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Research article

## A STUDY ON CORRELATION BETWEEN POSTERIOR CAPSULAR OPACIFICATION AND VISUAL FUNCTION BEFORE AND AFTER NEODYMIUM: YAG LASER POSTERIOR CAPSULOTOMY IN RURAL POPULATION OF NORTH MAHARASHTRA

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### ABSTRACT

Posterior capsular opacification is the opacity which follows after extra capsular cataract extraction and can be treated by surgery or laser. The laser is the procedure of choice because it is non invasive, outpatient procedure that clears visual axis and improves vision instantaneously. **Aims:** The aim of this study is to correlate density of Posterior capsular opacification in relation to visual deterioration and subsequent improvement after Nd: YAG laser, amount of energy required to cut the posterior capsule and to observe any complications during and after the procedure. **Methods:** It was a prospective study which was carried out over a period of two years. 40 eyes with posterior capsular opacification were included. Visual acuity and intraocular pressure were recorded before and after the procedure. **Result:** After the YAG capsulotomy 85% patients showed improvement by 3 snellen's line or more while 12.5% patients improved by 2 snellen's line or more and remaining 2.5% patients showed 1 snellen's line improvement. The average energy required per shot to break the posterior capsule was 3.08 ( $\pm$  1.12) mj. Average total energy used in our study is 50.13 $\pm$ 22.32mj. The 77.5% patients had no significant rise of IOP while 15% patients had rise of 2.2 to 5 mmHg and 7.5% patients had rise of IOP of 5 to 10 mmHg after YAG capsulotomy. 7.5% cases had IOL damage in the form of pitting but there were no visual complaints, 5% patients had mild iritis and 2.5% patient had iris bleed.

**Keywords:** Posterior capsular opacification, Laser, Posterior Capsulotomy

### INTRODUCTION

Cataract is any lens opacity on or inside the lens or functionally as only those lens opacities that interfere with vision<sup>1</sup>. Now days, extra capsular cataract extraction is the procedure of choice. In extra capsular cataract extraction, anterior capsulotomy is done and intra ocular lens is put

in the capsular bag with the posterior capsule intact. Posterior capsular opacification (PCO) is the opacity which follows after extra capsular cataract extraction of the lens<sup>2</sup>. PCO occurs as a result of formation of opaque secondary membrane by active lens epithelial cells

proliferation, transformation of lens epithelial cells into fibroblast with contractile elements and collagen deposit. The anterior lens epithelial cells proliferate onto posterior capsule at the site apposition of anterior capsular flaps to posterior capsule<sup>3</sup>. The treatment for PCO is surgery or LASER (Light Amplification by Stimulated Emission of Radiation). The laser is the procedure of choice because it is non invasive, outpatient procedure that clears visual axis and improves vision instantaneously. It can be performed with or without topical anesthesia and has the added benefit of elimination of surgical complications like endophthalmitis<sup>4</sup>. The aim of this study is to correlate density of Posterior capsular opacification in relation to visual deterioration and subsequent improvement after Nd: YAG (Neodymium: Yttrium Aluminum Garnet) laser, amount of energy required to cut the posterior capsule and to observe any complications during and after the procedure.

## MATERIALS AND METHODS

The study is a hospital based prospective study which was carried out over a period of two years in the department of ophthalmology, Rural Medical College, Loni. 40 eyes of 40 patients having Posterior capsular opacification attending ophthalmic outpatient department were included in the study after taking approval from institutional ethical committee. **Inclusion criteria:** Patients above the age of 40 years and both sexes having PCO with the presence of posterior chamber intraocular lens were included in the study. Written informed consent was taken from all the patients. **Exclusion criteria:** Patients with active ocular pathology, previously treated with laser, were not included in the study. Prior to the procedure complete ophthalmic history was taken. Visual acuity with and without

