

Clinical Outcome after Nd: YAG Laser Iridotomy in Patients with Primary Angle Closure Glaucoma: A Hospital Based Study

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ABSTRACT

Purpose: To find out the clinical outcome of Nd: YAG Laser iridotomy in primary angle closure glaucoma (PACG).

Study Design: Descriptive case series.

Place and Duration of the Study: Prevention of Blindness Eye Hospital Karachi, from January 2021 to June 2021.

Methods: Patients of 30 to 60 years of age, either gender and diagnosed with primary angle closure glaucoma were included. After taking informed consent, complete examination including pre and post laser intra ocular pressures (IOP) was performed. Follow up was at 2 hours, 1 day and 1 week. Data was collected and analyzed using SPSS version 22. Effect modifiers like age, gender, pre-laser IOP were controlled through stratification. Post stratification Chi square test was applied for complications (raised IOP, iritis, hyphema, corneal damage, lens opacity and posterior synechie) and efficacy. $P \leq 0.05$ was considered significant.

Results: Mean age of the patients was 44.48 ± 7.28 . Stratification of age and gender with efficacy of Laser Peripheral Iridotomy (LPI) and early complications showed that there was no effect of age and gender on the results of LPI ($p > 0.05$). Mean pre laser IOP was 18.56 ± 5.28 and post laser IOP was 15.28 ± 4.62 . Lens opacity was found in 10 (5.15%), followed by hyphema in 9(4.63%), corneal damage 8 (4.12%), posterior synechie 5 (2.57%), iritis 7(3.60%), raised IOP in 6 (3.069%) patients.

Conclusion: It is to be concluded that Laser iridotomy is an effective treatment for PACG even in thicker and more heavily pigmented irides with few reversible side effects.

Key Words: Intra Ocular Pressure, Iridotomy, Primary Angle Closure Glaucoma and Efficacy.

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INTRODUCTION

Glaucoma is one of the leading causes of irreversible blindness.^{1,2} Peripheral iridotomy is the treatment of choice for angle closure glaucoma and has been extensively used for managing this blinding disease.³ Pakistani population with brown and thick irides make

it difficult for the laser to perform as more laser power is required for such eyes as compared to populations with light colored irides. Although Nd: YAG laser has easy iris penetration with lower chances of iridotomy occlusion but in dark irides it is associated with high risk of failure and complications, including iris hemorrhage which may lead to abandoning of the procedure.⁴ The modified technique of laser iridotomy using Argon and Nd: YAG laser has benefits of both lasers and avoids complications. In dark Asian irides, it is probably the best technique to be used.⁵ Previous studies show that 76.5% eyes had IOP reduction of more than 8 mmHg.⁶ Complications included; raised

IOP in 45%, iritis in 80% and hyphema in 5%, 2 hours post laser.⁶ After one day, raised IOP was seen in 22%, iritis in 13% and hyphema in 4%.

The probability for achieving a significant IOP reduction with laser peripheral iridotomy (LPI) is high in patients with early or moderate Primary Angle Closure Glaucoma (PACG) and those with primary angle closure and IOP over 30 mmHg.⁷ LPI alters anterior chamber anatomy with posterior movement of lens-iris diaphragm and minimizing the chances of future angle closure attack.⁸

This study was done to see the effects of LPI in PACG in thick and dark irides in our prevention of blindness center.

METHODS

A total of 194 patients were selected from Out Patient Department of Prevention of Blindness hospital, Karachi. Inclusion criteria was age between 30 and 60 years, both males and females with raised IOP caused by PACG and diagnosed by slit lamp examination, gonioscopy and visual fields. The study was approved by the ethical committee of the institution. After taking informed consent, pre laser IOP was measured with Applanation Tonometer. LPI was performed and IOP was re-assessed at 2 hours, 1 day and 1 week post laser.

Data was analyzed using SPSS version 22. The quantitative variables (age, pre and post laser IOP) were presented by mean and standard deviation, frequency and percentages were calculated for qualitative variables like gender, efficacy and complications i.e. (raised IOP, iritis, hyphema, corneal damage, lens opacity and posterior synechie). Effect modifiers like age, gender, pre-laser IOP were controlled through stratification. Post stratification Chi square test was applied for complications (raised IOP, iritis, hyphema, corneal damage, lens opacity and posterior synechie) and efficacy. $P \leq 0.05$ was considered significant.

RESULTS

Mean age of the patients was 44.48 ± 7.28 . Stratification of age and gender with efficacy of LPI and early complications is shown in Table 1. There was no effect of age and gender on the results of LPI ($p > 0.05$). Mean pre laser IOP was 18.56 ± 5.28 and post laser IOP was 15.28 ± 4.62 . Lens opacity was found in 10 (5.15%), followed by hyphema in 9 (4.63%), corneal damage 8 (4.12%), posterior synechie 5 (2.57%), iritis 7 (3.60%), raised IOP in 6 (3.069%) patients (Table 2).

Table 1: Stratification of Age Group and Gender with Efficacy of LPI.

Age Group (in Years)	Efficacy of Laser		P-value	Gender	Efficacy of Laser		P-value
	Yes	No			Yes	No	
30-45	90 (75.0%)	30 (25.0%)	0.262	Male	85 (73.3%)	31 (26.7%)	0.674
>45.	50 (67.6%)	24 (32.4%)		Female	55 (70.5%)	23 (29.5%)	

n = 194

Table 2: Stratification and Frequency of Pre-laser IOP with Early Complication of LPI n = 194.

