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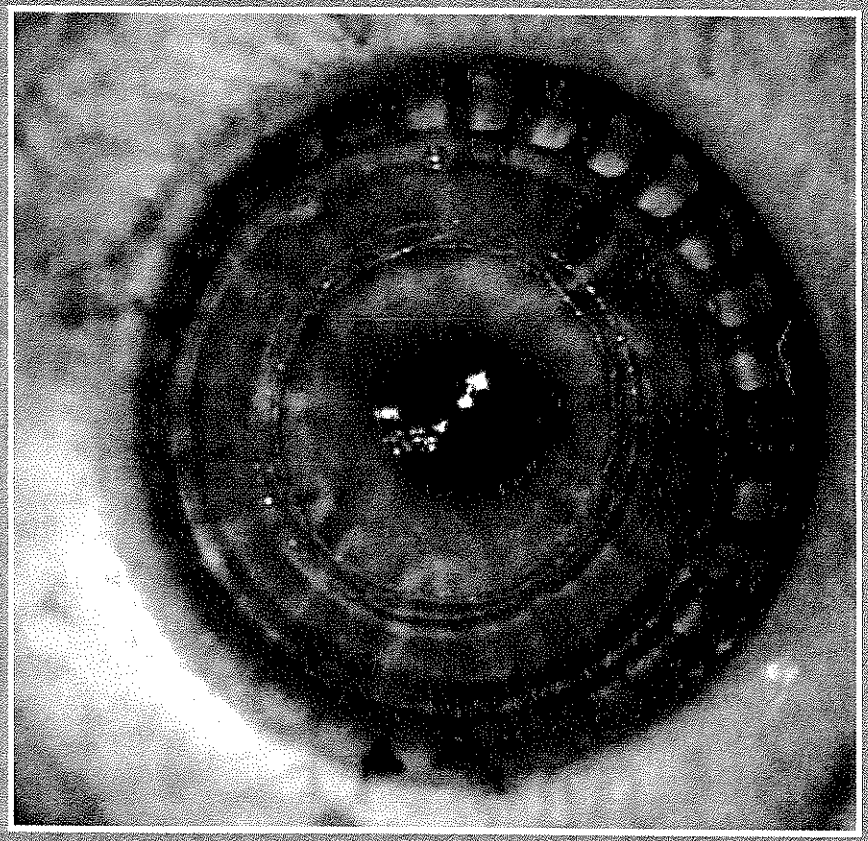

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An Expanded View of the Challenge of Small Pupils

I. Howard Fine, MD,† Richard S. Hoffman, MD,† and Mark Packer, MD†*

Abstract: Because the list of systemic medications with α1 antagonisms continues to grow, all cataract surgery patients with pupils that do not dilate well must be viewed as potential intraoperative floppy iris syndrome (IFIS) cases. Stretching the pupil in IFIS compromises the remaining structural integrity of the iris and is contraindicated in IFIS because it exacerbates floppiness of the iris. Therefore, the role of stretching the pupil has to be limited to very few indications, mainly inflammatory pupillary membranes and patients who have had prolonged miotic drop usage and well-known systemic medications.

(*Tech Ophthalmology* 2009;7: 110–114)

We will discuss the cases of 3 patients on whom we recently performed phacoemulsification of cataracts and intraocular lens implant surgery. All had small pupils that dilated minimally. We will detail the techniques that we used on these patients, which are now a part of our expanded view of the challenge of small pupils, all of which are a part of striving for surgical outcomes that include excellent cosmesis and maximally possible pupillary function.

