

SCIENTIFIC REPORT

Urrets-Zavalía syndrome as a complication of argon laser peripheral iridoplasty

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Br J Ophthalmol 2006;000:1–4. doi: 10.1136/bjo.2006.105098

Objective: To report on 8 patients who developed prolonged mydriasis after argon laser peripheral iridoplasty (ALPI).

Design: Retrospective case series.

Methods: A review of the charts of 8 patients with persistent occludable angles after laser iridotomy who developed mydriasis after undergoing ALPI.

Results: 12 eyes of 8 patients (mean age 50.2, standard deviation 6.9, range 40–61 years) developed persistent dilatation. 7 of 8 patients had plateau iris syndrome. Only one patient had a decrease in visual acuity. Intraocular pressure increased only in 1 eye and remained stable or decreased in the others. Of the 8 patients, 7 had blurred vision, 2 had photophobia, 4 had glare and 1 had discomfort. The pupillary response to pilocarpine instillation was minimal or absent. Mydriasis eventually resolved in all eyes without treatment.

Conclusion: ALPI can be complicated by mydriasis unresponsive to pilocarpine. Mydriasis and accompanying symptoms resolved spontaneously within 1 year in most patients.

Argon laser iridoplasty is a safe and effective procedure to open appositionally closed iridocorneal angles. It involves placing burns of large spot size, low power and long duration in the peripheral iris to permanently alter its configuration. The major indications are to break an episode of acute angle closure or to open an appositionally closed angle after elimination of pupillary block by iridotomy, most commonly caused by plateau iris syndrome.^{1,2}

In 1963, Urrets-Zavalía³ described a syndrome consisting of a fixed, dilated pupil, iris atrophy and secondary glaucoma after penetrating keratoplasty in patients with keratoconus, which he associated with postoperative mydriatic treatment. Uribe⁴ reported spontaneous mydriasis, unresponsive or poorly responsive to miotics after corneal transplantation for keratoconus, in which no mydriatic agents were used postoperatively. Subsequently, this syndrome was described after lamellar keratoplasty,^{5,6} penetrating keratoplasty for corneal dystrophies,^{7,8} trabeculectomy⁹ and after implantation of phakic intraocular lenses.¹⁰

We report on eight patients who developed mydriatic pupils after argon laser peripheral iridoplasty (ALPI) for the treatment of narrow anterior chamber angles in the presence of a patent peripheral iridotomy.

PATIENTS AND METHODS

This study was conducted in accordance with the tenets of the Helsinki Declaration of 1975 and the New York Eye and Ear Institutional Review Board guidelines. Patients gave written informed consent after they were informed about the nature, risks and possible adverse consequences of the procedure. The charts of eight patients with symptomatic mydriasis after laser iridoplasty were reviewed. No patient showed symptoms

consistent with acute or subacute angle closure or ocular inflammation and all were asymptomatic before ALPI; also, no patient complained of glare, blurred vision, pain or photophobia. Before ALPI, no patient had pupillary abnormalities, and all eyes had had patent laser iridotomies. No afferent pupillary defect was documented before ALPI.

The procedures were performed between October 1993 and March 2006 for persistent appositional closure after elimination of any pupillary block component by laser iridotomy. Seven patients had plateau iris syndrome, as determined by dark room gonioscopy (n = 8) and ultrasound biomicroscopy (n = 6). Laser settings were as follows; 0.5 s duration, 200–400 mW power and 500 µm spot size. A total of 20–36 burns were applied to 360° of the peripheral iris.

RESULTS

Twelve eyes of eight patients (mean age 50.2, standard deviation 6.9, range 40–61 years) who underwent ALPI had persistent mydriasis after the procedure. All patients had had a previous uneventful laser peripheral iridotomy to eliminate pupillary block for angle closure. Seven of eight patients had gonioscopic findings of plateau iris syndrome, consisting of an appositionally closed angle with a double hump sign on indentation gonioscopy, confirmed with ultrasound biomicroscopy.¹¹ Bilateral ALPI was performed in four patients and post-laser mydriasis occurred in both eyes of these patients. The other four patients had unilateral ALPI with post-laser mydriasis in the treated eye. All patients had open anterior chamber angles after the procedure, and these remained open during follow-up.

Postoperatively, seven of eight patients had blurred vision, two had photophobia, five complained of glare and only one had physical discomfort (table 1, fig 1). All had fixed and dilated pupils, unreactive to light or accommodation. Intraocular pressure (IOP) increased to >30 mm Hg in the presence of open angles in patient 5 (table 1), with a reduction in visual acuity from 20/20 to 20/30, and did not respond to medical treatment, necessitating trabeculectomy. Patient 8 was seen during a follow-up visit 2 months after ALPI. Although he had no complaints, his IOP was 50 mm Hg OD and 49 mm Hg OS, with open anterior chamber angles. Treatment with pilocarpine, timolol and acetazolamide lowered his IOP to 15 mm Hg OU.

