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A study on intraocular pressure changes after laser peripheral iridotomy in primary angle closure glaucoma among patients attending a tertiary health care centre.

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Abstract:
Background*: Glaucoma is one of the leading causes of worldwide preventable blindness and it represents a significant economic burden, both in terms of treatment costs and the impact on an individual's ability to lead normal life. Laser peripheral iridotomy is one of the popular first line treatment in primary angle closure disease. Limited information is available regarding the intra ocular pressure changes and complications of laser peripheral iridotomy in primary angle closure disease among people of Tripura. The purpose of study was to study the changes in intraocular pressure in primary angle closure disease after laser peripheral iridotomy and to study the complications after neodymium-doped yttrium aluminum-garnet (Nd: YAG) laser peripheral iridotomy in primary angle closure glaucoma disease patients of Tripura.*
Materials and Methods*: After taking informed consent 68 patients having primary angle closure disease undergone laser peripheral iridotomy were included in our study. After ruling out pre-existing ocular disease, surgery, trauma, and systemic diseases, Intra ocular pressure (IOP) evaluation by goldmann applanation tonometer done before laser PI after 1 hour of laser pi and followed up again on day 1 and after 1 week of laser peripheral iridotomy (PI). Data was collected and analyzed.*
Results*: The result from our study showed that after 1 week following laser PI intra ocular pressure reduced 9.55% in primary angle closure suspects, IOP reduced 35.48% in primary angle closure patients and in primary angle closure glaucoma the reduction was 40.27%. Among 68 patients transient IOP rise following laser PI was 16 in number (23.5%), 1 patient suffered from hyphema, and 2 patients suffered from mild uveitis and corneal burn as a complication.*
Conclusion: *We have concluded that Laser PI can reduce IOP in primary angle closure disease with few cases having transient IOP rise.*

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I. Introduction

Glaucoma is a progressive disease entity which comprises of specific visual field changes corresponding to characteristic optic disc changes which is intraocular pressure sensitive [1]. Glaucoma is the second leading cause of worldwide preventable blindness after cataract and Asian represents 47% of glaucoma of that glaucoma and 87% of those with angle closure glaucoma.[2] In 2013 the number of people (aged 40 to 80) with glaucoma worldwide was 64.3 million, increasing to 76.0 million in 2020 and estimated that it may cross 112 million by 2040.[3]. Laser peripheral iridotomy (LPI) is the standard first line intervention in primary angle closure disease [4]. It is successful in preventing recurrence of acute attacks and virtually eliminates the risk of an acute attack in the fellow eye. The mechanism of action is relief of relative pupillary block, allowing the convex iris to flatten and widening of the anterior chamber angle.[5] Our study has identified the changes in intraocular pressure in primary angle closure glaucoma after Nd: YAG laser peripheral iridotomy and the complications after Nd: YAG laser peripheral iridotomy in a tertiary care center in northeast India. This information can lend additional support the current treatment guidelines of primary angle closure disease, which will facilitate better patient care service.

II. Material and Methods

This cross-sectional descriptive study conducted in the Department of Ophthalmology, Agartala GovernmentMedical College, and GB Pant Hospital, Agartala Tripura.

Study Design: Hospital based interventional study.

Study Location: in the Department of Ophthalmology, Agartala Government Medical College, and GB Pant Hospital.

Study Duration: 24 months (October 2018 –May 2020)

Sample size: 68 patients.

Sample size calculation: All cases of primary angle closure disease attending Department of Ophthalmology OPD & IPD of AGMC & GBP Hospital during the one and half year's data collection period were enrolled in this study as per census sampling technique. As in last two consecutive years, per year there were around 50 primary angle closure disease cases enrolled in IPD & OPD register of Department of Ophthalmology; SO, in one and half year study period my target sample size was 75. But during my study period 68 PACD patients attended at Ophthalmology Department of AGMC & GBP Hospital. So, my sample size as 68.

