

# Laser Iridotomy in Pupillary Block Angle Closure Glaucoma

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## Abstract

**Background:** Glaucoma is a chronic Progressive multifactorial optic Neuropathy. Pupillary block is the most common mechanism leading to acute angle closure glaucoma. Nd:YAG Laser Iridotomy has been shown to be an effective primary therapy for early Primary Angle Closure Glaucoma with pupillary block as it eliminates the relative pupillary block. **Aim:** To assess the outcome of Nd : YAG laser Peripheral iridotomy in treatment of pupillary block Angle Closure Glaucoma. **Material and Methods:** Sixty patients diagnosed with pupillary block Angle closure Glaucoma were prospectively enrolled into the study. Intra ocular pressure changes, Peripheral Anterior Chamber Depth and Gonioscopic changes after Nd:YAG laser peripheral Iridotomy were recorded in all patients, data collected was analysed statistically. **Results:** Maximum patients were in the age group of 41 – 60 years. All patients diagnosed with Primary Angle Closure Glaucoma were treated with Nd: YAG laser iridotomy with an average 10 MJ of energy. IOP was controlled ( $\leq 21$  mm Hg) in 50 (83.3%) patients at 4<sup>th</sup> week of post laser iridotomy follow up. Peripheral anterior chamber depth increased to grade 3 and grade 4 in 80% of patients at 4<sup>th</sup> week follow up, PACD remained shallow (Grade 1 and Grade 2) in 12 (20%) patients change in PACD was statistically significant. ( $p < 0.01$ ). Post laser Iridotomy angles opened in 86.6% of patients at 4<sup>th</sup> week follow up. Complications like IOP spikes were seen in 36.6 % of patients, Iris bleeding was seen in 20 % of patients and anterior uveitis in 13.3 % of patients after Iridotomy. 28(93.3 %) cases had patent Iridotomy and 2 (6.6 %) had closed Iridotomy during follow up. **Conclusion:** Nd :YAG laser peripheral Iridotomy has a profound positive impact on the treatment outcome of pupillary block Primary Angle Closure Glaucoma. Early detection of eyes at risk of Angle closure will increase the probability of success of a laser Iridotomy.

**Key Words:** Pupillary Block, Angle Closure Glaucoma; Nd:YAG laser, Peripheral Iridotomy ; Intra Ocular Pressure

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## INTRODUCTION

Glaucoma is a chronic progressive multifactorial Optic neuropathy caused by a group of ocular conditions which damage the optic nerve with a resultant loss of visual function.<sup>1</sup> 60 million people are with glaucoma worldwide and more than 20 million have Primary Angle Closure Glaucoma, 47 % of the glaucoma worldwide

would be in Asia with more than 75% being Angle Closure.<sup>2,3</sup> Primary angle closure glaucoma is a condition in which elevation of IOP occurs as a result of obstruction of aqueous outflow by partial or complete closure of the angle by peripheral Iris. Functional pupillary block is the most common cause of Angle closure glaucoma. Clinically angle structures can be visualized by gonioscopic examination. Laser Iridotomy has been shown to be effective primary therapy for early Primary Angle Closure Glaucoma. Keeping these aspects in view, present study aims to study the outcome of Nd :YAG laser Iridotomy in the management of pupillary block Primary Angle Closure Glaucoma and its Post Iridotomy complications.

## MATERIAL AND METHODS

It was a prospective cross-sectional study which included 60 Primary Angle Closure Glaucoma patients who reported to the Department of Ophthalmology at rural

tertiary care hospital in Nalgonda District. Study was conducted during October 2018 to December 2019. All patients diagnosed as Pupillary block Angle Closure Glaucoma were included in the study. Patients with Secondary Angle closure Glaucoma, Neovascular Glaucoma, Eyes with Peripheral Anterior Syneciae, Corneal edema were excluded from the study. Detailed ocular Examination was done in each Patient which included, Visual acuity testing, Slit lamp examination for (Peripheral Anterior Chamber Depth - PACD), Intra Ocular Pressure (IOP) measurement with Applanation Tonometry (average of 3 reading), Gonioscopic examination with 4 Mirror Indirect Goniolens,

Indentation Gonioscopy was done to rule out Peripheral anterior Syneciae , Fundus examination was done to assess Optic neuropathy , Automated Perimetry was performed to assess Visual fields defects. All cases with pupillary block angle closure glaucoma were subjected to Nd YAG Laser peripheral iridotomy, number of laser pulses and the total energy used was recorded. Patients were closely followed up for any Post-laser complications and managed accordingly. IOP, Peripheral anterior chamber depth and Gonioscopic angle changes were recorded at one hour after the procedure and during further follow up at first week, second week and fourth week.