Early Complications		Pre-Laser IOP		P-Value	Frequency (%)
		12–18	> 18		
Raised IOP	Yes	4 (30%)	2 (34%)	1000	6 (3.09%)
	No	131 (97%)	57 (96.6%)		
IRITIS	Yes	1 (0.7%)	6 (10.2%)	0.003	7 (3.60%)
	No	134 (99.3%)	53 (89.8%)		
Hyphema	Yes	2 (15%)	7 (119%)	0.004	9 (4.63%)
	No	133 (98.5%)	52 (88.1%)		
Corneal Damage	Yes	3 (22%)	5 (8.5%)	0.057	8 (4.12%)
	No	132 (97.8%)	54 (91.5%)		
Lenoplasty	Yes	6 (4.4%)	4 (6.8%)	0.496	10 (5.15%)
	No	129 (95.6%)	55 (93.2%)		
Posterior Synechie	Yes	2 (1.5%)	3 (5.1%)	0.166	5 (2.57%)
	No	133 (98.5%)	56 (949%)		

DISCUSSION

PACG accounts for almost half of the patients of primary glaucoma worldwide.⁹ In East Asia, PACG is one of the most frequent type of glaucoma. According to one study, prevalence of PACG was considerably higher in southwestern rural island of Japan than in the Japanese mainland or other countries.⁹ In the medicare beneficiaries, number of laser iridotomies was fairly consistent between 1994 – 2012, increasing 9% over this period and ranging from 63 773 to 85 426.¹⁰ The Progression rate to Primary angle closure in untreated eyes is recorded to be 3.75% as compared to 2.5% in treated eyes.¹¹

In countries such as Pakistan, which lack in basic health care, the resources required for screening and treatment of PACG are far too much to look for. In these situations, even frequent examination of the patients is not realistic. Prescribing medication such as anti-glaucoma medications is far too much to ask for. Here comes the significance of looking for treatment options in which patients donot need to be followed frequently and they donot require expensive anti-glaucoma medications as well. In cases of primary angle closure glaucoma, such treatment option with onetime treatment, no frequent follow ups and no need of expensive anti-glaucoma medication required would be in the form of laser iridotomy. Some cases might need further treatment in the form of topical medications and filtration glaucoma surgery but most of the patients neither require topical medications nor any further surgical treatment.

LPI works by relieving the relative pupillary block. However, PACG can also occur by non-pupillary block mechanism where LPI might not be as effective. The degree of benefit conferred by LPI is not clear. When compared with the Argon laser, YAG laser resulted in much less closure rate. When compared with the surgical iridectomy, LPI is safe with respect to visual dysphotopsias regardless of location, LPI size, and amount of laser energy used.^{12,13}

With much higher energy levels, iritis, corneal burns, reduction in endothelial cell count and hemorrhage may occur. In our study, all these complications were noted. However, we did not measure the endothelial cell count after LPI. Higher energy levels were specially needed in patients with dark irides. Diplopia is also reported after LPI but not observed in our series. Diplopia is associated with the

location of iridotomy done. The more peripheral the iridotomy, lesser are the chances of diplopia but more frequency of endothelial damage. In one study, the mean rate of endothelial cell loss was 0.3% per year.¹⁴ In another study, eyes with chronic PACG had a lower specular count compared with age-matched controls.¹⁵

A recent study has shown that development of primary angle closure disease in primary angle closure suspect was 4.19 per 1000 eye-years in treated eyes compared with 7.97 per 1000 eye-years in untreated eyes.¹⁶ Thus, proving the positive effects of performing prophylactic LPI.

New techniques have been employed and one of these is the use of PASCAL. According to Chung et al, endothelial cell count decreased by 0.88% in the PASCAL group versus 6.72% in the conventional laser group (P = 0.044).¹⁷

Some researchers have also studied the mean iridocorneal angle widening. Mansoori et al reported this widening from $33.38 \pm 3.96^\circ$ to $34.82 \pm 4.27^\circ$ (p = 0.01), compared with pre-iridotomy status.¹⁸ Widening of angle is one of the factors for lowering of IOP. In our study, iridotomy was effective in lowering IOP greater than 8mm Hg in 35.7% of patients which improved to 59.1% after 1 week and finally to 76.5%.

At initial follow up IOP might be raised to due iris debris blocking trabecular meshwork. In this particular study, only 1.74% of patients had high IOP one day after LPI which reduced to 0.87% after one week. Macular hole after LPI is also reported in literature.¹⁹ In our study, no such complication was noted. Post laser iritis is controlled with anti-inflammatory drugs. Studies comparing the role of NSAID versus prednisolone eye drops have shown non-inferior results of NSAID.²⁰ We used topical steroids which were effective in controlling post laser iritis.

The main limitation of our study was that it was performed in a single centre, ethnic variability was not considered. Further studies can be carried out to compare the energy used for LPI in different ethnic groups.

CONCLUSION

It is to be concluded that Laser iridotomy is an effective treatment for PACG even in thicker and more heavily pigmented irides with few reversible side effects.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board (**POBEH/ERC/2022/01-001**).

Conflict of Interest: Authors declared no conflict of interest.

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Authors Designation and Contribution

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Zakaullah Gopang; Senior Registrar: *Statistical analysis.*

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