The Intraoperative Floppy Iris Syndrome

Surgical strategies for a new small pupil syndrome.

BY DAVID F. CHANG, MD

At the annual meeting of the ASCRS in April, John R. Campbell, MD, and I reported on two companion studies that we conducted to examine the incidence, characteristics, surgical outcomes, and etiology of floppy irides during cataract surgery.[1,2] We named this condition the *intraoperative floppy iris syndrome* (*IFIS*) (Figures 1 to 3). Based upon retrospective observations by Dr. Campbell regarding a possible association with tamsulosin (Flomax; Boehringer-Ingelheim Pharmaceuticals, Inc., Ridgefield, CT), we attempted to evaluate IFIS with both a retrospective and a prospective study. Because there is no mention of any such syndrome in the literature, we were not even sure how to define it at first.

In a prospective study of 900 consecutive cases in which I as the surgeon was masked as to the patient's medication history, approximately 2% of the eyes (21/900) and 2% of the total patients (16/741) were deemed to have a floppy iris. Fifteen of these 16 patients were either taking Flomax or had taken the agent in the past. This systemic alpha-1 antagonist drug is the most commonly prescribed medication for benign prostatic hypertrophy. None of the 725 non-IFIS patients was taking Flomax.

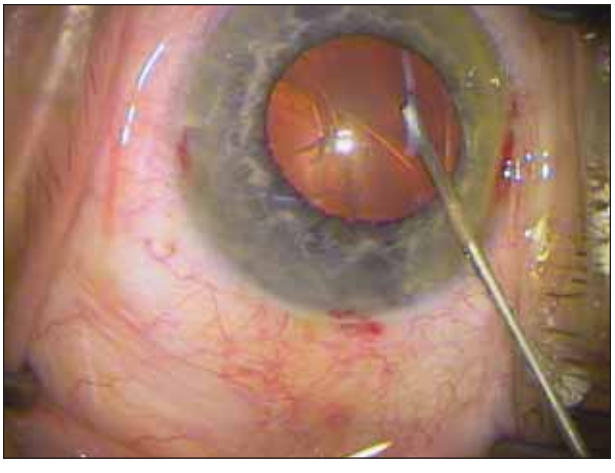

Figure 1. The surgeon easily performs the capsulorhexis despite suboptimal pupillary dilation in a patient taking Flomax.

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The retrospective study evaluated every cataract surgery performed in a two-surgeon (Dr. Campbell's) practice during the prior calendar year (2003). A floppy iris was noted in the operative report in approximately 2% of the total eyes (16/706) and patients (10/511). Every one of the IFIS patients was taking Flomax. Six patients on Flomax therapy did not have a floppy iris noted in the operative report. An additional 1.5% (11/706) of the patients were taking other systemic alpha-blockers (Hytrin [Abbott Laboratories Inc., North Chicago, IL], Cardura [Pfizer Inc., New York, NY], or Minipress [Pfizer Inc.]). None of these patients demonstrated a floppy iris. The rate of IFIS in the two combined studies—totaling more than 1,600 eyes and 1,250 patients—was 2%. Our findings convey the importance of ophthalmologists' recognizing and learning how to manage IFIS.

PHARMACOLOGY OF SYSTEMIC ALPHA-1 BLOCKERS

Flomax is one of several systemic alpha-1 blockers used to treat the urinary symptoms of benign prostatic hypertrophy. These drugs improve urinary outflow by relaxing the smooth muscle in the prostate and bladder neck. Their side effects can include postural hypotension due to alpha-1 blockade of the vascular wall's smooth muscle.

Molecular studies have demonstrated the presence of three different alpha-1 receptor subtypes: A, B, and D.[3] Flomax exhibits an extremely high affinity and specificity for the alpha-1A receptor subtype, which is the predominant receptor found in the prostatic and bladder smooth muscle. As the only drug in its class that is specific to one receptor subtype, Flomax is much more uroselective than Hytrin and Cardura, and physicians prefer the agent because of its much lower associated incidence of postural hypotension. Alfuzosin (Uroxatral; Sanofi-Synthelabo Inc., New York, NY) is a newer alpha-1 blocker that is also not subtype specific.

