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Clinical Study of Macular Changes and Visual Outcome After Nd: Yag Laser Posterior Capsulotomy in Posterior Capsular Opacification

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Abstract

Background: Extracapsular Cataract Extraction with Posterior Chamber Intraocular Lens (ECCE+PCIOL) is the surgery of choice. ND:YAG laser capsulotomy is most common procedure done in patients with posterior capsular opacification. Present study aimed to assess the clinical effects on macula and visual outcome after laser capsulotomy in the patients with posterior capsular opacification.

Material & Method: The present cross-sectional study conducted among the patients with undergoing the Nd-YAG laser treatment for the posterior capsular opacity. Patients with evidence of central corneal opacity, uveitis, retinal surgery, intra ocular infections, diabetes mellitus, nystagmus, patients not willing were excluded from the study. the opacity was assessed, and outcome was analysed. All the data were entered in excel sheet and analysed using SPSS v21 operating on windows 10.

Results: A total of 60 patients with criteria are included. Them mean age of the patients was found to be 64.183±7.42. Among them 46.7% were male patients 58.3% were involved with right eye. There was improvement in the vision of the patients. Significant rise in the IOP at 1st hr and 4hr after laser therapy compared to pre-laser IOP among the patients. The IOP was not found to be significant difference at other interval of time. Raised IOP was seen in 5% of patients, 6.7% with IOL marking, 5% with macular edema and 1.7% with iris bleeding.

Conclusion: The present study documented improvement in the vision with Nd-YAG capsulotomy, with minor complications which included the raise in

IOP which lasted for four hours post laser treatment, also documented presence of macular edema, IOL marking and iris bleeding.

Keyword: Intraocular Pressure, Posterior Capsular Opacity, Nd-YAG, Laser, Bleed, Macular Edema.

Introduction

The primary global cause of treatable blindness is cataract. The procedure of choice is extracapsular cataract extraction with posterior chamber intraocular lens (ECCE+PCIOL). The most frequent complication, posterior capsule opacification (PCO), affects 18% to 50% of individuals having ECCE+PCIOL surgery. The second most typical cause of blindness is PCO. Typically, PCO develops two years following surgery. Following congenital cataract surgery, it develops in approximately all patients. With advancing age, PCO incidence decreases. Reduced vision, glare, monocular diplopia, and other symptoms similar to those of a first cataract are brought on by PCO.

There are two clinically distinguishable morphological forms of PCO. They are PCO of the fibrosis and Elschnig-pearl types. Lens epithelial cells that are expanding and swollen make up vacuolated (Pearl-type) PCO. Common names for them include Elschnig pearls. Significant sight loss results from this. These are best visualized with silt lamp examination with retro illumination.

The most frequent technique carried out on patients with posterior capsular opacification is ND:YAG laser capsulotomy. It has been studied extensively in past about its effect on vision and differnt outcomes after laser capsulotomy. However the effects on macula and vision has not been studied adequately which warrants further studies.

Methods

This was a single centre hospital based Cross Sectional Study, conducted in patients who will come to Ophthalmology OPD and undergo treatment in our institute over a period of 18 months from November 2020 to May 2022.

Inclusion Criteria

- Patients with post operative posterior capsular opacification with vision 6/9 or <6/9.
- Patients with PCO had undergone cataract surgery after any type of cataract.
- Patients who diagnosed with any type of PCO.
- Patients with DM without macular edema.

Exclusion Criteria

- Any evidence of central corneal opacities.
- PCO in Paediatric patients after cataract surgery.
- Past history of uveitis, retinal surgeries, intra ocular infections.
- DM patients with macular edema.
- Patients with Nystagmus.
- Unconscious or comatose patients.
- Patients not willing to participate in the study
- Patients with other retinal manifestations eg ARMD, glaucoma and any evidence of disc pathology.

Observation and Result

Table 1: Showing the mean age of the patients.

