

## ORIGINAL ARTICLE

### EFFECTIVENESS OF ND YAG LASER IRIDOTOMY IN PATIENTS WITH PRIMARY ANGLE CLOSURE GLAUCOMA

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**ABSTRACT:** Primary angle closure glaucoma causes elevation of intra ocular pressure (IOP) due to obstruction to aqueous outflow by partial or complete closure of angle by iris. Apart from medical management with topical drugs and filtration surgery, laser iridotomy is an effective primary treatment option in cases with primary angle closure. The present study was carried out in 81 patients presented with PACS, PAC and PACG who had Nd YAG laser iridotomy averaging 20 mj spread over 6 shots and also as prophylaxis in fellow eyes of patients with PACS and PAC. 93% of the patients with PAC and 71% of the patients with PACS had good control of IOP and none developed glaucomatous optic neuropathy. The complications were minimal and managed with medical treatment. Nd YAG laser iridotomy is safe and minimally invasive procedure with least complications in our experience and follow up observations included uniformly good control of IOP and stable visual fields.

**KEYWORDS:** Glaucoma, Nd YAG Laser, IOP.

**INTRODUCTION:** Primary angle closure glaucoma (PACG) results from obstruction to aqueous outflow by partial or complete closure of angle by peripheral iris, causing elevation in intra ocular pressure (IOP). PACG is common in Indian population and diagnosis requires evaluation of anterior segment by slit lamp examination and evaluation of angle structures by gonioscopy.

Apart from medical management with topical drugs and filtration surgery, laser iridotomy is an effective primary treatment option in cases with primary angle closure. Eyes with angle closure have shallow anterior chamber and anteriorly positioned lens when compared to normal eyes. Iridotomy acts by eliminating relative pupillary block<sup>1</sup> which is one of the important mechanism in production of angle closure. In the present study, Nd Yag laser iridotomy is done in patients with primary angle closure suspect and primary angle closure. The effectiveness of iridotomy in controlling intra ocular pressure was demonstrated and the anatomical changes that take part in the anterior chamber following iridotomy are discussed. Role of prophylactic iridotomy in fellow eye with angle closure suspect is evaluated and the outcomes are presented.

**MATERIAL AND METHODS:** The present study includes Nd Yag laser iridotomy done in 146 eyes in 81 patients, during the period between July 2005 to 2006. Increase in the intraocular pressure in primary angle closure patients, early cases of primary angle closure glaucoma and occludable angle on gonioscopy were the indications. Patients with complete synechial angle closure, glaucomatous optic atrophy and secondary causes for angle closure glaucoma were excluded from the study.

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Examination of the patients includes visual acuity by Snellen's chart, slit lamp examination, and visual field evaluation with Humphrey automated field analyzer. On slit lamp examination, if the distance between the posterior corneal surface and anterior iris is less than one fourth of corneal thickness (Von Herick method), the eyes were subjected to applanation tonometry to measure IOP and 4 mirror gonioscopy to evaluate the angle structures in particular to assess the presence or absence of peripheral anterior synechiae in each quadrant and to distinguish from that of synchial angle closure by indentation. Optic nerve evaluation was performed with 90 D lens with slit lamp biomicroscopy. A-scan was done to measure the anterior chamber depth, lens thickness, axial length and keratometry was also done for evaluation of corneal curvatures and pachymetry for corneal thickness.

Eyes with iridotrabecular contact  $180^{\circ}$  on gonioscopy, no peripheral anterior synechiae (PAS) and normal IOP were recorded as primary angle closure suspects. Eyes with occludable angle, peripheral anterior synechiae and increased IOP were recorded as primary angle closure. Eyes with  $180^{\circ}$ - $270^{\circ}$  PAS, raised IOP, visual field defect, and glaucomatous optic neuropathy were recorded as primary angle closure glaucoma.

Procedure of Nd Yag iridotomy starts with constriction of pupil with 2% pilocarpine eye drops 1hour before the procedure, this puts the iris on stretch and makes creation of hole easy. The eye is anaesthetized with topical 4% xylocaine eye drops. Abraham's iridotomy contact lens with methylcellulose which acts as a coupling agent is placed over the cornea. This lens increases the magnification and helps to project the laser beam accurately. The patient is instructed to look down as laser beam is applied to iris. Once the laser has penetrated the iris, iris material bursts through the opening. Full thickness perforation was confirmed when aqueous moves from posterior chamber to anterior chamber with pigment dispersion. At this point, anterior part of the lens capsule can be seen through the opening. Iridotomy is performed on the crypts of iris at 11 or 1o'clock position so that the iris hole is covered by upper eye lid. The power settings are 4-6 mj(depends upon iris colour) and bursts are 1-4 pulses/ shot. Initial setting was 2mj and gradually increased to 6mj until iris was fully perforated. An iridotomy of 0.3mm was achieved. After iridotomy, gonioscopy was done to assess the angle width. Aftercare includes checking IOP every hour for 4 hours and again after 24 hours. Topical steroids are used for control of local inflammation. Patients with occludable angle on 4mirror gonioscopy were treated with Nd Yag laser iridotomy. These patients for were reexamined for patency of iridotomy, IOP, visual acuity, and gonioscopy finding were recorded. Iridotomy is unsuccessful if visual loss is  $<3/60$  from glaucomatous optic trophy or IOP was not controlled. Patients are examined every week for 2 weeks post laser, for complications. Finally visual field evaluation is done to determine the extent of damage to optic nerve during the follow up.