We reviewed the pharmacologic literature to find which alpha-1 receptor subtype mediates contraction of the iris dilator's smooth muscle. Based upon a number of animal studies, it appears that alpha-1A is the predominant receptor subtype in the iris dilator muscle as well.[4] Although systemic alpha-1 antagonists differ in their receptor subtype affinities, it is not clear why IFIS was not seen in our patients taking Hytrin and Cardura. Recently, urologists have begun to treat urinary retention symptoms in women taking Flomax,[5] and, predictably, anecdotal reports are emerging that these women demonstrate IFIS as well.

CLINICAL FEATURES

Based upon features common to all of our cases, we defined the IFIS according to a triad of signs: (1) a floppy iris that billows in response to normal irrigation currents in the anterior chamber (Figure 2); (2) a marked

DISCUSSION

By Richard A. Lewis, MD

The mention of intraoperative floppy iris syndrome (IFIS) by David Chang, MD, at the AAO's annual meeting in October 2004 was noteworthy.[1] His work with coauthor John R. Campbell, MD,[2] confirmed the observation of many ophthalmologists who had noticed that certain patients exhibited challenging pupillary characteristics during cataract surgery.

In glaucoma patients, especially those with a history of miotic use, pupillary management has always been critical, and new surgical procedures and devices (eg, iris hooks, pupil expanders) have been developed to enhance pupillary management. Glaucoma patients with IFIS are distinctive because, while their pupils can be managed, the floppiness of their irides into incisional sites continues to be disconcerting. Iris incarceration in the paracentesis site and in clear corneal or scleral wounds also challenges surgeons.

In the few months since Dr. Chang's first description, the IFIS has become well recognized. In fact, many physicians can recall specific patients from the past few years who exhibited the characteristics of IFIS during surgery, especially in complicated cases in which the patient had been taking Flomax (Boehringer Ingelheim Pharmaceuticals, Inc., Ridgefield, CT).

When managing patients with IFIS, I follow the recommendations of Drs. Chang and Campbell. If a patient has used Flomax, I am on the alert for subtle changes in his pupil or peripheral iris. Often, hydrodissection is the inciting event in bringing down the pupil. I try to perform very slow, gentle hydrodissection, and, when in doubt, I use iris hooks and Healon5 (Advanced Medical Optics, Inc., Santa Ana, CA). Iris stretching is not effective and may exacerbate a floppy iris. Low-flow irrigation and gentle aspiration are critical.

The important take-home message is that surgeons must be aware of specific patients who are at risk for IFIS and of iris hooks' value in managing the floppy iris. Like the rest of the ophthalmic community, I am grateful to Drs. Chang and Campbell for their important observation.

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propensity for the iris to prolapse to the phaco and sideport incisions; and (3) progressive pupillary constriction during surgery (Figure 3).

Although there are other possible causes of either iris prolapse or intraoperative miosis, it is the combined presence of all three aforementioned features that defines and characterizes the IFIS. The pupil frequently dilates poorly or suboptimally, but this feature was not uniform to all cases in our study. Because mechanical pupillary stretching or partial-thickness sphincterotomies are among the most commonly used techniques for small pupils,[6] a surprising and disappointing feature of the IFIS was the ineffectiveness of these techniques for achieving or maintaining adequate expansion of the pupil during surgery.

> "Although discontinuation [of Flomax] seemed to improve the preoperative dilation and iris floppiness in several patients, full-blown IFIS still occurred in others."

In our retrospective series, two of 16 (12.5%) patients with IFIS incurred posterior capsular rupture with vitreous loss. We also encountered several fellow eyes in cases of IFIS that had experienced vitreous loss during prior surgery performed elsewhere and outside of the study period. There were no instances of capsular rupture in the prospective IFIS series, but iris transillumination defects of varying severity resulted from iris prolapse in a number of eyes.

We believe that two features of the IFIS in particular

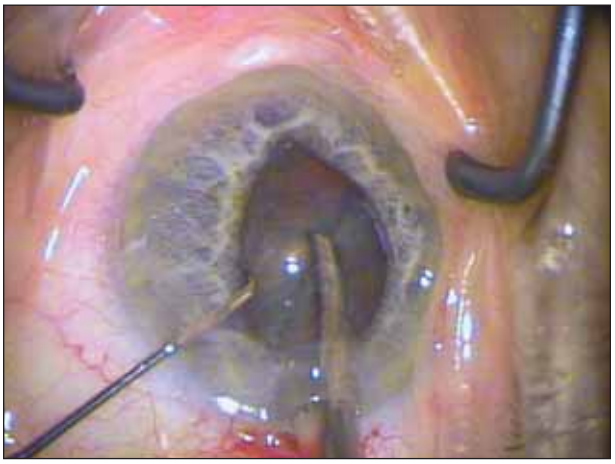

Figure 2. The iris billows in response to ordinary irrigation currents.

