

MANAGING INTRAOPERATIVE FLOPPY IRIS SYNDROME WITH I-RING PUPIL DILATOR

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ABSTRACT

Background: Intraoperative floppy iris syndrome (IFIS) is characterized by iris prolapse through the intraoperative section, as well as by progressive intraoperative miosis during cataract surgery.

Purpose: To estimate the effectiveness of I-Ring pupil dilator in patients that were treated with tamsulosin and having IFIS during cataract surgery.

Method: Eighty patients were included in the study; 40 patients were without (control group) and 40 patients were treated with application of I-Ring mechanic pupil dilator intraoperatively. Pre- and postoperative best corrected visual acuity (BCVA), intraoperative and postoperative pupil diameter and complications were evaluated in each patient.

Results: Intraoperative complications occurred in 40% and postoperative complications in 30% of patients in the control group. In the treated group there were no intra or postoperative complications. BCVA and pupil diameters were not significantly different among the two groups.

Conclusion: I-Ring pupil dilators are highly effective for prevention of complications in patients with IFIS.

Key words: *Intraoperative floppy iris syndrome, I-Ring, Cataract, Tamsulosin.*

INTRODUCTION

Intraoperative floppy iris syndrome (IFIS) represents a spectrum of iris changes during phacoemulsification. IFIS signs include - puckering of the iris, up to the tendency of the iris tissue to get caught into or prolapse towards the main and the lateral incisions, as well as a progressive intraoperative pupil constriction (miosis) that occurs despite standard procedures of prevention.^{1,2} IFIS certainly makes the cataract surgery more complicated in all of its phases.

First of all, it makes the capsule's coloring phase partial, however this step should not be avoided because it increases the visibility of the capsule during the entire operation. IFIS limits the size of the capsulorhexis, aggravates separation and phacoemulsification of the nucleus, but it also makes the aspiration of the epinucleus and the cortex of the lens difficult. However, the IOL implantation and the viscoelastic aspiration of the capsule bag also become problematic, especially the removal of the viscoelastic from behind the implanted IOL.^{3,4}

IFIS occurs in about 2% of the overall number of patients with cataract and leads towards a more complex surgery and a higher rate of complications.⁵ This syndrome was described for the first time in the medical literature in April 2005 by Chang and Kamble.⁵ Later IFIS was found to coincide with intake of all α 1-adrenergic blockers, but most often with tamsulosin, which is highly selective for α 1A receptor, and the most prescribed blocker of α -1 adrenergic receptors for the treatment of benign prostatic hyperplasia.^{6,7}

MATERIAL AND METHODS

We included one eye of 80 patients that was scheduled for cataract surgery in this study. All of the 80 patients were men, all of them were under tamsulosin therapy and without a medical history of another eye disease. We divided the patients into 2 groups:

Group 1: 40 patients under tamsulosin therapy, in whom a mechanical pupillary dilator was not used, i.e. they represent a control group;

Group 2: 40 patients under tamsulosin therapy, in whom an I-ring pupillary dilator was used.

The age of the patients ranged from 60 to 85 years.

Before performing the intervention, all of the patients have undertaken a complete ophthalmological examination; they were informed about the steps of the intervention and the possibilities and complications of the intervention. In all patients regular ophthalmologic preoperative examinations were performed: best corrected visual acuity (BCVA) with SCHIN-NIPONN phoropter, the intraocular pressure (measured by non-contact tonometer Huvitz), slit lamp biomicroscopy of the anterior and posterior segment (if detectable), A scan and B scan ultrasonography (Piropr ophthalmic scanner 2in1- A+B+CCT) and OCT (Cirrus HD OCT 5000 Zeiss) of the posterior segment (if detectable). Laboratory analysis of blood count, sedimentation rate, as well as an examination from internal medicine physician was also performed in all patients.

In order to obtain mydriasis preoperatively we used tropicamide (0,5%). Intraoperatively we used lidokaine as well as adrenaline when the action of

tropicamide (0,5%) was insufficient, and most often healon 5 or some other viscoelastic in order to achieve the wanted mydriasis of 6 mm or more. But, in patients with IFIS these measures are insufficient, as in these cases intraoperative mydriasis of about 2 to 3 mm occurs, even if mydriasis of 5 to 6 mm may have previously been achieved using eye drops. In these cases, it is inevitable to use a pupil dilator in order to accomplish a successful phaco surgery.

Preoperatively the diameter of the iris was measured with Atlas 900 Zeiss. During the surgery the diameter of the iris was measured with Rosenbaum cards and Colvard pupillometer.

Preoperative BCVA in all operated patients was ranged according to Snellen Eye Chart.

The phacoemulsification cataract surgery was performed with Zeiss OPMI Lumera operating microscope and Bausch Lomb Stellaris cataract surgery apparatus. One experienced surgeon (N.T.) performed each phaco surgery in both patient groups.