### **OBSERVATIONS AND RESULTS:** The following age and sex incidence is noted.

Age (years)	Male	Female	Total
31-40	0	3	3
41-50	10	22	32
51-60	12	19	31

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61-70	3	12	15
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Table 1: Age incidence

Total number of males was 25 and females were 56 in the present series.

The initial diagnosis in patients who had iridotomy were illustrated in table no. 2.

Diagnosis	number
Primary angle closure suspects	21
Primary angle closure	46
Primary angle closure glaucoma	14
Total no. of cases	81

Table 2: Initial diagnosis

The IOP readings before iridotomy were as follows, in table no. 3.

IOP	No. of cases
10-20	9
21-30	55
31-40	15
41-50	2

Table 3: IOP readings before iridotomy

Table no 4 shows IOP readings post iridotomy.

IOP	No. of cases
10-20	59
21-30	15
31-40	5
41-50	2

Table 4: IOP readings after iridotomy

The complications are mentioned in table no. 4.

Complication	No. of cases
Transient raise of IOP	31(38%)
Aqueous flare/ debris	29(36%)
Bleeding of iris	15(19%)
Corneal burns	4(5%)
Lens damage	3(4%)

Table 5: Complications

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**DISCUSSION:** Present study included 146 eyes of 81 patients with primary angle closure, attending Regional Eye Hospital, Kurnool during the period of July 2005 to 2006. In all after thorough evaluation, Nd Yag laser iridotomy was done. Average follow up period was 6 months. Subjects with complete synechial angle closure and glaucomatous optic atrophy were excluded from the study.

In our study most of the patients were 40-60yrs of age group (n=63). Studies from European community prove the incidence of angle closure is more between 50-70yrs. Thus angle closure occurs a decade earlier in the present study. Among the patients included in the study 56(69.1%) were females and 25(27.74%) were males with a ratio of 2.3:1, female to male preponderance.

In the present study, 46 patients presented with primary angle closure, 14 presented with primary angle closure with glaucomatous optic neuropathy and 21 were primary angle closure suspects.

Average amount of laser required was 20mj. Spread over 6 shots.

Definite improvement on gonioscopy two Shaffer's grades of angle of anterior chamber was observed in 65% of our cases and one grade improvement in 25% of cases. In patients with PAS in 3 quadrants of the anterior chamber angle, there was little improvement, in 10% of cases.

IOP control was achieved in 43(93%) of PAC patients in the present study with stable visual acuities. 17(71%) of 14 PACG patients also had good IOP control. All the PACS eyes and in all the fellow eyes prophylactic iridotomies were done with good IOP control. No eye developed glaucomatous optic neuropathy in the follow up.

In the present study, 7 patients presented with uncontrolled raised IOP. Among them, 5 had PAS in more than 3 quadrants of angle structures and 2 had PAS in more than 2 quadrants. All had treatment with filtration surgeries, trabeculectomy in 3 and 3 had combined procedure.

The patency of iridotomy hole was checked during the follow up.<sup>2</sup> Present study showed 6 patients with closed holes and most of them were found occluded in a period of 4-8 weeks post-operative time. A second iridotomy was carried out in all these patients. In a study by Jiang ye at Human Medical University,<sup>3</sup> Changsha, iridotomy hole was seen closed in 6% of the eyes at 6 months follow up.

The complications observed in our study included transiently elevated IOP in 31(38%) patients and iris bleed was observed in 15(19%). This increased incidence of complications may be attributable to requirement of high laser energy for dark brown Indian iridis. The incidence of other complications like corneal burns, aqueous flares, pigment dispersion were infrequent. Corneal burns were treated with pad and bandage, and mild iritis required topical steroids for 3 to 4 days. In a study by Hsiao Ch, Hsu CT, Shen et al,<sup>4</sup> transient elevation of IOP was observed in 23.5% of patients and iris bleed in 12.2% of patients.

In the present study, 30% of the eyes with glaucomatous optic neuropathy and 7% of the eyes with primary angle closure were classified as failures in controlling IOP and maintaining stable or improvement in visual acuity. These cases required filtration surgeries. In a study on primary angle closure in east asian eyes by Nolan et al<sup>5</sup> 47% eyes with glaucomatous optic neuropathy and 4% of eyes with primary angle closure were classified as failures and were subjected to filtration surgeries.

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**SUMMARY AND CONCLUSIONS:** Nd yag laser iridotomy was performed in 146 eyes of 81 patients in the present study, among which, 14 were PACG, 46 were PAC and 21 were PACS cases. All the patients were subjected to Nd YAG laser iridotomy after controlling initial raised intra ocular pressure with an average of total 20 mj shots. The present study has female preponderance and most of the patients belonged to 4<sup>th</sup> to 6<sup>th</sup> decade. Observations revealed that IOP was controlled well in 71% of the patients with PACS and 93% of the cases with PAC. All the PACS suspects group and the fellow eyes of PAC and PACS groups were treated with prophylactic YAG laser iridotomy. The complications were minor, transient elevation of IOP being frequent. In the present study, Nd YAG laser iridotomy proved to be effective in widening the drainage angle and reducing elevated IOP in primary angle closure patients suggesting that pupil block is a significant mechanism causing closure of the angle in the present series and Nd YAG laser iridotomy appears to be effective and safe procedure with minimum complications.

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