

Repair of angle recession prevents pupillary capture of intrasclerally fixed intraocular lenses

Yuki Kujime · Masayuki Akimoto 

Received: 28 December 2017 / Accepted: 22 March 2018 / Published online: 28 March 2018
© Springer Science+Business Media B.V., part of Springer Nature 2018

Abstract

Purpose We evaluated a new concept for treating pupillary capture of the intraocular lens (IOL) following intrascleral fixation of the IOL. Pupillary capture of the IOL is a common postoperative complication that occurs after suturing and intrascleral fixation of the IOL. In such cases, blunt trauma is often related to zonular dialysis, iris retraction, iridodonesis, and angle recession. Several methods such as barricading by suturing, pupilloplasty, and pars plana fixation are reported to prevent pupillary capture. Although effective, none of these techniques fix iris-malposition and angle recession. We considered that repairing angle recession could correct the iris position and prevent pupillary capture recurrence.

Methods We repaired angle recession in four cases and have followed up.

Results Pupillary capture was not observed in all three cases of larger IOLs for more than 9 months, but

observed after 1 month in an IOL with normal 6 mm diameter, in which the angle was not properly lifted.

Conclusion In select cases, repairing angle recession may be useful for preventing pupillary capture after IOL suturing and intrascleral fixation.

Keywords Pupillary capture of IOL · Barricading suture · Iris-lifting · Intrascleral fixation of IOL · Suturing of IOL

Introduction

Both suturing and intrascleral fixation of the intraocular lens (IOL) are performed for aphakia and inadequate capsular support, such as zonular dialysis and lens/IOL dislocation. Pupillary capture, the state in which the optic of the IOL is located anterior to the iris, is a common complication after suturing and intrascleral fixation of the IOL [1]. Eyes with pupillary capture often have a history of blunt trauma. Blunt trauma also often causes angle recessions [2, 3], which result in retraction of the iris plane. Iridodonesis is often observed [4], and flaccid retracted iris can be a risk factor for pupillary capture after suturing and intrascleral fixation of the IOL [5]. Pupillary capture decreases visual acuity due to IOL tilt, chronic uveitis, macular edema, and acute glaucoma [6]. Mydriatic, miotic eye drop, or laser iridotomy with a reverse

Meeting presentation: The 71st annual congress of Japan Clinical Ophthalmology, Tokyo, Japan, October 2017.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s10792-018-0911-5>) contains supplementary material, which is available to authorized users.

Y. Kujime · M. Akimoto (✉)
Osaka Red Cross Hospital, 5-30 Fudegasakicho,
Tennojiku, Osaka 543-8555, Japan
e-mail: masayuki@akimoto3.com

pupillary block is useful as treatments for pupillary capture. If there is no improvement after these treatments, surgical operation is adapted. Various factors are associated with pupil capture (Fig. 1). Several techniques to prevent pupillary capture have been reported; these include: forming a barricade with sutures for preventing backward deviation of the iris [7, 8], creating a distance between the iris and IOL by suturing the IOL through pars plana [9], and preventing mydriasis by suturing the pupil [10]. However, none of these techniques has resolved iris retraction, which is a potential major cause of pupillary capture. We speculated that repairing the angle recession by suture could place the iris at a normal position and create a distance between the iris plane and IOL to prevent pupillary capture. Here, we report 4 cases in which the angle recession was sutured to correct the iris position and thereby prevent pupillary capture of the IOL.

Case reports

Case 1

An 80-year-old woman was admitted to our hospital for decreased visual acuity and discomfort of the left eye. Her left eye had undergone intrascleral fixation of the IOL with a 7-mm-diameter optic, 6 months ago. The best-corrected visual acuity (BCVA) was 20/40. Intraocular pressure was 11 mmHg. Slit lamp examination showed nasal pupillary capture of the IOL (Fig. 2a). Anterior segment (AS) OCT of the left eye showed the IOL exposure to anterior chamber and angle recession (Fig. 2b). Dilated fundus examination showed no abnormality in the retina. Although the pupillary capture was corrected by a blunt needle, the pupillary capture occurred again. We decided to

