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Clinical outcome of iridotomy with Argon-YAG laser at a tertiary care center in Karachi, Pakistan

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Original Article

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Abstract

Objective: To assess the the efficacy and early and late complications of Argon-YAG combined laser iridotomy in the outpatient department of a tertiary care hospital.

Methods: This was a prospective observational study conducted at Aga Khan University Hospital Karachi, Pakistan. After detailed history taking and clinical examination, patients who had goniscopically evident closed angles and a positive provocative test were selected for laser iridotomy. They underwent iridotomy using Argon laser followed by YAG laser. The main outcome measures were patency of iridotomy at 6 months, angle grading at 6 months and early and late complications.

Results: Overall 40 eyes of 30 patients underwent iridotomy. Of these 18 (60%) were female. At presentation, 26, 10, 2 and 2 eyes had primary angle closure glaucoma (PACG), prodromal stage of PACG, chronic angle closure glaucoma, and seculusio papillae with iris bombe secondary to uveitis, respectively.

All the 40 iridotomies were patent at 6 months follow up. Majority of the eyes with primary acute angle closure glaucoma, and prodromal angle closure glaucoma had their angles opened from Grade 0 and Grade I to Grade III. At 6 months, 30(75%) eyes had a good control of intraocular pressure (IOP). Intraoperative complication, encountered were microhyphaema in 14 eyes and 2 developed corneal burns. Postoperative complications were transient rise of IOP in 18 eyes and post-laser iritis in 32 eyes, but they responded to recommended treatment.

Conclusions: Iridotomy with Argon laser followed by Nd-YAG laser was associated with good clinical outcome and fewer complications in eyes with PACG (JPMA 60:220; 2010).

Introduction

Peripheral iridotomy is the treatment of choice for angle closure glaucoma, which is one of the leading causes of blindness. Overall glaucoma is the second leading cause of blindness worldwide.[1,2] The relative prevalence of its different types varies geographically with open angle glaucoma being the predominant form in Caucasians and angle closure glaucoma in Asians.[1,2] Angle-closure glaucoma is characterized by narrowing or closure of the anterior chamber angle. Over the last decade laser surgery has superseded incisional surgery as the preferred method for creating an opening in the irides for the treatment of angle-close glaucoma caused by the pupillary block.

The Nd-YAG laser can be used at once in almost all the situations but is best with lighter coloured irides. Nd-YAG laser iridotomy alone is associated with high risk of failure and complications in dark irides.[3,4] The combined Argon and Nd: YAG technique is excellent for dark eyes, permitting utilizing advantages of both laser types and avoiding their disadvantages.[5] It is possibly the ideal technique to use in the Asian Irides.[5,6] A study conducted in Singapore showed that 2.65 times less energy was required with sequential Argon, Nd-YAG laser iridotomy as compared to using argon laser alone.[6] A similar study in Israel concluded that total energy required using combined Argon and Nd: YAG technique was lower than using either laser alone,[7] along with good safety and efficacy. Other studies have shown that argon laser pretreatment significantly reduces incidence of haemorrhage.[8,9]

To the best of our knowledge, there is no work documented from Pakistan in this regards. Hence we embarked with this study aimed to assess the efficacy and early and late complications of Argon-YAG combined laser iridotomy in the outpatient department of a tertiary care hospital in Karachi, Pakistan.

Patients and Methods

A prospective observational study was conducted at the outpatient department of Ophthalmology Aga Khan University Hospital Karachi, Pakistan. A detailed history of the patients was taken. Visual acuity recordings, slit lamp examination, applanation tonometry, gonioscopy and examination of the fundus were done on all the patients. Patients with gonioscopic evidence of narrow angles underwent the Dark-room Prone-position provocative test. Patient's pre test intra ocular pressure (IOP) was measured using applanation tonometer. They were then asked to lie prone in the dark room for an hour. The patient was

accompanied by an attendant all this time to make sure the patient stayed awake during the test. At the end of the test the IOP was recorded again. A rise of 8 mm Hg from the baseline was taken as a positive provocative test. After detailed history taking and clinical examination, patients who had goniscopically evident closed angles and a positive provocative test (Dark-room Prone-position Test) were selected for laser iridotomy. They were briefed about the procedure and written consent was taken. The study extended for over 15 months and there were 30 patients (40eyes) treated as part of the study.

