

EXTENDED REPORT

Pupillary block following posterior chamber intraocular lens implantation in adults

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Background: Pupillary block rarely occurs after cataract extraction with posterior chamber intraocular lens implantation.

Methods: A series of six patients (seven eyes) treated for pupillary block after posterior chamber intraocular lens implantation between 1990 and 2001 is described; in one eye, the attack occurred after phacoemulsification.

Results: The interval between pupillary block development and the cataract surgery ranged from 1 day to 5 years. In all eyes, treatment consisted of neodymium-YAG laser peripheral iridotomy. In four eyes, the laser peripheral iridotomy relieved the block (one procedure in two; two to three procedures in two). One patient was also treated with YAG capsulotomy, and two patients needed additional surgical intervention.

Conclusion: Despite the rarity of the complication of pupillary block after posterior chamber intraocular lens implantation, physicians should be aware of the sometimes difficult course of recovery after treatment.

Pupillary block occurs when aqueous flow from the posterior chamber and the irido-corneal angle is blocked by the strong apposition of the pupillary margin with adjacent structures. The iris bulges forward and balloons towards the anterior chamber (iris bombé), closing the angle and inducing an increase in intraocular pressure (IOP). Pupillary block is a frequent complication of cataract surgery with anterior chamber intraocular lens (IOL) implantation. However, there are only a few reports of pupillary block consequent to posterior IOL implantation.^{1–3} The largest such series in adults (12 patients) was reported, to the best of our knowledge, in 1987 by Samples *et al.*⁴ Several years later, Vajpayee *et al.*⁵ described a series of 16 affected children (8 years old or less).

The aim of the present study was to describe our 10 year experience with pupillary block complicating posterior intraocular (IOL) implantation. The possible underlying mechanisms, management, and final outcome are discussed.

PATIENTS AND METHODS

The charts of all patients treated at our centre for pupillary block following cataract surgery with posterior chamber IOL implantation between 1990 and 2001 were reviewed. The data collected were as follows: patient age and sex; operative method; additional ocular diseases; interval from cataract surgery to pupillary block; IOP before cataract surgery, at the time of the pupillary block attack and after its resolution; visual acuity before and after pupillary block; medical and surgical management; and final outcome.

RESULTS

Our chart review yielded six patients (seven eyes) with pupillary block after posterior chamber IOL implantation: two males and four females aged 58–84 years. The prepupillary block characteristics are shown in Table 1. Presurgery ocular diseases included diabetic retinopathy, which was managed preoperatively with retinal photocoagulation in two patients, chronic angle closure glaucoma in two patients, pseudoexfoliation glaucoma in one patient (two eyes), and phacomorphic glaucoma, which was the immediate indication for cataract surgery, in one. Two eyes had high IOP (25 mm Hg, 30 mm Hg)

and four had normal pressure (10–18 mm Hg). None of the patients had undergone any ophthalmic surgical procedure before the cataract extraction. Four eyes underwent extracapsular cataract extraction with scleral tunnel and posterior chamber IOL implantation, and one eye underwent phacoemulsification with foldable posterior chamber intraocular lens implantation. Both eyes of one patient (no 4, Table 1) underwent combined extracapsular cataract extraction with posterior chamber IOL implantation (tunnel) and trabeculectomy, including peripheral iridectomy which was performed during the operation itself. The interval from surgery to the appearance of pupillary block ranged from 1 day to 5 years.

The diagnosis of pupillary block was based on the appearance of iris bombé and a shallow anterior chamber with a fixed, non-reacting pupil and increased IOP (40 and 60 mm Hg). The cause of pupillary block in all eyes was seclusion of the pupillary margin by posterior synechiae to the implanted lens or the anterior lens capsule or both. In four patients, a fibrinous inflammatory reaction was recorded at the time of the pupillary block event.