CASES

The first case is a well-compensated elderly female patient with schizophrenia on a psychotropic drug that unbeknown to us has anti-α1 properties. The drug was actually a dopamine agonist, and another dopamine agonist also has been shown to have anti-α1 properties.[1] In this particular patient, we stretched the pupil with the resulting compromise of the remaining structural integrity of the iris. After the capsulorrhexis, we performed cortical cleaving hydrodissection and hydrodelineation resulting in prolapse of the iris through both side port incisions (Fig. 1). We addressed this problem by making another side port incision to allow some excess viscoelastic to extrude from the eye (Fig. 2). We used the Soft I/A Curved Micro-incision Aspirator (S-IA-02021-6; MicroSurgical Technology, Redmond, Wash) to reposit the iris in one of the initial side port incisions and to remove most of the remaining viscoelastic. We then used a heavier viscoelastic Healon 5 (10-2900-51; Abbot Medical Optics, Santa Ana, Calif) to reposit the prolapsed iris in the other initial side port incision, and to then tamponade the iris, sequester it, and as best as possible, dilate the pupil (Fig. 3). Then using the bimanual microincision phacoemulsification technique[2] with the Fine-Olson irrigating chopper (DU-02305; MicroSurgical Technology) held high in the anterior chamber,

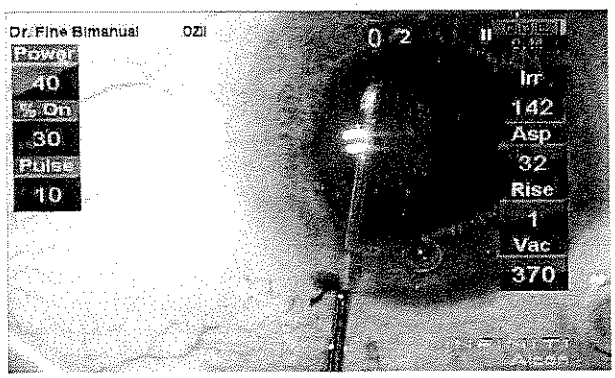

FIGURE 1. Prolapse of iris through both microincisions.

the iris remained tamponaded, and as a result, despite the relatively small size of the pupil, we never got any floppiness of the iris during the rest of the case. In situations such as this, we do our first 1 or 2 chops endolenticularly (Fig. 4), and from then on, the nuclear segments are brought up to the Fine-Olson irrigating chopper held high in the anterior chamber for further disassembly and mobilization. The tamponading effect of the incoming fluid can keep the iris flat, so that the phacoemulsification and cortical removal proceed in a routine fashion. Floppiness of the iris in intraoperative floppy iris syndrome (IFIS) occurs only when the incoming irrigation fluid goes below the iris. Biaxial microincision phacoemulsification is a great advantage in cases of IFIS because the technique prevents floppiness of the iris during the disassembly and mobilization of the nucleus and the mobilization of the endonucleus and cortex. With the irrigator held high in the anterior chamber, we do not get floppiness of the iris even if we go under the iris with the unsleeved phaco needle or under the implant with the microaspirator as we move residual viscoelastic (Fig. 5). An excellent result was achieved (Fig. 6).

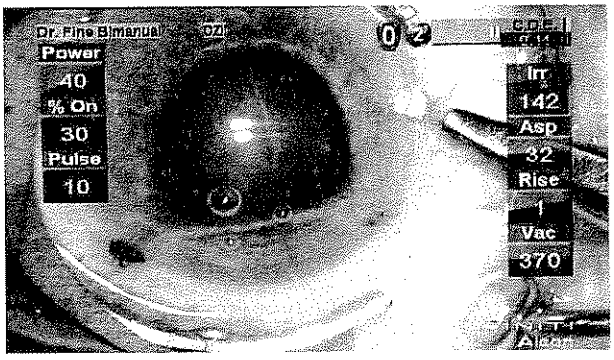

FIGURE 2. Release of some viscoelastic through a third microincision.

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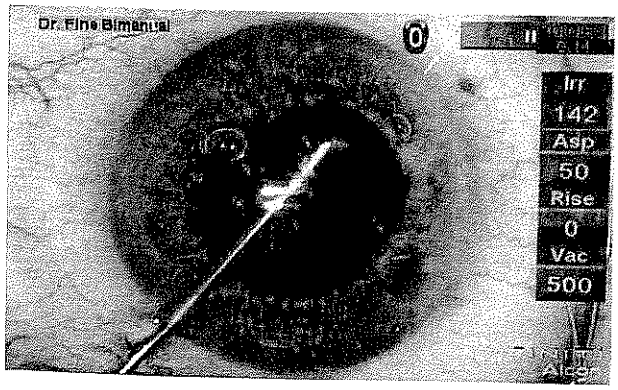

FIGURE 3. Dilation of pupil with Healon 5.

