



A COMPARATIVE STUDY OF DIABETICS AND NON-DIABETICS REGARDING VISUAL OUTCOME, IOP CHANGES AND MACULAR THICKNESS, IN PATIENTS TREATED WITH Nd-YAG LASER CAPSULOTOMY.

Ophthalmology

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ABSTRACT

Purpose: The aim of the study reported here was to compare visual outcome, IOP changes, macular thickness of diabetic and nondiabetic in patients treated with neodymium-doped yttrium-aluminium-garnet (Nd:YAG) laser capsulotomy.

Methods: This prospective study of 100 patients attending the regular outpatient door in the department of ophthalmology was conducted in Maharana Bhupal General Hospital, Udaipur from June 2019 to December 2020. Patients were divided into two groups of 50 each of diabetics and non-diabetics. All patients above 40 years were included in the study. Visual acuity was checked using Snellen's visual acuity chart and pinhole improvement was noted after 1st week, 2nd week and 3 months. IOP changes were noted using non contact tonometer the very next day and after a week and macular thickness with OCT after 1 week, 2 weeks, 1 month and 3 months.

Results: The difference between mean IOP at next day follow up between the two groups was found to be 0.32 ($p=0.508$) and that of 1st week follow up was 0.14 ($p=0.761$). Improvement in visual acuity at the first week was better in non-diabetic group where 30% of patients had visual acuity of $\geq 6/12$, compared to 24% in diabetics. The visual outcome at the end of first month was better in non-diabetic group where 66% of patients had visual acuity of $\geq 6/12$, compared to only 28% in diabetics. The difference between mean MT in the 2 groups pre laser was 38.04 ($p<0.001$), at 1st week follow up was 35.62 ($p<0.001$), 2nd week follow up was 38.60 ($p<0.001$), 1st month follow up was 38.14 ($p<0.001$) and after 3 months was 38.02 ($p<0.001$).

Conclusion: The pattern of IOP change was found to be similar in both groups. All the patients treated for PCO with Nd:YAG laser capsulotomy showed an improvement in visual acuity. The final visual outcome at first month (47% had $\geq 6/12$) was found to be better than that at first week (27%). The final visual outcome at one month was found to be better in non-diabetics (66% had $\geq 6/12$) compared to diabetics (28% had $\geq 6/12$). All the patients who underwent capsulotomy showed a rise in MT values after 1 week and return to near normal of baseline values on subsequent follow up.

KEYWORDS

INTRODUCTION

A cataract is one of the leading cause of curable blindness all over world. In the developing world, most popular method of cataract surgery is extra capsular cataract extraction with posterior chamber intraocular lens (IOL) implantation. In this operation, the posterior part of the anterior capsule is left in situ.¹ Posterior capsular opacification (PCO) also called 'after' or 'secondary' cataract is a common long-term complication of cataract surgery that causes decreased vision, glare and other symptoms similar to that of the original cataract.² PCO is caused by a proliferation of lens epithelial cells which causes fibrotic changes and wrinkling of the posterior capsule.³ It also decreases the field of view during therapeutic and diagnostic procedures and also causes uniocular diplopia/polyopia.⁵

Initially PCO used to be removed surgically but now, Neodymium: Yttrium-Aluminium-Garnet (Nd:YAG) laser capsulotomy is the standard treatment for PCO.^{6,7,8} Although Nd:YAG laser capsulotomy has been found to be safe and effective, events such as retinal detachment^{9,10,11}, cystoid macular edema^{11,12}, rise in intraocular pressure (IOP)^{13,14} and endophthalmitis tend to occur after Nd:YAG laser capsulotomy.

Macular edema is caused by movement and damage in the vitreous cavity and release of inflammatory mediators due to the damage of blood-aqueous barrier; elevated IOP is associated with and increased amount of aqueous particles following Nd:YAG laser capsulotomy.^{15,16} Nd:YAG capsulotomy remains the cornerstone in its treatment. The advantage of Nd:YAG is that it's non invasive, of short duration, very effective and relatively safe technique, to manage intact posterior capsule that opacifies post operatively.

