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Study of Contrast Sensitivity After Nd : YAG Capsulotomy

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Abstract

The present study was done to assess the Contrast sensitivity in patients who underwent Nd :YAG laser capsulotomy for posterior capsular opacification after cataract surgery. The study was conducted on 30 patients, diagnosed as having posterior capsular opacification (PCO) after uncomplicated cataract surgery. Visual acuity and contrast sensitivity assessment wereperformed before and after laser capsulotomy. In our study visual acuity and contrast sensitivity improved significantly post Nd : YAG capsulotomy.

Keywords: Contrast Sensitivity; Posterior Capsular Opacification; Nd :YAG laser Capsulotomy; Pelli Robson Contrast Chart

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Introduction

Posterior capsular opacification (PCO) is a common complication after cataract surgery [1]. At present the incidence of PCO post-cataract surgery is thought to be around 10% [2]. PCO causes difficulties for the patients in routine daily activities as patients may have good visual acuity but loss of contrast perception that can lead to visual disability [3].

The visible areas always have different luminance at different points and this difference in the luminance is called contrast. The ability to detect slight difference in luminance between two areas is called contrast sensitivity. Contrast is defined as ratio of the difference in luminance of these two adjacent areas to the lower or higher of these luminance values. The minimum amount of contrast that enables an individual to see a target is called contrast threshold [4].

Various charts are available to assess the contrast sensitivity like the Mars chart, Test chart 2000 and Pelli-Robson chart [5]. Contrast sensitivity measurement is most commonly performed by using the Pelli-Robson chart. Glare and contrast sensitivity testing are done in post cataract surgery patients to detect and typify the visual problems related to the surgical procedure [6].

Contrast sensitivity assessment has to be performed in those patients who have normal visual acuity but still experience visual problems. Visual function is impaired when contrast sensitivity is lost [7].

Posterior capsular opacification (PCO) is a common long term complication post-cataract surgery. It results in reduced vision and glare. Neodymium–doped yttrium aluminum garnet (Nd-YAG) laser capsulotomy is a relatively non-invasive procedure that is used in the treatment of PCO [8]. In the present study we have to attempted to assess the visual acuity and contrast sensitivity post Nd : YAG capsulotomy in our local population.

Aim

To study visual acuity and contrast sensitivity in pre and post Nd : YAG laser capsulotomy.

Materials and Methods

This was a prospective hospital based study

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and was conducted over a period of one year in in the department of Ophthalmology at Santhiram Medical College. Patients attending Ophthalmology OPD with complaints of decreased vision or visual disturbances post cataract surgery and with PCO were selected for the study. A detailed ophthalmic history was noted for all the patients and all patients underwent detailed ophthalmic examination.

Inclusion Criteria

Patients with post cataract surgery who had posterior capsular opacification

Exclusion Criteria

1. Macular pathologies
2. Corneal and media opacities
3. Optic disc pathology
4. Intraocular lens (IOL) tear or subluxation

Evaluation was done by

- Snellen's chart for Visual acuity
- Pelli Robson contrast chart for contrast sensitivity
- Slit lamp examination
- Fundus examination – indirect ophthalmoscope
- IOP – Non contact Tonometry
- Capsulotomy – Nd : YAG laser

Results

None of the 30 patients had any complications related to the Nd : YAG procedure.

Table 1: Age and gender distribution of patients

Age (in years)	No. of patients	Percentage (%)	Males	Females
<20	0	-	-	-
21–30	2	7%	2	0
31–40	2	7%	1	1
41–50	7	23%	3	4
51–60	8	27%	3	5
61–70	11	36%	8	3
Total	30	100%	17	13