	N	Minimum	Maximum	Mean	SD
Age (yrs)	60	48.0	85.0	64.18	7.42

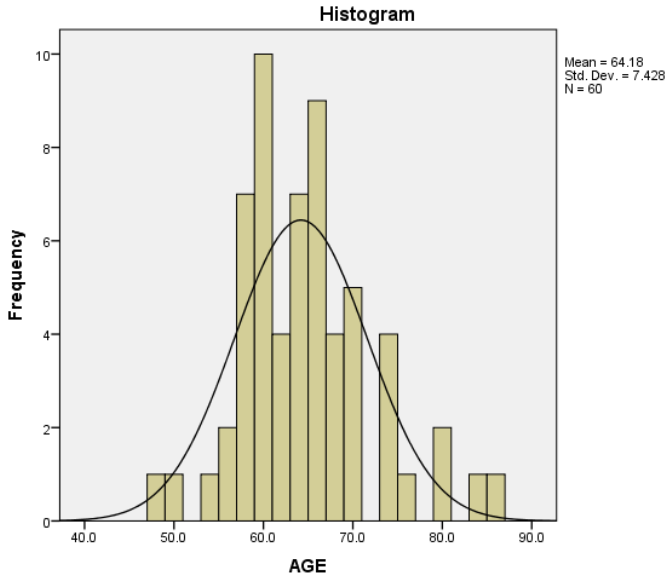


Figure 1: Mean age of the study participants

Table 2: Gender distribution among study participants

		Frequency	Percent(%)
Sex	**Female**	32	53.3%
	Male	28	46.7%
	Total	60	100.0%

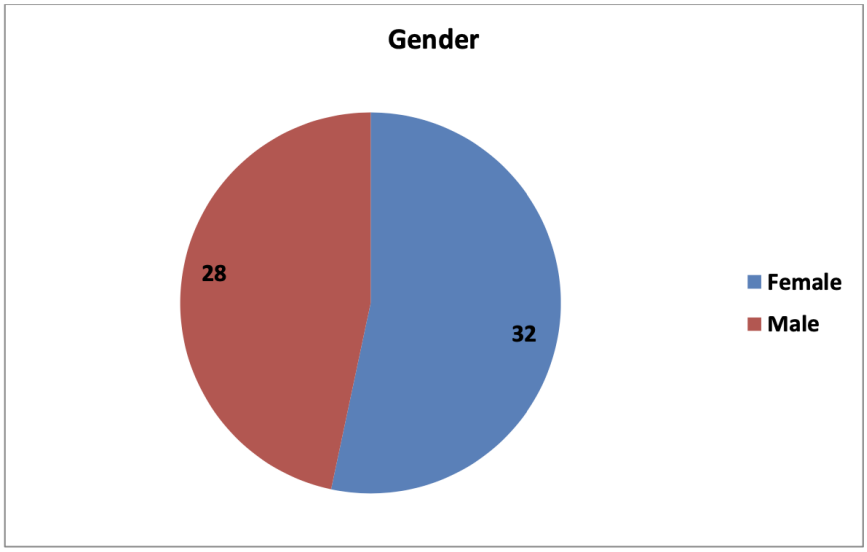


Figure 2: Gender distribution among study participants

Table 3: Comparison of mean age between the gender

	Female		Male	
	Mean	SD	Mean	SD
AGE	64.8	7.7	63.5	7.2

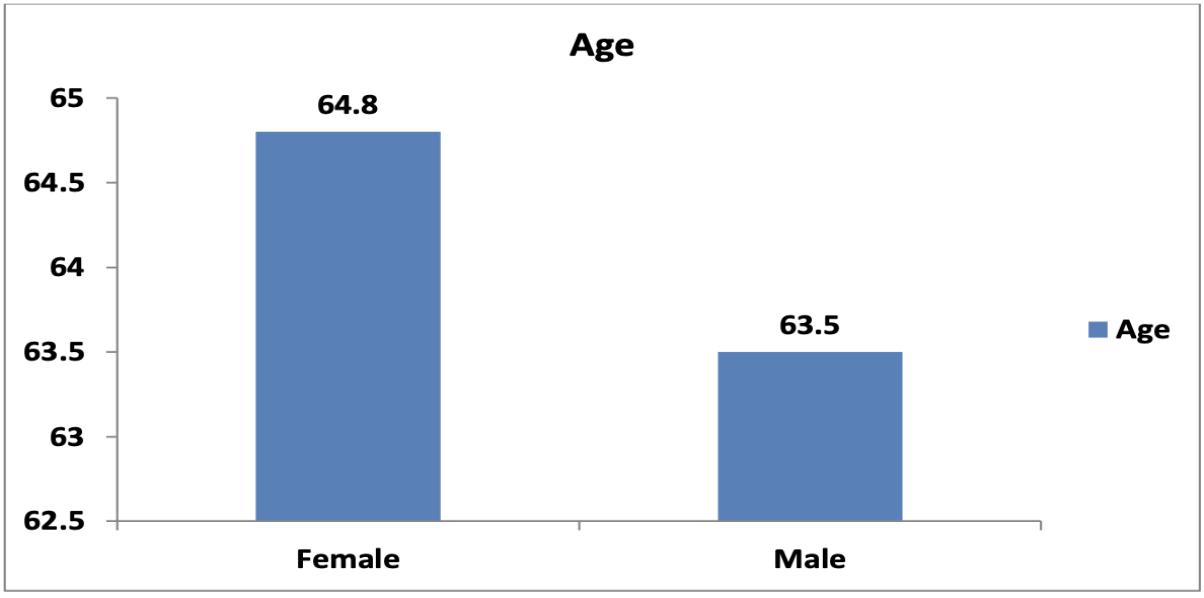


Figure 3: Comparison of mean age between the gender

Table 4: Showing the mean duration of symptoms

	Minimum (year)	Maximum (year)	Mean (year)	SD
Duration	1.0	17.0	7.733	2.85

Table 5: Showing the distribution of type of surgery among study participants

		Frequency	Percent(%)
Type of surgery	**PHACO**	12	20.0%
	SICS	48	80.0%
	Total	60	100.0%

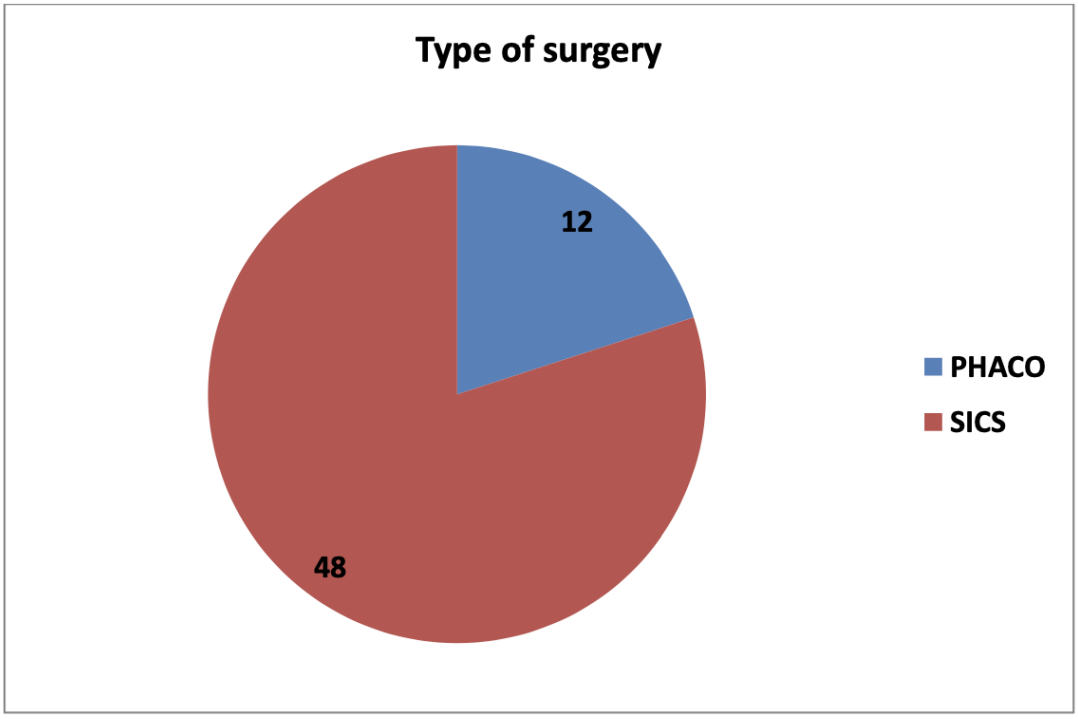


Figure 4: Showing the distribution of type of surgery among study participants

Table 6: Showing the laser power distribution among study participants

Total Energy (mJ)	Cases
10-25	29
26-45	12
46-65	7
66-85	8
86-100	1
>100	3

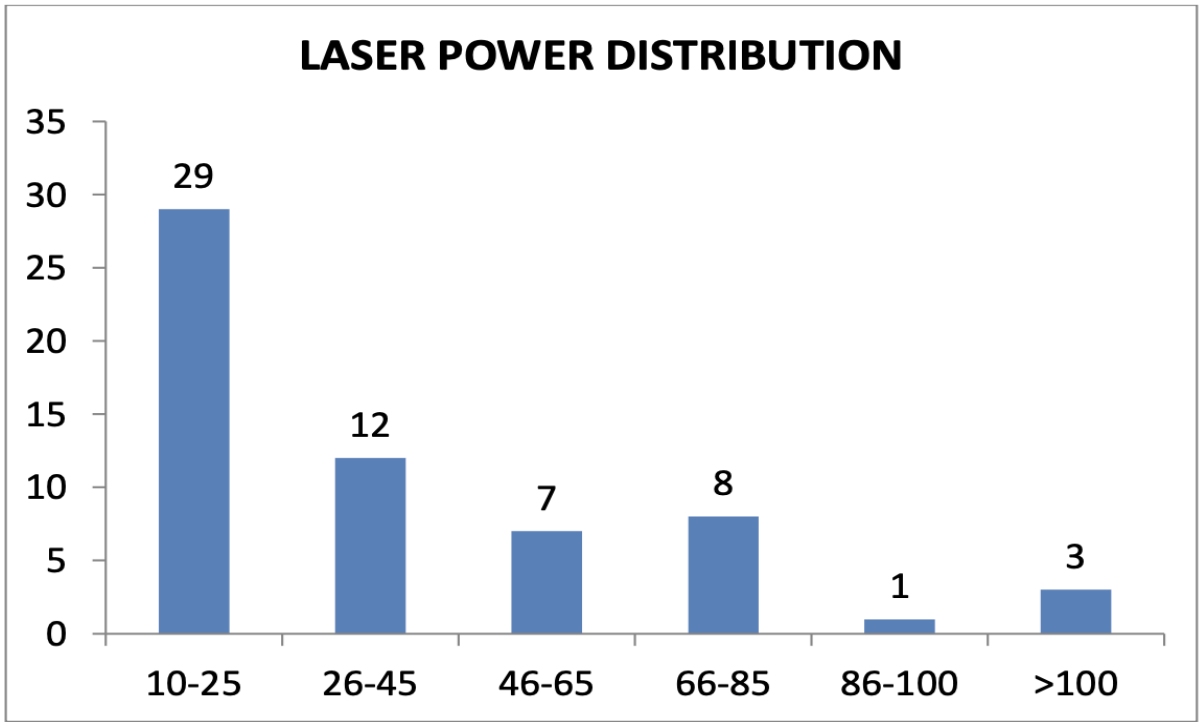


Figure 5: Showing the laser power distribution among study participants.