Inclusion criteria:

All patients who came to the Department of Ophthalmology OPD & IPD with primary angle closure glaucoma during this study period were included in this study.

Exclusion criteria:

a. Corneal ulcer
b. Corneal opacity
c. Corneal oedema
d. Neovascular glaucoma
e. Any inflammation of iris
f. Disorder of sclera like scleritis, episcleritis

Procedure methodology

Patients reporting to the Departments of Ophthalmology OPD & IPD with diminution of vision with raised intraocular pressure and shallow anterior chamber were approached and written informed consent for participation in this study was sought. Consenting participants were subjected to a detailed history including age, sex, place of residence, date of onset, progression of symptoms, associated complains, time gap between onset & presentation at hospital, which were collected on a proforma specially designed for this study. Information regarding past illnesses including medical disorders, ocular diseases, drug history, was obtained. They underwent a complete physical & ophthalmologic examination. Systemic examination was done to rule out the predisposing factors.

The ophthalmological examination included assessment of Best-corrected visual acuity (BCVA) Which was recorded using Snellen's acuity chart. Intraocular pressure measured with Goldman applanation tonometer. Gonioscopy was done by 4 mirror gonio lens and visual field analysis done by Humphrey field analyzer.

Then fundus examination with the direct & indirect ophthalmoscope with +20D lens for glaucomatous cupping. After confirming the diagnosis of Primary angle closure disease, categorization done as Primary angle closure suspect (PACS) where gonioscopy reveals irido-trabecular contact more than 270^0 without peripheral anterior synecia (PAS) and normal IOP with no optic disc and visual field change, Primary angle closure (PAC) where PAS will be there with elevated IOP but no disc and field changes and Primary angle closure glaucoma (PACG) where disc and field changes will be there. patients written informed consent was taken, after carefully explaining the potential side effects and benefits of LPI in details. Laser peripheral iridotomy was performed using a Nd: YAG laser. Pilocarpine 2% eye drop was instilled in the intervention eye 15 minutes before treatment for thinning and stretching of iris so that less energy needed to penetrate the iris. Laser was delivered in the peripheral supranasal or a supratemporal region (with the range from 10 to 2o'clock) in iris crypts where iris appeared thinnest. The iridotomy was performed using the Nd: YAG laser, starting at an initial 1. 5mj. All iridotomies were performed using an Abraham lens after giving methylcellulose to focus the laser beam and to minimize possible adverse effects.

FOLLOW-UP: Patients were examined after 1 hour for measurement of IOP. Patient were discharged after giving 1% prednisolone eye drop 1 drop 4 times daily with 2% pilocarpine eye drop ,1 drop twice daily. Patients were again recalled next day and after 1 week for IOP measurement and to see any complication.

Data Analysis: All data was recorded in the pro forma designed specifically for this study. On completion of the study, data was entered into Microsoft excel spreadsheet for analysis. Data was recorded, entered, and analyzed with computer using SPSS version 15.0 and Epi-info-version-7. Descriptive statistics and other statistical tests like Chi square test; binary logistic regression analysis was used as per applicability. P value of

less than 0.05 was considered as statistically significant.

Ethical Consideration: Informed written consent was obtained from each participant as per modified ICMR template, ensuring confidentiality while collecting and analyzing the data which was used for research purpose only. Application was placed before the Institutional Ethics Committee of Agartala Government Medical College for approval.

III. Result

A total of 68 cases of PACD underwent laser peripheral iridotomy over one and half year's period from 2019 to 2021 in this study.

AGE DISTRIBUTION	NO. OF PATIENTS	PERCENTAGE
21 - 30	4	6
31 - 40	3	5
41 - 50	20	30
51 - 60	25	37
61 - 70	11	16
71 - 80	5	6

Table 1: Showing Age distribution of 68 patients of Glaucoma.

Table 1 shows, total number of primary acute angle closure glaucoma patients who were treated with Nd YAG laser iridotomy was 68. These patients were grouped according to their age from 21 years to 80 years with interval of 10 years.