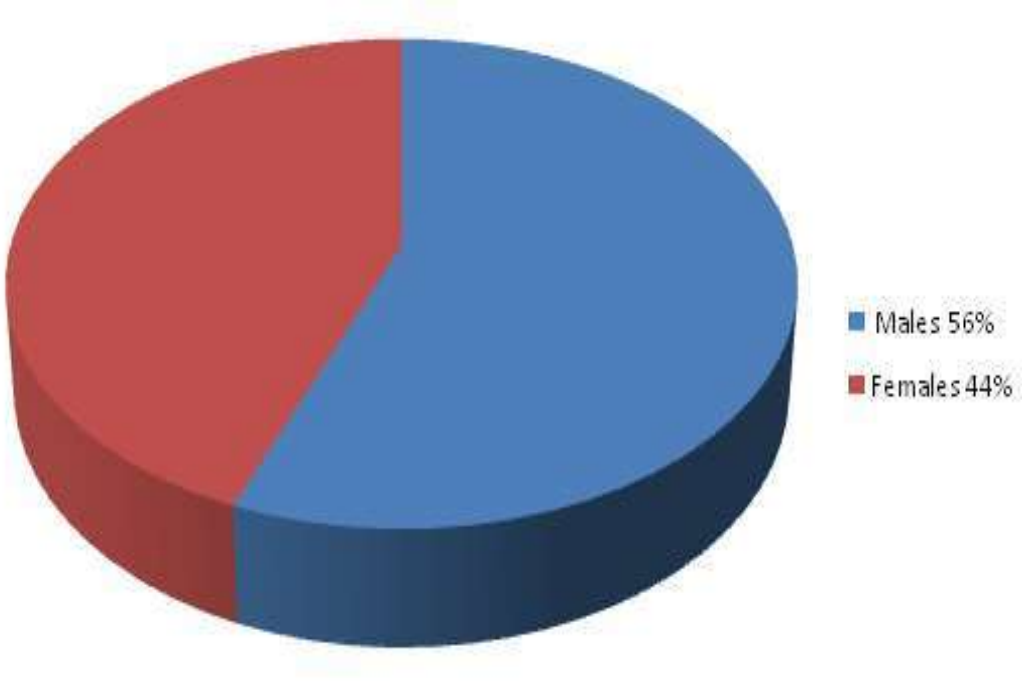

Fig. 1: Pie diagram showing gender distribution of the cases

Table 2: Distribution of cases according to visual acuity before and after laser capsulotomy

Visual acuity	No. of patients	Pre laser %	No. of patients	Post laser %
<6/9	0	0	1	3
6/9 – 6/12	5	17	19	64
6/18 – 6/24	12	40	7	23
6/36 – 6/60	9	30	2	7
6/60	4	13	1	3
Total	30	100	30	100

Table 3: Distribution of patients on the basis of contrast sensitivity before and after capsulotomy

Contrast sensitivity (log limits)	Pre capsulotomy No. of cases	Percentage (%)	Post capsulotomy No. of cases	Percentage (%)
0 – 1.50	14	47	5	17
1.55 – 1.65	7	23	4	13
1.70 – 1.80	7	23	5	17
1.85 – 1.95	2	7	10	33
2.00 – 2.10	0	0	6	20
2.22	0	0	0	0
Total	30	100	30	100

Discussion

Neodymium-doped yttrium aluminum garnet (Nd : YAG) laser capsulotomy is a relatively noninvasive procedure that is used in the treatment of posterior capsular opacification. Posterior capsular opacification (PCO) is a commonly encountered long-term complication of cataract surgery. It has to be suspected when patient complains of symptoms of a cataract like decreased vision and glare, despite the cataract being removed [9]. The incidence of posterior capsular opacification (PCO) has been reported variably in literature. According to Schaumberg *et al*. 25% percent of the patients, who underwent extracapsular cataract surgery developed significant PCO within the next 5 years post- procedure [1].

The mechanism for the development of PCO is due to the proliferation of lens epithelial cells inducing fibrotic changes and collagen deposition that wrinkle the posterior capsule. Also the lens epithelial cells gain myofibroblastic characteristics with capacity to contract that contribute to the capsular wrinkling. PCO incidence varies from 8.7% to 33.4% [10,11,12].