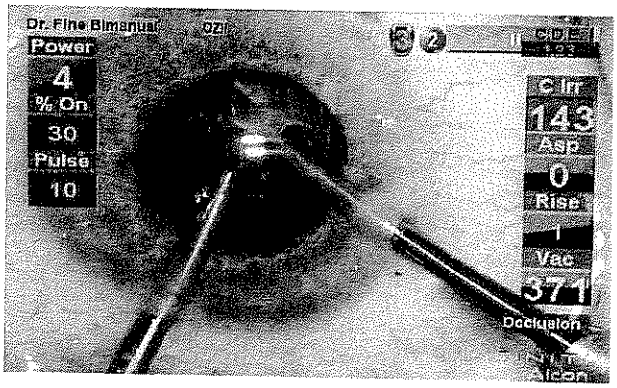

FIGURE 4. First endolenticular chop during biaxial phacoemulsification.

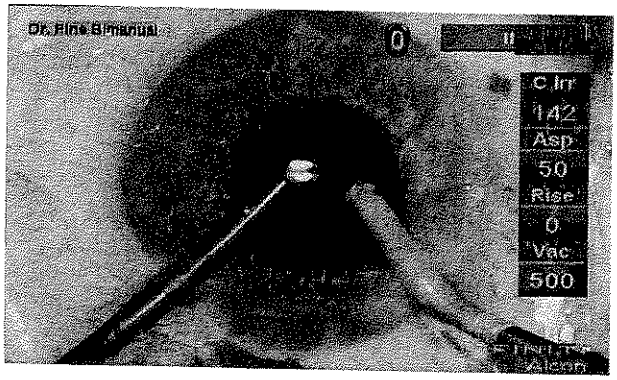

FIGURE 5. Biaxial removal of residual viscoelastic from behind the intraocular lens.

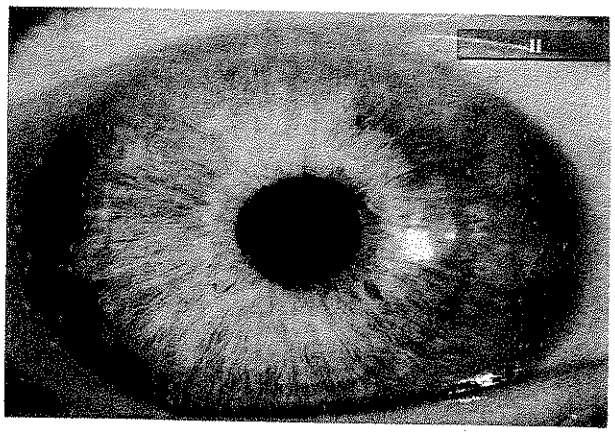

FIGURE 6. Excellent appearance of patient no. one 2 weeks after surgery.

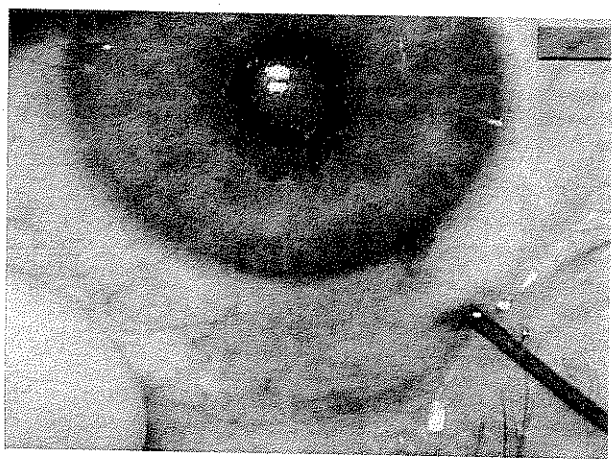

FIGURE 7. Sutureless 25-gauge transcleral vitrectomy.

