

Surgical Strategies for the Intraoperative Floppy Iris Syndrome

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Background

John R. Campbell MD and I recently reported on two companion studies that we undertook to study the incidence, characteristics, surgical outcomes, and etiology of floppy irides during cataract surgery¹. We named this condition the intraoperative floppy iris syndrome (IFIS). 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 this syndrome at first.

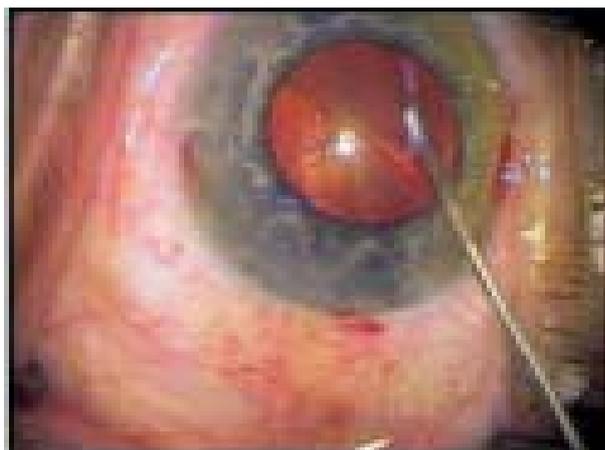


Figure 1. The surgeon easily performs the capsulorhexis despite suboptimal pupillary dilation in a patient taking Flomax.

From a prospective study of 900 consecutive cases in which the surgeon (DFC) 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. 15/16 of these patients were either on Flomax, or had taken Flomax 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 were taking Flomax.

The retrospective study evaluated every cataract surgery performed in a two-surgeon (JRC) practice during the prior calendar year (2003). A "floppy iris" was noted in the operative report in approximately

2% of the total cases (16/706) and patients (10/511). Every one of the IFIS patients was on Flomax. Six patients taking Flomax 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, Cardura, or Minipres). None of these patients demonstrated a floppy iris. The rate of IFIS in the two combined studies, totaling more than 1600 eyes and 1250 patients, was 2%.

Pharmacology of systemic alpha-1 blockers.

Tamsulosin (Flomax®) is one of several systemic alpha-1 blockers used to treat the urinary symptoms of benign prostatic hypertrophy. Other drugs in this group include terazosin (Hytrin®) and doxazosin (Cardura®). These drugs improve urinary outflow by relaxing the smooth muscle in the prostate and bladder neck. However, side effects can include postural hypotension due to alpha-1 blockade of the vascular wall smooth muscle.

Molecular studies have demonstrated the presence of three different alpha-1 receptor subtypes – A, B, and D. Flomax exhibits extremely high affinity and specificity for the alpha-1A receptor subtype, which is the predominant receptor found in the prostatic and bladder smooth muscle. Being the only drug in this class that is specific to one receptor subtype, Flomax is much more uroselective than Hytrin and Cardura, and is preferred because of a much lower incidence of postural hypotension. Alfuzosin (Uroxatral®) 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 smooth muscle. Indeed, based upon a number of animal studies, it appears that alpha-1A is the predominant receptor subtype in the iris dilator muscle as well². While these drugs differ in their receptor sub-type 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 with Flomax³. 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 intraoperative floppy iris syndrome (IFIS) according to a triad of signs:

- A floppy iris that billows in response to normal irrigation currents in the anterior chamber
- A marked propensity for the iris to prolapse to the phaco and side port incisions
- Progressive pupil constriction during surgery



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

While there are other possible causes of either iris prolapse or intraoperative miosis, it is the combined presence of all three features that defines and characterizes IFIS. The pupil frequently dilates poorly or sub optimally, but this variable feature was not uniform to all cases in our study. Mechanical pupil stretching or partial thickness sphincterotomies are among the most commonly used techniques for small pupils⁴. A surprising and disappointing feature of IFIS was the ineffectiveness of these techniques for achieving or maintaining adequate pupil expansion during surgery.

In the retrospective series, 2/16 (12.5%) IFIS cases incurred posterior capsule rupture with vitreous loss. We also encountered several IFIS fellow eyes that had 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 IFIS, in particular, increase the risk of posterior capsular rupture. The first is the relative ineffectiveness of mechanical pupil stretching, with or without partial thickness sphincterotomies, for expanding the IFIS pupil. Mechanical stretching in patients with posterior synechiae or taking chronic miotics creates microscopic tears in the fibrotic edge of the inelastic pupil. This is not the case in IFIS where, like an elastic waistband, the pupil simply snaps back to its original size. The IFIS pupil does expand following viscoelastic injection, particularly with Healon 5 (Advanced Medical Optics). The surgeon may develop a false sense of safety as the capsulorhexis is easily completed, and is unprepared for the iris prolapse and unexpected pupil constriction that occurs during phaco. By this point, inserting iris hooks or a pupil expansion ring is more difficult, and can tear the capsulorhexis edge.

IFIS is semi-permanent

Another surprising feature is the occurrence of IFIS even after stopping the drug for 1-2 weeks. While this seemed to improve the preoperative dilation and iris floppiness in several patients, there were others in whom full-blown IFIS still occurred. Even more interesting has been the observation of IFIS in several patients who had stopped Flomax for more than one year prior to surgery. I have observed iris billowing without prolapse and constriction in both eyes of a patient who had discontinued Flomax three years prior to his surgery.