The neodymium : yttrium-aluminium-garnet (Nd : YAG) laser has a wave-length of 1064 nm and is used as short high power pulses. It acts by disrupting ocular tissue causing plasma formation which in turn gives rise to shock and sound waves that break down the tissue [12].

In the early 1980s Drs. Aron-Rosa and Fankhauser developed the technique of capsulotomy by using Yttrium aluminum garnet. Prior to the development of Nd : YAG technique, opacification was managed by surgical cutting and polishing of the capsule. PCO is commonly seen after extracapsular extraction of senile cataracts. The opacification develops at different rates in different individuals. Young people develop opacification more early than older individuals. Phaecoemulsification reduces the rate of opacification. Presence of diabetes mellitus also slows down the onset of opacification [12].

The contraindications for Nd : YAG capsulotomy are corneal scars, edema, wherein the aiming beam cannot be seen properly, active inflammation, cystoid macular edema, and uncooperative listless patient [12].

In the present study, the mean age of our patients was 52.54 + 11.89. In the study done by Aslam TM *et al*. [13] they found the mean age to be 75.2 years with the range between 52–90 years.

The male to female ratio in our study was 1.3:1. Baratz KH *et al*. [14] conducted a study on 2718 patients and observed women tended to have a greater probability of capsulotomy, but this difference was not statistically significant in their study.

In the present study, the mean visual acuity improved by two Snellen lines in 14 cases i.e. almost in half of the cases followed by one Snellen line in 11 cases, followed by three lines in 5 cases,

post capsulotomy. Albert DW [15] *et al*. reported that 75% of cases in 120 eyes had a posterior capsulotomy visual acuity of 6/12 or better and 54% had 6/9 or better vision.

Bari [16] from Bangladesh studied 70 patients for visual acuity who had PCO and were treated with Nd : YAG laser capsulotomy. They observed excellent improvement in the visual acuity in all the 70 patients post-procedure. In addition, none of the patients had any further deterioration of visual acuity on follow up.

Hasan *et al*. [17] did a similar study in 86 patients and found improvement of VA on Snellen's chart as 1–3 lines in 42 and 4–6 lines in 31 patients. Latif *et al*. [18] in their study on Nd : YAG laser reported 87.5% improvement in the visual acuity with an average 3 lines on Snellen's chart.

The contrast sensitivity was measured by using the Pelli-Robson chart. In our study, the mean contrast sensitivity after capsulotomy was 1.779 + .2923 log units. Magno BV *et al*. [19] measured visual functions before and after capsulotomy in 24 patients, using Pelli Robson chart. In their study, the contrast sensitivity improved with a mean difference of 0.24 log units with $p < 0.0001$. Cheng CY *et al*. [20] reported an improvement of contrast sensitivity in patients with both types of PCO in 29 patients. Our observations are similar to the studies of the above authors.

PCO occurring post cataract surgery can be reduced or prevented by using better tools of good quality tools, better surgical procedures, skills and appropriate IOL designs [2].

Complications may occur in some cases that include transient intraocular pressure elevation, iritis, retinal tears and increased chances of retinal detachments, macular and corneal edema, intraocular lens dislocation into the vitreous and disruption of the anterior vitreous [1,21,22,23]. None of the patients in our study had any major complications.

Nd : YAG laser capsulotomy gives good visual acuity in 83% to 96% of the cases. In some cases the visual acuity may not improve which could be due to preexisting eye disease, senile macular degeneration, cystoid macular edema, detached retina, edema of the cornea, glaucoma, or other causes [12].

Nd : YAG laser capsulotomy is a relatively noninvasive and safe, effective, rapid treatment choice done as an out-patient procedure and gives immediate results in visual improvement [12,21].

Conclusion

Posterior capsular opacification is a complication of cataract surgery which causes a decrease in visual function including reduction in contrast sensitivity and that after Nd : YAG laser capsulotomy the contrast sensitivity improves significantly, as measured by Snellens chart and Pelli-Robson contrast sensitivity chart.

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