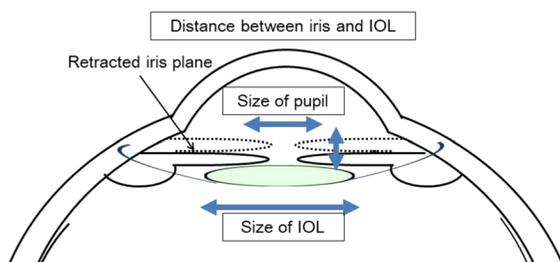


Fig. 1 Risk factors for pupillary capture are summarized

correct the angle recession by suturing the iris. AS-OCT of the left eye showed that the iris was lifted and fixed in the correct position (Fig. 2c, d). Visual acuity showed no change; however, pupil captures were not observed during the 1 year–4-month follow-up.

Case 2

A 57-year-old year woman was admitted to our hospital for discomfort due to pseudophacodonesis. She had undergone pars plana vitrectomy (PPV) and cataract surgery due to rhegmatogenous retinal detachment in her right eye, 3 years ago. The BCVA was 20/16. Intraocular pressure was 15 mmHg. Dilated fundus examination showed no abnormality in the retina. The swaying IOL was removed, and an alternative IOL of a 7-mm-diameter optic was fixed intrasclerally. After the operation, slit lamp examination showed no pupillary capture of the IOL (Fig. 3a), but AS-OCT of the right eye showed angle recession and the iris was almost capturing the IOL (Fig. 3b). Suturing of the iris was performed, after which the angle recession and distance between the iris and IOL had improved (Fig. 3c, d). No abnormality was found in the iris position during the 9-month follow-up.

Case 3

A 61-year-old man who had undergone cataract surgery 5 years ago in his right eye was admitted to our hospital for decreased visual acuity. The BCVA was 30/20. Intraocular pressure was 17 mmHg. Slit lamp examination showed pupillary capture of a dislocated IOL. The old IOL was removed and another IOL with a 7-mm-diameter optic was intrasclerally fixed. After the operation, pupillary capture occurred again on the second postoperative day (Fig. 4a) and AS-OCT showed angle recession (Fig. 4b). Therefore, we decided to correct angle recession by suturing the iris root. After the operation, angle recession and the distance between the iris and IOL had improved (Fig. 4c, d). No abnormality was found in iris position during the 9-month follow-up.

Case 4

A 62-year-old man was admitted to our hospital for double vision in the left eye. His left eye had undergone intrascleral fixation of an IOL with a

