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Nd:YAG laser iridotomy in the management of secondary glaucoma associated with Behçet's disease

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PURPOSE. *To report the outcome of Nd:YAG laser iridotomy in the management of secondary glaucoma associated with Behçet's disease (BD).*

METHODS. *In this prospective study, Nd:YAG laser iridotomy was performed on eyes with secondary angle-closure and pupillary block glaucoma associated with BD. The pretreatment and post-treatment intraocular pressures (IOP) and the number of antiglaucoma medications were compared by Mann-Whitney U test.*

RESULTS. *The study consisted of 16 eyes of 11 patients (2 female, 9 male, mean age 39.2±8.9 years). Post-treatment follow-up ranged from 6 to 36 months (mean 13.8±8.9). The mean IOP was 21.6±2.5 mmHg on 2.5±0.6 medications before iridotomy. IOP reduced to 17.7±2.5 mmHg on 1±0.6 medications at the first month and 17.1±3.2 mmHg on 1.7±0.9 medications at the sixth month of treatment. The differences between IOP and number of antiglaucoma medications at baseline and at the sixth month of the treatment was statistically significant ($p<0.00001$). For four eyes trabeculectomy with mitomycin C and for one eye Ahmed valve implantation were performed in the follow-up period.*

CONCLUSIONS. *Nd:YAG laser iridotomy can provide reduction of IOP and the number of antiglaucoma medications in selected cases with secondary glaucoma associated with Behçet's disease. (Eur J Ophthalmol 2007; 17: 191-5)*

KEY WORDS. *Uveitis, Behçet's disease, Secondary glaucoma, Nd:YAG laser iridotomy*

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INTRODUCTION

Behçet disease (BD) is a chronic multisystemic disease, which was first described by the Turkish dermatologist Hulusi Behçet in 1937 (1). It is characterized by relapsing uveitis, arthritis, oral and genital aphthous ulcerations, and skin lesions such as erythema nodosum. The major ocular manifestations are recurrent iridocyclitis, retinitis, and retinal vasculitis, which have been reported in 70% to 75% of patients with BD (1-5).

Glaucoma is one of the most important complications of BD with an incidence of 10.9% (5). It is caused by a number of mechanisms, including structural changes in the aqueous outflow pathway due to inflammation, morphologic changes in the anterior chamber angle, alteration of aqueous composition, steroid usage, or the combination of these mechanisms (5-8).

The management of uveitic glaucoma is challenging. Laser or surgical treatments are often necessary in spite of maximal medical therapy (9-12). Laser iridotomy is indicated in the case of posterior synechiae that precipitates iris bombe and angle closure glaucoma; however, this procedure may induce anterior uveitis leading to closure of the laser openings and further intraocular pressure

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(IOP) increase. Therefore, re-treatment or even surgical iridectomy may be required (12).
In this study, our aim was to evaluate the outcome of Nd:YAG laser iridotomy in the management of secondary glaucoma associated with BD.

PATIENTS AND METHODS

This prospective study consisted of 16 eyes of 11 patients with secondary glaucoma associated with BD, who underwent Nd:YAG laser iridotomy in the Uveitis and Glaucoma Clinics of Ankara Ulucanlar Eye Research Hospital between January 2000 and May 2005.
The age at onset of BD, the duration between the onset of secondary glaucoma and the Nd:YAG laser iridotomy, previous anti-inflammatory and anti-glaucoma medications, and ocular surgeries were recorded for each patient.
Eyes without active inflammation for the last 3 months that had pupillary block and iris bombe due to total posterior synechiae and/or secondary angle-closure glaucoma due to peripheral anterior synechiae were included in this study, while eyes with malignant or neovascular glaucoma and severe glaucoma that required surgical treatment were excluded.
Detailed ophthalmologic examinations including best-corrected visual acuities with Snellen charts, anterior and posterior segment examinations, gonioscopy with Goldmann three-mirror lens, and IOP measurements with Goldmann applanation tonometer were performed prior to laser treatment. Also, perimetric examinations with Humphrey automated perimeter were done for eyes with visual acuities better than 20/200.

