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## **Effect Of Diabetes On Visual Outcome And Iop Change, Treated With Nd:Yag Laser Capsulotomy**

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### **Abstract**

Posterior capsular opacification is the most common long term complication of modern IOL surgery. Nd: YAG laser remains the cornerstone of its treatment. In this study, an attempt was made to study the visual outcome and change in the intraocular pressure following Nd: YAG laser capsulotomy and compare the results between diabetic patients and non-diabetic patients.

**Methods:** This is a prospective study of 100 patients (50 diabetics and 50 non-diabetics), conducted in Govt. R.D.B.P. Jaipuriya Hospital, attached to R.U.H.S.-CMS Medical College, Jaipur. All patients aged 40 years and above, attending the regular OPD who presented with visually significant posterior capsular opacification were treated with Nd: YAG laser capsulotomy. Patients were followed up on first week and the first month and the improvement in the BCVA and the change in IOP was recorded.

**Results:** All the patients treated for PCO with Nd: YAG laser capsulotomy showed an improvement in visual acuity. The visual outcome at first month (46% had  $\geq 6/12$ ) was found to be better than that at first week (only 3% had the same). The final visual outcome at one month was found to be better in non-diabetics (62% had  $\geq 6/12$ ) compared to diabetics (30% had  $> 6/12$ ). All the patients showed an increase in IOP at the first week of follow up and return to near normal of baseline values at first month of follow up, the pattern of change in IOP being similar in both the study groups.

**Conclusion:** Nd: YAG laser capsulotomy effectively improves the visual acuity in patients with visually significant PCO. The comparatively poor outcome in the diabetic group can be attributed to the associated retinopathy changes. Nd: YAG laser capsulotomy is associated with a transient rise in the intraocular pressure in all patients which can very rarely remain persistently high.

**Keywords:** Nd, YAG, BCVA, PCO

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### **Introduction**

Posterior capsular opacification is the most common long term complication of modern IOL surgery. It occurs frequently in patients after cataract surgery, especially senile cataracts.

Many methods have been employed to reduce the incidence of PCO but none of these seems to be very effective on long term follow ups. Hence it has to be treated. Initially PCO used to be removed surgically but now, Nd: YAG laser is most commonly used as the best mode of 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 Diabetic patients are at a greater risk of developing PCO. In this study, we compare the outcome of Nd: YAG laser posterior capsulotomy in diabetics and non-diabetics who have developed PCO post operatively, in terms of the best corrected visual acuity (BCVA) and the intra ocular pressure (IOP).

### **Objectives**

- To compare the visual outcome following Nd: YAG capsulotomy in diabetics and non-diabetics.
- To compare the post-operative changes in IOP following Nd: YAG capsulotomy in diabetics and non-diabetics.

### **Methodology**

This is a prospective study of 100 patients with PCO, attending the regular out patient in the department of ophthalmology, conducted in Govt. R.D.B.P. Jaipuriya Hospital Patients were divided into two groups of 50 each of diabetics and non-diabetics. All patients above 35 years were included in the study. Detailed history was taken of each patient and recorded on specifically designed proforma. History was obtained with special attention to characteristic symptoms of decreased visual acuity, glare, or altered colour sensitivity, and the duration between surgery and the development of visually significant symptoms. Visual acuity was checked using Snellens's visual acuity chart and pinhole improvement was noted. Pupils were dilated using tropicamide 0.5% and phenylephrine 5% drops. Slit lamp examination was done to assess the cornea and also to assess the type and grade the PCO. Further, Fundus direct ophthalmoscopic examination was done. IOP was measured using applanation tonometry before the procedure. FBS was done in known diabetics, and RBS in those who were not diabetics.

### **Assessment of PCO**

Pupils were dilated and slit lamp biomicroscopy using retroillumination was performed giving special attention to

posterior capsule under the IOL optic. PCO grading was done as by Kucuksumer Y *et al* 45 by subjective assessment of the extent and density of the lens epithelial cells migration on the posterior capsule as follows.

Grade 0: posterior capsule completely clear and no LEC migration.

Grade 1: LEC migration at the periphery with a clear visual axis.