Maximum number of patients (37%) were between ages 51-60 years and minimum (5%) patients were between 31 to 40 years.

SEX DISTRIBUTION

SEX	NUMBER
MALE	28
FEMALE	40

Table 2: Showing sex distribution of patients.

TYPES OF GLAUCOMA

TYPE OF GLAUCOMA	NUMBER	PERCENTAGE
PRIMARY ANGLE CLOSURE SUSPECT	7	10
PRIMARY ANGLE CLOSURE	37	55
PRIMARY ANGLE CLOSURE GLAUCOMA	24	35

Table 3: various types of glaucoma.

Table 3 shows, among 68 eyes in various stage of primary angle closure disease treated with Nd: YAG laser peripheral iridotomy, 7 cases (10%) of primary angle closure were suspects, 37 cases (55%) were primary angle closure, and 24 cases (36%) were primary angle closure glaucoma**.**

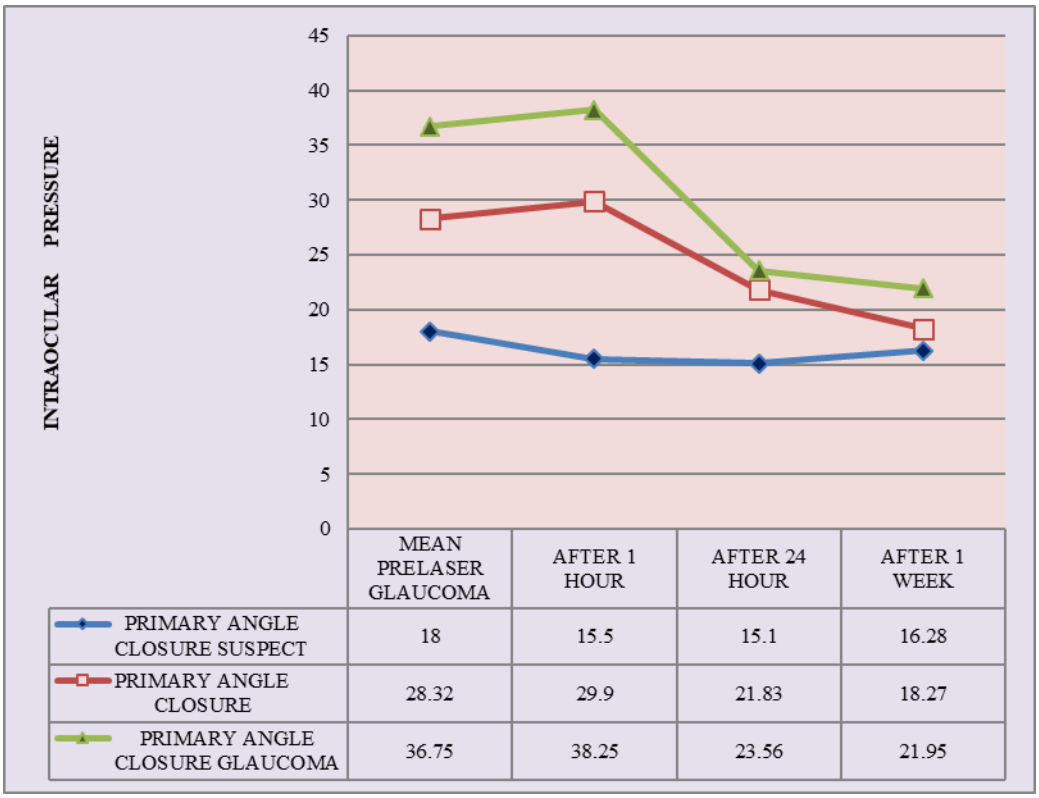

Figure 1: Showing mean IOP Changes following laser iridotomy in various types of Glaucoma.