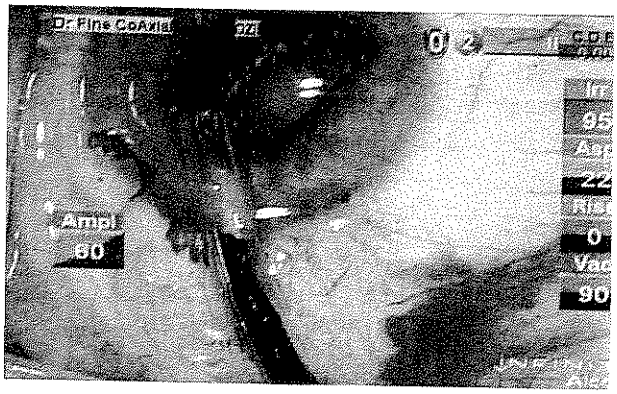

FIGURE 8. Injection of the Morcher Pupil Expander Ring.

The second patient had chronic angle closure, a very short axial length, a very shallow anterior chamber, and a very small pupil. In such cases, we use a pupil expander device, such as the Morcher Pupil Expander Ring Type 5S (Morcher GMBG, Germany; distributed by FCI Ophthalmics, Marshfield Hills, Me) or the Malyugin Ring (MAL-0001; MicroSurgical Technology) to address the second problem associated with IFIS; small pupils and intraoperative myosis. We commenced in the second case with a 25-gauge transcleral vitrectomy to give us a deepening of the anterior chamber (Fig. 7). After that, we lysed the synechiae, and after trying to stretch the pupil with Lester hooks, one in each microincision, we realized that we would not have adequate mydriasis. We abandoned our biaxial approach and created a 2.5-mm temporal corneal incision through which we injected the Morcher Pupil Expander Ring with the Geuder Reusable Injector (G-32960; Geuder AG, Heidelberg, Germany;

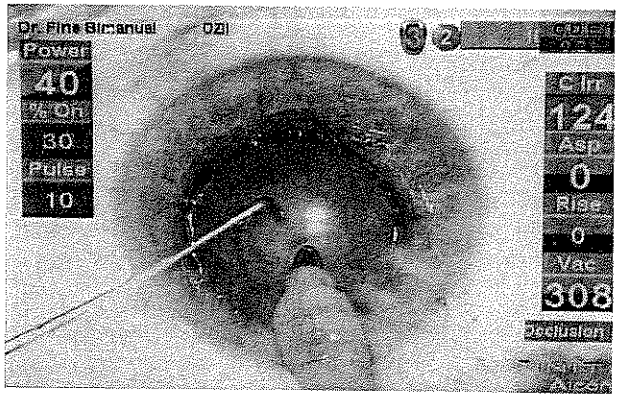

FIGURE 9. Coaxial phacoemulsification in the presence of the Morcher Ring.

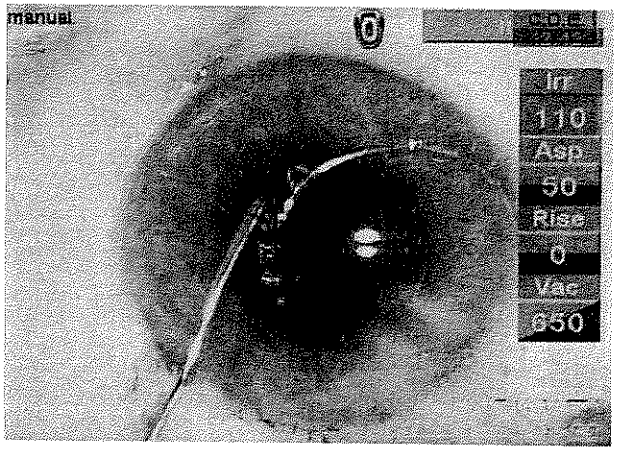

FIGURE 10. Positioning the Morcher Ring for removal from the eye.