It occurs in up to approximately 50% of patients within 2-3 years of their cataract surgery. Diabetic patients undergoing cataract surgery are at higher risk of postoperative complications. Diabetic patients have been reported to develop significantly greater PCO after cataract

surgery than nondiabetic patients; however, the stage of retinopathy and the systemic status of diabetes did not correlate with the degree of PCO.

There is a paucity of literature comparing the visual acuity (VA), IOP changes, macular thickness of diabetic and nondiabetic patients after Nd:YAG laser capsulotomy. Therefore, this study was designed to compare the the visual acuity (VA), IOP changes, macular thickness of diabetic and nondiabetic patients after Nd:YAG laser capsulotomy.

1.3 MATERIAL AND METHODS

All known cases of cataract satisfying the study criteria, presenting to or referred to ophthalmology department at RNT Medical College and Hospital Udaipur, from June 2019 to December 2020 were included in the study. Inclusion criteria were patient with PCO following cataract extraction with PCIOL implantation, pseudophakic eye with visual impairment due to significant PCO, minimum period of 3 months following uneventful cataract surgery, cooperative patients those who fully understand the procedure.

Exclusion criteria were patients with IOL implantation other than PCIOL, anterior segment abnormalities such as corneal opacities, aphakia and posterior segment abnormalities such as with retinopathy, PVD, maculopathy and optic neuropathy, who had any complication during cataract surgery, glaucoma or any anti-glaucoma medications, any pre-existing inflammation of the eye.

This was a prospective study of 100 patients attending the regular outpatient door in the department of ophthalmology, conducted in Maharana Bhupal General Hospital, Udaipur from June 2019 to December 2020. Patients were divided into two groups of 50 each of diabetics and non-diabetics. All patients above 40 years were included in the study. Visual acuity was checked using Snellen's visual acuity chart and pinhole improvement was noted after 1st week, 2nd week and 3 months. IOP changes were noted using non contact tonometer the very

next day and after a week and macular thickness with OCT after 1 week, 2 weeks, 1 month and 3 months.

Fasting Blood Sugar and Post prandial blood sugar levels were done in known diabetics and Random Blood Sugar in non-diabetics.

After taking consent from the patient, pupils were dilated using tropicamide 0.8% and phenylphrine 5% drops. Slit lamp examination was done to assess the cornea and also to assess the type and grade the PCO. Further direct/indirect ophthalmoscopic examination was done. IOP was measured using non contact tonometer before the procedure. Now eye drop paracaine (proparacaine) one drop was instilled once in operating eye. During Laser the patient fixed the red light by other eye (non-operating). The slit lamp was focused and the YAG was switched on. - The energy level's were fed into the computer. Usually 0.8 to 1mj, lower power setting were used initially and later increased as per requirement. Capsulotomy was started by marking the centre of pupil, shots were applied around it. Starting from 12 o'clock position and going clockwise until a satisfactory opening was made. Post-laser, Visual acuity was checked using Snellen's visual acuity chart and pinhole improvement was noted after 1st week, 2nd week and 3 months. IOP changes were noted using non contact tonometer the very next day and after a week and macular thickness with OCT after 1 week, 2 weeks, 1 month and 3 months.

1.4 RESULTS

Table 1: Age Distribution

AGE (YEARS)	DIABETIC (N=50)		NON-DIABETIC (N=50)		TOTAL	
	No.	%	No.	%	No.	%
41-50	0	0	3	6	3	3
51-60	20	40	12	24	32	32
61-70	17	34	20	40	37	37
71-80	13	26	14	28	27	27
81-90	0	0	1	2	1	1
Total	50	100	50	100	100	
Mean±SD	65.36 ± 8.223		65.86 ± 8.091			

P value (Pearson chi-square test, value - 6.280a, df-4) = 0.179, non-significant.

Table 2: Distribution Of Fasting Blood Sugar Values

PARAMETER	DIABETIC	SD	NON-DIABETIC	SD
FBS (mg/dl)	131.86	32.868	103.08	12.265
Mean Difference	28.780			
P value	<0.001 (HS)			

The mean of fasting blood sugar values among diabetics were 131.86 (±32.86) when compared to non-diabetics with mean of 103.08 (±12.26) having a mean difference of 28.780, showed high statistical significance.

