

# Intraoperative Floppy Iris Syndrome

A systematic approach.

By Samuel Masket, MD



Intraoperative floppy iris syndrome (IFIS) has been well defined by Chang and Campbell and is characterized by poor dilation of the pupil, intraoperative progressive miosis, billowing of the iris tissue, and iris prolapse through the ocular incisions during cataract surgery.<sup>1</sup> IFIS has been associated with increased rates of surgical complications, including capsular rupture, vitreous loss, and the loss of iris tissue. Induced primarily by the alpha 1-a inhibitor, tamsulosin (Flomax; Boehringer Ingelheim Pharmaceuticals, Inc.), IFIS may be associated with other alpha-blockers, psychotropic drugs, and over-the-counter agents such as saw palmetto. Tamsulosin is considerably more likely to induce IFIS than are other medications.

A number of surgical strategies can reduce the complication rates associated with IFIS and make cataract surgery similar to routine cases.<sup>2</sup> Extensive experience with patients using tamsulosin led me to develop a stepwise approach to management, which I use routinely for individuals with a history of therapy with this drug.

## HISTORY

It is essential to be aware of a patient's use of tamsulosin. Obtaining an accurate history may be difficult, however, because some individuals (typically men, in my experience) are reluctant to divulge a history of any genitourinary condition, particularly to a female staff member. Moreover, patients may only report medications they are currently taking, but past exposure to tamsulosin can have lingering effects.

In my practice, our protocol is to ask patients about any exposure to tamsulosin at any time. Cataract surgery patients are queried on several occasions—generally, when surgery is scheduled, when surgery is confirmed, when they arrive at the surgery center, and when they are interviewed by the circulating nurses and anesthesia personnel.

## PREOPERATIVE EVALUATION

Without a doubt, the key to success in the potential IFIS case is a widely dilated pupil. During the office visit, I carefully evaluate and record how the patient's pupil dilates in response to mydriatics/cycloplegics. A wide pupil in response to weak dilating agents confers an excellent surgical prognosis. Conversely, poor dilation in the office suggests that surgery could be challenging; I know to allow for greater-than-average procedural time and to be prepared to use additional surgical tools.

## PREOPERATIVE TOPICAL ATROPINE SULFATE 1%

A poorly dilating pupil is associated with a greater chance of capsular rupture in routine cataract surgery. In eyes with IFIS, irrigating fluid may pass beneath the iris and induce it to billow and possibly prolapse. A widely dilated pupil will allow the irrigating fluid to remain above the iris plane, thereby reducing the manifestations of IFIS. The chief purpose of atropine is to prevent progressive intraoperative miosis. As the strongest pupilloplegic agent, it offers the best chance of preventing the pupil's progressive constriction during surgery. Atropine must be administered well in advance of surgery, however, because considerable time is necessary to realize its full effect. As a result, I have patients instill the drop three times daily for 2 full days prior to surgery. For example, a patient scheduled to have surgery on Tuesday will begin using the medication on Sunday. Patients are also instructed to continue their tamsulosin therapy, due to the risk of acute urinary retention with the use of atropine.

As I have previously published, the synergism between topical atropine and intraocular epinephrine (to be discussed further) is very successful in eyes with IFIS, but the strategy requires that the surgeon be aware of the patient's history and that he or she initiate atropine well in advance of surgery.<sup>3</sup>