Nd:YAG laser iridotomy technique

The procedure was performed under topical anesthesia with proparacaine 0.5% drops. After the Abraham lens was placed over the cornea, the superonasal position (at 11 or 1 o'clock) was focused in order to prevent irradiation of the fovea. Under the Q-switched mode, 3–8 mJ energy, 1–3 pulses per shot, and 1 or more shots were used to perform two closed iridotomies in each eye. Fluorometholone 0.1% three times daily was instilled for 2 days before the treatment and for 1 week after the treatment. Also, the previous antiglaucoma medications were continued for at least 2 days after the treatment, and stopped one by one depending on the IOP level.
The examinations were performed at the first day, first week, first month, third month, and sixth month of the treatment, and with 1- to 3-month intervals thereafter. The IOP values, number of antiglaucoma medications, and the need for additional antiglaucoma laser or surgical procedures were recorded for each patient during the follow-up visits. The IOP and number of antiglaucoma medications before and after the laser treatment (at the first and sixth month) were compared by Mann-Whitney U test.
This study was approved by the local ethical committee of our hospital on December 22, 1999, and all cases gave informed consent.

RESULTS

The mean age of 2 female (18.2%) and 9 male (81.8%) cases at the time of the laser treatment was 39.2±8.9 (range, 25 to 58 years). The mean age at the diagnosis of BD was 29.6±4.6 (range, 22 to 36 years). The diagnosis of secondary uveitic glaucoma was made 9.4±5.3 months (1–20 months) prior to the iridotomy.
Topical brimonidine twice daily, carteolol 2% twice daily, timolol maleate 0.5%–dorzolamide fixed combination twice daily, dorzolamide HCL 2% twice daily, systemic acetazolamide (1–3/day), or their various combinations were used to control glaucoma before and after the laser iridotomy.
The uveitic lesions involved only anterior segment in 6 eyes (37.5%), and both anterior and posterior segments in 10 eyes (62.5%), which were all inactive for the last 3 months before laser treatment. All of the cases were using systemic anti-inflammatory agents at the time of laser iridotomy. Five of them were using oral prednisolone (1 mg/kg/day), 2 of them were using azathioprine (2 mg/kg/day), and 4 of them were using cyclosporine A (5 mg/kg/day). The previous ocular surgeries included phacoemulsification lens extraction and intraocular lens (IOL) implantation for two eyes and extracapsular lens extraction for one eye.
The best-corrected visual acuities measured just before laser iridotomy were 20/20 in 1 eye (6.3%), 20/30 in 4 eyes (25%), 20/200 to 20/40 in 8 eyes (50%), and 20/200 in 3 eyes (18.7%). Anterior segment findings just before the procedure included inactive inflammatory cells and in 16 eyes (100%), pigmentary cells on the lens or intraocular lens in 14 eyes (87.5%), total posterior synechiae and

associated iris bombe in 16 eyes (100%), cataract formation in 2 eyes (12.5%), aphakia in 1 eye (6.3%), and pseudophakia in 2 eyes (12.5%). Fundus examination before the procedure revealed cup to disc ratio (C/D) of 0.3 to 0.5 in 10 eyes (62.5%), 0.6 to 0.8 in 4 eyes (25%), optic atrophy in 2 eyes (12.5%), and cystoid macular edema (CME) in 2 eyes (12.5%).

Gonioscopic examinations before the procedure revealed partial angle closure in 15 eyes (93.7%) and total angle closure in 1 eye (6.3%), which were all secondary to peripheral anterior synechiae. Glaucomatous perimetric defects including nasal step, arcuate scotoma in the superior quadrant, peripheral and generalized visual field defects were detected in eyes with visual acuities better than 20/200 before laser iridotomy.

Thirty-two Nd:YAG laser iridotomies were performed in 16 eyes. We observed no complications during the procedure, while transient mild anterior chamber inflammation developed in 5 eyes (31.3%) within the first week after laser iridotomy. The cases were followed up regularly during a mean period of 13.8±8.9 months (range, 6 to 36 months).