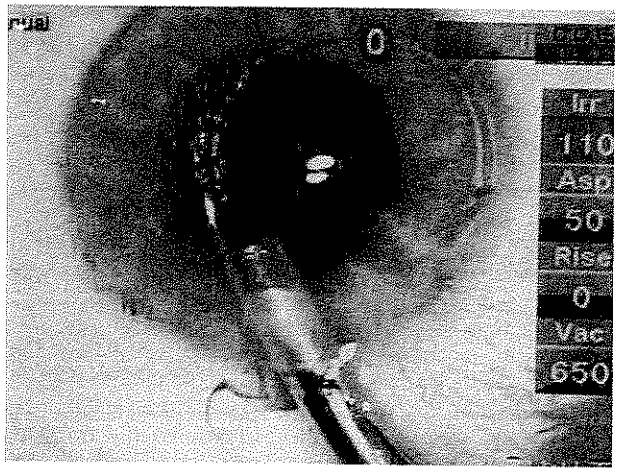

FIGURE 11. Engaging the Morcher Ring with the injector hook.

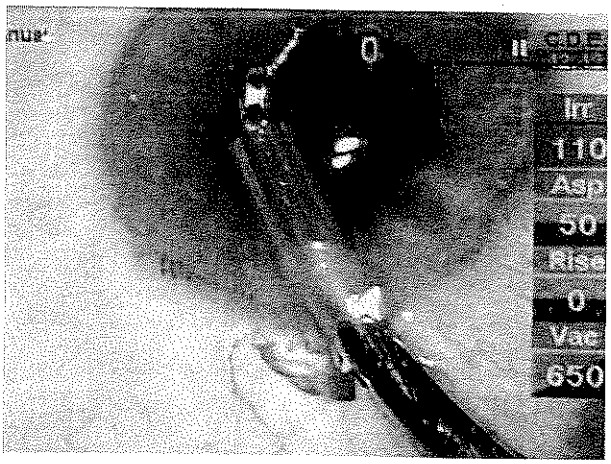

FIGURE 12. Removing the Morcher Ring from the eye using the injector.

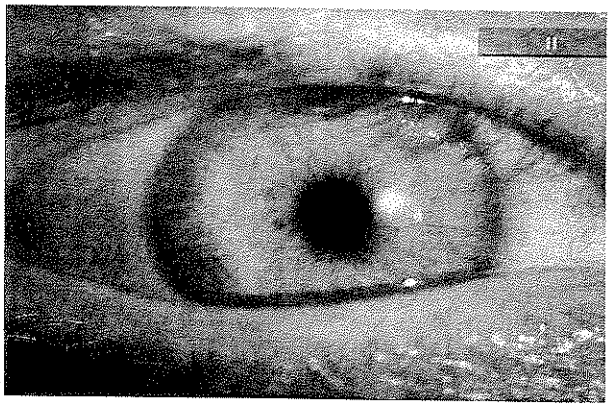

FIGURE 13. Two-week postoperative appearance of patient no. 2.

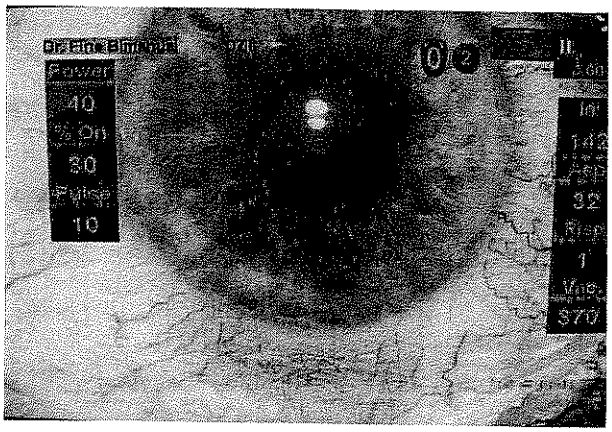

FIGURE 14. Adherent pupillary membrane and YAG laser iridotomy (upper left in photo).

distributed by FCI Ophthalmics) (Fig. 8). This ring is a 1-mm-tall device that has facets on it, above and below, with positioning holes in the facets. The facets surround the margin of the pupil in the same way that a tire is surrounded by the rim of a wheel. We engage the pupillary margin within the facets and then rotate the ring so that the opening of the ring faces the temporal corneal incision. We then have adequate dilation of the pupil to proceed in a usual and customary way, in this case, using a coaxial phaco technique (Fig. 9). At the completion of the case, but before removing the viscoelastic, we remove the ring. This

