

# Bilateral Intraoperative Floppy Iris Syndrome Associated with Silodosin Intake

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## ABSTRACT

Intraoperative floppy iris syndrome (IFIS) is described by three characteristics: floppy iris that billows in reaction to intraocular fluid currents during phacoemulsification surgery, flaccid iris stroma that tends to prolapse through well-constructed surgical incisions, and progressive pupillary miosis despite preoperative pharmacologic dilatation. A 63-year-old man presented with decreased vision in both his eyes. Ophthalmic examination revealed bilateral nuclear cataract. He was prescribed silodosin for the management of benign prostatic hyperplasia a month ago. Consecutive cataract surgery was planned at a 2-week time interval. All features of IFIS were encountered in both eyes of the patient during phacoemulsification surgery. IFIS was successfully managed by the aid of an iris retractor, and a 20/20 final visual acuity was achieved postoperatively in both eyes of the patient. To the best of our knowledge, this is the first study about bilateral IFIS associated with silodosin intake. Ophthalmologists and urologists prescribing silodosin should be aware of this possible association.

**Keywords:** Benign prostatic hyperplasia, cataract, intraoperative floppy iris syndrome, phacoemulsification, silodosin

## Introduction

Intraoperative floppy iris syndrome (IFIS) was first described by Chang and Campbell in 2005. The classic triads of IFIS are floppy iris that billows in reaction to intraocular fluid currents during phacoemulsification surgery, flaccid iris stroma that tends to prolapse through well-constructed surgical incisions, and progressive pupillary miosis despite preoperative pharmacologic dilatation [1]. Alpha 1a antagonists, especially tamsulosin, have the strongest association with IFIS, although a number of cases are associated with other classes of drugs [2-4]. Silodosin is a novel, more selective alpha 1 adrenoceptor blocker, which is specific to the lower urinary tract and may have fewer side effects than other alpha-blockers [5]. Silodosin-associated IFIS is very rare, and only two cases were reported previously [6, 7]. To the best of our knowledge, this is the first study regarding bilateral IFIS associated with silodosin intake in the literature.

## Case Presentation

A 63-year-old man presented with decreased vision in both his eyes. He had been taking silodosin 8 mg daily for the management of benign prostatic hyperplasia for a month. His best corrected visual acuity was 0.3 (-5.0-0.75×70) in the right eye and 0.4 (-2.00-1.00×90) in the left eye. Intraocular pressure was 17 mm Hg with air-puff tonometry in both eyes. On slit-lamp biomicroscopic examination, bilateral nuclear cataracts, which were more severe in the right eye, were seen. Other structures of the anterior segment were found to be normal. Fundoscopic examination was found to be normal.

Cataract surgery was planned for both eyes of the patient with priority on the right eye. Mydriasis of the pupil was achieved preoperatively by the topical instillation of cyclopentolate 1% (Sikloplejin, Abdi İbrahim), tropicamide 0.5% (Tropamid, Bilim ilaç), and phenylephrine 2.5% (Mydrin, Alcon). The pupil remained small (approximately 5 mm) during surgery despite the instillation of preoperative eye drops to dilate the pupil pharmacologically. After anesthesia with topical proparacaine solution 0.5% (Alcaine, Novartis), a 2.2 mm clear corneal incision was

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made on the temporal quadrant of the cornea. Intracameral epinephrine 1:4000 diluted with BSS was injected into the anterior chamber for more pupillary dilatation and prophylaxis of IFIS. Sodium hyaluronate 3.0% was filled into the anterior chamber, and then continuous curvilinear capsulorhexis was performed. There was undulated and billowing of the iris, which also prolapsed through the main corneal incision during hydrodissection (Figure 1a). The nucleus was emulsified using a peristaltic phacoemulsification machine (Centurion Vision System; Alcon Laboratories Inc., Fort Worth, TX, USA) after five iris retractors were placed (Figure 1b). The cortex was removed using irrigation and aspiration (Figure 1c). A single piece hydrophobic acrylic intraocular lens was implanted, and surgery was completed uneventfully (Figure 1d). His best corrected visual acuity was achieved 20/20 in the postoperative period.

After 2 weeks, left eye cataract surgery was performed. There was no adequate dilatation of the pupil although preoperative eye drops were applied to dilate the pupil. In addition, floppy iris that billows in reaction to intraocular fluid currents and progressive pupillary miosis were encountered, but they did not prolapse. Surgery was completed uneventfully after the application of iris retractors. Furthermore, there were

no complications observed in the postoperative period.