Table 7: Showing the comorbidities among study participants

Comorbidities	Cases	Percent(%)
Diabetes	18	30%
hypertension	27	45%
Nil	15	25%

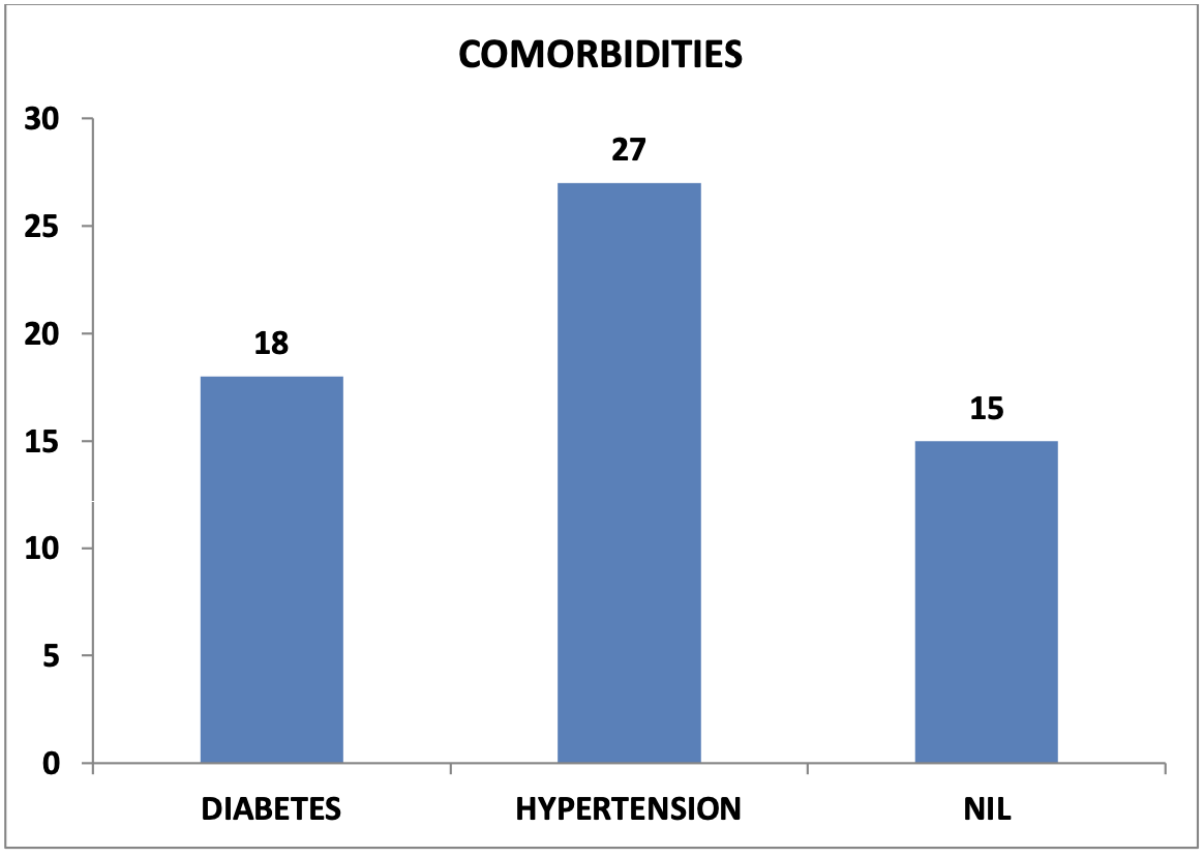


Figure 6: Showing the comorbidities among study participants.

Table 8: Showing the types of PCO among study participants

TYPE OF PCO	Cases	Percent (%)
FIBROUS	33	55%
ELSCHNIG'S PEARL	15	25%
MIXED	12	20%

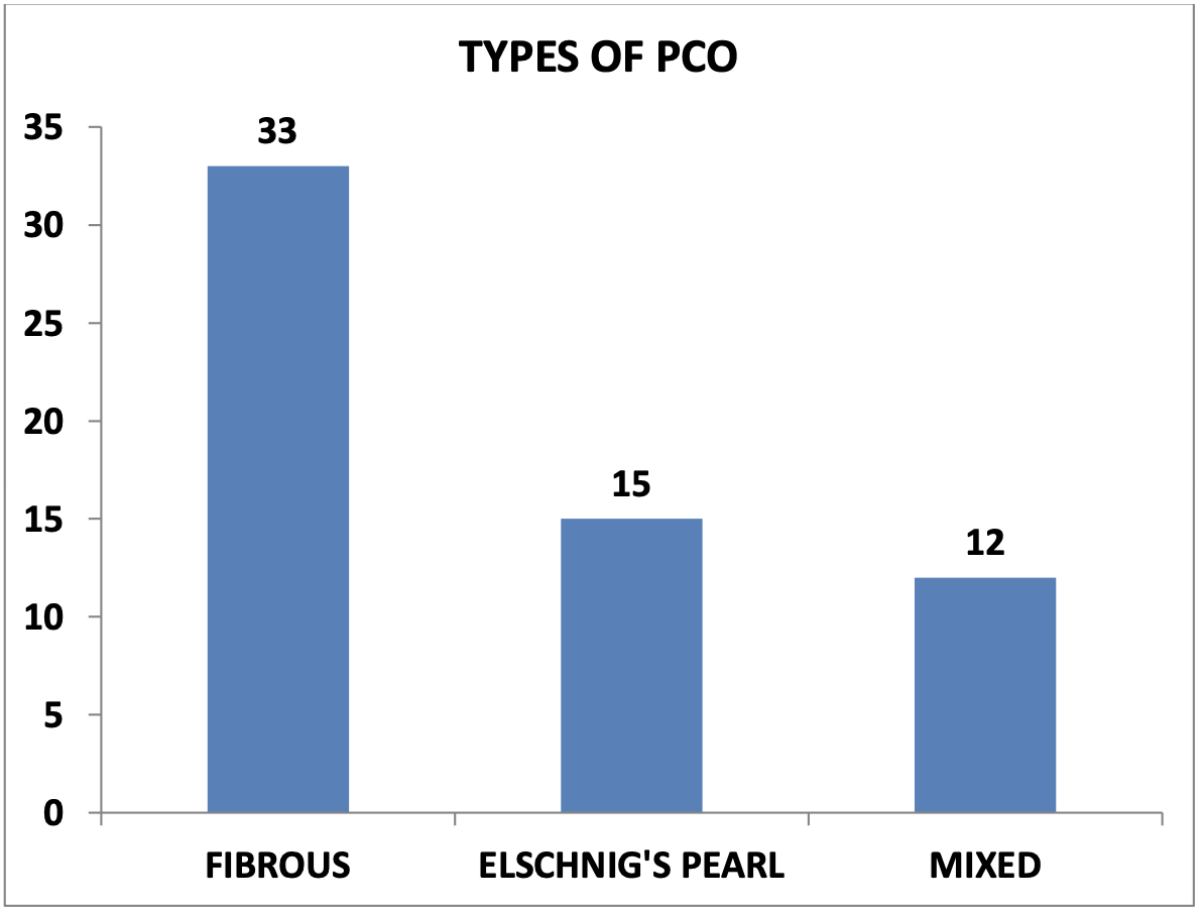


Figure 7: Showing the types of PCO among study participants.