Figure 1 shows, pre laser IOP measured for all 68 Primary angle closure disease patients participated in this study. Then Mean pre laser IOP measured for each type. Mean pre laser IOP for primary angle closure suspects was 18 mm of Hg, for primary angle closure it was 28.32 and for primary angle closure glaucoma it was 36.75 mm of Hg. 1 hour after laser therapy IOP measured for all patients and mean IOP for PACS, PAC and PACG was 15.5, 29.9, 38.25 respectively. IOP of all patients measured again after 24 hours and mean IOP for PACS, PAC and PACG was found 15.1, 21.83, 23.56 respectively. IOP of all patients rechecked again after 1 week and mean IOP for PACS, PAC, PACG was 16.28, 18.27,21.95 respectively.

TYPE OF GLAUCOMA	IOP REDUCTION AT 1 WEEK (mm Hg)	PERCENTAGE REDUCTION
PRIMARY ANGLE CLOSURE SUSPECT	1.72	9.55
PRIMARY ANGLE CLOSURE	10.05	35.48
PRIMARY ANGLE CLOSURE GLAUCOMA	14.8	40.27

Table 4: Percentage of IOP reduction in various type of Glaucoma after 1 week.

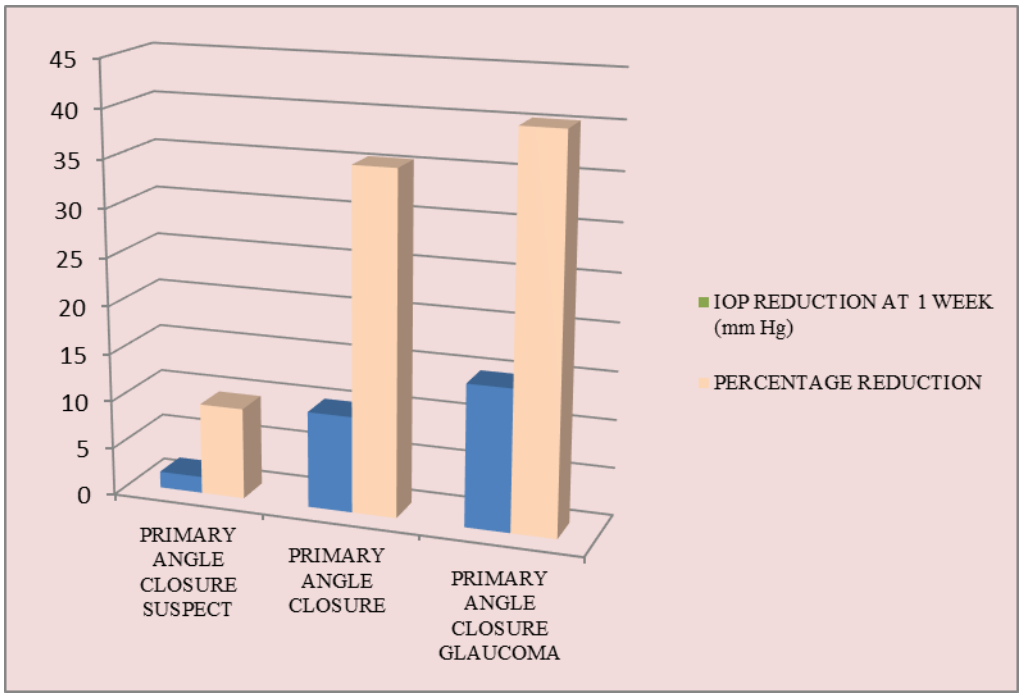

Figure 2: Bar diagram showing percentage of IOP reduction.

Table 4 and Figure 2showing mean and percentage of IOP reduction in various types of Angle closure disease following LPI after 1 week. For primary angle closure suspect mean IOP reduced after 1 week was 1.72 mmHg (9.55%) for primary angle closure it was 10.05 (35.48%) and for primary angle closure glaucoma 14.8 (40.27%)

ENERGY LEVEL	EYES	PERCENTAGE
<4	4	6
4 TO 5	3	5
5 TO 6	20	29
6 TO 7	25	37
7 TO 8	11	17
>8	5	6

LASER POWER DISTRIBUTION

Table 5: Percentage and number of laser energy used.