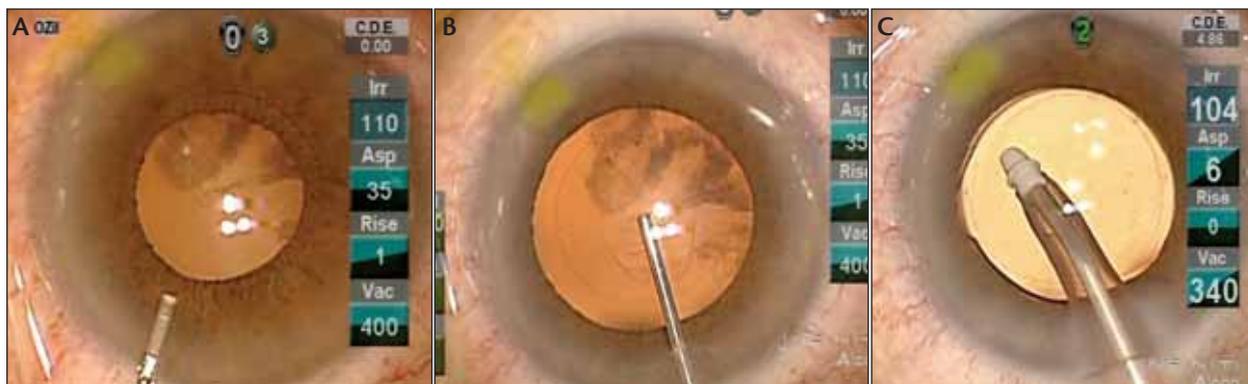


Figure 1. At the outset of surgery, the pupil is dilated to approximately 4 mm after the presurgical use of topical atropine sulfate. An epinephrine-lidocaine combination is administered via the paracentesis (A). The pupil has been further dilated by the epinephrine-lidocaine mixture, and DisCoVisc is added via the square 2.2-mm corneal tunnel incision. A faint corneal mark (5.75 mm) may be noted; it is used as a guide for the capsulorhexis (B). The cataract has been removed, the IOL has been implanted, and removal of the OVD has commenced. Note that the pupil has remained adequately dilated (C).



Figure 2. The nucleus has been partially prolapsed anterior to the iris plane for phacoemulsification.

### WOUND CONSTRUCTION

Given the proclivity of the iris to prolapse as a manifestation of IFIS, the surgeon should take care to construct incisions that have long tunnels. A square surface configuration offers the best protection for both the main incisions and paracenteses.

### INTRACAMERAL EPINEPHRINE

The late Joel Shugar, MD, reported a benefit to the direct stimulation of the iris dilator muscle by intracameral epinephrine as another pharmacologic method to eliminate or reduce the signs of IFIS.<sup>4</sup> My experience, however, dictates that epinephrine or atropine alone is not as useful as their use in combination. Direct stimulation of the iris dilator muscle from epinephrine together with nearly absolute pupilloplegia allows me to perform routine

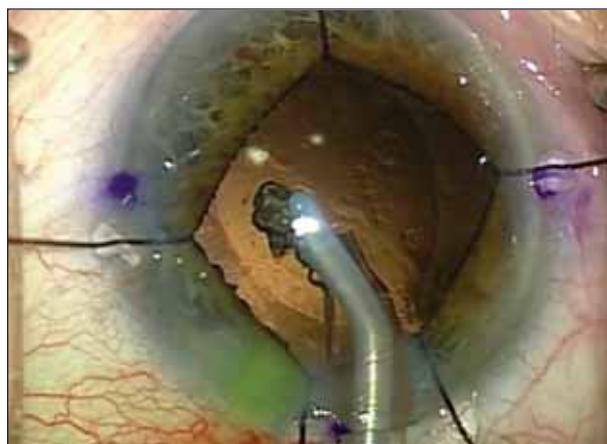


Figure 3. Five disposable iris retractors (Alcon Laboratories, Inc.) create a pentagonal pupil and afford adequate space for surgery.

cataract surgery for well above 90% of tamsulosin users.

My initial approach was to administer 1:4000 epinephrine beneath the iris at the outset of surgery.<sup>3</sup> Recently, I determined that I achieve an equal effect with a combination of unpreserved lidocaine 1% and unpreserved, bisulfite-free epinephrine 1:100,000 in final dilution. I employ this mixture in routine cataract surgery for intraoperative pupillary dilation, and I combine it with presurgical topical atropine for IFIS prevention (Figure 1).

### CHOICE OF OPHTHALMIC VISCOSURGICAL DEVICE

In addition to the pharmacologic strategies already described, retentive ophthalmic viscosurgical devices (OVDs) can mechanically help maintain a dilated pupil. High-viscosity OVDs can apply pressure to the anterior

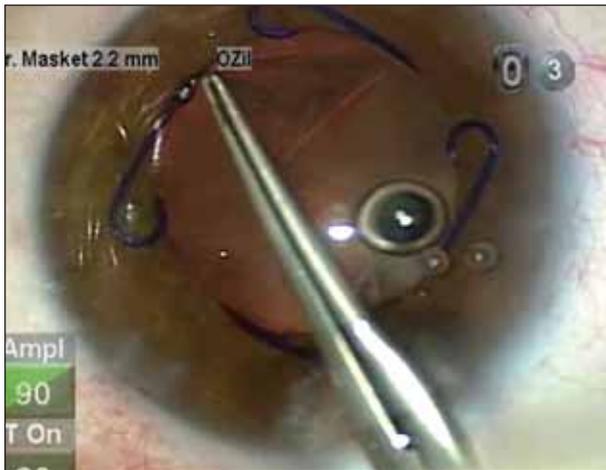


Figure 4. The Malyugin Ring stabilizes the pupil and prevents intraoperative miosis.