### Discussion

Benign prostatic hyperplasia is one of the most common conditions of lower urinary tract disease in elderly men. It is characterized by an unregulated proliferative process of connective tissue, smooth muscle, and glandular epithelium within the prostate. Alpha 1a antagonists are widely used to treat benign prostatic hyperplasia and act by relaxing the smooth muscle in the bladder neck, urethra, and prostate [5]. However, alpha 1a adrenoceptor is the dominant adrenergic receptor in the iris; it is important for pupillary dilation. Cataract is another common disease in the elderly population. Inadequate pupil dilatation led to increased risk for complications of cataract surgery. Therefore, ophthalmologists should be aware of situations that cause poor pupil dilatation before cataract surgery, such as alpha 1a adrenoceptor blockers [2-4].

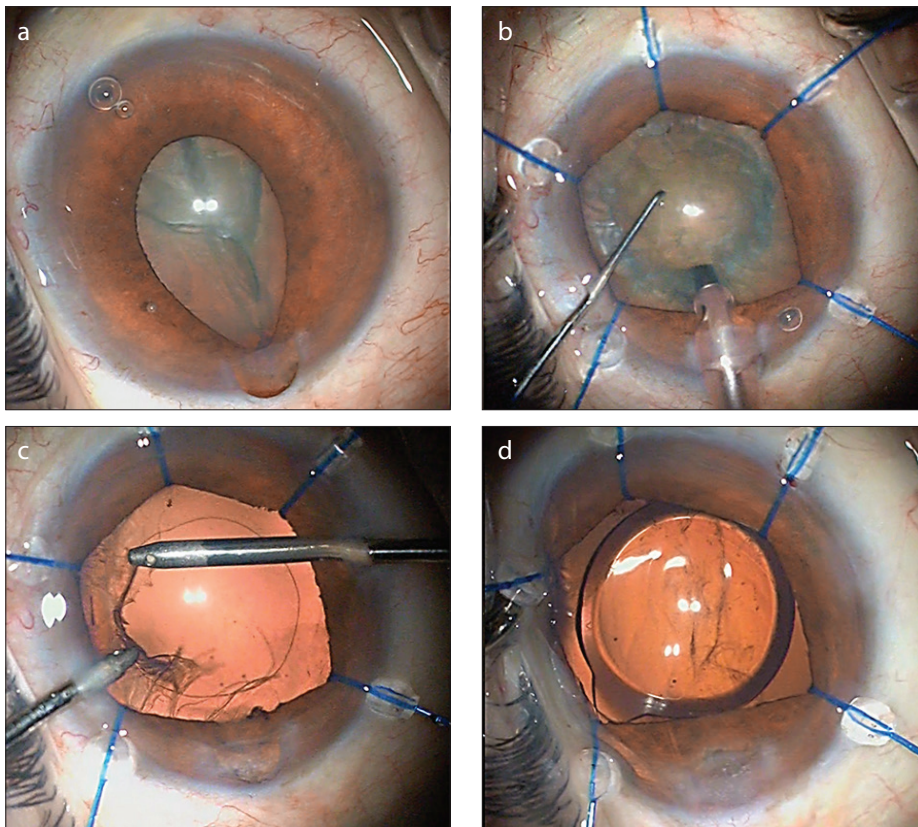
The alpha 1 adrenoceptors contribute to various physiological actions in and around the eye and are, for example, involved in the regulation of protein secretion in the lacrimal gland, tone of ocular blood vessels, and pupil diameter. The alpha 1 adrenoceptor family is composed of three

subtypes. These three subtypes are alpha 1a, 1b, and 1d. All three receptor subtypes are activated by catecholamines and can mediate constriction of smooth muscle cells. Pharmacological studies in various species that used selective antagonists for individual alpha 1 adrenoceptor subtypes suggested that the alpha 1a adrenoceptor plays a major role in adrenergic pupil size regulation [3, 8].