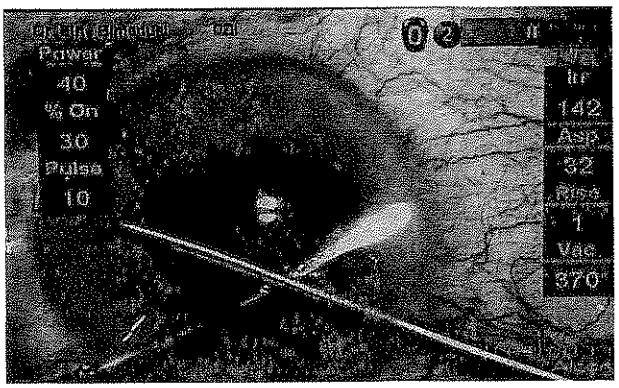

FIGURE 15. Freeing a segment of the circumferential pupillary membrane.

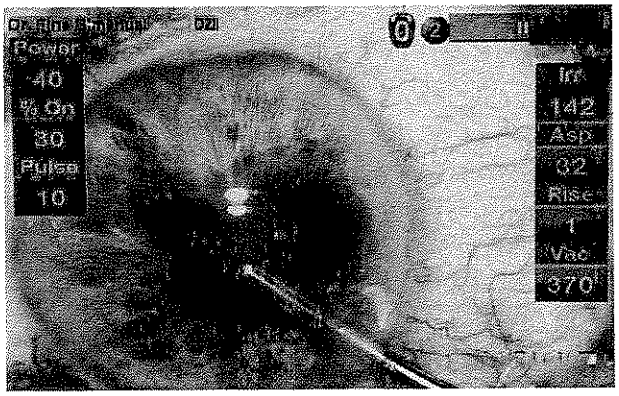

FIGURE 16. Stripping of the pupillary membrane.

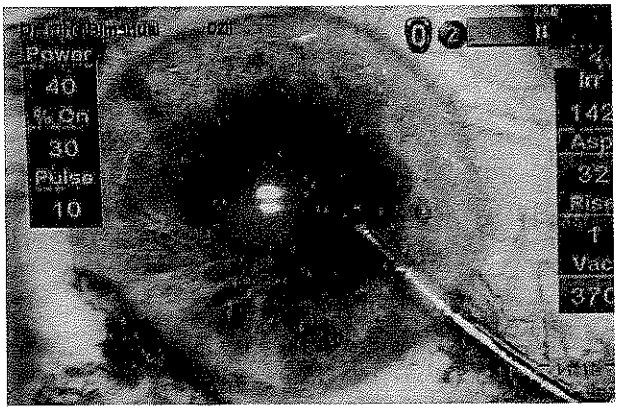

FIGURE 17. The membrane is stripped tangentially.

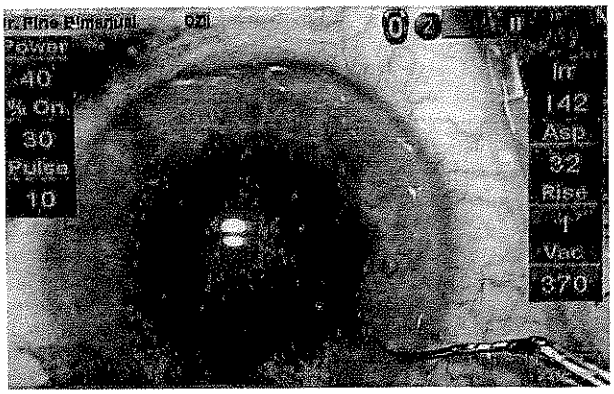

FIGURE 18. Removing the membrane from the eye.

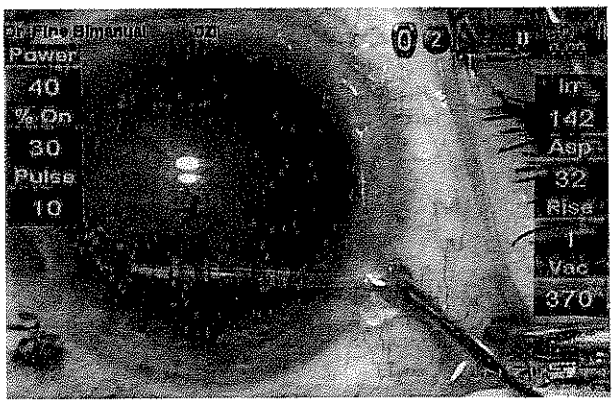

FIGURE 19. Dilation of the pupil with viscoelastic.

