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Nd:YAG in the Treatment of Posterior Capsular Opacification: A study in A Tertiary Care Centre

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Abstract

Introduction: One of the most common complications of a cataract surgery is the Posterior Capsular Opacification. In the past, the treatment of PCOs was done surgically by making a small opening in the posterior capsule. Nd. YAG laser treatment causes photo disruption at a very high energy levels thereby disintegrating tissues. *Materials and Methods:* 140 patients ranging from 31 to 90 years of age with significant PCO, and complaining of gradual diminution of vision after a period of appreciably good vision following successful cataract extraction surgery were included in the study. After regular physical and clinical examination and visual acuity exam by Snellen's test, confirmation was done by slit lamp method. With the help of the slit lamp, the optical beam was focuses on the posterior capsule and the laser shots were given. Lowest energy of 1.0 mJ was used initially and was increased as and when required. *Results:* The predominant age group affected was between 51 to 70 years of age. It took 6-12 months in most of the cases for the PCO to form after the cataract surgery (31.43%). For mild opacification, laser power setting was between 1-2mJ for most of the patients, For moderate opacifcation, >2 – 3mJ was required and for severe, requirement was >3-5 mJ. the visual acuity of the patients improved to a large extent. 6/6 -6/12 improvement was seen in 82 (58.57%) of the patients, while 46 patients (32.85%) had an improvement to 6/18-6/24. Out of the complications observer among the patients, the most common one was a rise in intraocular pressure by more than 5 mmHg which was seen in 22.14% patients. *Conclusion:* Nd:YAG laser capsulotomy as a good and successful treatment of PCO. It is one of the recent, non invasive and effective mode of treatment for PCO with least amount of complications and no hospitalization.

Keywords: Cataract surgery; Posterior Capsular Opacification; Neodymium Yttrium Aluminium-Garnet.

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Introduction

One of the most common complication of a cataract surgery is the Posterior Capsular Opacification (PCO). It mainly results from the proliferation and the migration of residual lenticular epithelial cells [1-3]. Earlier studies have indicated that PCO occurs due to the result of the formation of opaque secondary membranes by active lens epithelial cells into fibroblasts with contractile elements and collagen deposition[4,5]. PCO is also said to result from the deposition of fibrin and other cell types into the posterior capsule during surgery or postoperatively [1].

It is estimated that the overall incidence of PCO is about 50% by 5 years of the cataract surgery [6-8]. It is said to occur in younger patients due to the higher cell proliferation rate [9]. This results on a decrease in the visual acuity and contrast sensitivity due to glare [10,11]. There was a difference on the rate of incidence of the PCO with different Intra Ocular lenses used. It was found that with silicone lenses, the rate of opacification was 27.9% while with polymethylmethacrylate (PMMA) lenses it was 7% [12].

In the past, the treatment of PCOs were done surgically by making a small opening in the posterior capsule. However, with the advent of Neodymium Yttrium Aluminium-Garnet (Nd. YAG) has changed it all. It has revolutionalized

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the management of PCO. Nd:YAG laser treatment causes photodisruption at a very high energy levels thereby disintegrating tissues [13,14]. Today, it is one of the most widely used tool with a fundamental output of 1064 nm in the Infra red range. Nd:YAG is used to make a hole in the clouded back lining of the lens capsule (posterior capsule) to allow the light to pass through the membranes to the retina at the back of the eye.

This procedure is done in the outpatient ward itself and lasts only about 3-5 minutes. The patient is normally free to leave immediately after the procedure and many times is able to observe an immediate improvement in the vision.

This study was therefore performed to assess the effects on the visual acuity following ND:YAG laser capsulotomy, as well as the total laser energy required for the same among the patients in our area.

Materials and Methods

This study was performed in the outpatient Department of Ophthalmology in Mallereddy Medical College for Women during the period of of 2 years 4 months ie from June 2015 to Sep 2017. 140 patients ranging from 31 to 90 years of age with significant PCO, and complaining of gradual diminution of vision after a period of appreciably good vision following successful cataract extraction surgery were included in the study. Patients who did not gain good vision following a previous cataract surgery, those who had decreased visual acuity due to any other ocular or systemic pathology such as granulomas, corneal opacity etc were excluded from the study. Patients with posterior segmental disorders were also excluded from the study. All the selected patients underwent Nd:YAG laser posterior capsulotomy.

Complete demographic details were collected from the and chief complaints of the patients such as the duration and the progression of he diminution of vision, time between the cataract surgery and the present complaint, the time duration of the good vision etc were considered carefully and noted. History of glaucoma, and other diseases like hypertension and diabetes were also acquired.

Complete physical and clinical examination was performed for all the patients. Visual acuity test with Snellen test and Jegger's test were performed before torch examination for the assessment of palpebral aperture, lids, conjunctiva, sclera, cornea, anterior chamber, iris, pupil and intraocular lens and posterior capsule status. Confirmation of this test was done by slit lamp method. Refraction of both the eyes, fundus examination and Schiotz tonometry was done for both the eyes for all the patients.