## RESULTS

**Table 1:** Age wise distribution of study population (n=60)

Age	Number of patients	Percentage
≤20	0	0%
21-40	6	10%
41-60	44	73.3%
61-80	10	16.6%
<b>Total</b>	<b>60</b>	<b>100%</b>

In our study 73.3% of patients were in age group 40 to 60 years of age

**Gender distribution:** In present study total of 60 patients, 44 (64%) patients were Female and 16 (36%) were Male, indicating a Female : Male ratio of 2.75 : 1.0 , suggestive of female preponderance.

**Table 2:** Intra Ocular Pressure changes- Pre and Post Laser Iridotomy (n=60)

IOP range (mm Hg)	Pre laser	Post laser (1 hr)	Post laser (1 week)	Post laser (2 weeks)	Post laser (4 weeks)
14-17	-	-	8	12	12
18-21	-	12	36	36	38
22-25	-	16	6	4	2
26-29	36	20	6	4	4
30-33	14	12	4	4	4
34-37	6	-	-	-	-
38-41	4	-	-	-	-
<b>P value</b>			<b>&lt; 0.001</b>		

There was decrease in IOP in all cases who underwent laser peripheral iridotomy as compared to their respective initial IOP levels recorded at the time of presentation. Mean range of drop in IOP was 8-10 mmHg. IOP was controlled ( $\leq 21$  mm Hg) in 50 (83.3%) patients at 4<sup>th</sup> week of post laser iridotomy follow up. Drop in IOP was statistically significant ( $p < 0.01$ ). 10 cases had raised IOP even after 4 weeks of follow up which required intervention.

**Table 3:** Peripheral Anterior Chamber Depth (PACD) Changes: Pre and Post Iridotomy (n=60)

PACD	Pre Laser	Post laser (1 week)	Post Laser (2 weeks)	Post Laser (4 weeks)
Grade 1	28	6	4	4
Grade 2	32	8	10	8
Grade 3	0	34	36	38
Grade 4	0	12	10	10
<b>P-value</b>			<b>&lt; 0.001</b>	

Peripheral anterior chamber depth increased to Grade 3 and Grade 4 in 80% of patients at 4<sup>th</sup> week follow up. Change in PACD was statistically significant. ( $p < 0.01$ ). PACD remained shallow (Grade 1 and Grade 2) in 12 patients (20%).

**Table 4 :** Gonioscopic changes Pre and Post Nd:YAG Laser ( n=60)

Shaffers Grade	Pre laser	Post laser (2 weeks)	Post laser (4 weeks)	Post laser (6 weeks)
IV	0	0	0	0
III	0	16	16	16
II	0	30	32	36
I	36	8	6	4
0	24	6	6	4
<b>P-value</b>			<0.001	

Post laser Iridotomy, gonioscopic Anterior chamber angles opened to grade II and III in 86.6% of patients at 4<sup>th</sup> week follow up. Change in angle was statistically significant (P < 0.01). In 8 (13.4%) patients angle remained narrow or closed after 6 weeks, these patients were taken for trabeculectomy for control of IOP.

**Energy used:** In present study 6 -10 MJ energy was used for iridotomy in 70 % of patients, 11-15 M J energy in 23.3% of patients and (6.6%) patients needed 16 – 20 MJ of energy.

**Table 5:** Complications of Nd -YAG Laser iridotomy (n=60)

Complication	Number of patients	Percentage (%)
Iris bleeding	12	20%
IOP spike	22	36.6%
Anterior uveitis	8	13.3%

Transient IOP spikes were seen in 36.6% of patients, iris bleeding was encountered in 20% of patients and anterior uveitis was seen in 13.3% of patients all the complications were managed as per protocol accordingly.

#### Patency of Laser Peripheral Iridotomies at 6 weeks (n=60)

In the present study 56 out of 60 (93.3%) patients had patent iridotomy during 4 weeks follow up and in 4 (6.6%) patients iridotomy hole was closed who presented with shallow anterior chamber and narrow angles.

