.14 mm at 0.2 sec ($P = 0.906$), -0.14 ± 0.11 mm at 0.4 sec ($P = 0.514$), -0.16 ± 0.12 mm at 0.6 sec ($P = 0.624$), and -0.13 ± 0.17 mm at 0.8 sec ($P = 0.295$).

The change of the nasal height from the baseline in eyes with a PI was not significantly different from that of eyes without a PI at 0 sec ($P = 0.50$), 0.2 sec ($P = 0.218$), 0.4 sec ($P = 0.212$), 0.6 sec ($P = 0.378$), and 0.8 sec ($P = 0.302$). The amount of change of the height of the temporal sector in eyes with a PI was not significantly different from that without PI at 0 sec ($P = 0.319$), 0.2 sec ($P = 0.079$), and 0.8 sec ($P = 0.212$), but was significantly lower at 0.4 sec ($P = 0.035$), 0.6 sec ($P = 0.033$) than that without a PI. These results suggest that there is a delayed recovery of temporal height to the baseline in eyes with PI in the ISF group.

Discussion

During saccadic eye movements of normal eyes, the iris, crystalline lens capsule, and anterior vitreous cortex form a barrier that prevents the aqueous humor and vitreous humor to flow into the other chamber. These barriers then prevent iris flutter. The absence of the vitreous gel after vitrectomy is believed to enhance the flow of vitreous humor into the anterior chamber during eye movements. Silva and associates¹³ reported that computational fluid dynamics of vitreous humor during saccadic eye movements was different for the gel phase in the vitreous cavity than that with the liquid phase because the inertial effects were more significant with the liquid vitreous. In contrast, the shear stress produced by the gel phase of vitreous humor more than twice that of liquid phase.¹³

After an intrascleral fixation of an IOL without a lens capsular support, the height of the temporal sector of the iris increased, and the nasal sector decreased immediately after the eye moved from a temporal gaze to the primary position. The aqueous humor is more susceptible to the inertia moments than the vitreous humor during eye movements because the aqueous humor is located further from the center of the eye. When the eye moves from a temporal gaze to primary position and comes to rest at the primary position, the nasal sector of the iris is pushed posteriorly by the movement of the aqueous humor toward the posterior chamber, and the height of the nasal sector of the iris is pushed down, i.e., decreased height. At the same time, the temporal sector of the iris is pushed upward and anteriorly toward the anterior chamber as the aqueous humor moves nasally and the vitreous liquid flows into the anterior chamber and the temporal height of the iris increases.

When the nasal sector of the iris is pushed posteriorly, the pupil margins contact the anterior surface of the IOL, and the flow of the aqueous humor stops as if a valve was closed. On the other hand, even if the temporal sector of the iris is lifted up due to the inflow of vitreous humor into the anterior chamber, the pupil margin does not contact the IOLs. Thus, the flow of the vitreous humor into the anterior chamber on the temporal side is enhanced more than the outflow of aqueous humor on the nasal side. These movements change the iris height which then returns to the baseline level after 0.2 seconds. However, the heights of both the nasal and temporal sectors of the iris remain lower than the baseline and gradually

returns to the baseline level after 0.4 seconds. The decreased height of the iris indicates that the process of recovery from the influx of vitreous humor into the anterior chamber.

A reverse pupillary block occurs when either side of the iris is pushed posteriorly during eye movements and the pupillary margin do not stay on the anterior surface of IOL but is pushed behind the IOL by the flow of aqueous humor. A PI was thought to be able to prevent a reverse pupillary block.²⁰⁻²² In our cohort, we found that a PI did not block the inflow of vitreous humor and the outflow of aqueous humor through the pupil. The flow of fluid through the PI was expected to alter the amount of decrease in the height of the nasal sector of the iris and increase the height of the temporal sector at 0 second but the changes were not significant. At 0.2 to 0.6 seconds, the heights of the nasal and temporal sectors of the iris in eyes with a PI decreased more than that in eyes without a PI, and there was a significant difference only in the temporal height at 0.4 and 0.6 seconds. This indicated that a delayed recovery of the temporal sector to the baseline in eyes was possibly due to the inflow or outflow through the PI.

However, the ACD was shallower in the ISF group with a PI at the baseline. There was one eye with an impending pupillary block that had a history of occasional pupillary block and spontaneous recover in which the iris retracted posteriorly and contacted the anterior surface of IOL even at the stationary baseline position in an eye after ISF without a PI (Fig. 6). This case was excluded from the analyses, but the iris retracted excessively, and the ACD was deep with the angle widely opened as described in eyes with reverse pupillary block.¹² These cases are believed to be due to an excessive inflow of vitreous humor into the anterior chamber caused by eye movements. Such cases were not seen in the ISF group with a PI. Suturing the iris to repair the angle recession due to the iris retraction to prevent pupillary capture by the IOL has been described.⁹

The results indicated that the PI did not reduce iris fluttering due to eye movements, however, it is assumed the PI prevented a reverse pupillary block by blocking a homeostatic backward movement of the iris. We believe that a simulation of fluid dynamics can be reproduced using a computational model. However, *in vivo* and live evaluations by AS-OCT are probably more important because the conditions can vary in each case.