Table 3: Distribution Of Random Blood Sugar Values

PARAMETER	DIABETIC	SD	NON-DIABETIC	SD
RBS (mg/dl)	169.94	30.592	132.80	9.760
Mean Difference	37.140			
P value	<0.001 (HS)			

The mean of random blood sugar values among diabetics were 169.94 (±30.592) when compared to non-diabetics with mean of 132.80 (±9.760) having a mean difference of 37.140, showed high statistical significance.

Table 4: Intergroup Comparison Of Change In Iop

PARAMETER	DIABETIC (n=50)		NON-DIABETIC (n=50)		MEAN DIFFERENCE	P VALUE	T VALUE
	MEAN	SD	MEAN	SD			
IOP (PRE-Nd)	14.08	2.42	14.16	2.566	0.08	0.873	0.160
FOLLOW UP NEXT DAY	17.86	2.38	18.18	2.439	0.32	0.508	0.664
FOLLOW UP 1 WEEK	14.12	2.23	14.26	2.346	0.14	0.761	0.305

Independent t test. The difference between mean IOP at next day follow up between the two groups was found to be 0.32 (p=0.508) and that of 1st week follow up was 0.14 (p=0.761). Both these values were

statistically non-significant, showing that pattern of IOP change was not related to the diabetic status of the patient.

Table 5: Distribution Of Beva At 1st Week Follow Up Among 2 Groups

VISUAL ACUITY	DIABETIC (n=50)	%	NON-DIABETIC (n=50)	%	TOTAL
6/6	0	0	0	0	0
6/9	0	0	0	0	0
6/12	12	24	15	30	27
6/18	16	32	11	22	27
6/24	14	28	11	22	25
6/36	8	16	13	26	21
6/60	0	0	0	0	0
5/60	0	0	0	0	0
4/60	0	0	0	0	0
3/60	0	0	0	0	0
2/60	0	0	0	0	0
1/60	0	0	0	0	0
HM	0	0	0	0	0
TOTAL	50	100	50	100	100

Pearson chi-square test value-2.810a, df-3, p value-0.422

In diabetic group, 16% of patients improved to 6/36, 28% improved to 6/24, 32% improved to 6/18 and 24% improved to 6/12. In non-diabetic group, 26% of patients improved to 6/36, 22% to 6/24 and 6/18 and 30% to 6/12. Therefore, improvement in visual acuity at the first week was better in non-diabetic group where 30% of patients had visual acuity of >= 6/12, compared to 24% in diabetics.

Table 6: Distribution Of Beva At 1st Month Follow Up Among 2 Groups

VISUAL ACUITY	DIABETIC (n=50)	%	NON-DIABETIC (n=50)	%	TOTAL
6/6	1	2	4	8	5
6/9	3	6	10	20	13
6/12	10	20	19	38	29
6/18	17	34	11	22	28
6/24	11	22	5	10	16
6/36	8	16	1	2	9
6/60	0	0	0	0	0
5/60	0	0	0	0	0
4/60	0	0	0	0	0
3/60	0	0	0	0	0
2/60	0	0	0	0	0
1/60	0	0	0	0	0
HM	0	0	0	0	0
TOTAL	50	100	50	100	100

Pearson chi-square value-17.342a, df-5, pvalue-0.004 (significant)

In diabetic group, 16% of patients improved to 6/36, 22% improved to 6/24, 34% improved to 6/18, 20% improved to 6/12, 6% to 6/9 and 2% to 6/6. In non-diabetic group, 2% of patients improved to 6/36, 10% to 6/24, 22% to 6/18, 38% to 6/12, 20% to 6/9 and 8% to 6/6. Therefore, the visual outcome at the end of first month was better in non-diabetic group where 66% of patients had visual acuity of >= 6/12, compared to only 28% in diabetics.