Grade 2: LEC migration onto the visual axis with no drop in BCVA. Grade 3: LEC migration onto the visual axis with BCVA better than 6/12 Grade 4: LEC migration onto the visual axis with BCVA of 6/12 or worse

Grade 4 of PCO was considered as visually significant PCO and was considered as an indication for Nd: YAG capsulotomy.

**Nd: YAG capsulotomy**

- After assessing the type and the grade of PCO, visual acuity was recorded with snellen’s chart, and the intra ocular pressure was measured with applanation tonometry.
- All patients with grade 4 PCO were offered Nd: YAG laser capsulotomy.

**Results**

This study was an attempt to assess the visual outcome and change in intraocular pressure between the diabetic patients and non-diabetics following Nd: YAG posterior capsulotomy. A total of 100 cases were studied, out of which 50 were diabetics and 50 were non-diabetics.

**Table 1:** Showing age distribution of the patients

| Age (years) | Diabetic (n=50) |     | Non-Diabetic (n=50) |     | Total |    |
|-------------|-----------------|-----|---------------------|-----|-------|----|
|             | No.             | %   | No.                 | %   | No.   | %  |
| <40         | 0               | 0   | 4                   | 8   | 4     | 4  |
| 41-50       | 11              | 22  | 4                   | 8   | 15    | 15 |
| 51-60       | 9               | 18  | 12                  | 24  | 21    | 21 |
| 61-70       | 17              | 34  | 14                  | 28  | 31    | 31 |
| 71-80       | 12              | 24  | 12                  | 24  | 24    | 24 |
| 81-90       | 1               | 2   | 4                   | 8   | 5     | 5  |
| Total       | 50              | 100 | 50                  | 100 | 100   |    |
| Mean+/-SD   | 62.7+/-10.5     |     | 63.8+/-13.4         |     |       |    |

P Value (students unpaired t test) = 0.65, non-significant

In the diabetic group, majority of the patients were in the age group of 61 – 70 years (34%). In the non-diabetic group also, majority of the patients were in the age group of 61 – 70 years (28%). The mean of age groups being 62.5 (+/-10.5) in diabetics and 63.8 (+/-13.4) in the non-diabetics, showing no statistical significance

**Table 2:** Showing the sex distribution of patients

| Sex    | Diabetic (n=50) | Non-Diabetic (n=50) |
|--------|-----------------|---------------------|
| Male   | 24 (48%)        | 22 (44%)            |
| Female | 26 (52%)        | 28 (56%)            |

X2 = 0.16 P=0.68 Not significant

Among the diabetics, 24 patients were males (48%) and 26 patients were females (52%). In the non-diabetic group, 22

Patients were males (44%) and 28 were females (56%). No statistical significance was found among the groups

**Table 3:** Showing the fasting blood sugar values

| Parameter | Diabetic (n=50) |       | Non-Diabetic (n=50) |       |
|-----------|-----------------|-------|---------------------|-------|
|           | Diabetic (n=50) | SD    | Non-Diabetic (n=50) | SD    |
| FBS       | 131.56          | 36.38 | 103.04              | 11.89 |

|                        |              |
|------------------------|--------------|
| <b>Mean Difference</b> | <b>28.50</b> |
| P* Value, significance | P<0.001 HS   |

\*students unpaired t test

The mean of fasting blood sugar values among the diabetics were 131.56 (+/-36.38) when compared to non-diabetics who had a mean of 103.04 (+/- 11.89), with a mean difference of 28.50, which showed high statistical significance.

**Table 4:** Showing the distribution of type of PCO

| Type of PCO | Diabetic (n=50) | Non-Diabetic (n=50) |
|-------------|-----------------|---------------------|
| Fibrous     | 28 (56%)        | 32 (64%)            |
| Pearl       | 22 (44%)        | 18 (36%)            |

Fibrous type of PCO was observed in 28 diabetic and 32 non-diabetic patients, whereas pearl type of PCO was observed in 22 diabetic and 18 non-diabetic patients

**Table 5:** Showing the pre Nd: YAG intraocular pressure

| Parameter    | Diabetic (n=50) |      | Non-Diabetic (n=50) |      |
|--------------|-----------------|------|---------------------|------|
|              | Mean            | SD   | Mean                | SD   |
| IOP (Pre Nd) | 14.4            | 2.62 | 14.44               | 2.50 |

|                        |             |
|------------------------|-------------|
| <b>Mean Difference</b> | <b>0.04</b> |
| P* Value, significance | 0.93 NS     |

\*students unpaired t test.