Table 9: Showing the Post-laser vision at 24 hr findings among study participants

		Frequency	Percent(%)
	6/9-6/12	41	68.3%
Post Laser BCVA at 24 Hr	**6/18-6/60**	18	30.0%
	<6/60	1	1.7%
	Total	60	100.0%

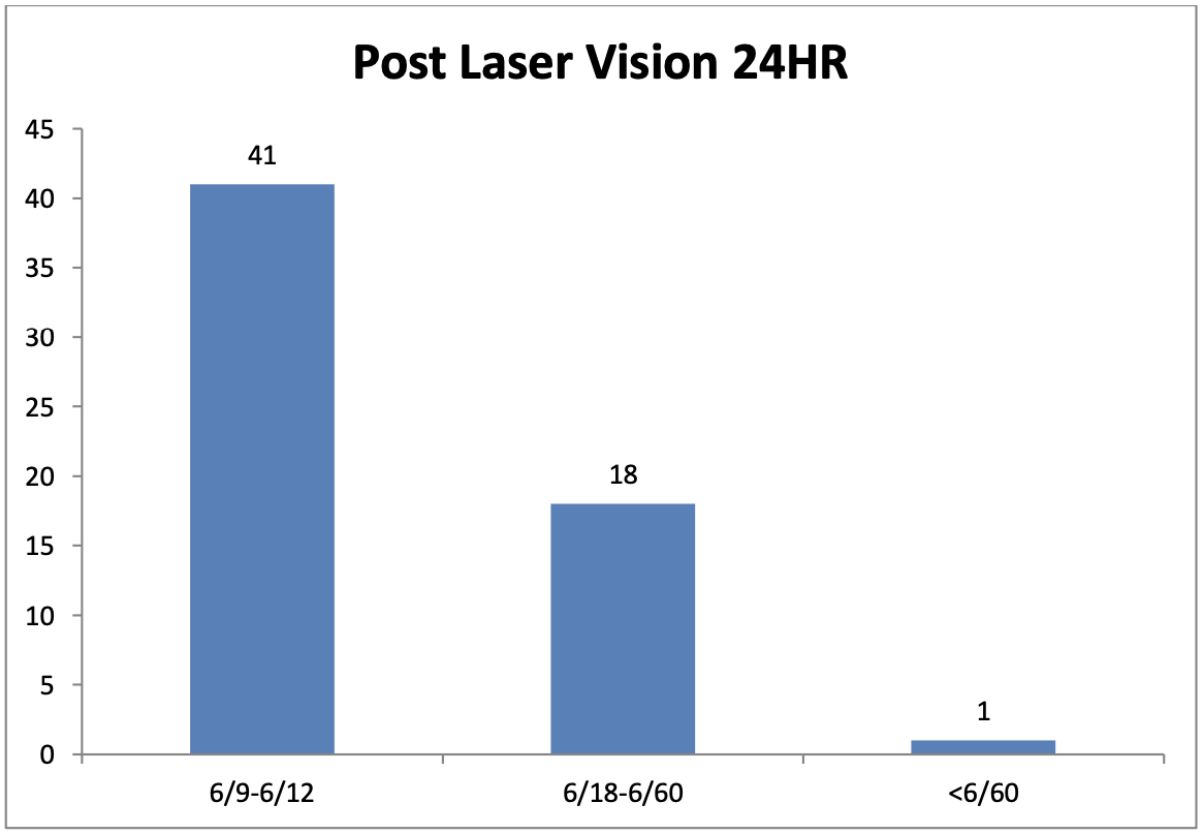


Figure 8: Showing the Post-laser vision at 24 hr findings among study participants.

Table 10: Showing the Post-laser vision at 1st week findings among study participants

		Frequency	Percent(%)
	6/6-6/12	49	81.6%
Post Laser BCVA at 1 WEEK	**6/18-6/60**	10	16.7%
	<6/60	1	1.7%
	Total	60	100.0%

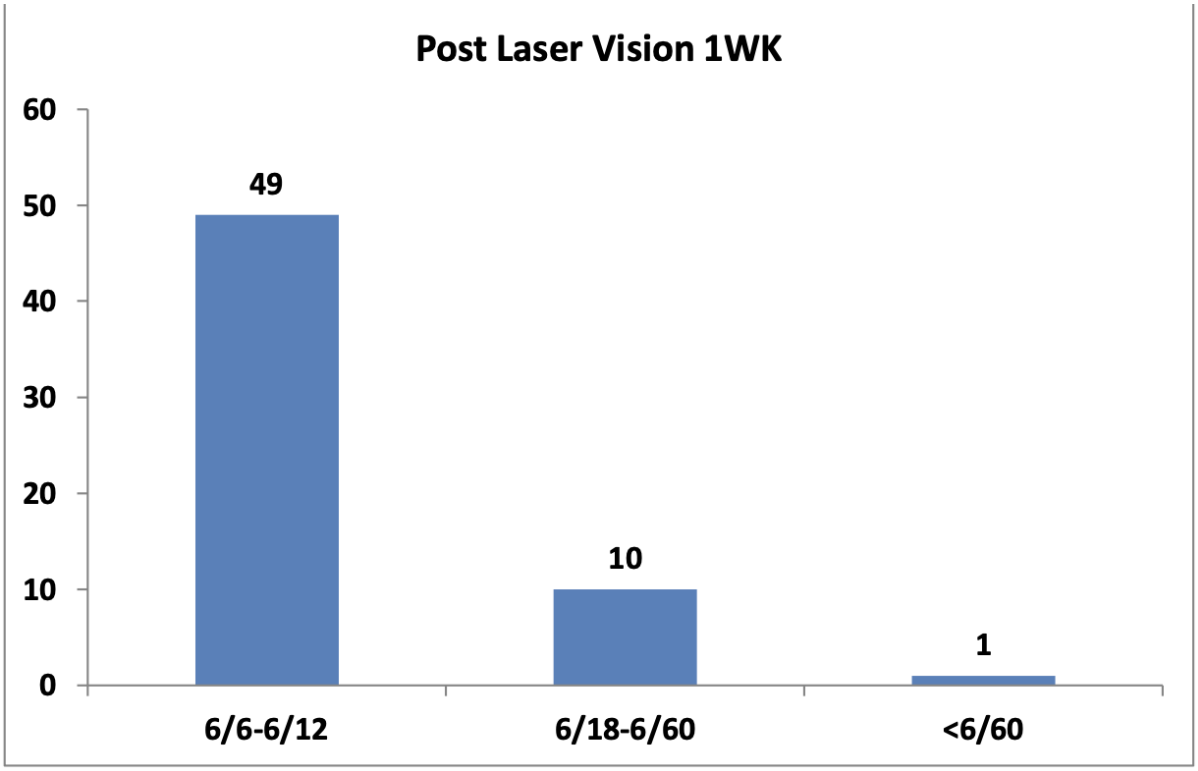


Figure 9: Showing the Post-laser vision at 1st week findings among study participants.