All the laser iridotomies were performed as an outpatient procedure. A combination of Argon and YAG for laser iridotomy was used in all the patients. Nd: YAG laser Abraham iridotomy lens was used in our study as a focusing lens before application of laser to the iris using methylcellulose as a coupling solution. We used power of 1000mw for Argon laser with spot size of 50 microns requiring 50-80 Number of shots. In Nd: YAG laser we used power of 4-6 mJ requiring 3-5 shots. The argon laser was used to thin the iris so that approximately 20% of the tissue remains. When this was accomplished, the patient was moved to the Nd: YAG laser. The Nd: Yag laser beam was then focused into the depth of the creator already made with the help of argon laser and 2-3 shots were needed to complete the iridotomy. The iridotomy was considered complete when the anterior lens capsule could be seen through the opening made by the iridotomy.

Post laser management included, IOP monitoring which was checked 1 and 2 hours post laser. All the patients were discharged on topical steroid (prednisolone acetate) four times a day and a topical beta blocker twice a day. This combination of steroid and anti glaucoma therapy was continued for five days, after which they were stopped.

After the discharge, the patients were followed at 1 day, 1 week, 4 weeks, 3 month and 6 month intervals. If at 6 months post laser their iridotomies were patent, the intra ocular pressure normal and provocative test negative, the treatment was considered successful.

At each visit in addition to the routine ophthalmologic examination including measurement of visual acuity and applanation IOP, the status of the overlying corneal endothelium, anterior chamber reaction and iridotomy patency were evaluated. In addition, goniscopy was done to confirm that the pupillary block had been relieved and to determine the extent of PAS. All patients underwent provocative testing on the 7th day following laser, after discontinuation of hypotensive medication.

The main outcome measures were (1). Patency of iridotomy at 6 months (2), angle grading at 6 months and (3) early and late complications.

The data were entered and analyzed using SPSS version 15.0(SPSS Inc., Chicago, IL). Percentages, frequencies were calculated and tables were made for rate of complications and outcome variables.

Results

In all, 40 eyes of 30 patients were subjected to iridotomy. Of these 18 (60%) were females and 12 (40%) were males (Table-1). At presentation, 26, 10, 2 and 2 eyes had primary angle closure glaucoma (PACG), prodromal stage of PACG, chronic angle closure glaucoma, and seculusio papillae with iris bombe secondary to uveitis, respectively.

Table-1: Demography of patients undergoing laser peripheral iridotomy at a tertiary care hospital in Pakistan (n=30).

Gender	Number (Percentage)
Male	12 (40%)
Female	18 (60%)
Age	
40 - 50 years	15 (50%)
51-60 years	10 (33.33%)
61 - 70 years	5 (16.66%)
Family History	
Positive	5 (16.66%)
Refractive Error	
Emmetropic	8 (20%)
Hypermetropic	32 (80%)

Headache was the most common presenting symptom present in 24 patients (80%), followed by blurred vision 17 (56.6%), coloured haloes 15 (50%), painful red eyes 15(50%) and ocular pain 13 (43.3%). Almost 100% of the patients had shallow anterior chamber. Ciliary congestion was noted in 17 eyes (42.5%) and corneal oedema in 18 eyes (45%). The pre treatment IOP in all the patients with corneal oedema was more than 45 mmHg. Pupil was normally reacting in 10 eyes (25%) and mid dilated with very sluggish reaction was present in 30 eyes (75%). Iris atrophy was seen in 2 eyes (5%). On gonioscopy 22 (55%) eyes had totally closed angle i.e. grade zero according to Shaffer's classification at presentation (Table-2).

Table-2: Angle grading at presentation and on final follow-up at 6th month post laser peripheral iridotomy at a tertiary care hospital in Pakistan (n=40).

Number	Angle grading at presentation	Angle grading at 6th month follow-up
22	Grade 0	Grade 3
18	Grade 1	Grade 3
Peripheral Anterior Synechiae		
4 eyes with PAS < 1/2 of angle	Grade 1	Grade 2

There was no closure of iridotomy at 6 months follow up. All 40 iridotomies were patent as judged by retroillumination. Regarding post laser appearance of the angle width, majority of the eyes with primary acute angle closure glaucoma, and prodromal angle closure glaucoma had their angles opened from Grade 0 and Grade I to Grade III and deepening of the anterior chamber (Table-2). Two eyes with PAS involving more than half of the angle did not show any improvement.

Majority of the eyes 30(75%) had a good control of the IOP at 6 months follow up period. Two patients (2eyes) who had PAS involving more than half of the angle did not show reduction in IOP and were eventually treated with trabeculectomy. Three patients out of 4 who had PAS involving less than half of the angle, showed slight reduction of IOP, with pressures of 27, 26, 28 mmHg respectively. They were prescribed topical beta blockers twice a day, which brought their pressures to 19-20 mm Hg.

The patients were followed up after one month, three months and six months. No serious complication occurred. Some minor and transient complications that occurred are given in Table-3.

Table-3: Complications of laser iridotomy using Argon laser followed by YAG laser at a tertiary care hospital in Pakistan (n=40 eyes).