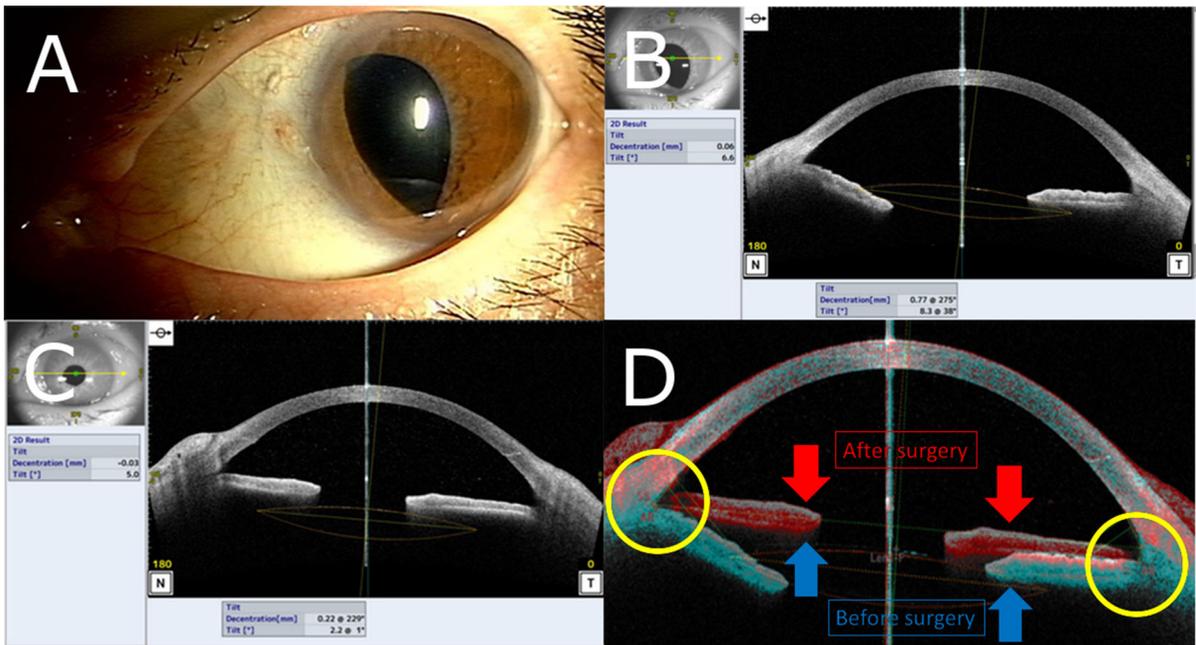


Fig. 2 Case 1. **a** Slit lamp photography of pupillary capture of the IOL at first visit. **b** IOL exposure to anterior chamber and iris recession are shown. **c** Corrected position of the iris by lifting

iris. **d** Comparison of the iris position before (blue) and after (red) surgery. The iris root was lifted (yellow circle)

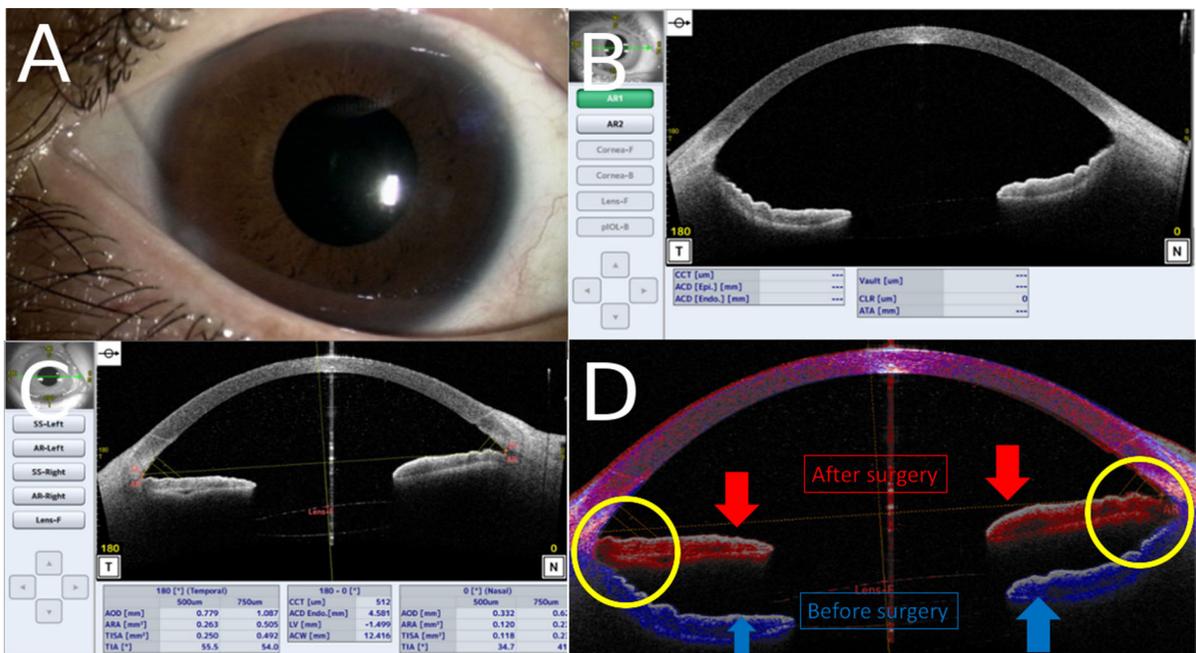


Fig. 3 Case 2. **a** Slit lamp photography at first visit. **b** Iris bowing backward to the IOL. **c** Distance created between the iris and the IOL by lifting iris. **d** Comparison of the iris position before (blue) and after (red) surgery. The iris root was lifted (yellow circle)