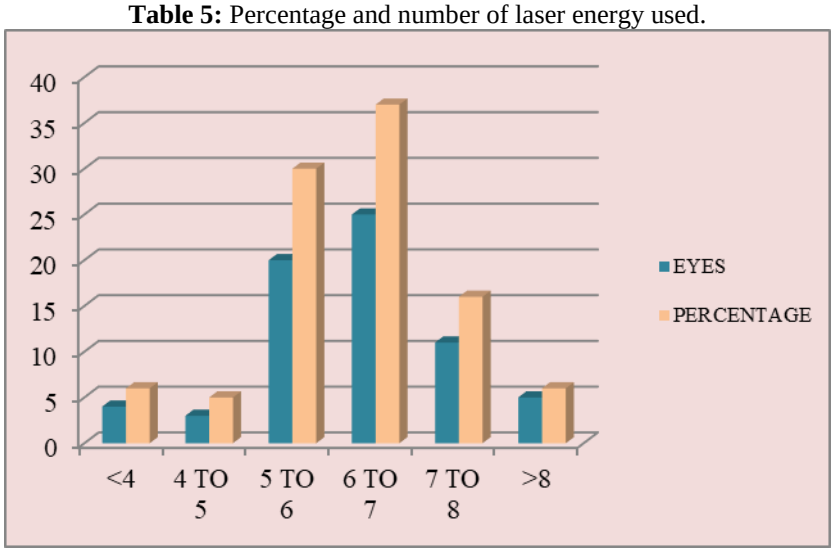

Figure 3: Bar diagram showing number and percentage of laser energy used.

Table 6 and Figure 20 showing Among 68 eyes 20 eyes (29%) were treated with 5 to 6 mJ, 25 eyes (37%) were treated with 6 to 7 mJ laser energy, 4 to 5 mJ (5%) energy used for 3 eyes, more than 8 mJ energy used for 5 eyes (6%).

COMPLICATIONS

COMPLICATIONS	NUMBER	PERCENTAGE
TRANSIENT RISE IN IOP	16	23.5
HYPHAEMA	1	1.4
MILD UVEITIS	2	2.94
CORNEAL BURNS	2	2.94
REPEAT PI	6	8.8
TOTAL	27	39.7

Table 6: showing number and percentage of complications**.**

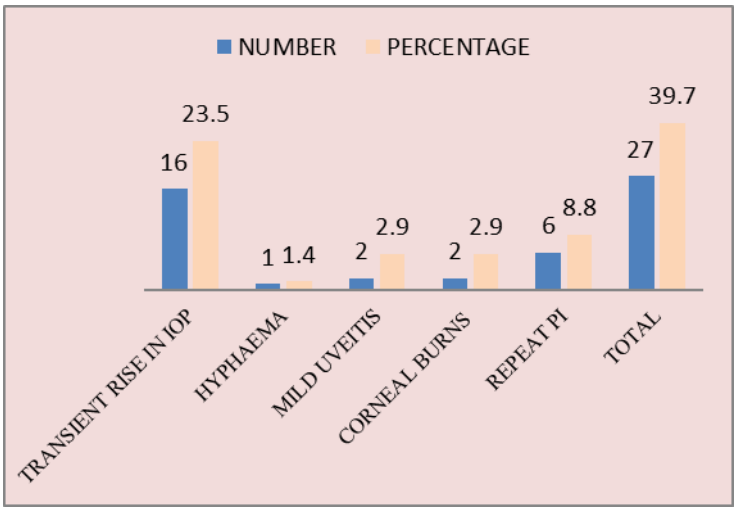

Figure 4: Bar diagram showing number and percentage of complications**.**

Table 6 and Figure 4 showing Complications attributable to Nd: YAG laser therapy were minimal. 1 patient had hyphema following laser treatment controlled with pressure by Abraham lens. 2 patient (2.9%) had corneal burn. 2 patients (2.9%) had mild uveitis at the end of 24 hour, 8.8% of eyes needed repeat PI. IOP measured after 1 hour and transient IOP rise found in 16 cases (23.5%).