## DISCUSSION

Laser Peripheral Iridotomy is considered as the first line of management in patients with Acute Angle Closure Glaucoma<sup>4</sup>. This method has also been suggested as the preventive treatment option in eliminating the risk of recurrent acute attacks.<sup>5,6</sup> In present study, we aimed to investigate the efficacy of laser peripheral iridotomy as initial management of primary Angle closure glaucoma where pupillary block is the main mechanism involved. This study showed significant decrease in Intra ocular pressure and increase in Peripheral anterior chamber depth after Laser Peripheral Iridotomy. Furthermore, Iridotomy resulted in significant widening of the angle in four quadrants based on the gonioscopic examination.

**Age:** In our study maximum patients were in the age group of 40 to 60 years consisting 73% of study population. The results of our study were similar to studies done by Savita Bhat *et al*<sup>7</sup>, Fu J *et al*<sup>8</sup>. Studies from European community prove incidence of angle closure is more between 50-70 years group which is similar to studies conducted by How AC *et al*<sup>9</sup>, K Lei *et al*<sup>10</sup>, Singh P *et al*<sup>11</sup>.

**Gender:** out of 60 patients included in the study, 44 (64%) were females and 16(36%) were males with a Female Male ratio of 2.75 : 1.0, suggestive of female preponderance, this was similar to studies done by How AC *et al*<sup>9</sup>, K Lei *et al*<sup>10</sup>, Singh P *et al*<sup>11</sup>.

**Intra ocular pressure:** In the present study, 60% of patients had IOP in range of 26-29 mm Hg, 23.3% patients have IOP in range of 30-33mm Hg, 10% patients have IOP in range of 34-37mm Hg and 6.6% patients have IOP in range of 38-41mm Hg. There was significant decrease in IOP in all cases who underwent laser peripheral iridotomy. Mean range of drop in IOP was 8-10 mmHg. IOP was controlled ( $\leq$  21 mm Hg) in 50 (83.3%) patients at 4<sup>th</sup> week of post laser iridotomy follow up. 10 cases had persistent raised IOP after 4 weeks of follow up who required intervention. Drop in IOP was statistically significant (p<0.01) These findings correlate with study done by Jovina L S See *et al*.<sup>12</sup> Which showed that in 72% patients IOP got controlled with iridotomy. AAO publication 2007, showed 86.7% patient's IOP got controlled with Iridotomy.<sup>13</sup>

**Anterior chamber depth:** In present study Peripheral anterior chamber depth increased to Grade 3 and Grade 4 in 80% of patients at 4<sup>th</sup> week follow up, change in PACD was statistically significant (p<0.01). PACD remained shallow (Grade 1 and Grade 2) in 12(20%) of patients., similar results were seen in study done by He M Friedman DS.<sup>6</sup> Alireza Esmaeili *et al*.<sup>14</sup>

#### COMPLICATIONS:

**a) Transient rise in intra ocular pressure:** In present study, IOP spikes were seen in 36.7% of patients at 1 Hour post laser iridotomy which is similar to studies

conducted by N Naveh *et al*<sup>15</sup>*et al.* **b) Iris bleeding:** In the present study, minimal bleeding from the iridotomy site was seen in 16.7% of patients. It is a common complication but is rarely serious. These findings were similar to the studies conducted by N Naveh *et al.*<sup>15</sup> **C) Anterior uveitis:** In present study 4(13.3%) patients have been reported with mild iritis. There is no evidence of iritis in other studies like N Naveh *et al.*<sup>15</sup>. **Patency of Nd:YAG iridotomy :** In present study, 56(93.3%) patients showed patent iridotomy during follow up and this is similar to study by Nolan *et al*<sup>16</sup> in which patent iridotomies were seen in 157 out of 160 eyes treated (98.1%).

## CONCLUSION

In present study we conclude that primary Angle Closure Glaucoma is most common in the age group of 40-60 years and females are affected more than males. After Nd:YAG Laser Peripheral Iridotomy, there is significant decrease in intra ocular pressure, increase in Peripheral Anterior Chamber Depth and gonioscopic angle. IOP spike is the most common complication followed by iris bleeding. Nd:YAG Laser Peripheral Iridotomy is an effective procedure in initial treatment of Pupillary Block Angle Closure Glaucoma.

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