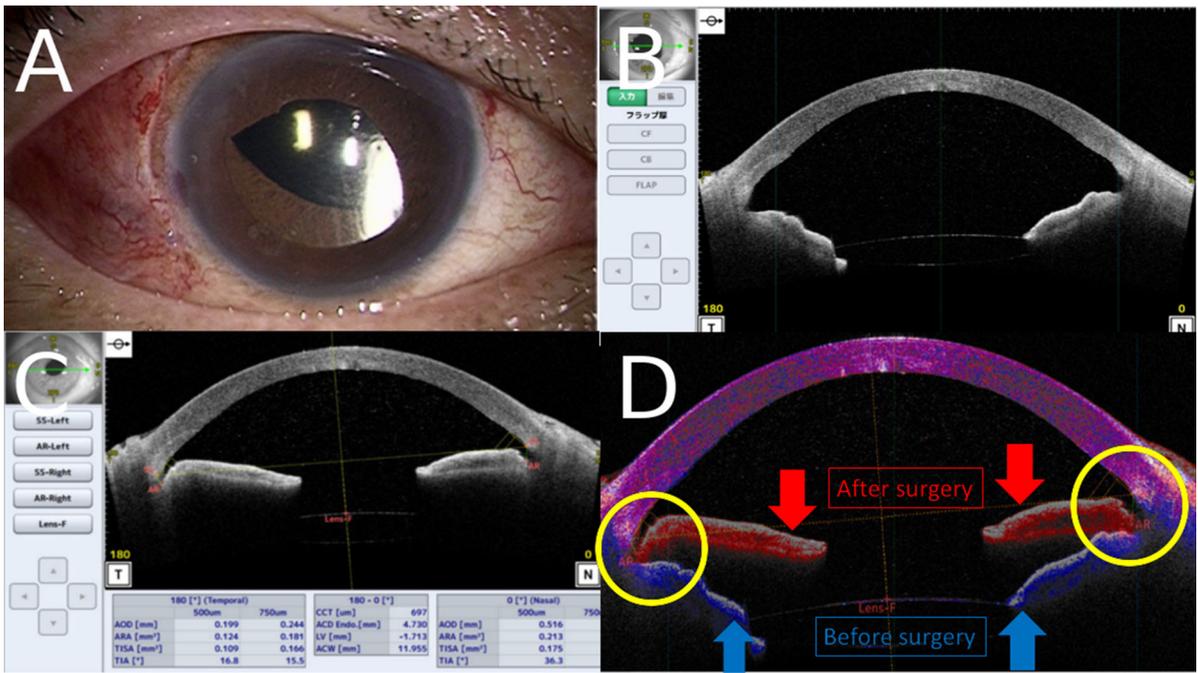


Fig. 4 Case 3. **a** Slit lamp photography at first visit. **b** IOL exposure to anterior chamber and iris recession are shown. **c** Corrected position of the iris by lifting. **d** Comparison of the iris position before (blue) and after (red) surgery. Iris root was lifted (yellow circle)