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

We postulate that the iris billowing and propensity to prolapse result from a lack of dilator smooth muscle tone. While the dilator muscle accounts for only a small

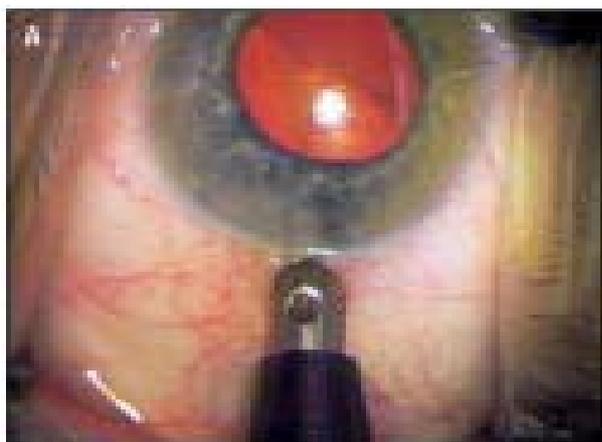


Figure 4. For the proximal iris hook, the surgeon makes a separate stab incision parallel to the iris and just behind the clear corneal phaco incision (A). Before performing phacoemulsification, the surgeon inserts self-retaining iris retractors in a diamond configuration. The proximal retractor and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

fraction of the overall iris stromal thickness, the usual intraoperative rigidity of the iris must be the result of normal muscle tone. The persistence of IFIS long after discontinuing Flomax suggests a semi-permanent muscle atrophy and loss of tone. We do not know how long one must be on Flomax before these chronic muscle changes occur. From anecdotal reports however, it seems that IFIS does not occur until patients have been on Flomax for approximately 4-6 months.

Surgical recommendations

IFIS is best managed by using devices or viscoelastic agents that mechanically hold the pupil open and restrain the iris from prolapsing. Of all the different viscoelastics, Healon 5 is best able to visco-dilate the pupil, and it is uniquely able to block the iris from prolapsing to the incisions. However, low aspiration flow and vacuum settings (e.g., <22 cc/min; < 200

mmHg) must be used to delay its evacuation from the anterior chamber. As the pupil constricts during phaco, Healon 5 can be repeatedly re-injected. Robert Osher MD, Douglas Koch MD, and others have described this IFIS strategy. Compared to expansion devices, this Healon 5 method is more dependent upon surgical technique and fluidic parameters, and is most effective when the preoperative pupil diameter is reasonably large. Temporarily stopping Flomax for 1-2 weeks prior to surgery should be considered if one intends to use this technique.

In my experience, iris retractors or a pupil expansion ring are the most reliable means of maintaining a safe pupil diameter during surgery. These devices are more costly and time-consuming to insert, and 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 capsulorhexis initiation. As suggested by Thomas Oetting MD, one



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

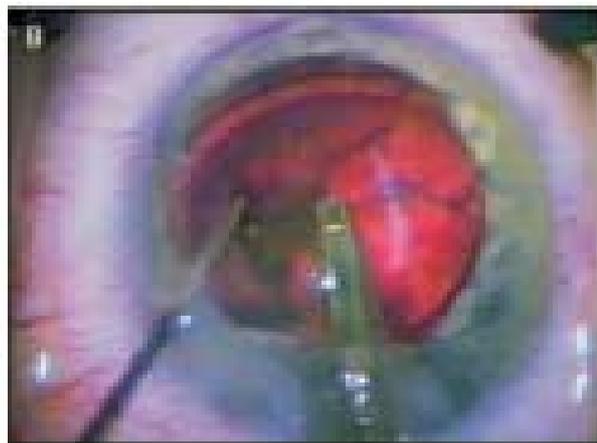
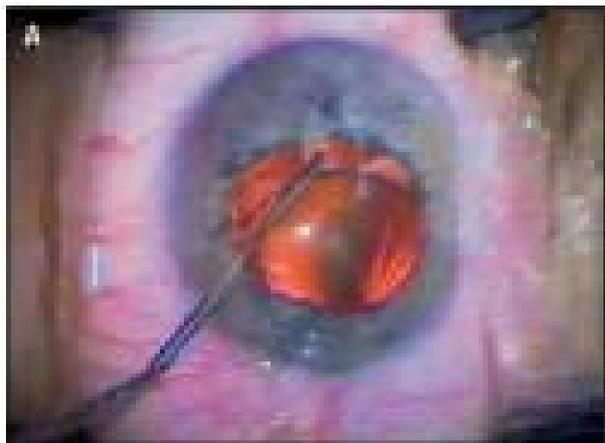


Figure 6. The Perfect Pupil pupil expansion ring (Milvella Pty. Ltd., Epping,Australia) creates a 7-mm pupil. Note how the floppy iris prolapses to the phaco and sideport incisions through the gap in the ring during phacoemulsification (A and B).

should place iris retractors in a diamond configuration⁵. This requires a separate stab incision just posterior to the clear corneal incision, but maximizes surgical exposure immediately in front of the incision. This also retracts the iris posteriorly, as compared to 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 not experienced with using Healon 5. 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 surgeons 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 small pupil management prior to starting the capsulorhexis. Educating ophthalmologists about IFIS is paramount for this reason, and led ASCRS to issue a member advisory alert regarding Flomax in January 2005. I believe that using iris retractors, a pupil expansion ring, or the Healon 5 technique should result in cataract surgical outcomes comparable to non-IFIS eyes. We have initiated a multi-center trial to prospectively determine the complication rate and surgical outcomes in Flomax patients when one of these three pupil-expanding strategies is used.

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