The procedure was thoroughly explained to the patients as well as their relatives and an informed consent was taken from all of them. The pupil was then dialated with topical 1% Tropicamide and 10% phenylephrine. Just before the procedure, 1% topical Apraclonidine was instilled. The eye was the anaesthesised using 4% lignicaine drops. With the help of the slit lamp, the optical beam was focuses on the posterior capsule and the laser shots were given. As the Nd:YAG produces invisible infrared rays, an inbuilt orange-red He-Ne beam outlines the infra-red rays and helps in focusing it on or slightly behind the posterior capsule. Lowest energy of 1.0 mJ was used initially and was increased as and when required. The first shot was given as close to the visual axis as possible and was extended in a crucial manner. Post capsulotomy, one drop of the same antiglaucoma medicine which was given at the start of the procedure was instilled. Topical non-steroid anti-inflammatory medication was advised 4 times a day for 7 days following the procedure. Post procedure, evaluation was done at 1 hour, 24 hours, 1 week and 2 weeks, after which, glasses were prescribed. Further follow up was done after month and 6 month interval. 1% Apraclonidine hydrochloride eye drops, twic daily and Flurbiprofen eye drops 4 times daily for 7 days was prescribed. If Intra ocular pressure was found to be more than 5 mm HG, than its base line reading, Tablet Acetazolamide 20 mg was advised.

Results

Out of the 140 patients, most of the patients belonged to the 51-60 years age group (41.43%) followed by 27.14% in 61-70 years. 81-90 year age group had the least incidence of cases (1.67%). Females were a more dominant group (52.86%) compared to the males (47.14%), with the male to female ratio being 1:1.12. (Table 1).

Table 1: Age wise distribution of the patients

Age Group	Males	% age	Females	% age	Total	% age
31-40	4	2.85	6	4.29	10	7.14
41-50	6	4.28	10	7.15	16	11.43
51-60	26	18.58	32	22.85	58	41.43
61-70	20	14.28	18	12.86	38	27.14
71-80	10	7.15	6	4.28	16	11.43

>81	00	00	2	1.43	2	1.43

It took 6-12 months in most of the cases for the PCO to form after the cataract surgery (31.43%) followed by 12-18 months in 24.29 cases. In 5.71% of the cases, it took 3-5 years (Fig. 1). The mean time interval for the development of PCO after the cataract surgery was found to be 16.28 months.

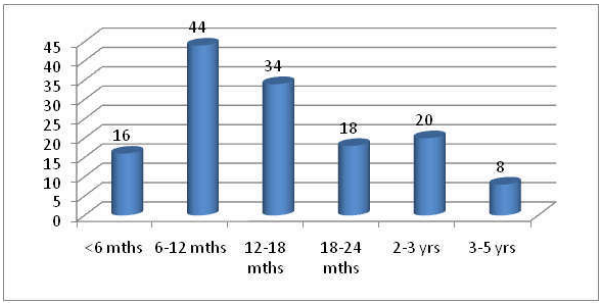

Fig. 1: Time interval between cataract surgery and PCO

Most of the PCO patients had fibrosis as the chief capsular opacification (47.14%), followed by mixture of Elsching's pearls and fibrosis (32.86%) (Fig. 2).

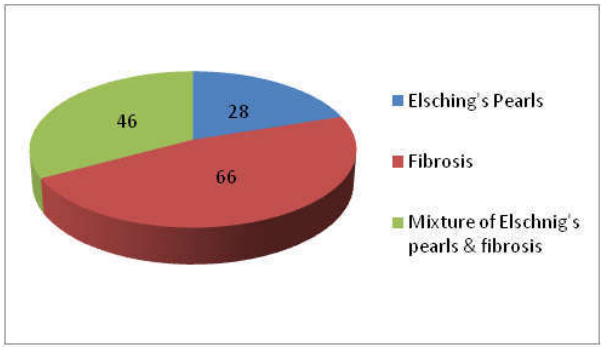

Fig. 2: Type of Posterior Capsular Opacification

Upon grading, the PCO was divided into mild, moderate and severe according to the visual acuity. Out of these the most common type was moderate (47.14%), closely followed by severe in 42.86% of the patients. Mild type of PCO was seen only in 10% of the cases (Table 2).

Table 2: Grading of PCO according to Visual Acuity

Grade	Number	Percentage
Mild (VA: 6/18 -6/24)	14	10
Moderate (VA: 6/36 -6/60)	66	47.14
Severe (VA: 6/60 -1/60)	60	42.86
Total	140	100

Among the 14 members who had mild opacification, initial laser power setting was between 1-2mJ for most of the patients. Out of the patients with moderate opacification, 30 patients had 1-2 mJ and 28 patients required >2–3mJ and the rest required >3-5 mJ. Among the patients with severe opacification, very few had 1-3mJ shots, while most of them required an energy level of >2-3 mJ (Table 3).