Per-operative Complications	% Affected
Transient hyphaema	14 (35%)
Pain in the eye	2 (5%)
Corneal damage	2 (5%)
Pigment release	40 (100%)
2 hours post laser	
Transient rise of IOP	18 (45%)
Transient iritis	32 (80%)
Transient hyphaema	2 (5%)
One day post laser	
Transient iritis	22 (55%)
Transient rise of IOP*	13 (32.5%)
Transient hyphaema	4 (10%)
1 week post laser	
Transient iritis	1(2.5%)
Transient rise of IOP	1(2.5%)
Corneal damage	1(2.5%)
Posterior Synechiae Formation	1(2.5%)
Lens opacity	1 (2.5%)
Closure of iridotomy	Nil (0%)
hyphaema	Nil (0%)

*IOP: Intra Ocular pressure.

One patient developed corneal endothelial whitening during argon photocoagulation of the iris due to energy absorption by the endothelium. The lesion was small and did not affect corneal clarity or function. One patient developed posterior synechae at 12' clock meridian, detected in the 3rd day follow up. One patient developed anterior subcapsular lens opacity under the iridotomy site which was non progressive upto 6 months follow up.

Discussion

The Nd-YAG laser alone is most effective in light coloured irides.[5,10] Nd-YAG laser iridotomy alone is associated with high risk of failure and complications in dark irides.[3,4] It is complicated in up to 40% cases with iris haemorrhage.[11-14] The haemorrhage may be severe enough to postpone the procedure or repeat the iridotomy at an alternative site.[5]

The combined Argon and Nd: YAG technique is more appropriate for dark eyes, permitting utilizing advantages of both laser types and avoiding their disadvantages. It is possibly the ideal technique to use in Asian Irides.[5,6] The argon laser is used to thin the iris so that approximately 20% of the tissue remains. When this is accomplished, The Nd: Yag laser beam is then focused into the depth of the creator already made with the help of argon laser to complete the iridotomy requiring only a third of the corresponding power reported for pure YAG laser iridotomy.[15]

In our study all the the 40 iridotomies were patent at 6 months follow-up. Regarding post laser appearance of the angle width, majority of the eyes with primary acute angle closure glaucoma, and prodromal angle closure glaucoma had their angles opened from Grade 0 and Grade I to Grade III and deepening of the anterior chamber. Two eyes with PAS involving more than half of the angle did not show any improvement.

In our study over one third (35%) of the patients developed a transient micro hyphaema at the time of iridotomy and 45% patients developed transient rise of IOP at 2-6 hours post laser. No major iris haemorrhage occurred in our study, which is a known complication of YAG laser when used alone in dark eyes. Another study from Pakistan has reported hyphaema in 48% and post laser pressure rise in 14% of cases using YAG laser for iridotomy alone.[16] Other studies in USA have reported hyphaema in 45% cases.[11,17] The risk of iris haemorrhage decreases in combined Argon-Yag laser iridotomy due to less amount of total YAG energy requirement.[18] Another study from USA reported that argon laser pretreatment decreased intra-operative haemorrhage from 67% to 12%.[8]

Post laser anterior uveitis with anterior chamber reaction was noted in 32 (80%) eyes. In most of the cases it settled within 48-72 hours with topical steroids four times a day for 5 to 7 days. In one eye the anterior uveitis lasted for about 4 weeks.

Corneal endothelial damage was noted in 2 patients (5%) in our study. Both patients had suffered acute angle

closure attack with a very shallow anterior chamber and irido corneal contact. The lesions were small and self limiting and resolved with time. Proper focusing may minimize this problem. Studies have reported 4 to 35 % of eyes developing focal endothelial changes post YAG laser iridotomy.[12,14,19,20] High levels of energy required in dark iridies with Yag laser alone may also adversely affect the endothelial cell count.[19,21]

One patient developed a post laser anterior subcapsular lens opacity, under the iridotomy site, which was non progressive.

Formation of posterior synechae occurred in one patient only on the third post laser day. It was treated with a short acting mydriatic. Formation of posterior synechie is more common after Argon laser iridotomy alone. They can usually be prevented by dilating the pupil and treating the inflammation appropriately.[22]

There was a transient elevation of IOP in (45%) of our cases which was controlled with topical beta blockers. The average rise of IOP was 10 mmHg (range 4-20mmHg). This pressure spike resolved in almost all the patients within 2 weeks without any sequlea.

Conclusion

The combined Argon-Yag laser iridotomy is an effective technique to use in our population, because of the thicker and more heavily pigmented irides. It reduces the risk of iris haemorrhage and high patency is achieved after the primary treatment.

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