Figure 5: Hyphema following laser PI.

IV. Discussion

Laser iridotomy has become the treatment of choice for primary angle closure and other forms of pupillary block glaucoma. The advent of Nd: YAG laser has afforded a safe, cost effective, repeatable, and efficacious alternative to surgical iridectomy.

In our study 68 eyes of 68 patients, the age distribution was predominantly between 51-60 years. This age group prevalence correlate with the fact that angle closure glaucoma occurs commonly in this age group. In a study done by A1an.L. Robin et al [(6)], they found a mean age of 66 years and a range of 42-83. In another study of done by David K. Gieser et al [(7)], they had found a mean age of 60.0 ± 11.8. S.A.

Sex distribution among patients underwent Nd: YAG laser peripheral iridotomy in this study was males 41% and females 59%. This correlate with the fact that primary angle closure glaucoma is more common in females than in males, found in the following studies done by SA. Buckley [(8)] where they noticed sex distribution of 35% males and 65% females.

N. Naveh and M.Blumenthal [(9)]in their preliminary study of Nd : YAG Peripheral Iridotomy in angle closure glaucoma, found a distribution of 55% females in chronic angle closure glaucoma, corelating with this study.

The mean pre laser intraocular pressure in this study was 28.32 mmHg for PAC. In a study conducted by Karim F. Tomey Carlo [(10)] et al the mean pre laser intraocular pressure in Acute angle closure glaucoma was 49.3 ±16.8 and in Chronic Angle closure Glaucoma was 24.8 ±11.2 mmHg. In a study conducted by Alan. L. Robin, Irvin. P. Pollack et al [(6)] the mean pre laser IOP was 23± 7mm of Hg. The mean post laser IOP at the end of one week in our study was 18.27 mmHg in PAC cases. In Karim F. Tomey et al [(10)]. study, in Acute angle closure glaucoma it was 26±8.3 and in Chronic angle closure glaucoma it was 17.5± 6.7mm of Hg corelating to this study. In Alan. L. Robin, Irvin. Pollack study of Chronic angle closure glaucoma group, the post laser IOP reduction after LPI was 18±4 mm Hg. This is correlating with the IOP reduction in this study.

In our study the transient IOP spike was 23.5% which compared favourably with study conducted by jiang Y, Foster PJ et al [(11)] where they found transient IOP spike 26%. Shani et al [(12)] reported a series of 212 eyes treated with Nd YAG laser, in their study 21.2% of all cases reported transient IOP elevation, which is also corelate well with this study. Study conducted by Schwartz LW et al [(13)] reported transient IOP spike following Nd-YAG laser PI was 12 to 14 %, which is not corelating to this study.

In this study 91% of the cases required only one sitting to create a patent iridotomy. 9% of the eyes required more than single sitting. This is not correlating well with the study done by Karim F. Toomey-Carlo [(10)] et al, they had found that 69% of eyes required single session and 27% required second sittings. N-Naveh, L. Zborowsky[(9)] et al in their preliminary study of Nd. YAG laser iridotomy in angle closure glaucoma had found that 90% were treated with single sitting and only 4% needed two sittings, which correlates well with this study.

Regarding complications, cases had mild bleeding from iris which disappeared by keeping the lens, pressed for some time. In this study one patient developed Hyphema following laser PI. 3% of cases had mild uveitis. This is less because all patients were given topical steroids for one week prophylactically. Few cases 3% had corneal bums which were transient, and hence no significant side effects of laser treatment were noted. In a previous study, done by Alan. L. Robin and Irvin P. Pollack [(6)] found that 45% of the eyes treated with Nd: YAG laser had bleeding from the iridotomy site, not correlating to this study. In another study done by N. Naveh. L Zborowsky[(9)] et al, they had found 20% of the cases developed minimal bleeding from iris vessels which lasted up to three minutes, again not correlating to this study. In this study no corneal and lenticular opacity developed.