The mean IOP before performing the procedure was observed to be 14.4 in diabetics and 14.44 in non-diabetics. The mean difference is 0.04, which showed no statistical significance.

**Table 6:** Showing the pattern of change in IOP during follow up

| IOP  | Pre Nd: YAG (A) | Follow Up week 1 (B) | Follow up month 1 © | A Vs B           | A Vs C          |
|------|-----------------|----------------------|---------------------|------------------|-----------------|
| Mean | 14.4            | 19.5                 | 15.3                | 5.04 P*<0.001 HS | 0.9 P*<0.001 HS |
| SD   | 2.5             | 3.4                  | 2.9                 |                  |                 |

In comparison to the mean baseline pre Nd: YAG values of 14.4 (+/-3.4), all the 100 patients who underwent treatment showed a rise in the intraocular pressure values at the first week of follow up showing a mean of 19.5(+/-2.5), which showed high statistical significance. All these patients showed values returning to near normal of the base line values at the second follow up at one month, the mean value being 15.3 (+2.9). Even though this shows a high statistical significance in comparison to the pre Nd: YAG values, it was of no clinical significance.

**Table 7:** Showing the comparison of the change in the intraocular pressure on follow up between diabetics and non-diabetics – intergroup comparison

| Parameter         | Diabetic (n=50) |          | Non-Diabetic (n=50) |          | Mean Difference | P* Value, sig |
|-------------------|-----------------|----------|---------------------|----------|-----------------|---------------|
|                   | Mean            | SD       | Mean                | SD       |                 |               |
| IOP (Pre Nd)      | 14.4            | 2.618615 | 14.44               | 2.500286 | 0.04            | 0.93 NS       |
| Follow up 1 week  | 18.56           | 2.997686 | 18.92               | 4.430138 | 0.36            | 0.63 NS       |
| Follow up 1 month | 15.22           | 2.150368 | 15.32               | 3.466693 | 0.10            | 0.86 NS       |

The difference between the mean IOP at first week follow up between the two groups were found to be 0.36 (p=0.63), and that of first month follow up is 0.10 (p=0.86).

Both these were found to be statistically non-significant, showing that the pattern of IOP change is not related with the diabetic status of the patient.

**Table 8:** Change in visual acuity (BCVA) during follow up

|         | BCVA       |                     |                      |
|---------|------------|---------------------|----------------------|
|         | Pre Nd (%) | Follow Up week 1(%) | Follow up month 1(%) |
| 6/6     | 0          | 0                   | 3                    |
| 6/9     | 0          | 1                   | 11                   |
| 6/12    | 0          | 2                   | 32                   |
| 6/18    | 1          | 1                   | 27                   |
| 6/24    | 0          | 11                  | 17                   |
| 6/36    | 2          | 28                  | 8                    |
| 6/60    | 15         | 38                  | 0                    |
| CF-5mt  | 0          | 9                   | 0                    |
| CF-4mt  | 16         | 8                   | 0                    |
| CF-3mt  | 7          | 0                   | 0                    |
| CF-2mt  | 20         | 2                   | 2                    |
| CF-1mt  | 28         | 0                   | 0                    |
| CF-1/2m | 2          | 0                   | 0                    |
| HM      | 9          | 0                   | 0                    |

In the study group, 28% of the patients had a vision of CF 1 mt, 20% of them had a vision of CF 2 mt, 16% patients had a vision of CF 4 mt and 15% had a vision of 6/60 before the treatment. Following treatment, at first week follow up, 38% of the patients had visual acuity improved to 6/60 and 28% of them improved to

6/36. By the second follow up at the first month, 32% of the patients improved to 6/12 and 27% of them improved to 6/18. Most of the patients improved from CF 1 - 4 mt before treatment, to 6/60 - 6/36 after one week, with further improvement to 6/18 - 6/12 after one month. All the patients showed improvement in visual acuity irrespective of their diabetic status.