Tamsulosin is associated with the greatest risk for IFIS, presumably because of its high affinity and selectivity for the alpha 1a adrenoceptor. Chang and Campbell [1-3] reported that IFIS occurs in approximately 2% of the cataract surgery population and appears to be due to tamsulosin. There are many reports considering tamsulosin-associated IFIS after Chang and Campbell's study. Recent studies comparing tamsulosin and alfuzosin (a nonselective alpha 1 antagonist) indicated that IFIS was 30 times more frequent, and was more severe, in patients taking tamsulosin. Nonselective alpha 1 antagonists are associated with a lower, but not negligible, risk of IFIS. Alfuzosin, terazosin, and doxazosin are all independent risk factors for IFIS [2-4].

In addition to alpha antagonist drugs, IFIS was also reported with other drugs and substances, such as the 5-alpha-reductase inhibitor finasteride, the herbal supplement for benign prostatic hypertrophy saw palmetto (*Serenoa repens*), several neuromodulators, and antipsychotic medications, such as benzodiazepines, duloxetine, mianserin, and donepezil, and some beta-blockers, such as labetalol with alpha-blocking properties [2-4, 9]. In their meta-analysis study, Chatziralli and Sergentanis [4] revealed that hypertension, but not diabetes mellitus, emerges as a risk factor for IFIS. Chatziralli et al. [10] in their prospective study comprising 1274 consecutive patients also reported that short axial length and rivastigmine are significantly associated with IFIS [10].

Silodosin, a new selective alpha 1 antagonist, has similar kinetics to tamsulosin in rabbit iris and was associated with IFIS in two recent case reports [6, 7, 11]. Ipekci et al. [6] first reported silodosin-associated IFIS in a 60-year-old man. They reported the patient taking silodosin 8 mg daily for the management of benign prostatic hyperplasia for 2 months and stopped 45 days before cataract surgery. Nevertheless, triad of IFIS occurred during surgery [6]. In addition, Chatterjee and Agrawal [7] reported silodosin-associated IFIS in a 75-year-old man taking silodosin for the management of benign prostatic hyperplasia for 4 years.



**Figure 1. a-d.** (a) Intraoperative floppy iris syndrome and iris prolapse during hydrodissection. (b) Placement of iris retractors before phacoemulsification. (c) Irrigation/aspiration of the cortex. (d) After intraocular lens implantation.

Goseki et al. [11] investigated IFIS by examining the binding affinity of tamsulosin and silodosin to alpha adrenoreceptors and melanin pigment using control and alpha 2 blocker chronically administered in isolated albino and pigmented rabbit iris dilators. In the isolated albino rabbit and pigmented rabbit iris dilator, tamsulosin and silodosin inhibited the contraction of phenylephrine in a dose-dependent manner. Compared with other nonselective alpha-blockers, the inhibitory effects of tamsulosin and silodosin were  $pK_b$  (constant of the antagonist-receptor complex)  $\geq 8.0$ , indicating the high affinity for alpha 1 receptor of the rabbit iris dilator. They also reported that IFIS should not be attributed to long-term binding with receptors alone; the drug-melanin interaction causing dilator muscle atrophy is probably another important factor in the mechanism of IFIS [11].

Another important subject about IFIS is that discontinuing the alpha 1a adrenoreceptor blockers does not reduce the risk of IFIS; thus, ophthalmologists should be asked about the current or prior use of alpha 1a adrenoreceptor blockers. This is often attributed to disuse atrophy of the dilator iris muscle. Intraoperative management of IFIS included intracameral  $\alpha$ -adrenergic agonists (epinephrine with and without lidocaine and phenylephrine), higher retentive or visco-adaptive ophthalmic viscosurgical devices, iris retractors, and pupil expanders. Mechanical pupil stretching and partial sphincterotomy were not recommended in IFIS due to the elastic nature of the iris. Certain generally accepted surgical principles should be followed in IFIS cases as well. Well-constructed clear corneal incisions should be penetrated away from the iris root.

Hydrodissection should be performed very gently to minimize iris movement or prolapse using low-flow phacoemulsification settings if possible and to direct irrigation currents away from the pupillary margin [1-3, 12].

All features of IFIS in both eyes of the patient were encountered during phacoemulsification surgery. IFIS was successfully managed by the aid of an iris retractor and reached 20/20 final visual acuity postoperatively in both eyes of the patient. The prevalence of cataract and benign prostatic hyperplasia is increasing in the aging world. Ophthalmologists and urologists prescribing silodosin should be aware of this possible association.

**Informed Consent:** Written informed consent was obtained from the patient who participated in this study.

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