V. Conclusion

Primary angle closure disease is one of the preventable causes of blindness if treated early. It can be treated by medication, surgery or by laser. In this study, we used laser as an early treatment procedure for various types of primary angle closure diseases. Nd: YAG laser iridotomy was found to be safe and efficacious in reducing intraocular pressure to some extent in various forms of angle closure disease with pupillary block. Although the technique of Nd: YAG laser iridotomy is simple, it can be complicated by the oedematous hazy cornea, shallow anterior chamber, and thickened iris of the patient. But there were no potentially blinding complications attributable to Nd: YAG laser iridotomy and in majority of patients, the patency of iridotomy was established after first sitting only.

References:

[1]. Sihota R, Tandon R. Parson"s diseases of the eye .21 st edition. Elsevier; 2011:280.
[2]. Khandelwal R, Raje D, Rathi A,Khandelwal R. EVALUATION OF NARROW ANGLE GLAUCOMA CASES ATTENDING A TERTIARY CARE CENTER OF CENTRAL INDIA. Journal ofEvidence Based Medicine and Healthcare.2015;2(43):7724-31.
[3]. Tham Y-C, Li X, Wong TY, Quigley HA, Aung T, Cheng C-Y. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systemic review and meta-analysis. Ophthalmology. 2014,121;2081-90.
[4]. Salmon JF. Long-term intraocular pressure control after Nd-YAG laser iridotomy in chronic angle-closure glaucoma. *J Glaucoma* 1993; 2:291–6
[5]. Grewal SP, Jain R, Grewal D. Evaluation of anterior segment changes following laser peripheral iridotomy using Pentacam

Scheimpflug imaging system in eyes with primary angle closure (PAC). Highlights of ophthalmology.2008;36(4):13-14
[6]. Robin AN, Pollack IP A comparison ND Yag and Argon laser iridotomy Ophthalmology 91-1011 1984
[7]. Gieser D, Wilensky J Laser iridotomy in the management of chronic angle glaucoma Am J ophthalmol 98-446 1984
[8]. Buckley-SA; Reeves-B; Burdon-M; Moorman-C; Wheatcroft.S Edelsten-C, Benjamin-L.Acute angle closure glaucoma: relative failure of Yag iridotomy in affected eyes and factors influencing outcome.Br. J. Ophthalmology 1994; 78: 529-533.
[9]. Naveh N, Zborwsky- Gutman L, Blumenthal M, Rosner M Nd YAG laser iridotomy in ACG- Prelimilinary study. Br. J ophthalmology 1987 april 71(4) 257-61.
[10]. Karim F. Tomey MD; Carlo E. Traverso, M.D.; Ibrahim V.Shammas M.D."Neodymium - Vag laser Iridotomy in the treatment and prevention of angle closure glaucoma"Arch. Of Ophthalmology, Vol: 105 (4) 1987 APR.P-476-481
[11]. He M, Jiang Y, Huang S, Chang DS, Munoz B, Aung T, Foster PJ, Friedman DS. Laser peripheral iridotomy for the prevention of angle closure: a single centre, randomised controlled trial. Lancet. 2019 Apr 20;393(10181):1609-1618. doi: 10.1016/S0140-6736(18)32607-2. Epub 2019 Mar 14. PMID: 30878226.
[12]. Shani L, David R, Tessler Z et al intraocular pressure after neodymium:YAG laser treatment in anterior segment. J cataract Refract Surg. 1994; 20:455-8.
[13]. Schwartz LW, Moster MR, Spaeth GL, Wilson RP, Poryzees E. Neodymium-YAG laser iridectomies in glaucoma associated with closed or occludable angles. Am J Ophthalmol. 1986 Jul 15;102(1):41-4.

Dr. Amit Sen, et. al. "A study on intraocular pressure changes after laser peripheral iridotomy in primary angle closure glaucoma among patients attending a tertiary health care centre." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(08), 2022, pp. 35-42.