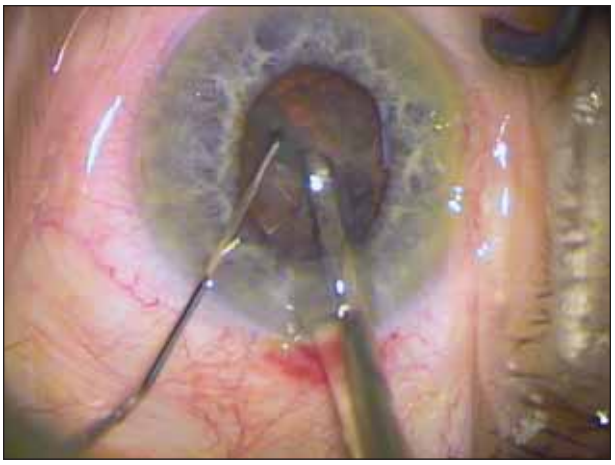

Figure 3. The iris prolapses to the phaco and sideport incisions, and the pupil constricts.

increase the risk of posterior capsular rupture. The first is the relative ineffectiveness of mechanical pupillary stretching, with or without partial-thickness sphincterotomies, for expanding the pupil in eyes with IFIS. Mechanical stretching in eyes with posterior synechiae or in patients chronically taking miotics creates microscopic tears in the fibrotic edge of the inelastic pupil. This is not the case in eyes with IFIS, where, like an elastic waistband, the pupil simply snaps back to its original size. Second, because these pupils do expand following viscoelastic injection, particularly with Healon5 (Advanced Medical Optics, Inc., Santa Ana, CA), the surgeon may develop a false sense of safety upon easily completing the capsulorhexis and may then be unprepared for the iris prolapse and unexpected pupillary constriction that occurs during phacoemulsification. By this point, inserting iris hooks or a pupil expansion ring is more difficult and can tear the capsulorhexis' edge.

THE IFIS IS SEMIPERMANENT

Also surprising is the occurrence of IFIS even after a patient ceases taking Flomax for 1 to 2 weeks. Although discontinuation seemed to improve the preoperative dilation and iris floppiness in several patients, full-blown IFIS still occurred in others. Even more interesting has been our observation of IFIS in several patients who stopped taking Flomax more than 1 year prior to surgery. I have observed iris billowing without prolapse and constriction in both eyes of a patient who had discontinued Flomax 3 years prior to his surgery.

We postulate that the iris' billowing and propensity to prolapse result from a lack of tone in the dilator smooth muscle. Although the dilator muscle accounts for only a small fraction of the iris' overall stromal thickness, the usual intraoperative rigidity of this tissue must be the result of normal muscle tone. The persistence of IFIS long after the discontinuation of Flomax suggests a semipermanent muscular atrophy and loss of tone. We do not know how long one must take Flomax before experiencing these chronic muscular changes. From anecdotal reports, however, it seems that IFIS does not occur until patients have been on Flomax therapy for approximately 4 to 6 months.

SURGICAL RECOMMENDATIONS

Cataract surgeons should inquire specifically about the use of Flomax during the patient history in order to plan appropriately. The IFIS is best managed with devices or viscoelastic agents that mechanically hold the pupil open and restrain the iris from prolapsing. Of