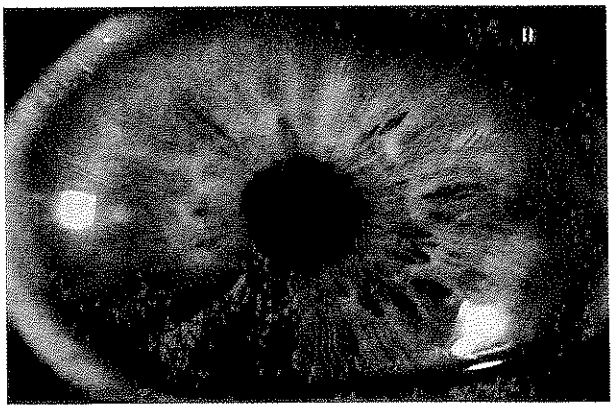

FIGURE 20. Third patient at the 2-week postoperative appointment.

involves engaging the positioning holes with a hook to first remove the ring from the pupillary margin and move it to the right side of the anterior chamber and align the leading edge of the ring perpendicular to the incision (Fig. 10). We can extract the ring by engaging the leading positioning hole with the hook of the injector (Fig. 11) and then atraumatically draw the entire ring into the cannula of the injector (Fig. 12). If the ring is not positioned exactly, that is to say, if it is positioned at an angle rather than aligned with the axis of the cannula, it is possible to snap off a portion of the leading positioning hole. When this happens, you are left with a transparent intraocular foreign body that may be difficult to find and remove. The patient achieved an excellent result devoid of any iris damage (Fig. 13).

The third case is a patient who had chronic uveitis and a pupillary membrane that surrounded the pupil and was totally adherent to the anterior lens capsule, resulting in iris bombé. The referring surgeon had done an inferior temporal yttrium-aluminum-garnet (YAG) laser iridotomy to address the iris bombé (Fig. 14). Through limbal microincision just opposite the YAG laser iridotomy, we put a cannula and injected Viscoat

(8065183905; Alcon Laboratories, Inc, Fort Worth, Tex) under the iris to elevate it. We then swept the pupillary membrane off the anterior lens capsule moving from peripheral with the Viscoat cannula toward the center of the pupil so that if a capsular tear resulted, the tear would go centrally rather than out peripherally. After freeing the membrane from the anterior lens capsule, we then stripped the membrane from the pupil. We commenced by pushing against the membrane to the right as if to stretch the pupil and against the iris peripheral to the membrane to the left (Fig. 15). This results in a pulling away of a portion of the pupillary membrane to the left that looks like a handle. We can then grasp the handle of the membrane with the 23-gauge Fine-Hoffman Rhexis Forceps with MST Touch Forceps Handle (DF-0004; MicroSurgical Technology) and strip it from the pupil (Fig. 16). It is best to strip the membrane tangentially to the pupil rather than radially (Fig. 17), away from the pupil, to avoid an iris dialysis. Usually, the membrane will separate and come out of the eye as a single strand (Fig. 18). In almost all cases, after removal of the pupillary membrane, the pupil dilates very adequately under the influence of viscoelastic (Fig. 19) and the remains adequately dilated throughout the case and functions physiologically postoperative (Fig. 20).

CONCLUSIONS

In summary, many new and undoubtedly some unknown pharmaceuticals have $\alpha 1$ antagonism and result in IFIS. Stretching small pupils in IFIS exacerbates iris floppiness by compromising the remaining structural integrity of the iris. Pupillary membranes should be stripped or divided. Stretching of the pupil should be limited to eyes with a history of chronic miotic drops and well-known systemic medications. All other small pupil cases should be viewed as potential IFIS and approached appropriately.

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