The mean IOP was 21.6±2.5 mmHg (range, 18 to 26 mmHg) on a mean number of 2.5±0.6 (range, 2 to 4) antiglaucoma medications prior to the laser treatment, while it decreased to 17.7±2.5 mmHg (range, 12 to 20 mmHg) on the mean 1±0.6 (range, 0 to 2) medications at the first month and 17.1±3.2 mmHg (range, 12 to 24 mmHg) on the mean 1.7±0.9 (range, 1 to 3) medications at the sixth month of the laser iridotomy (Tab. I, Fig. 1).

During the mean 13.8±8.9 months of follow-up, 9 of the 32 (28.1%) iridotomies failed. However, all eyes had at least one patent iridotomy at the end of the follow-up period. There was a statistically significant decrease in IOP values in the postoperative first and sixth months when compared to the baseline IOP values ($p<0.00001$). The post-treatment reduction in the number of antiglaucoma medications was also statistically significant ($p<0.00001$, $p=0.01$) (Tab. I).

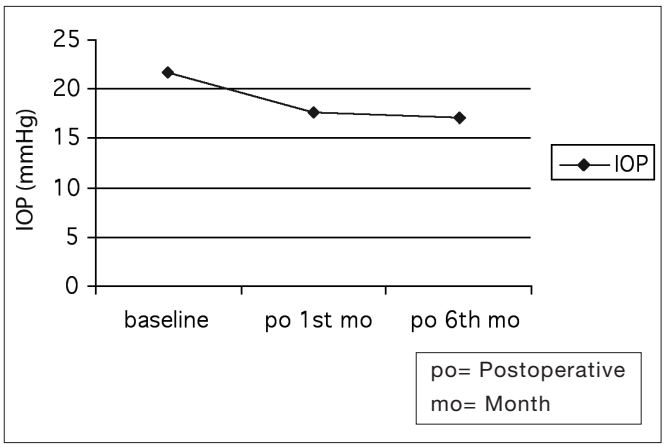

Fig. 1 - *Intraocular pressure before and after Nd:YAG laser iridotomy.*

After the laser treatment, frequent uveitic relapses (intervals ≤2 months) occurred in 6 eyes (37.5%) of 6 cases. Three of these cases used prednisolone (1–2 mg/kg/day) and three of them used cyclosporine A (5 mg/kg/day) in addition to topical corticosteroids during the follow-up period. The post-treatment antiglaucoma medications were adjusted according to the level of IOP. Additional laser or surgical treatments were performed in required cases, including trabeculectomy with mitomycin-C in 4 eyes (25%) 9.8±3.8 months (range, 6 to 15 months) after iridotomy, Ahmed valve implantation in 1 eye (6.3%) 16 months after iridotomy. All of these 4 eyes that underwent filtering surgery had histories of frequent uveitic relapses after laser iridotomy.

The best-corrected visual acuities measured at the last visit after laser iridotomy were 20/30 in 4 eyes (25%), 20/200 to 20/40 in 5 eyes (31.25%), 20/200 in 5 eyes (31.25%), counting fingers in 1 eye (6.25%), and seeing

TABLE I - PRETREATMENT AND POST-TREATMENT INTRAOCULAR PRESSURE (IOP) AND NUMBER OF ANTIGLAUCOMA MEDICATIONS AND p VALUES

	Baseline	1st month postop	6th month postop
IOP, mmHg	21.6±2.5	17.7±2.5	17.1±3.2
		p<0.00001	p<0.00001
No. antiglaucoma medications	2.5±0.6	1±0.6	1.7±0.9
		p<0.00001	p=0.01

hand motion in 1 eye (6.25%). During the follow-up period, 6 eyes (37.5%) lost two or more lines on the Snellen visual acuity chart or dropped one or more categories in the low-vision range and all of these six eyes had histories of frequent uveitic relapses after laser iridotomy. Also, four of them in which the IOP and glaucomatous optic nerve changes could not be controlled under maximal medical therapy after laser iridotomy (IOP > 22 mmHg) had undergone trabeculectomy with mitomycin-C.