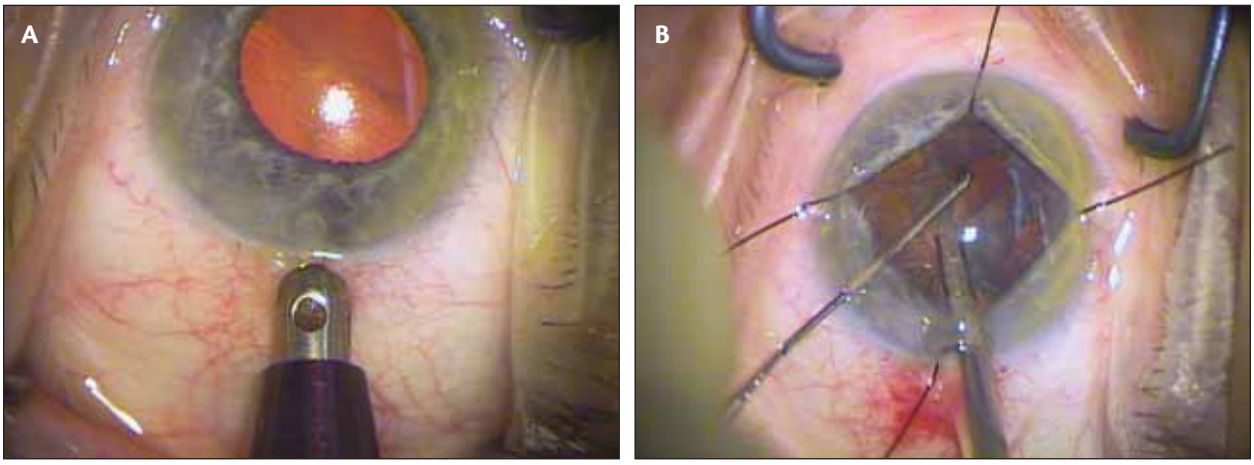

Figure 4. For the proximal iris hook, the surgeon makes a separate stab incision parallel to the iris and just behind the clear corneal phaco incision (A). Before performing phacoemulsification, the surgeon inserts self-retaining iris retractors in a diamond configuration. The proximal retractor and the phaco tip do not share the same incision (B).

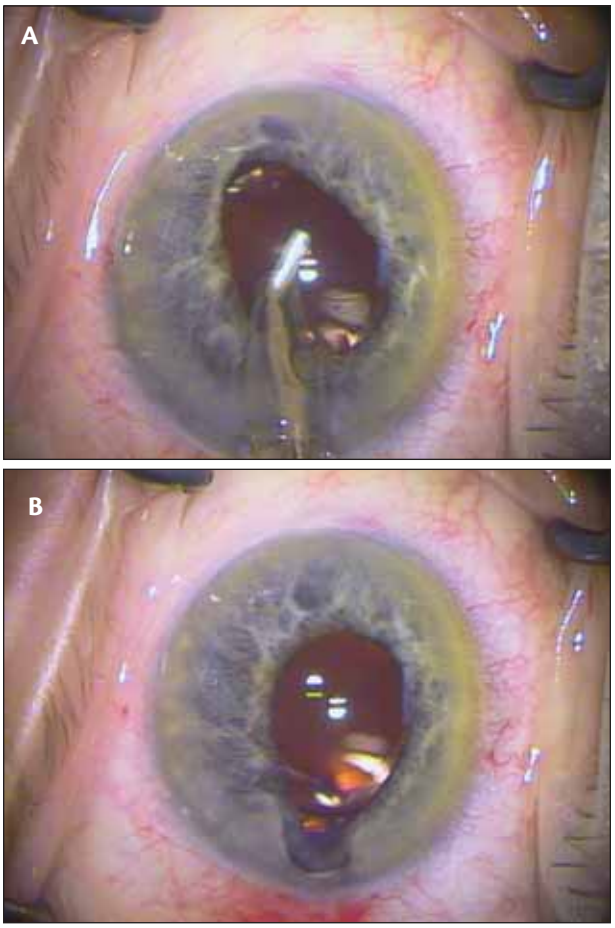

Figure 5. Characteristic billowing and prolapse of the iris are evident after IOL insertion and removal of iris retractors (A and B).

all the different viscoelastics, Healon5 (which is extremely viscous and highly retentive) is best able to viscodilate the pupil and is uniquely capable of blocking the iris from prolapsing to the incisions. Surgeons, however, must use low aspiration flow and vacuum settings (eg, < 22 mL/min and < 200 mm Hg) to delay the viscoelastic's evacuation from the anterior chamber. As the pupil constricts during phacoemulsification, one can repeatedly inject Healon5. Robert Osher, MD; Douglas Koch, MD; and others have described this strategy for IFIS. Compared with using expansion devices, operating with Healon5 in this manner is more dependent upon surgical technique and fluidic parameters, and it is most effective when the preoperative pupillary diameter is reasonably large. When intending to use this technique, one should consider temporarily stopping Flomax for 1 to 2 weeks prior to surgery.