surface of the iris and create so-called viscomydriasis. In the United States, I find the two best-suited agents for this purpose are Healon5 (Abbott Medical Optics Inc., Santa Ana, CA) and DisCoVisc (Alcon Laboratories, Inc., Fort Worth, TX). These OVDs differ in their rheology, so surgeons should become familiar with their use in routine situations before applying this strategy for IFIS. For example, it is necessary to add Healon5 to the anterior chamber multiple times during phacoemulsification, and the surgeon may need to reduce fluidic turnover by modifying the vacuum and flow settings.

### FLUIDICS DURING NUCLEAR MANAGEMENT

It is important to avoid irrigating large volumes of balanced salt solution infusate under the iris, as this will increase the likelihood that the tissue will billow and prolapse, particularly with poor pupillary dilation. In this situation, the surgeon may consider reducing the height of the infusing bottle during disassembly of the nucleus. After nuclear division, the surgeon should bring the pieces anterior to or into the plane of the iris for removal, while allowing the infusion to be directed anterior to the iris. At this juncture, the bottle height can be raised to routine levels, as long as the infusion is anterior to the iris.

An alternative strategy for nuclear removal in IFIS cases is to prolapse one pole of the nucleus anteriorly, assuming adequate chamber depth and corneal endothelial health (Figure 2). In this manner, the infusion of balanced salt solution will be directed anterior, rather than posterior, to the iris diaphragm.

### MECHANICAL PUPILLARY EXPANDERS

In my experience, the strategies described have been successful for the great majority of potential IFIS patients.

Occasionally, however, the pupil may fail to dilate beyond the edge of the planned capsulorhexis, which can foreshadow difficulty during phacoemulsification. In such cases, I find that it is safest to employ mechanical iris retraction. Although a number of tools are available for that purpose, I have had experience and excellent results with both standard iris retractors (Figure 3) and the Malyugin Ring (MicroSurgical Technology, Redmond, WA) (Figure 4). These devices slightly lengthen surgery and variably increase its expense, but the complications that their use prevents make them more than worthwhile.

### CONCLUSION

In potential IFIS eyes, a logical approach allows the surgeon to take advantage of the available pharmacologic, fluidic, and mechanical strategies that all contribute to a successful outcome. The one unifying element is adequate pupillary dilation.

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### By David F. Chang, MD



Five years after intraoperative floppy iris syndrome (IFIS) was first described,<sup>1</sup> there is still no clear preference among ophthalmologists for the surgical management of these cases, according to a survey conducted in 2008 by the ASCRS Cataract Clinical Committee.<sup>2</sup> In fact, when asked to name their preferred single method for IFIS, the most common response (33%) was “always employ multiple strategies” (Figure 1).

One reason for the diversity of opinions and approaches is the variable range of IFIS' severity. A prospective multicenter study of cataract surgery in 167 consecutive eyes of patients on tamsulosin rated IFIS as mild (billowing only), moderate (billowing and intraoperative miosis), or severe (billowing, miosis, and iris prolapse).<sup>3</sup> Using this classification, 10% of the tamsulosin cases had no IFIS, 17% had mild IFIS, 30% had moderate IFIS, and 43% had severe IFIS. In general, I anticipate severe IFIS when the patient is taking tam-

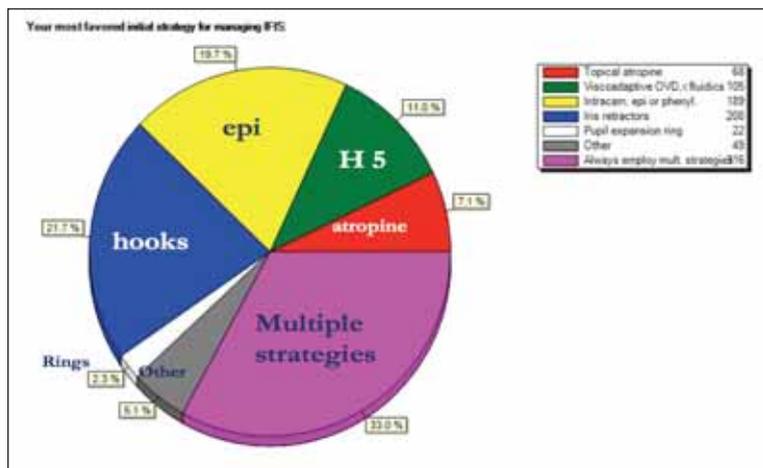


Figure 1. Responses to the 2008 poll of the ASCRS membership in which ophthalmologists were asked to name their preferred initial strategy for IFIS.

sulosin and the pupil dilates poorly preoperatively. Another warning sign is billowing of the iris immediately upon the instillation of intracameral lidocaine. In contrast, if the pupil dilates well preoperatively, I expect mild-to-moderate IFIS, but I am still prepared for iris prolapse. Patients taking non-

or billowing or prolapse of the iris in other eyes.