Our study has several limitations. First, the number of the patients was too few to perform meaningful statistical analyses. In addition, the types of patients in the two groups varied because of its retrospective design. Second, the AS-OCT analyses were performed one month after the surgery and lacked data for longer postoperative follow-up times. Third, we evaluated the iris height with AS-OCT, and we did not evaluate the intracameral flow directly.

In conclusion, iris fluttering can be detected and quantified by examining consecutive AS-OCT images. The greater iris fluttering by eye movements in eyes after intrascleral fixation of the IOL may cause reverse pupillary block because of the absence of a lens capsular support behind the iris. A PI does not reduce the fluttering of the iris caused by eye movements but it stabilizes the iris height to prevent a pupillary block.

Methods

Study design

The iris height was measured in consecutive images immediately after an eye movement, and the iris heights of the nasal and temporal sectors were compared between the eyes in the ISF group and the control group. The iris height was also compared in eyes of the ISF group with or without a PI. The height of the iris of the eye in the primary position without eye movement was designated as the baseline height. The height of the iris in the ISF group was also compared in eyes with or without a PI.

The axial length was measured with the OA2000 Optical Biometer (TOMEY Corp, Nagoya, Japan). Swept source AS-OCT (CASIA2, TOMEY Corp, Nagoya, Japan) with a light source of 1310 nm was used. The ACD was measured from the corneal endothelium to the anterior surface of the IOL along the visual axis with the caliper software integrated into the AS-OCT device.

All of the patients received a detailed explanation of the surgical and ophthalmic procedures, and all signed an informed consent form. The study conformed to the tenets of the Declaration of Helsinki and was approved by the Institutional Review Committee of the Kyorin University School of Medicine. All of the patients consented to our review of their medical records and their anonymized use in medical publications.

Measurement of iris flutter by anterior segment optical coherence tomography (AS-OCT)

Cross-sectional images of the anterior segment including the iris were obtained by AS-OCT (CASIA2, TOMEY Corp, Nagoya, Japan). Consecutive images were recorded with the movie mode from both groups one month after the surgery. For this, the patient's head was fixed to the head holders of the AS-OCT device, and the patient was instructed to fixate a target located 30 degrees laterally from the primary visual axis for one second and then move the eye back to the primary position and to hold this position for 3 seconds (Fig. 1). This sequence was repeated several times, and the sequences with blinking were excluded from the analyses. The timing of the eye movements was controlled by the sound of a metronome with a repetition rate of one second.

Video images were recorded with the AS-OCT device at 5 frames/sec. In each sequence, the time when the eye stopped at the primary position was set to 0. The heights of the anterior surface of the middle sector of the iris from the iris plane which is a simulated line between the anterior chamber angles (Fig. 1) at the primary position were measured for the temporal and nasal sectors with the caliper function of the ImageJ software (National Institute of Health, Maryland). The baseline values were measured at the primary position without an eye movement.

Surgical procedures

The PPV and all other surgical procedures were performed by two surgeons (TK and MI) with 27-gauge instruments of the Constellation[®] Vision System (Alcon Laboratories, Fort Worth, TX) under local anesthesia. The surgery of the ISF group was for a dislocated or subluxated crystalline lens or an IOL, or aphakia. For these eyes, the dislocated lens was lifted by suction of a vitreous cutter and then phacoemulsified or extracted. A dislocated acrylic or silicone IOL was cut into 2 or 3 pieces by scissors then extracted through a transconjunctival single plane corneoscleral incision. A residual posterior hyaloid cortex was made more visible by an intravitreal injection of triamcinolone acetonide (MaQaid[®], Wakamoto Pharmaceutical Co., LTD, Tokyo, Japan), and the residual posterior hyaloid cortex was removed by suction with a vitreous cutter if it was present.

The intrascleral fixation was performed as described by Yamane, et al.^{7,8} The limbal positions where the haptics of the IOL extracted were at approximate 2 and 8 o'clock which were marked with a toric marker. Two angled parallel incisions were made at 2 mm posterior to the limbus at the marked positions by 30-gauge thin-walled needles. A 3-piece IOL with a 7 mm diameter optics (NX-70, Santen Pharma, Osaka, Japan) was implanted in the anterior chamber and both haptics of the IOL were inserted into 30-gauge needles and extracted with the needles. The excess lengths of the haptics were cut, and the ends were flanged with a coagulator (Accu-Temp[®], Alcon Laboratories, Fort Worth, TX).

The control group underwent PPV combined with cataract surgery and an implantation of an IOL in the lens capsular bag before the PPV. Posterior vitreous detachment, membrane peeling, internal limiting peeling with the aid of brilliant blue G, endo-photocoagulation, tamponade by air or 20% sulfur hexafluoride (SF6) were performed as needed.