Table 7: Intergroup Comparison Of Change In Macular Thickness Between The Two Groups

PARAMETER	MEAN	SD	MEAN	SD	MEAN DIFFERENCE	P VALUE	T VALUE
MT (PRE-Nd)	239.74	6.305	201.70	12.588	38.040	0.000	19.106
FOLLOW UP 1 ST WEEK	251.72	8.418	216.10	10.080	35.620	0.000	19.179
FOLLOW UP 2ND WEEK	241.30	7.115	202.70	12.274	38.600	0.000	19.238
FOLLOW UP 1 ST MONTH	240.30	6.876	202.16	11.932	38.140	0.000	19.583
FOLLOW UP 3 RD MONTH	239.66	6.620	201.64	11.955	38.020	0.000	19.673

Independent t test

The difference between mean MT between 2 groups pre laser was 38.04 ($p=0.000$), at 1st week follow up between the two groups was found to be 35.62 ($p=0.000$), 2nd week follow up was 38.60 ($p=0.000$), 1st month follow up was 38.14 ($p=0.000$) and after 3 months was 38.02 ($p=0.000$).

DISCUSSION

In our study, out of 100 patients, majority of them were in 51-70 yrs of age group. A similar trend was reported in the study conducted by Shetty NK and Sridhar N et al¹⁷, found, there were 21 males (60%) and 14 females (40%); amongst whom 68.6% were in 50-70 years age group.

In our study, the most common type of PCO was capsular fibrosis which was similar to the studies of Kundi and Younas¹⁸ and Bari et al¹⁹ but differed from the study of Hasan et al²⁰ who reported Elschnigs pearls as the most common type of PCO in pseudophakic eyes and secondary fibrosis in aphakic eyes.

All the 100 patients who underwent laser capsulotomy, in our study, showed a rise in IOP, recorded after 24hrs following the procedure, with a mean value of 3.90 mm of Hg. There was no statistically significant difference (0.873) between pattern of change in IOP among diabetics and non-diabetics. Our study results were in concordance with the study conducted by Hassan KS et al²⁰ and Kraff CM et al²¹ who reported average rise in IOP by 6mm Hg and 3.5 mm Hg after laser capsulotomy respectively. In a study conducted by Lin JC et al²², an IOP rise of at least 5 mm Hg was noted, 1hr after the capsulotomy in 7.2% of the patients.²³ In another study, a transient rise in IOP (>5mmHg) in early post capsulotomy period occurs in approx. 10-40% of all individuals.^{24,25}

Another parameter evaluated in our study was visual outcome following Nd-YAG laser capsulotomy. All the 100 patients in our study showed improvement in visual acuity. The 34% of patients had a pre laser visual acuity of $\leq 1/60$. After 1 week, visual acuity improved to $> 6/12$ in 27% of patients. After one month, 47% showed improvement to $\geq 6/12$. Thus, a good number of patients showed improvement on subsequent follow ups following capsulotomy. In a study of 100 patients, done by Ohm Vrajlal Patel et al²⁶, at Venu Eye Institute and Research Centre, New Delhi; pre laser VA ranged from 1/60 to 6/12. Results showed statistical significant improvement in BCVA with 70% patients had BCVA 6/6, 21% had BCVA 6/9 and 8% had BCVA 6/12 post laser at 1 month.

Similar findings have been noted by Gardener KM²⁷, Wasserman et al²⁸, Mohan Lal Gupta²⁹, which reports significant improvement in capsulotomy in $> 90\%$ patients out of 100.

Study done by Polak M Zarnowski, T Zogorski Z³⁰ have included 25 and 26 eyes respectively and visual outcome was 89% and 95% respectively.

All the 100 patients who underwent laser capsulotomy, in our study, showed a rise in macular thickness, after 1 week with a mean of 233.91 (± 20.143), which showed high statistical significance showing that pattern of MT change was related to the diabetic status of the patient. In a study conducted by Ugur Yilmaz et al³¹ showed similar results with an increase in MT observed after laser capsulotomy especially in diabetic patients.

1.5 CONCLUSION

All the patients showed an increase in IOP after 24 hours of follow up and return to near normal of baseline values at first week of follow up. The pattern of IOP change was found to be similar in both groups. All the patients treated for PCO with Nd:YAG laser capsulotomy showed an improvement in visual acuity. The final visual outcome at first month (47% had $\geq 6/12$) was found to be better than that at first week (27%). The final visual outcome at one month was found to be better in non-diabetics (66% had $\geq 6/12$) compared to diabetics (28% had $\geq 6/12$).

There was no significant difference in total amount of laser energy used among the two groups. All the patients who underwent capsulotomy showed a rise in MT values after 1 week and return to near normal of baseline values on subsequent follow up.

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