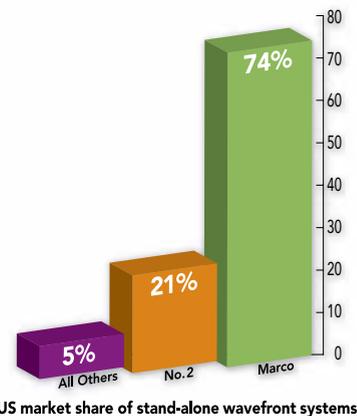
## STRATEGIES

Using intracameral epinephrine is both safe and inexpensive, and if the pupil dilates moderately well, I rou-

selective alpha-1 antagonists or who have stopped their alpha blockers for several months are most likely to display mild-to-moderate IFIS.<sup>4</sup>

Considering the variable severity of IFIS, it makes sense that certain strategies, such as pharmacologic approaches, may work well in some eyes but poorly in others.<sup>2,4</sup> Clearly, it is to surgeons' advantage to be familiar with several different strategies from which they may select according to the situation or that they may use in combination to achieve complementary benefits. Intracameral alpha agonists, such as epinephrine, illustrate this point well. In some eyes, injecting epinephrine results in significant mydriasis and rigidity of the iris, whereas it has little effect on pupillary size

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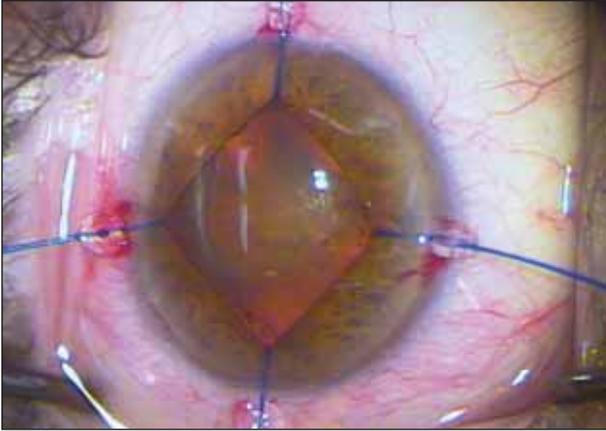
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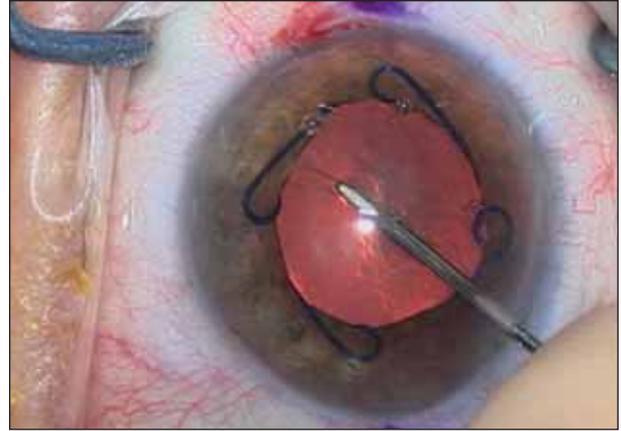


**Figure 2.** The surgeon places reusable 4–0 polypropylene iris retractors in a square configuration in the eye of a patient on tamsulosin therapy. At the bottom, the temporal iris retractor is within a separate paracentesis track just behind the clear corneal incision.

tinely inject this agent prior to initiating the capsulorhexis. It may take a minute before the pupil slowly dilates, but even if it does not, the alpha agonist will often increase tone in the iris dilator muscle, thereby reducing billowing and the tendency for prolapse or further miosis. A 1:4000 epinephrine solution is made by adding 0.2 mL of commercially available 1:1000 epinephrine to 0.6 mL of plain balanced salt solution in a 3-mL disposable syringe. The late Joel Shugar, MD, determined that this dilution raised the acidic pH of the stock epinephrine solution to physiologic levels, and I have used this formulation more than 200 times without evidence of endothelial toxicity.<sup>5</sup> American Regent, Inc. (Shirley, NY), and Cura Pharmaceutical Co., Inc. (Eatontown, NJ), produce a bisulfite-free epinephrine solution.