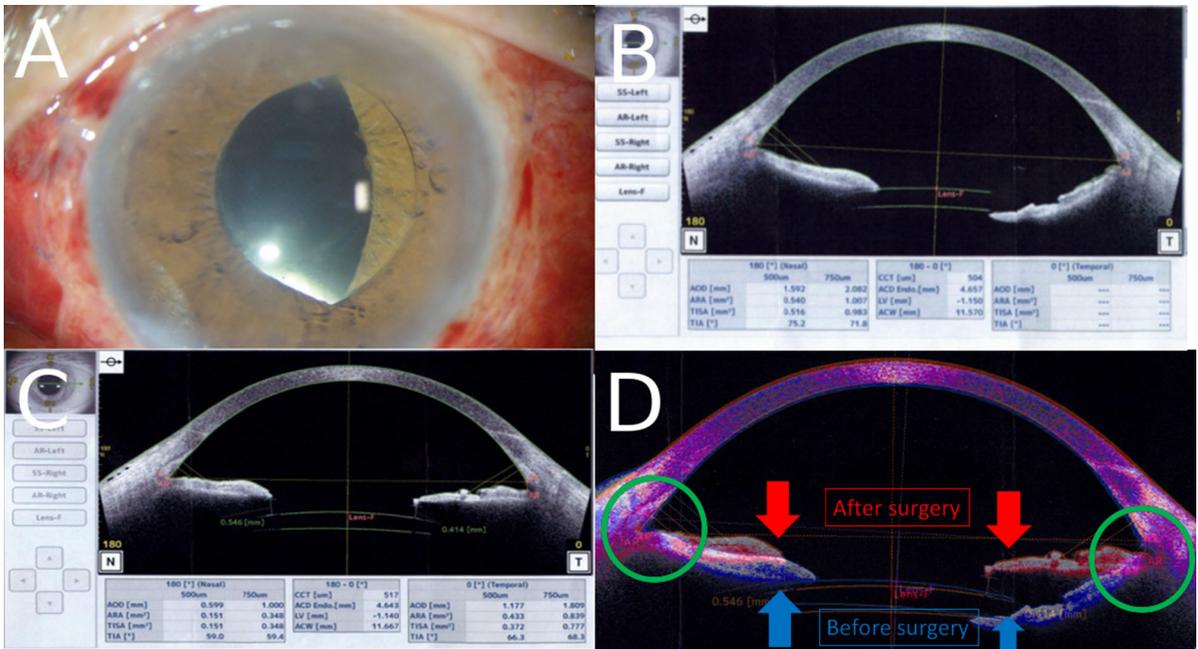


Fig. 5 Case 4. **a** Slit lamp photography of pupillary capture of the IOL at first visit. **b** IOL exposure to anterior chamber and iris recession are shown. **c** IOL placed behind the iris after surgery.

d Comparison of iris position before (blue) and after (red) surgery. Iris root was not lifted (green circle)

6-mm-diameter optic, 2 months ago. On the second postoperative day, pupil capture was observed. This was fixed by a blunt needle, after which the BCVA was 20/13. Intraocular pressure was 14 mmHg. However, the iris capture kept repeating (Fig. 5a, b). Repair of angle recession was planned and performed. AS-OCT revealed that the iris root was not properly lifted (Fig. 5c, d). A month later, pupillary capture occurred again. A barricading suture was placed.

Surgical technique

Since different suturing techniques were used for each case, a representative technique is shown (Video1). Conjunctival peritomies were created at 3 o'clock and 9 o'clock. 20G V-lance was passed at corneal limbus at 2 o'clock and 11 o'clock. A-bent 27G needle was passed from corneal limbus at 11 o'clock. Then, the 27G needle was advanced behind the iris with the iris lifted. After this, the needle penetrated the peripheral iris and was passed transsclerally 1.5-mm posterior to the corneal limbus at 3 o'clock. 10-0 nylon was docked in the lumen of the 27G needle and returned to the eye. It penetrated the peripheral iris adjustment to the first site. 10-0 nylon was tied outside the eye. The ends of suture were embedded in the peritomy. This process was repeated at 9 o'clock.

Discussion

Several common complications that occur after suturing and intrascleral fixation of IOL have been reported. These complications include: transient intraocular pressure elevation, pupillary capture, vitreous hemorrhage, traumatic deviation of IOL, haptics of IOL detachment, and retinal detachment [1]. Pupillary capture seems closely related to the history of the trauma because of the existence of angle recession and iridodonesis. Herschler reported that 60% of angle recessions were caused by blunt trauma [2]. Blanton reported that 60–100% of hyphema due to blunt trauma displayed angle recessions [3]. Iridodonesis is often seen [4] and flaccid retracted iris can be a risk factor for pupillary capture after suturing and intrascleral fixation of the IOL [5].

Various methods of preventing pupillary captures have been reported. Yoo et al. [7] reported that the H technique was an effective way to prevent pupillary

capture of intrascleral fixation of the IOLs of 40 eyes. Once they removed the IOL, they created barricades by sutures between the iris and IOL with intrascleral fixation of the IOL again. Similarly, Sung et al. [8] reported the Tram Track suture technique. Fangju et al. [9] reported that pars plana scleral fixation of the IOL could prevent pupillary capture by creating a distance between the iris and IOL. Narang and Agarwal [10] reported pupilloplasty for pupil size attenuation to prevent pupillary capture.