In my experience, iris retractors or a pupil expansion ring are the most reliable means of maintaining a safe pupillary diameter during surgery (Figures 4 to 6). These

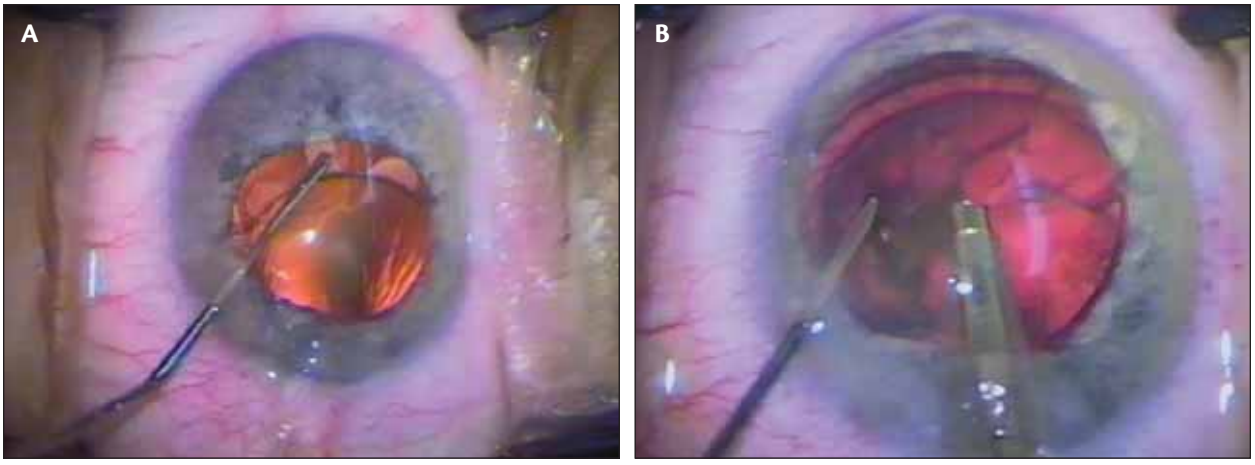

Figure 6. The Perfect Pupil pupil expansion ring (Milvella Pty. Ltd., Epping, Australia) creates a 7-mm pupil. Note how the floppy iris prolapses to the phaco and sideport incisions through the gap in the ring during phacoemulsification (A and B).

devices are costly and time-consuming to insert, and the placement of expansion rings is difficult if the pupil is small or the anterior chamber is shallow. It is safer to insert these devices before, rather than after, initiating the capsulorhexis. As suggested by Thomas Oetting, MD, one should place iris retractors in a diamond configuration (Figure 4).[7] Doing so requires a separate stab incision just posterior to the clear corneal incision, but it maximizes surgical exposure immediately in front of the incision. This subincisional retractor also draws the iris posteriorly, unlike laterally situated iris hooks (square configuration), which tent the iris up anteriorly in front of the phaco incision. I recommend using iris retractors in Flomax patients if the pupil is small, if the nucleus is dense (requiring high vacuum), if the anterior chamber is shallow, or if the surgeon is inexperienced with Healon5. Stopping Flomax preoperatively should not be necessary if one plans to use iris hooks.

IS FLOMAX SAFE?

As urologists and patients learn that Flomax causes IFIS, the question of whether this drug is safe to use in the cataract population will arise. In our two companion studies, the ophthalmologists had no way to foresee the occurrence of IFIS. Being able to elicit a prior history of Flomax use now enables cataract surgeons to anticipate IFIS and to employ alternative methods of managing small pupils prior to starting the capsulorhexis. Educating ophthalmologists about IFIS is paramount for this reason, and the ASCRS issued a member advisory alert regarding Flomax in January 2005. I believe that using iris retractors, a pupil expansion ring, or the Healon5 technique should result in cataract surgical outcomes comparable to those normally attained in non-IFIS eyes. I have initiated a multicenter trial to determine prospectively the complication rate and surgical outcomes in patients taking Flomax when one of these three strategies for expanding the pupil is used. ❑

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