**Table 9:** BCVA at the first month follow up

| Visual acuity | Diabetic (n=50) | %  | Non-Diabetic (n=50) | %  | Total |
|---------------|-----------------|----|---------------------|----|-------|
| 6/6           | 0               | 0  | 3                   | 6  | 3     |
| 6/9           | 2               | 4  | 9                   | 18 | 11    |
| 6/12          | 13              | 26 | 19                  | 38 | 32    |
| 6/18          | 15              | 30 | 12                  | 24 | 27    |
| 6/24          | 13              | 26 | 4                   | 8  | 17    |
| 6/36          | 5               | 10 | 3                   | 6  | 8     |
| 6/60          | 0               | 0  | 0                   | 0  | 0     |
| CF-5mt        | 0               | 0  | 0                   | 0  | 0     |
| CF-4mt        | 0               | 0  | 0                   | 0  | 0     |
| CF-3mt        | 0               | 0  | 0                   | 0  | 0     |
| CF-2mt        | 2               | 4  | 0                   | 0  | 2     |
| CF-1mt        | 0               | 0  | 0                   | 0  | 0     |
| CF-1/2m       | 0               | 0  | 0                   | 0  | 0     |
| HM            | 0               | 0  | 0                   | 0  | 0     |

At the end of one month, in the diabetic group, 30% of the patients had a visual acuity of 6/18 and 26% of them had a visual acuity each of 6/12 and 6/24. 4% patients did not show significant improvement in visual acuity (CF- 2 mt), due to advanced diabetic changes in the retina.

In the non-diabetic group, 38% of the patients have achieved a visual acuity of 6/12, 24% achieved visual acuity of 6/18 and 18 % improved to 6/9. 6% of patients in this group achieved vision of 6/6. The visual outcome at the end of one month was comparatively better in the non-diabetic group in which 62% of

the patients had a visual acuity of  $\geq 6/12$ , than in the diabetic group in which only 30% had visual acuity of  $\geq 6/12$ .

### Discussion

In our study all the 100 patients who underwent laser capsulotomy, showed a rise in the intraocular pressure, recorded at the end of one week following the procedure, the mean value being 5.04 mm Hg. The pattern of change in the intra ocular pressure between the diabetics and the non-diabetics, did not show any statistically significant difference ( $p=0.63$ ).

In a study conducted by Lin J C *et al*, an IOP rise was noted of at least 5 mm Hg, 1 hr following the capsulotomy in 7.2% of the patients<sup>10</sup>. A transient IOP rise ( $>5$ mmHg) in the early post capsulotomy period occurs in approximately 10 to 40 % of all individuals<sup>10</sup>. In another study<sup>11</sup>, Forty-one percent of eyes developed an intraocular pressure greater than 30 mmHg and 14% greater than 40 mmHg.

The second parameter evaluated in our study was the visual outcome following laser capsulotomy. All the 100 patients in our study showed improvement in visual acuity following the procedure. 82% of the patients had a pre laser visual acuity of  $\leq$  CF 4 mt. After one week, the visual acuity improved to  $\geq 6/60$  in 81% of the patients. After one month, there was further improvement where 73% of the patients gained visual acuity of  $\geq 6/18$ . It was evident that a good number of patients gained better vision after one week of capsulotomy, and the vision has further improved after one month of capsulotomy. This shows that Nd: YAG capsulotomy in PCO can improve vision, which can be augmented by optical correction one month after surgery.

The visual improvement co-relates with the findings of other studies. In a study of 140 patients by Uddin MG, it was found that 26 patients gained 6/6 vision while 31 patients were 6/60 or less vision before capsulotomy.<sup>13</sup> Hossain AM *et al* compared pre and post laser and found 85.9% achieved a visual acuity of  $\geq 6/12$  after laser capsulotomy.<sup>14</sup>

### Conclusion

All the patients treated for PCO with Nd: YAG laser capsulotomy showed an improvement in visual acuity.

The visual outcome at first month (46% had  $\geq 6/12$ ) was found to be better than that at first week (only 3% had the same). The final visual outcome at one month was found to be better in non-diabetics (62% had  $\geq 6/12$ ) compared to diabetics (30% had  $\geq 6/12$ ). All the patients showed an increase in IOP at the first week of follow up and return to near normal of baseline values at first month of follow up.

The pattern of change in IOP was found to be similar in both the study groups. There was no significant difference in the total number of spots or the total energy of laser used between the two groups.

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