Anterior segment findings at the last visit after laser iridotomy included inflammatory cells (grade 1–2 inflammatory cells in anterior chamber) in 4 eyes (25%), pigmentary cells on the lens or intraocular lens in 16 eyes (100%), total posterior synechiae in 16 eyes (100%), one or two patent peripheral iridotomies in 16 eyes (100%), cataract formation in 4 eyes (12.5%), aphakia in 1 eye (6.3%), pseudophakia in 2 eyes (12.5%), peripheral iridectomy and bleb in 4 eyes (25%), and Ahmed valve implant in 1 eye (6.3%). Fundus examination at the last visit after laser iridotomy revealed cup to disc ratio (C/D) of 0.3 to 0.5 in 8 eyes (50%), 0.6 to 0.8 in 4 eyes (25%), and optic atrophy in 4 eyes (25%). In none of the eyes was iris bombe detected.

DISCUSSION

The management of glaucoma secondary to uveitis can be a challenging problem. In spite of maximal medical therapy, laser or surgical antiglaucoma treatments are often necessary with higher complication rates than other types of glaucoma (9-12).

When closed-angle glaucoma with pupillary block develops, the communication between anterior and posterior chamber must be re-established by either Nd:YAG laser or surgical iridotomy (12-15). Fleck et al reported that Nd:YAG laser iridotomy was a good alternative to surgical iridectomy in the prophylactic treatment of eyes with closed angles (13). Similarly, Hsiao et al reported Nd:YAG laser iridotomy as a safe and effective procedure for the treatment and prevention of angle-closure glaucoma (14).

Nd:YAG laser is more rapid and requires less energy to create a peripheral iridotomy than argon laser (15). So, it induces less postoperative inflammation than argon laser, which makes it more suitable for the treatment of glaucoma in uveitic cases. However, it still has a tendency to activate anterior chamber inflammation, so it should be avoided in eyes with severe active uveitis. Topical corticosteroids should be administered before and after the treatment. Post-treatment inflammation may cause closure of the iridotomy openings, so several iridotomies are generally necessary. In the study of Spencer et al, Nd:YAG laser iridotomy was reported to have a high early failure rate in eyes with uveitic glaucoma (12). They reported the mean time of failure as 85 days.

In our study, the mechanism of glaucoma was predicted as mainly the combination of secondary angle closure and pupillary block depending on the anterior chamber and gonioscopic findings. Additionally, aphakia, pseudophakia, and steroid usage were considered to contribute to IOP increase. Besides these, steroid usage and aphakia or pseudophakia is thought to contribute to glaucoma. In order to eliminate pupillary block and iris bombe, we performed laser iridotomy. Our aim was to detect the effect of this procedure on IOP and number of antiglaucoma drops. We preferred Nd:YAG laser to argon laser because of its lower postoperative inflammation rate. The only post-treatment complication was transient mild anterior chamber inflammation in 5 eyes within the first week of the treatment. The post-treatment reduction of IOP and the number of antiglaucoma medications were statistically significant. Our failure rate was lower than the rate reported by Spencer et al, which can be attributed to adequate suppression of inflammation in our cases. In spite of effective reduction in both IOP and the number of medications, glaucoma was not adequately controlled in 37.5% of the eyes, which required additional surgical procedures. A total of 37.5% of the eyes lost two or more lines on the Snellen visual acuity chart during the follow-up period and the main cause was thought to be the frequent uveitic relapses after laser iridotomy. Also, progression of glaucomatous optic nerve changes and trabeculectomy with mitomycin-C should be considered to be a risk factor for decrease in visual acuity because four of these eyes had undergone filtering surgery.

Secondary glaucoma is one of the most important ocular complications, which accelerates the visual loss in uveitic eyes. Treatment of glaucoma is usually challenging in such eyes, because every surgical procedure may induce uveitic relapses. Various procedures have been advocated for the treatment of different types of uveitic glaucoma. In this study, Nd:YAG laser iridotomy was found to be safe and effective with few complications in the management of secondary glaucoma associated with chronic uveitis due to BD. The most crucial factor for the success of these procedures is appropriate patient selection. Also,

adequate suppression of inflammation before and after the laser treatments has great importance in the prevention of postoperative complications and failure. However, studies with longer follow-up period and higher number of cases are required in order to demonstrate the efficacy and long-term results of these laser procedures.

Proprietary interest: None.

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