Prescription Rates of Laser Peripheral Iridotomy and Its Outcome in Angle Closure Suspects in a Tertiary Hospital in Dakshina Kannada - A Retrospective Study

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ABSTRACT

BACKGROUND

Primary angle-closure glaucoma affects 20 million people worldwide. There is a significantly high incidence of PACG in India, which forms almost half of all adult primary glaucoma seen in a hospital setting. The primary angle closure suspects (PACS) are defined as patients with narrow angles with no evidence of glaucoma or damage to the angle. Half of those blind from glaucoma are due to angle-closure disease. Not all PACS need LPI, as the incidence of acute angle closure in angle closure suspects is not very high according to a few studies. Some studies have shown that LPI may not necessarily widen the angle following iridotomy. We wanted to study the completeness of the pre- and post-procedure evaluation of PACS in terms of gonioscopy and tonometry and the prescription and treatment rate of Nd YAG LPI and its complications in a tertiary hospital.

METHODS

This is a retrospective analysis of medical case records of patients with angle closure suspects. Data was retrieved from hospital EMR and also from the glaucoma specialty clinics registry. Only PACS were included where at least two quadrants of posterior trabecular meshwork were not visible with normal IOP and with no peripheral anterior synechiae. PAC, PACG, secondary angle closures and all open angle glaucomas were excluded.

RESULTS

61 records were included for analysis. 38 (62%) were females and 56 (92%) were bilateral. The pre- and post-procedure IOP performed were 82% and 90% respectively, and gonioscopy performed were 87% and 77% respectively. 53 (86%) were advised LPI and 25 (71.5%) underwent the same immediately.

CONCLUSIONS

The pre-procedure tonometry and post procedure gonioscopy rates confirming the state of angle anatomy and patency of iridotomy were not satisfactory. The rate of LPI prescription was high. Majority of patients underwent LPI immediately on prescription. Hyphema was the only complication documented.

KEYWORDS

Primary Angle Closure Suspect, Laser Peripheral Iridotomy, Gonioscopy, Tonometry, Hyphema

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Primary angle-closure glaucoma affects 20 million people worldwide. Angle-closure glaucoma is characterized by narrowing or closure of the anterior chamber angle. This leads to increased IOP and damage to the optic nerve. Angle-closure glaucoma is divided into two main groups; Primary angle-closure where patients are anatomically predisposed to this type of glaucoma and there is no identifiable secondary cause. Secondary angle-closure where a secondary process is responsible for narrowing or closure of the anterior chamber angle. The Primary angle closure suspects (PACS) are defined as patients with narrow angles ≥180 degrees Irido-Trabecular Contact (ITC) with no evidence of glaucoma or damage to the angle (that is, no elevated IOP or peripheral anterior synchia). Primary angle closure (PAC) are defined as ≥180 degrees ITC with peripheral anterior synchia (PAS) or elevated IOP, but no optic neuropathy and Primary angle closure glaucoma (PACG) as ≥180 degrees ITC with PAS, elevated IOP, and optic neuropathy. People with primary angle closure suspects have a higher but poorly measured risk of developing glaucoma.

The incidence of PACG in India is significantly high, it contributes to almost half of all adult primary glaucomas seen in a hospital setting. In Indian population-based studies, the prevalence of PACG varies in different surveys according to the methodology and the age of the patients that were included. If not properly treated PACG can result in blindness. Although angle closure disease contributes to only 25% of any glaucoma detected half of those blind from glaucoma are due to angle-closure disease. Risk of blindness is almost three folds higher than in open-angle glaucoma (OAG). Early detection and appropriate management of angle closure disease poses a challenging task, especially in the developing world. However not all PACS need LPI, as the incidence of acute angle closure in angle closure suspects is not very high according to a few studies.

Gonioscopy is an essential for the diagnosis of PACS. For the flashlight test the sensitivity was 45.5% and the specificity was 82.7%. For the Van Herick’s test, it was 61.9% and 89.3%. In conditions where good gonioscopy is not possible, anterior chamber depth assessment and pupillary ruff evaluation may highlight angle closure. When needed dark room prone provocative test (DRPPT), can also be performed with any tonometer. LPI may not widen the angle post procedure as 80% of the eyes with narrow angles have gonioscopic residual angle closure following iridotomy. Hence post op evaluation in the form of gonioscopy to check the opening of angles and patency of iridotomy and measurement of IOP becomes important.