pinhole and intraocular pressure (IOP) with schiotz tonometer were recorded. Slit lamp examination was done to evaluate the type of PCO and fundus examination with direct ophthalmoscope was done. After the procedure visual acuity and IOP were recorded and fundus examination was performed again. Patients were given prednisolone acetate (1%) eye drops four times a day for 5 days and timolol maleate (0.5%) eye drop twice daily for 7 days. Patients were followed after 1 hour, on 7<sup>th</sup> day and after 1 month. Parameters like visual acuity, IOP (intraocular pressure), slit lamp and fundus examination were done in every visit and recorded. The statistical correlation between posterior capsular opacification and visual acuity before and after Nd-YAG laser posterior capsulotomy was calculated by using t-test.

## RESULTS

In our study, 13 patients (Table 1) with visual acuity less than 6/60 group improved with 2 patients improving to 6/36, 3 patients improved to 6/24, 2 patients improved to 6/18, 3 patients improved to 6/12, and 2 patients improved to 6/6. Of the 11 patients having pre YAG visual acuity of 6/60, 4 patients improved to 6/18 while 3 patients improved to 6/12, 2 patients each improved to 6/9 and 6/6. 6 patients having pre YAG visual acuity of 6/36, 1 patient improved to 6/24 and 5 patients to 6/6. 4 patients had pre YAG visual acuity of 6/24, of this 1 patient improved to 6/12 and 2 patients to 6/9 and 1 patient to 6/6. Of the 6 patients of pre YAG visual acuity of 6/18, all 6 patients improved to 6/6. The post YAG visual acuity improvement is statistically significant ( $p$  value  $< 0.01$ ). SYSTAT version 12 was used to for the statistics.

**Table 1: Showing pre YAG and post YAG visual acuity**

Pre YAG visual acuity	Post YAG visual acuity							Total
	6/60	6/36	6/24	6/18	6/12	6/9	6/6	
Less than 6/60	01	02	03	02	03	-	02	13
6/60	-	-	-	04	03	02	02	11
6/36	-	-	01	-	-	-	05	06
6/24	-	-	-	-	01	02	01	04
6/18	-	-	-	-	-	-	06	06
6/12	-	-	-	-	-	-	-	-
6/9	-	-	-	-	-	-	-	-
6/6	-	-	-	-	-	-	-	-
Total	01	02	04	06	07	04	16	40

**Table 2: Showing energy requirement per pulse**

Energy required per pulse (mj)	Number of patients	Percentage
1-2	07	17.50
2.1-3.0	12	30.00
3.1-4.0	16	40.00
4.1-5.0	01	2.50
>5.1	04	10.00
Total	40	100

**Table 3: Showing total amount of energy required per patients**

Total energy required ( mJ)	Number of patients	Percentage
<50	22	55
50-100	16	40
>100	02	05
Total	40	100

**Table 4: Showing post laser IOP changes**

IOP changes	Number of patients
<2.5 mmHg	31 (77.5%)
2.5 to less than 5 mmHg	06 (15%)
5- 10 mmHg	03 (7.5%)
Total	40 (100%)

In our study (Table 2) the average energy required per shot to break the posterior capsule was 3.08 ( $\pm$  1.12) mJ with a range of 1.4mj - 5.9mj. Maximum number of patients required energy in between 2 to 4mj i.e. 70%. The results were statistically significant (p value < 0.05) (t table= 2.0201, t cal. = 14.63).

Average total energy used in our study is 50.13 $\pm$ 22.32mj (Table 3). The maximum number of patients (55%) required a total energy of less than 50 mJ (Ranged between 12 to 49 mJ). The results were statistically significant (p value < 0.01) (t table= 2.71, t cal. = 2.99).

In our study, (Table 4) the maximum number of patients (77.5%) had no significant rise of IOP while 15% of patients had rise of 2.2 to 5 mmHg and 7.5% of patients had rise of IOP of 5 to 10

mmHg after 1 hr of YAG capsulotomy. The results were statistically not significant (p value > 0.05) (t table= 2.021, t cal. = 0.0681).