Table 2 summarises the treatment and outcome of the pupillary block. All eyes were initially treated with maximally tolerated topical and systemic antiglaucoma medications. This was followed by neodymium-YAG laser peripheral iridotomy, done twice to three times in three eyes. The laser treatment relieved the block in four eyes (57%); in the remainder, anterior chamber washout, owing to excessive fibrin, and anterior vitrectomy with surgical iridectomy were needed. The patient with bilateral involvement underwent diode laser cyclophotocoagulation in one eye to control the IOP. In another patient, the pupillary block was relieved by neodymium-YAG laser capsulotomy. After treatment of the acute event, IOP normalised in five of the seven eyes (71.4%). Visual acuity improved in three eyes (42.8%), did not change in two (28.5%), and deteriorated in one (14.3%).

On follow up, neovascular glaucoma developed after 7 months in patient 2, with an increase in IOP to 40 mm Hg. Treatment consisted of trabeculectomy with surgical peripheral iridectomy. Nevertheless, the neovascularisation worsened and was accompanied by anterior chamber hyphaema in

Table 1 Pre-pupillary block characteristics

Patient No	Age (years)/sex	Type of procedure	Time of PB after cataract op	IOP before cataract op (mm Hg)	IOP during PB (mm Hg)	Visual acuity before cataract op	Visual acuity after cataract op	Known glaucoma/diabetic retinopathy
1	58/M	ECCE+PC IOL (scleral tunnel)	1 week	10	60	20/400	20/400	Diabetic retinopathy
2	57/F	ECCE+PC IOL (scleral tunnel)	1 day	30	50	CF		Phacomorphic glaucoma Peripheral annular choroidal effusion
3	84/F	ECCE+PC IOL (scleral tunnel)	5 years	No data available*	56	No data available*	No data available*	Angle closure glaucoma
4 RE	71/M	ECCE+PC IOL+trabeculectomy+PI	1 week	17	40	20/70	1/15	PXF glaucoma
4 LE		ECCE+PC IOL+trabeculectomy+MMC	3 weeks	18	30	1/9	1/12	PXF glaucoma
5	67/F	ECCE+PC IOL (scleral tunnel)	3 years	25	49	20/70	20/30	Narrow angle glaucoma
6	80/F	Phacoemulsification+PC IOL	6 months	14	58	1/12	20/150	Non-proliferative diabetic retinopathy

ECCE = extracapsular cataract extraction, PC = posterior chamber, IOL = intraocular lens, IOP = intraocular pressure, PB = pupillary block, PI = peripheral iridectomy, MMC = mitomycin C, PXF = pseudoexfoliation.

*The patient underwent surgery in a different medical centre.

addition to elevated IOP. The patient was treated conservatively with topical antiglaucoma agents and systemic carbonic anhydrase inhibitor. After 3 years, visual acuity was uncertain light perception with pupil seclusion.

In one eye of patient 4, the earlier trabeculectomy became occluded, and on follow up, addition and surgical intervention were suggested, but the patient refused. Because the IOP remained uncontrolled, visual acuity deteriorated after 6 years to no light perception. Malignant glaucoma, diagnosed with ultrasound biomicroscopy, developed in the fellow eye 5 months after the pupillary block and was treated with pars

plana vitrectomy with sectoral iridectomy. At follow up, IOP ranged from 17 to 28 mm Hg with medical treatment. Visual acuity after 3 years was 20/200.

Patient 5 required trabeculectomy a few months after resolution of the pupillary block because of an increase in IOP and worsening of the visual field. After surgery, IOP was maintained around 10 mm Hg with stable visual acuity.

DISCUSSION

Pseudophakic pupillary block occurs when aqueous flow through the iris is blocked by various mechanisms. It is

Table 2 Post-pupillary block characteristics

Patient No	Medical intervention	Surgical intervention	IOP final (mm Hg)	Visual acuity after PB relieved
1	Topical β blockers Topical and systemic carbonic anhydrase inhibitors Topical α adrenergic agonists Hyperosmotic agents Cycloplegia Topical steroids	YAG laser iridotomy	6	20/300
2	Topical β blockers Systemic carbonic anhydrase inhibitors Hyperosmotic agents Cycloplegia Topical steroids	YAG laser iridotomy AC washout (for fibrin)	10	20/80
3	Topical β blockers Topical α adrenergic agonists Xalatan	YAG laser iridotomy (x2)	6	20/150
4 RE	Topical β 1 selective blockers Topical α adrenergic agonists Pilocarpine 2% Systemic carbonic anhydrase inhibitors Cycloplegia	YAG laser iridotomy (x3)	30	20/120
4 LE	Topical β 2 selective blockers Topical α adrenergic agonists Systemic carbonic anhydrase inhibitors	YAG laser iridotomy Anterior vitrectomy+surgical iridectomy (x2) Cyclodiode	28	1/24
5	Topical β blockers Pilocarpine 2% Systemic carbonic anhydrase inhibitors	YAG laser iridotomy	8	20/30
6	Topical β blockers Topical α adrenergic agonists Topical carbonic anhydrase inhibitors	YAG laser iridotomy (x2) YAG laser capsulotomy	18	20/150