Intra and postoperative complications were noted for each patient as they represent a measure of the success of the phacoemulsification cataract surgery.

The first follow-up was performed 24 hours after the intervention, and the second follow-up was performed 30 days after the intervention to assess the subjective and objective findings in patients.

We used unpaired Student t-test for evaluation of significance of difference between the patient groups.

RESULTS

Preoperatively the diameter of the iris was measured with Atlas 900 Zeiss, which was in between of 4mm up to 6mm, in average 5mm (Table 1).

Patients	Preoperative dimensions of the iris diameter								Total
	2,5 mm	3.5 mm	4.0 mm	4.5 mm	5.0 mm	5.5 mm	6.0 mm	6.5 mm	
Group 1	2	2	4	7	15	6	3	1	40
Group 2	2	3	6	11	11	5	2	0	40
Total	4	5	10	18	26	11	5	1	80

Table 1. Preoperative iris dimensions in all patients included in the study

During the surgery the diameter of the iris was measured with Rosenbaum cards and Colvard pupillometer, where the pupil diameter was in between from 2mm up to 4mm, in average 3mm (Table 2).

Patients	Final intraoperative dimensions of the iris diameter				Total
	2,5	3.0	3.5	4.0	
	mm	mm	mm	mm	
Group 1	9	22	5	4	40
Group 2	14	15	6	5	40
Total	23	37	11	9	80

Table 2. Final intraoperative iris dimensions in all patients included in the study

Preoperative visual acuity in all operated patients ranged from 0.2 to 0.4, on average 0.3 according to Snellen Eye Chart.

Intraoperatively, in the control group there were 16 patients with mild complications such as an iris prolapse or microbleeding (Figure 1).

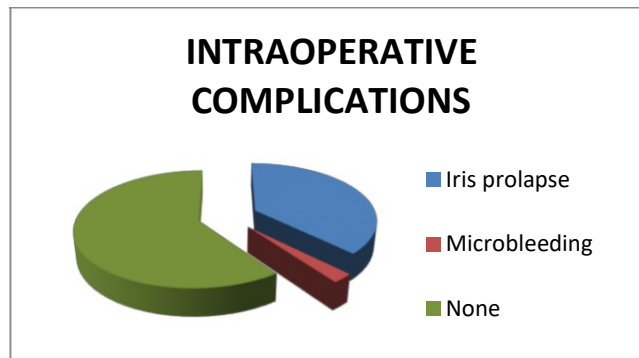


Figure 1. Intraoperative complications in patients who were under tamsulosin therapy and mechanical dilators were not used while operating

Postoperatively in 7 patients from the control group there was a rupture of the iris sphincter, in 4 patients there was a transillumination defect and in 1 patient both complications occurred in combination (Figure 2).

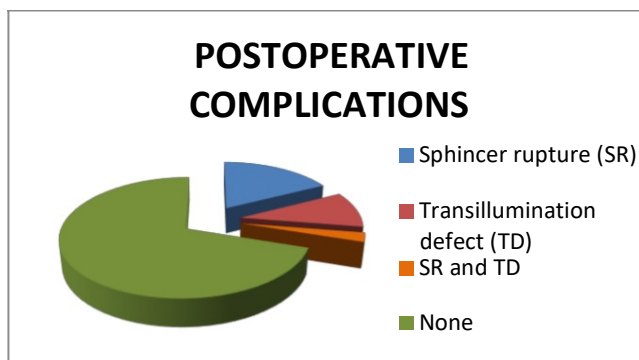


Figure 2. Postoperative complications in patients who were under tamsulosin therapy and mechanical dilators were not used while operating

On the other hand, there were no intraoperative and postoperative complications in patients that were treated with phacoemulsification facilitated with the mechanic pupil dilator I-Ring.

The operative mydriasis in all cases, when the pupil dilator has been applied was 6 to 6.5mm. In all patients, the BCVA of the operated eye was at least 0.8 according to Snellen Eye Chart.

In 67 of the 80 patients, on the first postoperative follow-up, an increase in IOP was observed, appropriate therapy was given, and until the second control, when IOP normalized in all patients, the therapy was discontinued.

Of associated systemic diseases, all patients had a positive history of hypertension (under control with therapy, on average 120/80mmHg).

		Age	BCVA (preop.)	BCVA (postop.)	IOP (first patient control)	Preop. mydriasis	Intraop. mydriasis	Intraop. complications	Postop. complications
Group I	Mean	74,4	0,3	19.75	0.9	4,8	3,05	8	6
	Standard	5,6	0,062	1.51	0.051	0,846	0,436	11,3	8,49
Group II	Mean	74,6	0,29	20.05	0.9	4,6	3,025	0	0

	Standard deviation	5,4	0,069	1.48	0.051	0,792	0,506	0	0
	Student t-test (p value)	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	<0.05	<0.05

BCVA (preoperative) - Preoperative best corrected visual acuity; **BCVA (postoperative)** - Postoperative best corrected visual acuity; **Preoperative mydriasis**- preoperative dimensions of the iris; **Postoperative mydriasis** - postoperative dimensions of the iris; **IOP** - intraocular pressure on the first postoperative day.