Table 11: Showing the Post-laser vision at 1st month findings among study participants

		Frequency	Percent
	6/6 – 6/12	53	88.3 %
Post Laser BCVA at 1month	**6/18-6/60**	6	10.0 %
	<6/60	1	1.7%
	Total	60	100.0%

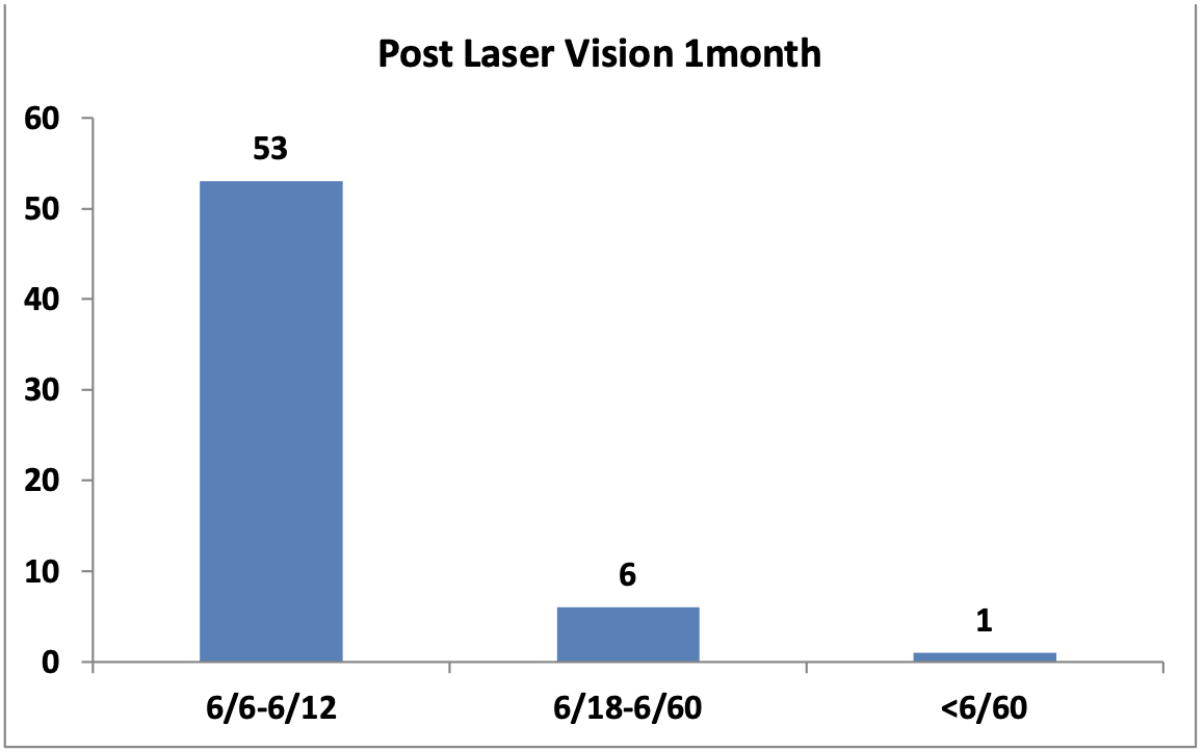


Figure 10: Showing the Post-laser vision at 1st month findings among study participants

Table 12: Showing the Post-laser vision at 3rd month findings among study participants

		Frequency	Percent
Post Laser BCVA at 3 month	6/6-6/12	56	93.3%
	6/18-6/60	2	3.4%
	<6/60	2	3.3%
	Total	60	100.0%

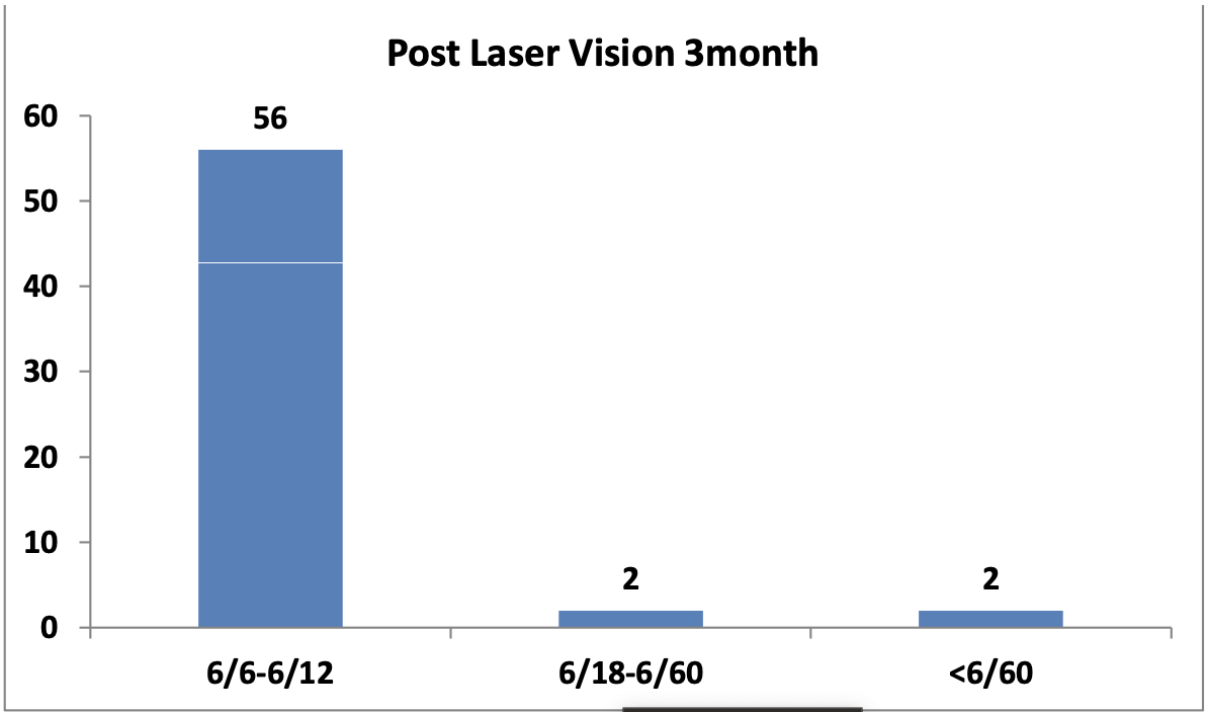


Figure 11: Showing the Post-laser vision at 3rd month findings among study participants

Table 13: Showing IOP of patients at different points of time.