Although we did not find any association between mydriasis after ALPI and any ophthalmic or systemic conditions, 1 patient had iridociliary cysts, 2 of 4 women had uterine fibroadenomas, 1 patient had a history of Bell's palsy and 2 patients had a history of facial trauma. All patients were treated with pilocarpine to induce pupillary miosis and symptomatic relief. No or minimal constriction was obtained in all patients, either after a single application of 4% pilocarpine or after prolonged

Abbreviations: ALPI, argon laser peripheral iridoplasty; IOP, intraocular pressure

Table 1 Clinical data

Eye	Sex	VA		Age (years)	IOP		Diagnosis	Symptoms	Pupil diameter (mm)	Other findings	
		Pre	Post		Pre	Post					
1	OD	M	20/20	20/20	57	18	14	Plateau iris	Glare, blurred vision, photophobia	7.5	Orbital trauma
2	OD	F	20/20	20/20	40	14	14	Plateau iris	Glare, blurred vision	6.0	
3	OU	F	20/20	20/20	49	15 OS	10 OU	Plateau iris	Blurred vision, photophobia	7.7	Head trauma, uterine fibroadenoma
4	OU	M	20/20	20/20	51	18 OD	15 OS	Plateau iris	Blurred vision	6.6	Bell's palsy
5	OD	M	20/20	20/40	54	18 OD	30	Plateau iris	Blurred vision, ocular discomfort	8.0	
6	OD	F	20/20	20/20	45	14 OU	14 OU	Anatomic narrow angles	Glare	6.0	
7	OU	F	20/20	20/20	45	26 OU	21 OU	Plateau iris	Glare, blurred vision	7.0	Bilateral iridociliary cyst, uterine fibroadenoma
8	OU	F	20/60	20/60	61	12 OD	50 OD	Plateau iris	Glare, blurred vision	7.0	
			20/100	20/100		11 OS	49 OS				

IOP, intraocular pressure; OD, right eye; OS, left eye; OU, both eyes; VA, visual acuity.

treatment. Three patients required treatment for IOP control, including patient 8, and patient 5 required trabeculectomy.

Pilocarpine was given to patients in an attempt to treat the mydriasis.

Pilocarpine initially prescribed at bedtime was discontinued in most patients for lack of response and was not used for >1 year in any case. The mydriasis gradually resolved spontaneously over a period of 3–12 months (mean 8 months); patients with a follow-up of >1 year showed improvement in pupillary responses and symptoms, and were asymptomatic in the absence of any treatment.

DISCUSSION

A fixed, dilated pupil is an uncommon postoperative complication initially described after corneal transplantation. ALPI is a simple and effective means of opening an appositionally closed angle in situations in which laser iridotomy either cannot be performed or does not physically eliminate appositional angle closure because mechanisms other than pupillary block are present. The procedure consists of placing contraction burns (long duration, low power and large spot size) in the extreme iris periphery to contract the iris stroma between the site of the burn and the angle, physically pulling open the angle.¹ This study describes eight patients who developed symptomatic mydriatic and fixed pupils not responding to light, accommodation or pilocarpine treatment after uneventful ALPI. This complication has occurred in <1% of our patients undergoing ALPI.

Although our findings are similar to those originally described by Urrets-Zavalía,³ we found some clinically relevant

differences. None of our patients developed visible iris atrophy and a postoperative increase in IOP was uncommon. Iris angiography was not performed in our patients, and thus we did not determine the presence or absence of ischaemic changes. All patients had a normal external and pupillary examination without signs of third nerve palsy, Adie's pupil or afferent pupillary defect, all patients were asymptomatic before the procedure and none had severe anterior chamber inflammation.

The aetiology for this phenomenon after ALPI is unknown. In all previous reports, the Urrets-Zavalía syndrome has occurred after operative surgery, most often penetrating keratoplasty, and, to our knowledge, this is the first report of its occurrence after laser surgery for glaucoma. A similar phenomenon has been described after peripheral panretinal photocoagulation.^{12 13} Histopathological studies on monkeys showed extensive parasympathetic degeneration after argon laser photocoagulation with impaired accommodation and pupillary responses.¹⁴

A neurological effect is the most probable aetiology. Injury to the radial nerve fibres of the parasympathetic nerves will denervate the constrictor pupillae muscle, resulting in unopposed sympathetic drive to the dilator muscle. This would explain the slow recovery observed with time, suggesting a gradual process of nerve regeneration. Why this phenomenon has been observed in only a few patients undergoing ALPI is not yet clear.