Table 3. Statistical analysis, calculated standard deviation and Student t-test for patients from both groups

According to the statistical data processing (Table 3), we can conclude that the difference between the incidence of intra and postoperative complications is significant, i.e. significantly prevails in patients in whom we did not use any mechanical pupillary dilator during the cataract surgery with phacoemulsification.

DISCUSSION

Intraoperative floppy iris syndrome was described for the first time in the medical literature in April 2005 by Chang and Kamble and they have published it in the magazine for cataract and refractive surgery, defining it as a triad of intraoperative findings: a) flaccid stomata of the iris that leads to iris pulsating and iris puckering; b) iris prolapse through the surgical sections, and c) progressive constriction of the pupil.⁵ IFIS has variable manifestations between patients, but also between eyes of the same patient. The clinical signs can be classified as follows:⁸

- Mild form, with good dilated pupil intraoperatively and some intraoperative movements (pulsation) of the iris;
- Moderate form, with moderately dilated pupil intraoperatively and moderate tendency of iris prolapse through the intraoperative sections;
- Severe form, where patients have dilation-resistant pupils and the iris prolapses through intraoperative sections, and as a consequence, a rupture of the posterior capsule occurs and the vitreous body prolapses into the anterior chamber.

Tamsulosin is the most prescribed blocker of α -1 adrenergic receptors for treatment of benign prostatic hyperplasia. These receptors are present especially in the smooth muscles of the urinary bladder and in the iris dilator muscle. It relaxes the iris muscle by binding its postsynaptic nerve

endings. This allows uncontrolled action of the parasympathetic innervated iris muscle and loss of its tonus, resulting in this clinical syndrome. The abnormal iris behavior, during the cataract surgery, occurs most probably as a result of the turbulences of the irrigation fluid in the anterior eye chamber, and in addition, the contractions of the pupillary sphincter, during the incontinous contractions of the pupillary dilator.⁹

Even though tamsulosin does not cause permanent anatomic changes in the iris dilator muscle, its effect could stay even several years after the termination of the use of the medicine. There was a moderate success in patients who have terminated the use of tamsulosin up to 8 weeks before the surgery.¹⁰

Many authors have described the connection of IFIS with the usage of tamsulosin, like Pärssinen O., who describes it in 2005¹¹, Chadha V., Borooh S. and Tey A. in 2007¹², then Chan D.G. and Francis's studies¹³, Gurbaxani A. and Packard R.'s studies¹⁴, as well as the studies of Masket S. and Belani S.¹⁵, suggesting different ways to solve it. Unfortunately, none of these procedures are fully efficient. When pupil stretching is done with spatulas or Kuglen hook, iris bleeding can occur, as well as postoperative pupil atony. Also there was a technique presented which used iris hooks that were applied in a diamond configuration, but with this method a sphincter rupture may occur with a risk of bleeding. Recently, Asia Pupil Expander introduced a square pupil hook, in a scissor-like form, but to apply it four intraoperative incisions need to be performed.¹⁶ In the present study we show that there were no intra and postoperative complications using the pupil I-Ring dilator in patients with IFIS taking tamsulosin. Figure 3 presents an installed I-Ring mechanic pupil dilator.

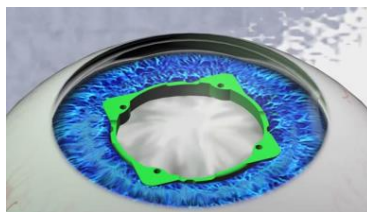


Figure 3. I-Ring Pupil Expander

Advantages of the I-Ring pupil dilator:¹⁷

1. It is disposable and very effective device because it does not have any sharp or pointed ends that could damage the ocular structures in the anterior chamber;
2. Additional incisions are not necessary. This device could be inserted through a section of 2.2 mm. The device is inserted through the

main section, which reduces the surgical trauma and minimizes the risk of postoperative inflammatory reactions, and there is no risk of iris aspiration during the phacoemulsification;

3. There is sufficient space for the phacoemulsification of the nucleus and removal of the cortex;

4. The dilator is inserted and removed from the eye by an additional instrument in order to reduce the risk of contamination and disruption of the architecture of the incision. The time for the insertion and the removal is relatively short;

5. I-Ring pupil dilator is very efficient and reaches an aperture of 360 degrees enabling excellent visualization.

CONCLUSION

The I-Ring pupil expander is highly effective for management of the eyes with IFIS preventing iris prolapse and other complications while performing phaco surgery. This study suggests that I-Ring pupil dilator provides safe and successful phaco cataract surgery for men with IFIS, as a result of taking tamsulosin therapy, due to benign prostatic hyperplasia.

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