	Minimum	Maximum	Mean	SD
Pre Laser IOP	8.6	18.0	12.717	2.2913
Post laser IOP 1hr	10.0	30.0	14.260	3.4431
Post laser IOP 4hr	6.0	18.0	13.990	2.2162
Post laser IOP 1wk	10.0	17.0	13.572	1.8652
Post laser IOP 1Month	10.0	17.0	12.668	1.4279
Post laser IOP 3Month	9.9	16.5	12.640	1.6427

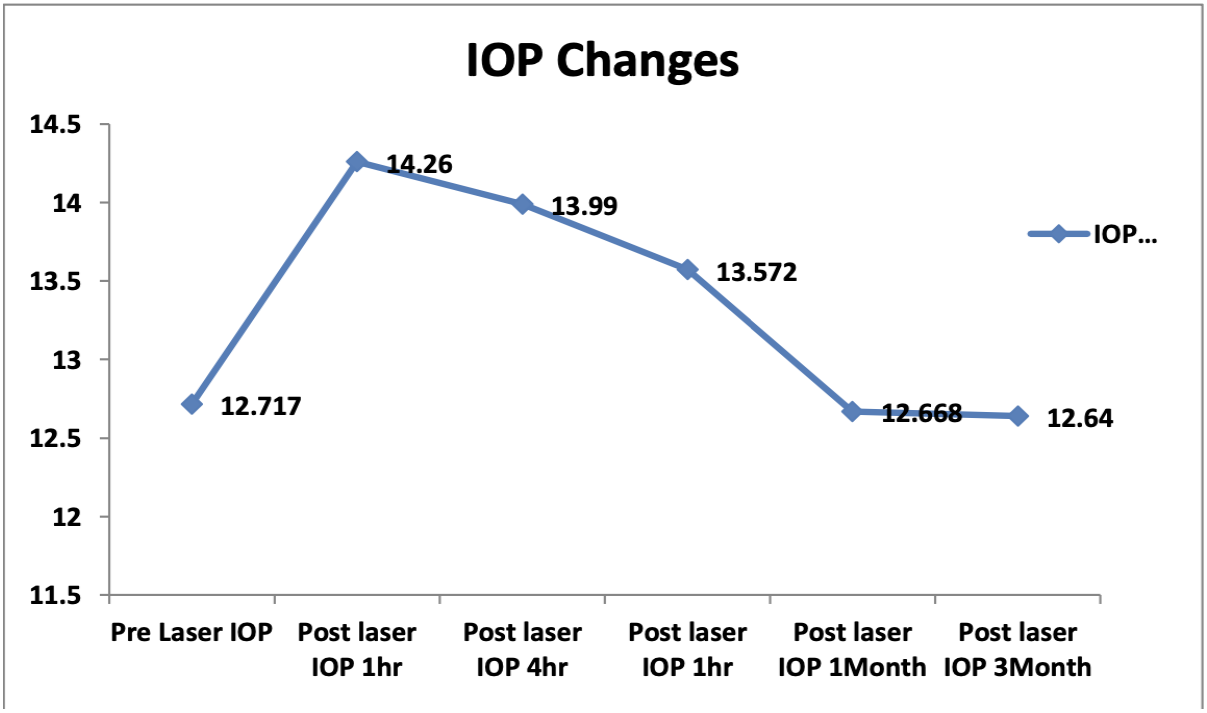


Figure 12: Showing IOP of patients at different points of time

Table 14: Showing CMT of patients at different points of time.

	Minimum	Maximum	Mean	SD
Pre Laser CMT	189.8	256	219.978	17.82463627
Post laser CMT at 1 week	190	436	228.4983333	37.62183144
Post laser CMT at 1 month	190	448	230.645614	43.7762985
Post laser CMT at 3 month	190	416	231.3701754	42.37940017

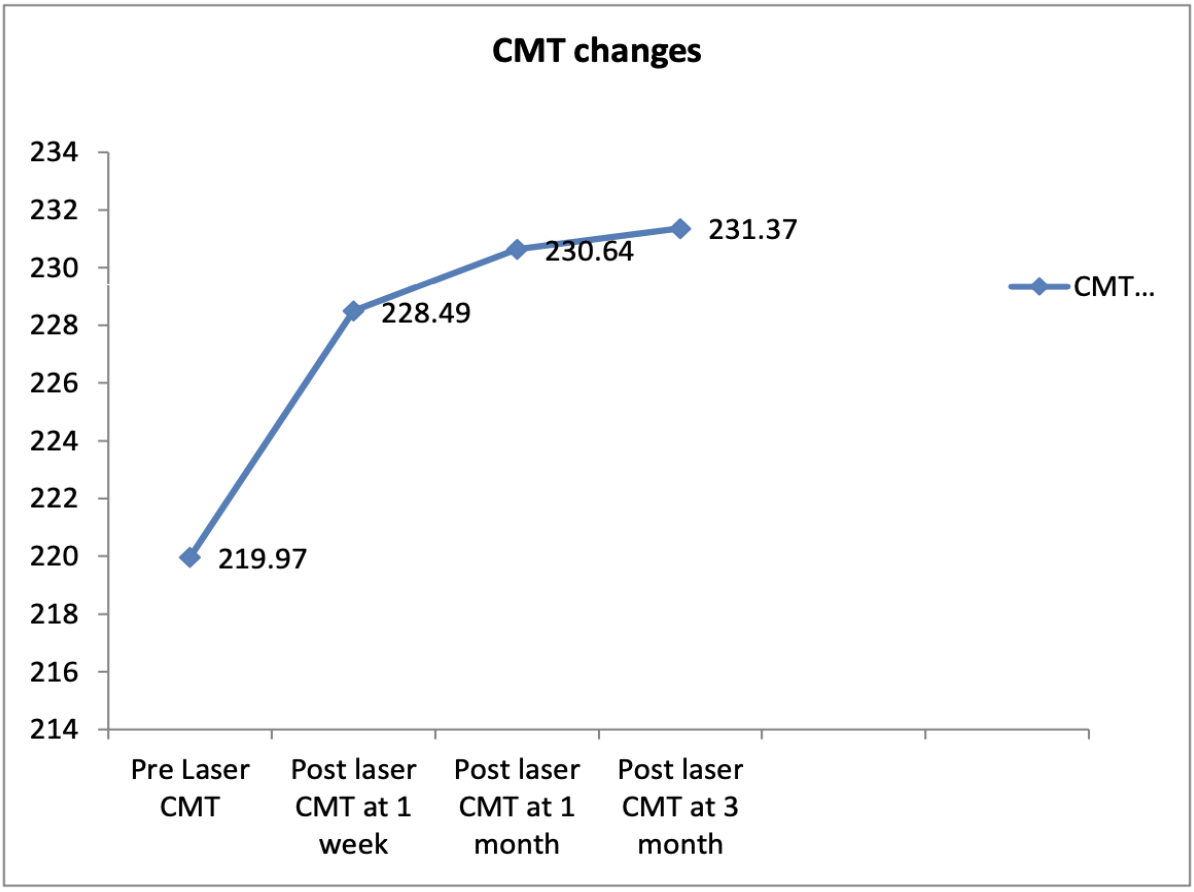


Figure 13: Showing CMT of patients at different points of time.

Table 15: Comparison of change in CMT at different points of time with baseline pre-laser CMT using paired t-test.