We wanted to study the completeness of the pre- and post-procedure evaluation of PACS in terms of gonioscopy and tonometry evaluate the prescription and treatment rate of Nd YAG LPI and its complications in a tertiary hospital.

Retrospective analysis of medical case records of patients with angle closure suspects. Ethics committee clearance was obtained for the same (Letter No. YEC2/336) Data was retrieved from hospital EMR using ICD coding (H40.069) and also from the glaucoma specialty clinics registry.

Inclusion Criteria
Patients with the documented diagnosis of primary angle closure suspects were included.

Exclusion Criteria
Primary angle closure, primary angle closure glaucoma, Secondary angle closure glaucoma, open angle glaucoma, secondary glaucoma

Demographic data including age, gender was noted. Documentation of the performance of pre laser tonometry and gonioscopy as well as post laser tonometry and gonioscopy was noted. Prescription rate is the frequency of advising LPI as a modality for the management of angle closure suspects. The advice given for the management of angle closure suspects was noted as observation/close follow up or laser PI or surgical PI/ cataract surgery. The complications of LPI if documented were noted. The duration between the advice and performance of PI was noted. For the purpose of this study if 90% of participants had undergone a procedure (tonometry/gonioscopy) it was considered satisfactory. Descriptive statistics in the form of mean, percentages were used.

86 medical records were retrieved however only 61 records were included for analysis due to incomplete data entry or wrong diagnosis. Female predominance was apparent and most cases were bilateral (Table 1). For the purpose of analysis in bilateral cases the right eye was considered and in unilateral cases the affected eye was used for analysis.

### Results

| Gender Distribution | No. % (n=61) |
|---------------------|--------------|
| Males              | 23 (38%)     |
| Females            | 38 (62%)     |
| Unilateral         | 5 (08%)      |
| Bilateral          | 56 (92%)     |

**Table 1. Gender and Laterality Distribution**

| Procedure Evaluation | Pre-Procedure | Post-Procedure |
|----------------------|--------------|---------------|
| IOP                  | 50 (82%)     | 55 (90%)      |
| Gonioscopy           | 53 (87%)     | 47 (77%)      |

**Table 2. Shows the Pre- and Post-Procedural Evaluation Performed on The Patients**

| Procedure | Observation and Close Follow-up | Surgical PI | Cataract Surgery |
|-----------|---------------------------------|-------------|-----------------|
| LPI       | 53 (86%)                        | 0           | 4 (6.5%)        |

**Table 3. Showing the Treatment Pattern Advised for the Management of PACS (n=61)**
Out of 53 patients who were advised LPI only 35 underwent the procedure. Out of the 35 patients who underwent LPI, only 13 (37.14%) underwent post-procedure slit lamp, gonioscopy examination to check the opening up of the angles and patency of the iridotomy. 4 (30%) PI were not patent, 3 (23.07%) were partially patent and in 6 cases there was no mention on the status of iridotomy. The only documented complication post PI was hyphema in 5 patients.