All these methods are effective for prevention of pupillary capture; however, iris retraction and angle recession were not corrected in these cases. Suturing the pupil may obstruct fundus observation.

We speculated that repairing angle recession itself could restore the iris plane in the normal position and that separation of the iris and IOL could prevent pupillary capture of IOL while retaining normal pupillary function. Separation of the iris and IOL may also prevent potential pigmentary glaucoma caused by pigment dispersion resulting from rubbing the posterior iris surface by the IOL.

In our case series, although the prevention was effective for the cases with larger IOLs, pupillary capture was observed again in a case with a normal 6-mm-diameter IOL. Since the optimal power of the IOL was +4.0D in case 4, we could not use an IOL with a larger diameter. AS-OCT showed successful elevation of iris plane in 3 cases in which pupillary capture was prevented, but not in another case in which pupillary capture was not prevented. Uncorrected iris position may result in repeating pupillary capture. However, a smaller diameter of IOL remains another risk.

Suturing the iris root in the appropriate position is slightly difficult technically. We used different techniques for each case to explore the best method. We reached the best technique using bent-27G needles. The ciliary sulcus guide may be useful for this purpose, although we have not used this yet [11].

To our knowledge, there has been no report on preventing pupillary capture by repairing angle recession. Although our case series is small and limited, repairing angle recession may be a useful method for preventing complications after IOL suturing and intrascleral fixation of IOL, in select cases.

Acknowledgements The studies have been approved by the institutional ethics committee and have been performed in

accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Patients have consented to the usage of pictures and videos in this paper and the publication of the case reports to the journal.

Compliance with ethical standards

Conflict of interest M. Akimoto is a consultant at Kowa Co. Ltd. No conflicting relationship exists for any other author.

References

1. Bum-J HG (2014) Surgical outcomes according to vitreous management after scleral fixation of posterior chamber intraocular lenses. *Retina* 34:1977–1984
2. Herschler J (1977) Trabecular damage due to blunt anterior segment injury and its relationship to traumatic glaucoma. *Trans Sect Ophthalmol Am Acad Ophthalmol Otolaryngol* 83:239–248
3. Blanton FM (1964) Anterior chamber angle recession and secondary glaucoma: a study of the after effects of traumatic hyphemas. *Arch Ophthalmol* 72:39–44
4. Loo AV, Lai JS, Tham CC, Lam DS (2002) Traumatic subluxation causing variable position of the crystalline lens. *J Cataract Refract Surg* 28(6):1077–1079
5. Bang SP, Joo CK, Jun JH (2017) Reverse pupillary block after implantation of a scleral-sutured posterior chamber intraocular lens: a retrospective, open study. *BMC Ophthalmol* 17(1):35
6. Lindstrom RL, Herman WK (1983) Pupil capture: prevention and management. *J Am Intraocu Implant Soc* 9:201–204
7. Yoo YJ, Kim ET, Heo JW (2016) Safety barricade suture for preventing pupillary capture of intraocular lens with scleral fixation: H-technique. *Retina* 36:206–210
8. Sung IK, Kiseok K (2016) Tram-track suture technique for pupillary capture of a scleral fixated intraocular lens. *Case Rep Ophthalmol* 7:290–295
9. Fanglu H, Wei L, Xiangwei S, Ruili T, Qiang J, Xiangjuan Z (2014) Evaluation of pars plana sclera fixation of posterior chamber intraocular lens. *Indian J Ophthalmol* 62:688–691
10. Narang P, Agarwal A (2017) Pupiloplasty for pupil size attenuation to prevent pupillary capture: theory of quintet in glued IOL. *J Cataract Refract Surg* 43(1):3–7
11. Can E, Gul A (2016) A safe method of ciliary sulcus fixation of foldable intraocular lens using a ciliary sulcus guide. *Int Ophthalmol* 36:463–468