Paired t-test		Mean	SD	p-value
Pair 1	Pre Laser CMT	219.978	17.82463627	0.1156
	Post laser CMT 1WEEK	228.4983333	37.62183144	
Pair 2	Pre Laser CMT	219.978	17.82463627	0.0831
	Post laser CMT 1 MONTH	230.645614	43.7762985	
Pair 3	Pre Laser CMT	219.978	17.82463627	0.0573
	Post laser CMT 3 MONTH	231.3701754	42.37940017	

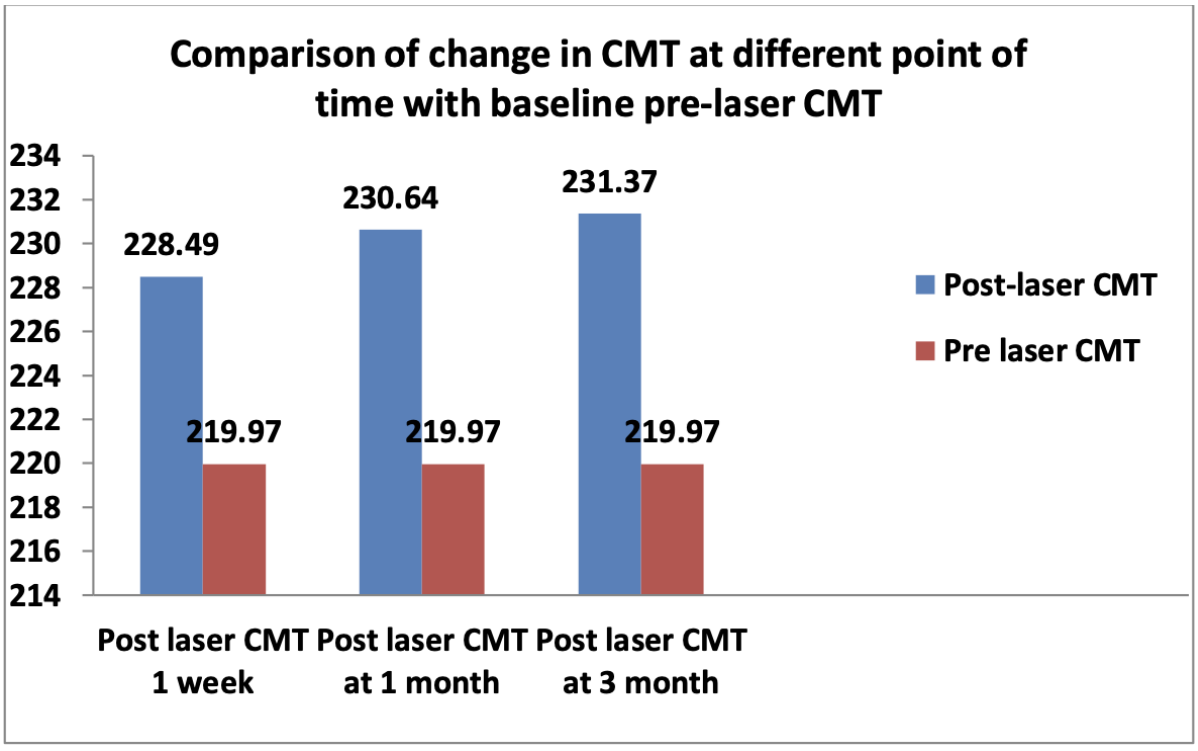


Figure 14: Comparison of change in CMT at different points of time with baseline pre-laser CMT using paired t-test.

Table 16: Showing presence of macular edema among the comorbid patients

COMORBIDITIES	MACULAR EDEMA PRESENT	PERCENT (%)	MACULAR EDEMA ABSENT	PERCENT (%)
DIABETES	3	5%	15	25%
HYPERTENSION	0	0%	27	45%
NIL	0	0%	15	25%