AC = anterior chamber.

relatively common when the pupil is occluded by the lens optic in eyes with anterior chamber intraocular lenses,^{6,7} leading to peripheral iridectomy for all cases of anterior chamber IOL implantation. It is a much less frequent complication of posterior chamber intraocular lenses, probably owing to the more physiological location of the lens in the capsular bag and its more appropriate angle design. In these cases, the pupillary block may be related to excessive postoperative inflammation, with the formation of posterior synechiae and adhesions between the pupillary margins and the anterior IOL plane.^{5,8} It may also be caused by aqueous accumulation between the posterior capsule and the anterior face of the vitreous,⁹ an alteration in the anatomy of the anterior chamber angle due to placement of the lens in the ciliary sulcus rather than in the capsular bag,¹⁰ or a wrong apposition, possibly due to incorrect inverted implantation of the IOL. The block can occur immediately after posterior chamber IOL implantation or years later.^{4,11} The risk is higher in diabetic patients, apparently because of the abnormal permeability of the blood-aqueous barrier,¹⁰ and in glaucoma patients, especially those with angle closure glaucoma.^{1,12} Our series included two patients with known diabetic retinopathy and four patients with glaucoma. In the past, some authors recommended preventive peripheral iridectomy during routine cataract surgery,^{4,11} but this is not accepted today for posterior chamber IOL implantation.

Of about 10 000 cataract operations performed in our centre from 1990 to 2001, none involved routine peripheral iridectomy. Nevertheless, only seven eyes were complicated by posterior chamber pseudophakic pupillary block, thus confirming that peripheral iridectomy is not routinely required during cataract surgery.

After the initial medical treatment, peripheral neodymium-YAG laser iridotomy was used to relieve the block. Other authors have also reported on this procedure.^{10,13-15} Thereafter, IOL normalised in all but one patient (with bilateral involvement). Naveh *et al*⁸ and Melamed *et al*¹⁶ reported that neodymium-YAG peripheral iridotomy does not easily resolve pseudophakic pupillary block because the fibrinous inflammatory reaction tends to occlude the opening. According to our experience, more than half the patients responded to peripheral iridotomy, although it had to be repeated in three of them because of a tendency to occlusion. Most of our cases (85.7%) were associated with a fibrinous inflammatory reaction and formation of posterior synechiae.

We found only sporadic reports in the medical literature of pupillary block after phacoemulsification surgery with posterior chamber IOL implantation.^{9,17} Our series also included one patient after phacoemulsification cataract surgery with foldable IOL implantation. Thus, even the newer techniques in cataract surgery may be associated with pupillary block.

In conclusion, we presented seven eyes of six patients that developed pupillary block following cataract extraction with posterior chamber IOL implantation. One patient underwent the newer phacoemulsification technique. It remains to be seen if this complication will become less frequent with phacoemulsification when compared to former techniques. In

agreement with other authors, all but one of our patients (83%) had risk factors for pupillary block (diabetes or glaucoma). In more than half the patients, the block resolved with peripheral iridotomy, although the procedure needed to be repeated in some of them, owing to a high occlusion tendency. Furthermore, in most of our patients, visual acuity either improved or remained unchanged, with 71% of the eyes having a visual acuity of 20/150 or better. In only one patient, with bilateral involvement, did IOP levels fail to return to normal.

Although pupillary block occurs in only a few patients after posterior chamber IOL implantation, physicians should be aware that some of them have a very difficult and complicated course and require closer follow up.

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