Although no lasting response to pilocarpine treatment, given as either single or repeated dosage, was observed and although it was essentially with the passage of time that the pupil slowly and progressively recovered without treatments, we still think

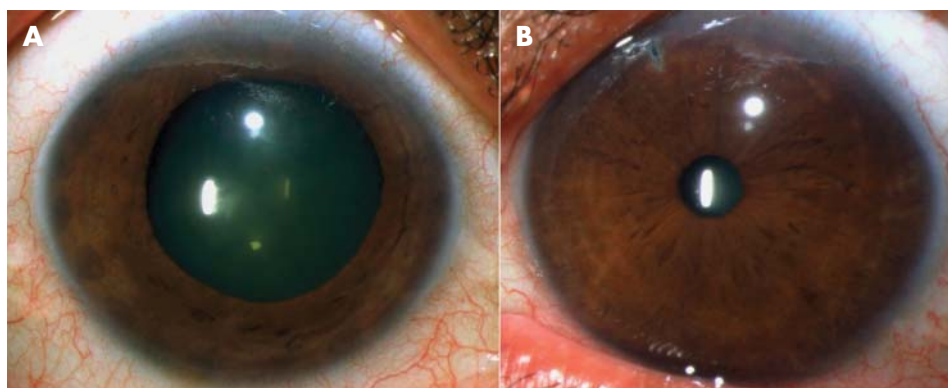


Figure 1 A 54-year-old man with a diagnosis of narrow angles and plateau iris configuration presented 24 h after argon laser peripheral iridoplasty complaining of discomfort and blurred vision. (A) Slit-lamp examination showed a dilated and fixed pupil not responding to pilocarpine 4%. (B) His left pupil responded to pilocarpine 4% instillation.

that pilocarpine should be given at least a brief trial, as it is safe and some patients in the future may respond. Clinicians performing ALPI should be aware of this condition.

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Funding: This study was supported by the Norman and Sandra Pessin Research Fund of the New York Glaucoma Research Institute, New York, New York, USA

Competing interests: None.

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Accepted 9 September 2006

Published Online First 20 September 2006

REFERENCES

- 1 **Ritch R, Liebmann JM.** Argon laser peripheral iridoplasty: a review. *Ophthalmic Surg Lasers* 1996;**27**:289–300.
- 2 **Ritch R, Tham CCY, Lam DSC.** Long-term success of argon laser peripheral iridoplasty in the management of plateau iris syndrome. *Ophthalmology* 2004;**111**:104–8.
- 3 **Urrrets-Zavalía A Jr.** Fixed, dilated pupil, iris atrophy and secondary glaucoma. *Am J Ophthalmol* 1963;**56**:257–65.
- 4 **Uribe LE.** Fixed pupil following keratoplasty. Evaluation of six cases. *Am J Ophthalmol* 1967;**63**:1682–6.
- 5 **Minasian M, Ayliffe W.** Fixed dilated pupil following deep lamellar keratoplasty (Urrrets-Zavalía syndrome). *Br J Ophthalmol* 2002;**86**:115–16.
- 6 **Maurino V, Allan BD, Stevens JD, et al.** Fixed dilated pupil (Urrrets-Zavalía syndrome) after air/gas injection after deep lamellar keratoplasty for keratoconus. *Am J Ophthalmol* 2002;**133**:266–8.
- 7 **Srinivasan M, Patnaik L.** Fixed dilated pupil (Urrrets-Zavalía syndrome) in corneal dystrophies. *Cornea* 2004;**23**:81–3.
- 8 **Jastaneiah S, Al Towerki AE, Al Assiri A.** Fixed dilated pupil after penetrating keratoplasty for macular corneal dystrophy and keratoconus. *Am J Ophthalmol* 2005;**140**:484–9.
- 9 **Jain R, Assi A, Murdoch IE.** Urrrets-Zavalía syndrome following trabeculectomy. *Br J Ophthalmol* 2000;**84**:338–9.
- 10 **Yuzbasioglu E, Helvacioğlu F, Sencan S.** Fixed, dilated pupil after phakic intraocular lens implantation. *J Cataract Refract Surg* 2006;**32**:174–6.
- 11 **Ritch R, Liebmann JM, Tello C.** A construct for understanding angle-closure glaucoma: the role of ultrasound biomicroscopy. *Ophthalmol Clin North Am* 1995;**8**:281–93.
- 12 **Rogell GD.** Internal ophthalmoplegia after argon laser panretinal photocoagulation. *Arch Ophthalmol* 1979;**97**:904–5.
- 13 **Lifshitz T, Yassur Y.** Accommodative weakness and mydriasis following laser treatment at the peripheral retina. *Ophthalmologica* 1988;**197**:65–8.
- 14 **Kaufman PL.** Parasympathetic denervation of the ciliary muscle following retinal photocoagulation. *Trans Am Ophthalmol Soc* 1990;**88**:513–53.

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