**DISCUSSION**

In our study the gender predominance was seen among females and majority cases were bilateral as mentioned in other studies. Pre-procedure tonometry was not adequately documented/ performed. However the post procedure tonometry rate was better probably to rule out post procedure increase in IOP which is commonly mentioned in literature. The post procedure gonioscopy was not performed/documented in a fairly large number of patients. The draw backs of not doing so, include the progression of the disease due to incomplete treatment (non-patent iridotomy), non-pupillary block mechanisms of angle closure such as plateau iris syndrome may be missed. The rate of prescription of LPI in this study was quite high (86.88%). Probably the demography and remote geographic location of the patients, difficulty in accessing timely treatment, affordable cost of treatment and as well as cautious nature of the treating doctors could be the reasons behind the high prescription rates. In Indian studies however the progress to PAC and PACG was not high. In an Indian population-based study of primary angle closure suspect (PACS) the 5-year incidence of PAC was 22% and hence LPI could not be warranted for PACS per se unless there was some risk factor that could be identified. Repeated dilatation for diabetics or for logistical reasons as the surgeon’s individual decision were some such factors. The drawback of the study however was that it was only a 5 year follow-up which was insufficient to understand the course of the disease. In another Indian hospital-based study by Ramani KK. et al on the course of PACS subjects after LPI, they found that 28% progressed to PAC. The study claimed decreasing anterior chamber angle (ACA) was the predictive factor for the progression of PACS to PAC. In the randomized controlled Zhongshan Angle Closure Prevention (ZAP) trial, they evaluated the efficacy of prophylactic laser peripheral iridotomy (LPI) in bilateral angle-closure suspects. They found that the risk of converting from PACS to PAC was low during the 6-year Chinese trial and laser iridotomy decreases the risk of this conversion, although the incidence of PAC is remarkably low. This study suggests that perhaps laser iridotomy is not required in all angle-closure suspects at least in that ethnicity. In a study by Wilensky et al on European patients with “occludable” angles, they found that eight patients (6.2%) developed acute angle closure glaucoma (AAGC) and 17 (13.2%) developed either appositional closure or peripheral anterior synechiae. In contrast the Greenland Eskimos had a high percentage of individuals 35%, (7 out of 35) with occludable angles developed ACG, in a study by Alsbirk.

In India the prevalence of ACG is high and asymptomatic chronic angle closure glaucoma mimicking POAG is common. More than 80% of the patients with chronic angle closures will not have any significant symptoms. Three landmark studies were conducted in India, the Vellore eye survey showed a prevalence of 4.32% for PACG and 10.3% for occludable angles in the population. The Andhra Pradesh eye disease survey showed a prevalence of 0.71% for PACG and 1.41% for occludable angles in the study population. The Aravind comprehensive eye survey showed a prevalence of 0.5% for PACG. The course and progression from PACS to PAC or PACG may vary according to different populations affordable cost of treatment and as well as cautious nature of the treating doctors could be the reasons behind the high prescription rates.

Theoretically, laser peripheral iridotomy should prevent the onset of chronic ACG as well as acute ACG which are associated with higher rates of blindness. Studies have proved that after performing an LPI there was no increase in IOP, history or symptoms of acute attack of glaucoma among the study subjects. Another hospital-based study reported that after LPI, no eye with PACS progressed to PAC or PACG. On the basis of this, many advocate aggressive screening and early laser peripheral iridotomy in individuals with “high risk” of either acute ACG or chronic ACG. Although beneficial, laser iridotomies can give rise to ocular morbidities. The laser energy as well as the altered fluidics may give rise to endothelial cell loss more in case of argon laser peripheral iridotomy than after YAG laser peripheral iridotomy. It can also give rise to uveitis and posterior
synechiae which could make future cataract surgery more challenging.\textsuperscript{24} While complications may seem minor when compared with the risk of an acute attack, they become significant when considering glaucoma control programmes in developing countries with high prevalence of narrow angles. Even if visually significant complications affect as few as 5% of those treated, the consequences can be devastating to such programmes. For example the cataract due to LPI might cause more blindness than glaucoma itself where cataract services are not freely available. The Chennai eye disease incidence study found that the rate of cataract progression in six years was significantly higher than those who had undergone LPI.\textsuperscript{25}

As rightly suggested by Thomas R. et al the decision of LPI should be based on how far patients stay from the hospital and the connectivity of the place, laterality, motivation level of patients and their alertness, also keeping in mind the consequences of side effects of LPI.\textsuperscript{8}

Limitations
The reasons or justification for high rate of LPI prescription could not be concluded as many details like the geographic location, the socioeconomic status and family support available in case follow-up was advised but were not available in many files. These drawbacks are as expected in a retrospective analysis.

**CONCLUSIONS**

The pre-procedure tonometry and post-procedure gonioscopy rates confirming state of the angle anatomy and patency of iridotomy were not satisfactory. The rate of LPI prescription was high. Majority of patients underwent LPI immediately on prescription. Hyphema was the only complication documented.

**REFERENCES**

[1] Prum BE, Herndon LW, Morio SE, et al. Primary angle closure preferred practice Pattern® guidelines. Ophthalmology 2016;123(1):P1-40.

[2] Sihota R, Agarwal HC. Profile of the subtypes of angle closure glaucoma in a tertiary hospital in north India. Indian J Ophthalmol 1998;46(1):25-29.