**Table 5: Showing complications after YAG capsulotomy**

Complications after YAG capsulotomy	Number of patients
IOL pitting	03
Iris bleed	01
Mild iritis	02
Retinal detachment	00
Vitreous floaters	00
Reopacification	00
Cystoid macular edema	00
Total	06

In our study, 7.5% cases (3 patients) had IOL damage in the form of pitting but there were no visual complaints (Table 5). 2 patients (5%) had mild iritis and 1 patient (2.5%) had iris bleed.

## DISCUSSION

We observed marked improvement in visual acuity (Table 1) in all patients which is comparable to the studies done by Hayashi K et al<sup>5</sup>, Gardner KM and associates<sup>6</sup>, Wang J et al<sup>7</sup> who also reported marked improvement in visual acuity in all patients. In our study after the YAG capsulotomy 85% patients showed improvement by 3 snellen's line or more while 12.5% patients improved by 2 snellen's line or more and remaining 2.5% patients showed 1 snellen's line improvement. There was no patient showing any decrease in snellen's line after YAG capsulotomy. Skolnick KA and associates<sup>8</sup> who in their study reported best corrected visual acuity in 45.3% improving by 3 or more lines, in 20.3% by 2 lines and 51% by 1 line.

The average energy used in our study (Table 2) to break the posterior capsule is comparable to the study done by Wang J et al<sup>7</sup> who reported average energy required per pulse was 2.93±0.63mj. The maximum number of cases (70%) was done between 2 to 4mj. Flohr et al<sup>9</sup> in their study used 1.7mj energy per pulse in 67% of cases.

The average total energy used in our study (Table 3) is comparable with the study of Chen et al<sup>10</sup> who used average energy of 52.44±24.62mj. The amount of laser energy used is proportional to the capsulotomy size as patients subjected to lower amounts of laser energy may benefit by having fewer complications. However we could not correlate the amount of energy used and the complications encountered.

In our study 7.5% of patients had rise of IOP of 5 to 10 mmHg (table 4) which is comparable to the study of Skolnick KA et al<sup>8</sup> who reported 6.8% of IOP rise in 212 patients. Terry AC et al<sup>11</sup> reported the rise of 5mmHg of IOP is extremely common after 1 to 4 hr of post laser treatment. We could not correlate the increase in IOP to capsulotomy size and laser power used, though Channel et al<sup>12</sup> reported higher pressure rise for larger capsulotomy. The IOP rise subsided in all our patients within 5 days post YAG capsulotomy with anti glaucoma medications like Timolol (0.5%) eye drop twice daily. There is no evidence that the temporary IOP rise actually cause damage to a patient's long term vision. There are no reports of vein occlusions, arterial

occlusions or optic nerve damage as a result of Nd: YAG capsulotomy unprotected by pressure lowering drops.

We observed (Table 5) 7.5% cases of intra ocular lens (IOL) pitting which is comparable to Wang J and associates<sup>7</sup> who reported 6.8% of cases, while Flohr MJ et al<sup>9</sup> noted a very high incidence of IOL pitting (81%). In our study, 2.5% cases (1 patient) had iris bleed, which was mild and subsided immediately. This was comparable with 2% incidence of iris bleed as noted by Navin S et al<sup>13</sup>. There are no reports of iris bleed causing any significant long term reduction of vision. 5% cases (2 patients) had mild iritis in our study which was treated with Prednisolone acetate 1% eye drop four times a day for another 7 days. Our values are comparable with Navin S et al<sup>13</sup> who reported 6% of incidence of iritis in their study. The low incidence reported by us could be due to the prophylactic treatment of all eyes with prednisolone acetate (1%) eye drops four times a day for 7 days post laser.

## CONCLUSION

Nd: YAG laser is safe, easy, non invasive outpatient procedure, usually performed in few minutes and without discomfort to the patient. It is highly effective in restoring visual acuity in eyes with posterior capsular opacification with minimum complications.

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