Statistical analyses

The significance of the differences in the baseline characteristics and the degree and time course of the iris fluttering between the 2 groups was determined by the Wilcoxon signed rank tests, Mann-Whitney *U* tests, or Fisher's exact probability tests. Statistical analyses were performed with the software in the *VassarStats* website (<http://vassarstats.net>) and KaleidaGraph 4.5.0. (SynergySoftware, PA). A *P* value < 0.05 was taken to be statistically significant.

All data generated or analysed during this study are included in this published article.

Declarations

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Author contributions

We declared the authorship according to the following criteria, substantial contributions to conception and design of the work: MI, TK, drafting the work or revising it critically for important intellectual content, final approval of the version to be published: MI, AH, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: MI, TK.

Competing interests

The authors declare no competing interests. MI: research grants from Alcon Laboratories, Inc., and personal fees (lecture fees) from Alcon Laboratories, Inc., Novartis Pharma K.K., Bayer AG, Carl Zeiss Meditec AG, Novartis Pharma K.K., Santen Pharmaceutical Co., Ltd., and Senju Pharmaceutical Co., Ltd. AMO, outside the submitted work. TK: research grants from Ellex, and personal fees (lecture fees) from Alcon Laboratories, Inc., Novartis Pharma K.K., Bayer AG, Carl Zeiss Meditec AG, Novartis Pharma K.K., Santen Pharmaceutical Co., Ltd., and Senju Pharmaceutical Co., Ltd. AMO, outside the submitted work.

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Figures

Figure 1

Anterior segment optical coherence tomographic (AS-OCT) images taken when the eye is fixed on a temporal target then moves to the primary position. Also shown are images that show the parameters of the AS-OCT images that are measured.

a. AS-OCT image when the patient is looking at a point located 30 degrees temporal from the visual axis.

b. AS-OCT image taken immediately after the patient has moved the eye to the primary position and holds this position for 3 seconds.

c. The heights of the temporal and nasal sectors of the iris are defined as distance from the iris plane (line between anterior chamber angles) to the anterior surface of the nasal and temporal sectors of the mid-iris.

Figure 2

Plot of changes in the height of the temporal and nasal sectors of the iris immediately after a movement of the eye from a 30° temporal position to the primary position in an eye with an intrascleral fixation (ISF) of an intraocular lens (IOL). Also plotted are the values of an eye in which the IOL was implanted in the lens capsule, the control group.

a. The height of the nasal sector of the iris of eyes in the ISF group decreases significantly from the baseline at 0 sec ($P < 0.0001$) and returned at 0.2 sec. The height of the temporal sector in eyes of the ISF group increases significantly from the baseline at 0 sec and returned to the baseline at 0.2 sec.

b. The height of the nasal sector of the iris in the ISF group at 0 sec was significantly smaller than that of the control group ($P < 0.0001$). The temporal height of the ISF group at 0 sec was greater than that of control ($P < 0.0001$). The nasal height of the ISF group at 0 sec was smaller than that of control ($P < 0.0001$).

(* $P < 0.05$)

Figure 3

AS-OCT images of a 72-year-old woman in the ISF group.

The nasal height of the iris (white arrow) decreases and the temporal height (yellow arrow) increases at 0 sec (b) from the baseline (a). The height of the nasal and temporal iris (yellow arrows) remains at the lower level at 0.2 sec (c) and 0.4 sec (d), and returns to the baseline level at 1.0 sec (e and f).

Figure 4

AS-OCT images of a 67-year-old man in the control group who had undergone vitrectomy combined with cataract surgery for an idiopathic macular hole and had the IOL implanted in the capsular bag.

The nasal height of the iris (white arrow) decreases at time 0 sec (b) immediately after the eye stopped at the primary position from the baseline (a). The nasal height (white arrows) increases at 0.2 sec (c) and decreases (white arrows) at 0.4 sec (d). The nasal height returns at 1.0 sec (e) to the baseline position (f). The temporal height of the iris (yellow arrow) increases at 0 sec and remained higher at 0.2 sec (yellow arrow, c) and then returns to the baseline position at 0.4 sec (d, e, and f).

Figure 5

Changes in the height of the iris in eyes after intrascleral fixation with and without peripheral iridectomy (PI)

The nasal height of the iris in eyes with and without PI is lower than the baseline position at 0 sec and returned to the baseline position at 0.2 sec. The temporal height in eyes with and without PI was higher than the baseline position and also returned to the baseline position at 0.2 sec. The temporal height of the iris in eyes with a PI was significantly lower at 0.2, 0.4, 0.6 sec than that without PI. The nasal height in eyes with PI was also lower than that without PI but not significantly different. (* $P < 0.05$)

Figure 6

AS-OCT images of a 55-year-old man with an impending pupillary block after intrascleral fixation of an IOL without a peripheral iridectomy.

a. AS-OCT image indicates that there is an excessive iris retraction and the anterior chamber depth is 7.07 mm.

b. Analysis of the AS-OCT images indicates that the nasal and temporal heights of the iris changes by eye movements but the height is maintained very low.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [VideoAsameeyeinFigure3.mp4](#)
- [VideoBsameeyeinFigure4.mp4](#)