Table 3: Laser power setting for categories of PCO

Type of PCO	1-2 mJ	>2-3 mJ	>3-5 mJ	>5-7 mJ
Mild	11	3	0	0
Moderate	30	29	7	0
Severe	5	42	13	0
Total	46	74	20	0

Post laser, the visual acuity of the patients improved to a large extent. 6/6 -6/12 improvement was seen in 82 (58.57%) of the patients, while 46 patients (32.85%) had an improvement to 6/18-6/24 (Table 4).

Table 4: Post laser best corrected Snellen acuity

Post laser Snellen acuity	No of patients	Percentage
6/6 – 6/12	82	58.57
6/18 – 6/24	46	32.85
6/36 – 6/60	6	4.29
No improvement	6	4.29

Out of the complications observer among the patients, the most common one was a rise in intraocular pressure by more than 5 mmHg which was seen in 31 patients (22.14%). These occurred as spikes which reduced to the base line level within 24 hours. In most cases they returned to normal in 4 hours itself. Glare was another complication which was seen in 5 patients (Fig. 3).

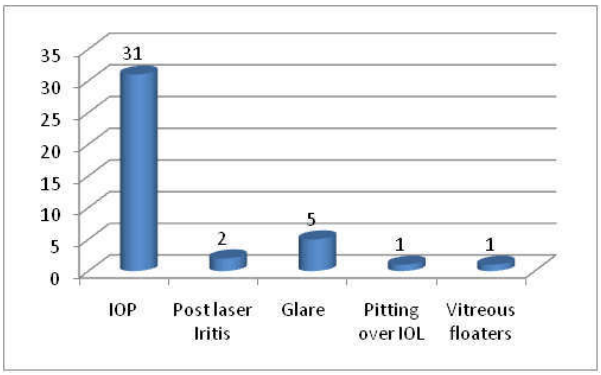

Fig. 3: Complications of Nd. YAG laser capsulotomy.

Discussion

Post operative opacification is one of the common occurrences in patients who have undergone

extracapsular extraction of senile cataracts. The incidence seems to be more common in youngsters compared to the elderly. The time required for the opacification also varies between patients and may range from few months to years.

Nd:YAG laser capsulotomy is a non invasive procedure which has shown immediate effect and improvement in the visual acuity. Few studies have shown the effects of the size capsulotomy and the energy levels required.

The most dominant age group in our study to be affected was 51-60 years followed by 61-70 years. The rate of opacification was found to be more among the younger patients rather than the older ones, with more patients below 60 years being affected than above it. This was in concordance with another study by Emery et al, who also stated that the rate of opacification declined with age [1,15]. However, Westling et al and Calissendorff et al found no relation between the age and sex of the patients. The probable reason for the high rates of PCO in this age could be due to the increase cataract surgeries which are common in this age group [16].

The occurrence of PCO after the cataract surgery was the most between 6-12 months. In different studies, the time intervals were different, and varied from months to years [17]. Emery et al observed 28% of the patients to have PCO after 3-5 years of surgery [15], while Sinskey and Cain reported 43% of the patients having PCO after 3 months to 4 years of cataract surgery [18].

The most common type of PCO in the present study was fibrosis which was followed by a mixture of fibrosis and Elschnig's pearls. Elschnig's pearls, one, without combination was seen in very few patients in our study. Our study was corroborated by Nicula et al. [19], who also stated that fibrosis was the most common type of PCO observed and seen in 86% of the cases.

As early as 1986, Auffarth et al. [20] analyzed the energy levels for Nd:YAG capsulotomy and concluded that different ocular conditions of the anterior and the posterior segment showed a different profile for capsulotomy and laser repetition. They also concluded that the total energy requirement for capsulotomy was 12.7±9.4 mJ.

In the present study, the visual acuity was 6/6 -6/12 in most of the cases post treatment (59%) with improvement seen in all the eyes except for 4 (4.2%). Similar case was observed in a study by Patil et al., where in 100% improvement was observed in the vision of all the eyes with 67% of the patients having visual acuity of 6/9 [21]. In a study by Clark et al., 98% improvement was observed with a vision improvement in 84% of the cases [22].

The most common complication observed in the present study was an increase in the intraocular pressure (IOP) seen in 31 cases. The rise in the IOP was maximum between 1-3 hours after the procedure, which declines within 24 hours and resolves in a few days. In a similar study by Patil et al., 7% of the patients were observed with IOP, which was the most common complication [21].

Conclusion

Nd:YAG laser capsulotomy as a good and successful treatment of PCO. It is one of the recent, non invasive and effective mode of treatment for PCO with least amount of complications and no hospitalization. This can be used regularly fo the treatment of PCO, instead f the other conventional methods.

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