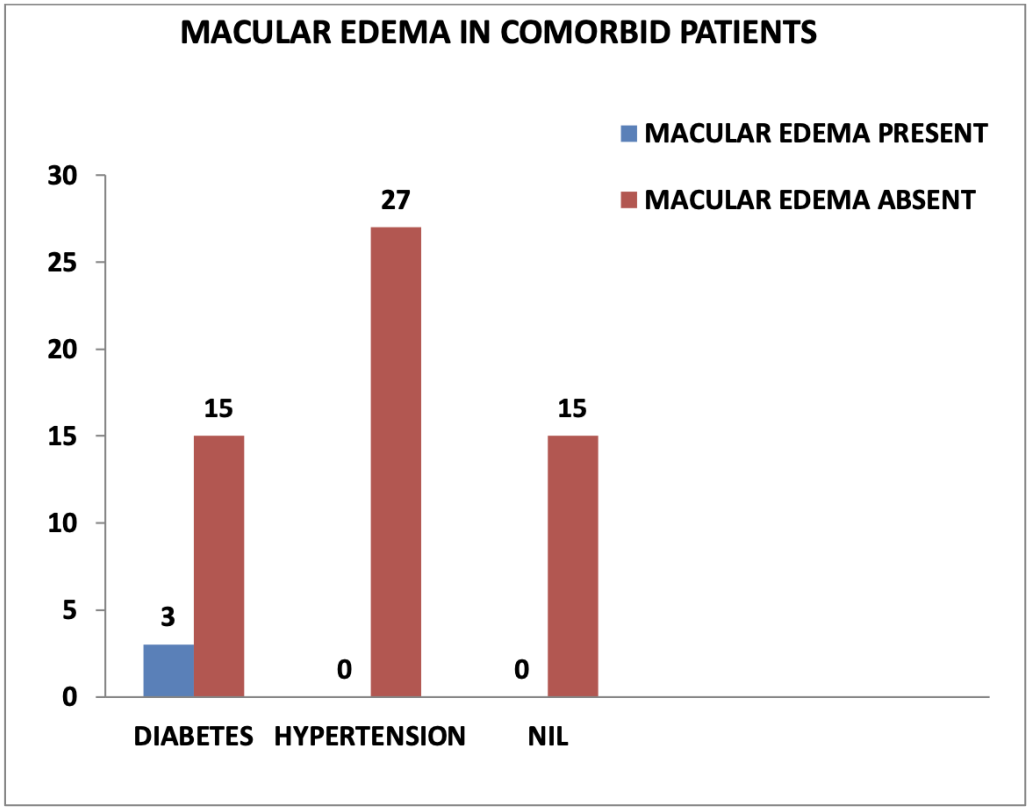


Figure 15: Showing presence of macular edema among the comorbid patients

Figure 16: Case 3

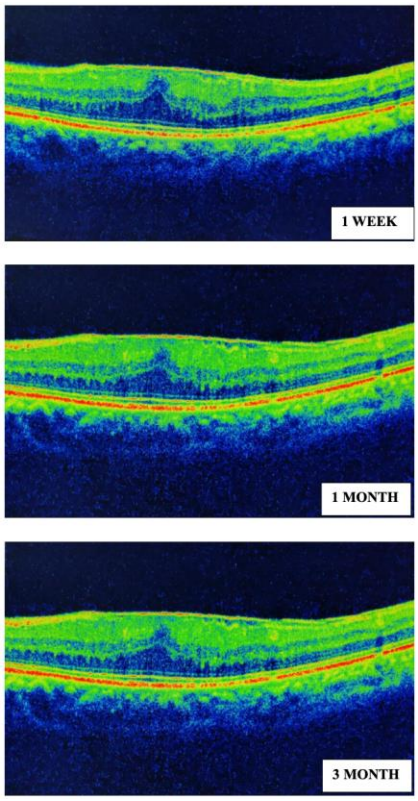


Figure 17: Case 2

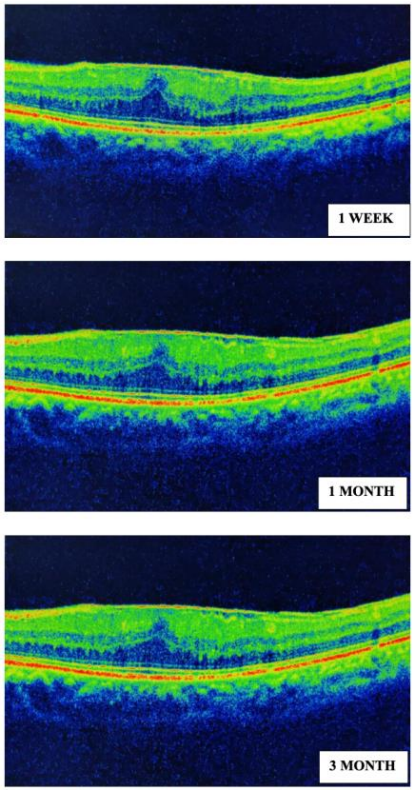
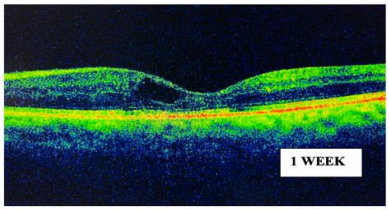
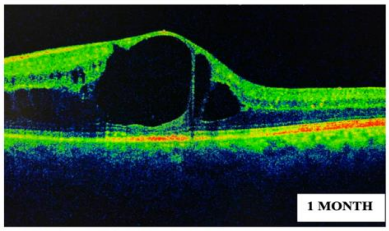


Figure 18: Case 3





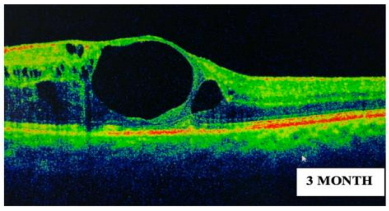


Table 17: Showing presence of various complications among the patients

		Frequency	Percent(%)
Complications	**Transient Increased IOP**	3	5.0%
	IOL pitting	4	6.7%
	Photo disruption of iris	1	1.7%
	Macular Edema	3	5.0%
	Uveitis	0	0%
	Retinal detachment/tear	0	0%
	Macular hole	0	0%
	Corneal burn	0	0%
	Vitreous into Anterior chamber	0	0%
	Endophthalmitis	0	0%
	NIL	49	81.7%
	Total	60	100.0%

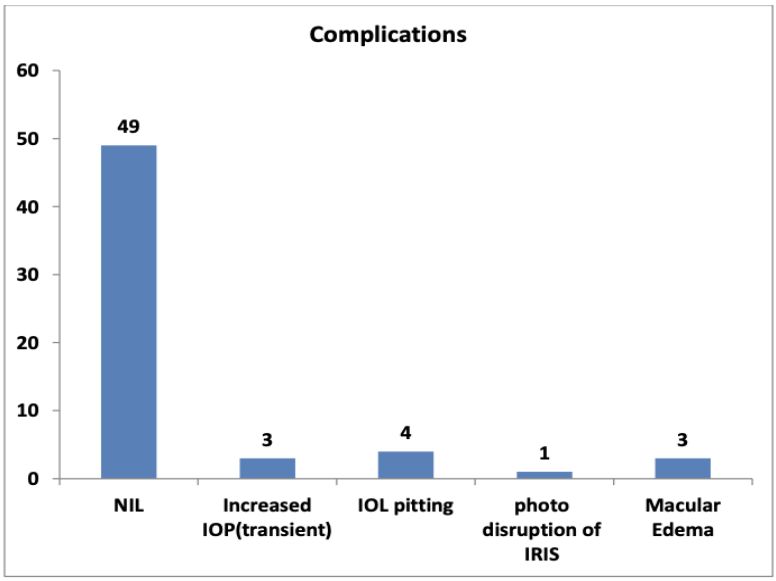


Figure 19: Showing presence of various complications among the patients.

Discussion

The present cross sectional study conducted among the patients who underwent the Nd- YAG laser treatment for the posterior capsular opacity. Patients with evidence of central corneal opacity, uveitis, retinal surgery, intra ocular infections, pre existing diabetic maculopathy, nystagmus, patients who were not willing to participate in the study were excluded from the study. the opacity was assessed, and outcome was analysed.

In present study total of 60 patients fulfilling inclusion criteria were included. The mean age of the patients was found to be 64.183±7.42.

- On assessment of the gender, 46.7% were male patients and 53.3% were female patients.
- On assessment of the laterality, 58.3% were involved with right side and 41.7% with left side.
- The mean age of patients between the gender was found to be comparable with no significant difference in the mean age.
- In the study, the duration (in year) of disease was found 7.73±2.85.
- On assessment of the type of surgery 80% were with SICS and 20% with phaco.
- On assessment,30% were diabetic, 45% were hypertensive, rest 25% were without any comorbidities.
- In the study, fibrous type PCO was found in 55% patients, pearl type of PCO in 25%, mixed type in 20%.
- On assessment, as per laser power distribution in mJ, 48.3% patients were underwent laser capsulotomy with 10-25 mJ power, 20% with 26-45 mJ power, 11.6% with 46-65mJ power, 13.3% with 66-85mJ power, 1.6% with 86-100mJ power, 5% with >100mJ power.
- In the study, pre-laser vision was found to be 20.0% with 6/9-6/12 vision, followed with 70% with 6/18-6/60, 10.0% with <6/60.
- Post laser BCVA after 1hr was found to be 36.7% with 6/9-6/12, 61.7% with 6/18- 6/60, 1.7% with <6/60.
- At post laser BCVA after 24hr, 68.3% had the 6/9-6/12, 30.0% with 6/18-6/60, 1.7% with <6/60.

- In the study of BCVA at 1st week, 81.6% with 6/6-6/12, 16.7% with 6/18-6/60, 1.7% with <6/60.
- At 1st month of post laser, 88.3% had the BCVA of 6/6-6/12, followed by with 10% with 6/18-6/60, and 1.7% with<6/60.
- On assessment of post laser BCVA on 3rd month, 93.3% had the BCVA of 6/6- 6/12, 3.4% with 6/18-6/60, 3.3% with <6/60.
- On comparison of the intra-ocular pressure between the intervals of time, we found a significant rise in the IOP at 1st hr and 4 hr after laser therapy compared to pre-laser IOP among the patients. The IOP was not found to be significantly different at other intervals of time.
- On comparison of the central macular thickness (CMT) between the intervals of time, we found a significant rise in the CMT after 1 week of laser therapy compared to pre-laser CMT among the patients. Among the complications, macular edema was seen in 5% of patients, which is not statistically significant and shows no correlation between change in CMT post laser. macular edema was not reduced to pre laser CMT after 3 month of follow up with appropriate treatment.
- Among the complications, increased IOP was seen in 5% of patients, 6.7% with IOL pitting, 5% with macular edema and 1.7% with photo disruption of iris.
- Among the complications, Macular edema was found in 5% of patients with diagnosed case of diabetes mellitus without pre laser macular edema. Macular edema occurred after 1 week of Nd-YAG capsulotomy and did not recover after 3 months of period with appropriate treatment.

Conclusion

- The present study documented improvement in the vision with Nd-YAG capsulotomy, with minor complications which included a temporary and reversible rise in IOP.
- Percentage of macular edema in 5% cases, and all cases were diabetic as comorbidities.
- Percentage of IOL pitting and photo disruption of iris was negligible.
- Nd-YAG laser proves to be the most effective and noninvasive treatment modality for posterior capsular opacification.

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