If mydriasis remains borderline adequate after the injection of epinephrine, Healon5 (Abbott Medical Optics Inc., Santa Ana, CA) can then be used to mechanically expand the pupil further.<sup>6</sup> Viscomydriasis facilitates the capsulorhexis and combines with the epinephrine-induced iris rigidity to block iris prolapse. Keeping the aspiration vacuum and flow rate to a minimum prolongs the presence of Healon5 in the anterior chamber, as does the strategy from Wendell Scott, MD, of adding a dispersive ophthalmic viscosurgical device over the lens to displace the Healon5 peripherally and delay its aspiration.

When the pupil dilates poorly preoperatively (eg, 3 to 5 mm in diameter), I have found it easiest to proceed directly to mechanical devices, which are more difficult to insert following the creation of the capsulorhexis. Both iris retractors and the Malyugin Ring (MicroSurgical Technology, Redmond, WA) provide 100% assurance that the pupil will be adequately large and will not constrict



**Figure 3.** The Malyugin Ring does not impede the access of the irrigating cystotome.

during surgery. These devices also allow surgeons to use their routine ophthalmic viscosurgical device, phaco technique, and fluidic parameters. For example, I would rather not give up the higher vacuum and flow parameters that I prefer for dense nuclei. This guarantee of adequate pupillary diameter and control is helpful in the presence of other risk factors such as pseudoexfoliation, weak zonules, brunescient nuclei, or a poor red reflex. Other issues to consider are the individual surgeon's level of confidence with small pupils or with functionally one-eyed patients.

Iris retractors should be placed in a diamond configuration, as described by Oetting and Omphroy<sup>7</sup> (Figure 2). The subincisional retractor occupies a separate paracentesis tract that is located just posterior to the temporal clear corneal incision. Because it pulls the iris down and behind the phaco tip, this configuration provides excellent access to subincisional cortex and avoids tenting the iris up in front of the phaco tip, as occurs with a square configuration of retractors. The nasal iris retractor also provides excellent visualization for the chopper's placement. My preference is to use 4–0 polypropylene iris retractors (available from Katena Products, Inc. [Denville, NJ], and FCI Ophthalmics, Inc. [Marshfield Hills, MA]), because they are stiffer and easier to manipulate than 6–0 nylon retractors. The increased girth and sturdiness of 4–0 polypropylene iris retractors also make them autoclavable and reusable. Finally, the IFIS pupil is not fibrotic and typically can be maximally stretched with retractors without tearing the sphincter muscle. Iris retractors therefore provide the best surgical exposure of any method for managing IFIS.

The disposable 5–0 polypropylene Malyugin Ring is my pupillary expansion ring of choice, and most surgeons will find it easier and faster to insert and remove than iris retractors<sup>8</sup> (Figure 3). Because the iris drapes over the sides of the device, it creates a round pupil with a 6- or 7-mm diameter,

depending on which of the ring's two sizes is used. The tip of the disposable injector goes through a 2.5-mm incision and is used both to place and remove the ring. Compared with bulkier plastic pupillary expansion rings, the thin profile of the Malyugin Ring reduces the risk of accidental corneal or incisional trauma, and it does not impede instruments' access to the lens. There is no need for multiple paracentesis sites, which is advantageous in the presence of a bleb or pterygium, and the problem of iris hooks pushed against the lid speculum with a tight palpebral fissure is avoided. Finally, the smooth coils are very gentle on the pupillary margin, which minimizes depigmentation and damage to the sphincter. Because it is disposable, the Malyugin Ring is more costly to use than reusable iris retractors.

### CONCLUSION

Some combination of intracameral epinephrine, Healon5, and iris expansion devices enables me to handle the entire spectrum of IFIS severity. Knowing this, I neither stop the patient's systemic alpha blockers nor employ topical atropine preoperatively. In this way, these patients receive the same simple preoperative instructions as everyone else undergoing routine cataract surgery. ■

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*David F. Chang, MD, is a clinical professor at the University of California, San Francisco. He acknowledged no financial interest in the products mentioned herein, and he stated that his consulting fees from Abbott Medical Optics Inc. and Alcon Laboratories, Inc., are donated to the Himalayan Cataract Project. Dr. Chang may be reached at (650) 948-9123; dceye@earthlink.net.*

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