[3] Das J, Bhomaj S, Chaudhuri Z, et al. Profile of glaucoma in a major eye hospital in north India. Indian J Ophthalmol 2001;49(1):25-30.

[4] Dandona L, Dandona R, Mandal P, et al. Angle closure glaucoma in an urban population in southern India. The Andhra Pradesh eye disease study. Ophthalmology 2000;107(9):1710-1716.

[5] Ramakrishnan R, Nirmalan PK, Krishnadas R, et al. Glaucoma in a rural population in southern India. Ophthalmology 2003;110(8):1483-1490.

[6] Vijaya L, George R, Arvind H, et al. Prevalence of primary angle-closure disease in an urban south Indian population and comparison with a rural population. The Chennai Glaucoma Study. Ophthalmology 2008;115(4):655-660.

[7] Foster PJ. The epidemiology of primary angle closure and associated glaucomatous optic neuropathy. Semin Ophthalmol 2002;17(2):50-58.

[8] Thomas R, George R, Parikh R, et al. Five year risk of progression of primary angle closure suspects to primary angle closure: a population based study. Br J Ophthalmol 2003;87(4):450-454.

[9] Thomas R, George T, Braganza A, et al. The flashlight test and van Herick's test are poor predictors for occludable angles. Aust N Z J Ophthalmol 1996;24(3):251-256.

[10] Sihota R, Saxena R, Agarwal HC. Entropion uveae: early siphincter atrophy, signposting primary angle closure glaucoma? Eur J Ophthalmol 2004;14(4):290-297.

[11] Baskaran M, Yang E, Trikha S, et al. Residual angle closure one year after laser peripheral iridotomy in primary angle closure suspects. Am J Ophthalmol 2017;183:111-117.

[12] Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol 2006;90(3):262-267.

[13] Lewis R, Perkins TW, Gangnon R, et al. The rarity of clinically significant rise in intraocular pressure after laser peripheral iridotomy with apraclonidine. Ophthalmology 1998;105(12):2256-2259.

[14] Krupin T, Stone RA, Cohen BH, et al. Acute intraocular pressure response to argon laser iridotomy. Ophthalmology 1985;92(7):922-926.

[15] Ramani KK, Mani B, George RJ, et al. Follow-up of primary angle closure suspects after laser peripheral iridotomy using ultrasound biomicroscopy and A-scan biometry for a period of 2 years. J Glaucoma 2009;18(7):521-527.

[16] He M, Jiang Y, Huang S, et al. Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial. Lancet 2019;393(10181):1609-1618.

[17] Willensky JT, Kaufman PL, Frohlichstein D, et al. Follow-up of angle-closure glaucoma suspects. Am J Ophthalmol 1993;115(3):338-346.

[18] Alsbirk PH. Anatomical risk factors in primary angle-closure glaucoma. A ten year follow up survey based on limbal and axial anterior chamber depths in a high risk population. Int Ophthalmol 1992;16(4-5):265-272.

[19] Sihota R, Agarwal HC. Profile of the subtypes of angle closure glaucoma in a tertiary hospital in North India. Indian J Ophthalmol 1998;46(1):25-29.

[20] South East Asia Glaucoma Interest Group. Asia Pacific Glaucoma Guidelines. SEAGIG; Sydney 2003.

[21] Sihota R. An Indian perspective on primary angle closure and glaucoma. Indian J Ophthalmol 2011;59(Suppl 1):76-81.

[22] Pandav SS, Kaushik S, Jain R, et al. Laser peripheral iridotomy across the spectrum of primary angle closure. Can J Ophthalmol 2007;42(2):233-237.
[23] Robin AL, Pollack IP. A comparison of neodymium: YAG and argon laser iridotomies. Ophthalmology 1984;91(9):1011-1016.

[24] Quigley HA. Long-term follow-up of laser iridotomy. Ophthalmology 1981;88(3):218-224.

[25] Vijaya L, Asokan R, Panday M, et al. Is prophylactic laser peripheral iridotomy for primary angle closure suspects a risk factor for cataract progression? The Chennai Eye Disease Incidence Study. Br J Ophthalmol 2017;101(5):665-670.