

Rise Of Intraocular Pressure After Nd: Yag Laser Capsulotomy

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Abstract

Objective: Aim of this study was to evaluate changes in intraocular pressure after Nd-Yag laser posterior capsulotomy for posterior capsule opacification.

Methodology: This retrospective study using convenient sampling technique was done at Eye Department of Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Sindh Government General Hospital, Karachi for six months from 1st January 2020 to 30th June 2020. After ethical approval and informed permission from patients and guardian, 50 eyes of were chosen for the research through non probability purposive sampling. Data was collected and analyzed by SPSS version 20 and presented by calculating mean and standard deviation for quantitative data and frequency and percentages for qualitative data.

Results: Total 50 patients (20 males and 30 females) were studied where 22 right and 28 left eyes. Mean age was 59.08 years. Mean pre-operative Intraocular Pressure was 13.28 and 13.12 mmHg of right and left eye respectively (Table I). At 2 hours mean Intraocular Pressure was 16.84 ± 3.63 mmHg and after one week 12.48 ± 2.0 mm Hg. Base line pre-laser Intraocular Pressure was measured by Goldman Applanation Tonometer and slit lamp examination. Pupils were dilated using 1% tropicamide eye drops Intraocular Pressure was evaluated immediate post-procedure, two hours post-procedure and one week from date of laser.

Conclusion: Nd -Yag laser capsulotomy is treatment of choice for posterior capsule opacification and associated with complications like Raised Intraocular Pressure (IOP), Intraocular lens pitting, cystoid macular oedema, retinal detachment. Raised IOP is most common complication and prescribing anti-glaucoma drugs in order to decrease intraocular pressure.

Keywords: Posterior capsule opacification, intraocular pressure, Nd-Yag laser, capsulotomy.

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Introduction

Cataracts are elaborated as eye's lens opacification resulting in decline of vision. Cataracts usually build up slow and either one or both eyes can be affected by cataract. Secondary cataracts, regarded as posterior capsule opacification (PCO), that are one of the most commonly observed com-

plications following surgical procedure of cataract that results due to movement as well as increase production of epithelial cells in the residual lens (LECs) on posterior capsule (centrally), leads to weaken the visual function in addition to visual acuity¹.

Because of cataract, approximately 20 million people are found to be blind due to it. In United States, cataract's the main reason for blindness in about 5 % of people and almost 60% population of South America and Africa². Mostly blindness can be caused by cataracts globally. In cataract, age is one of the most vital risk factors. About 1 in every 5 individuals in-between 65-74 years of age build up a cataract which is too much severe to diminish vision, roughly 1 in 2 individuals above the age of 75

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years suffers from cataract. It is predicted that in Pakistan, around 570,000 including 225,000 males and 345,000 females that carry blindness because of cataracts, being chief reason (51.5%) of unnecessary countrywide blindness³.

Different types of cataracts are identified. They are classified on the basis of location and process of cataract formation in the eye. They are as follows: cortical, nuclear, congenital, radiation, traumatic, posterior capsular and secondary cataracts. Symptoms of cataracts are fading of color, blurred or double vision, light halos, problem in vision due to lights that are bright, difficulty in night vision leads to reading, driving difficulties as well as issues in facial recognition⁴.

Advance age is the main causative factor of cataract but it may also occur because of any type of injury, trauma or exposure to radiation. It may be congenital, take place after ophthalmic operations for other conditions like lens implantation. Risk factors that are usually responsible for cataract are tobacco smoke, diabetes and sunlight exposure for a longer period of time, and intake of alcohol. The underlying mechanism of the disease involves accumulation of protein clusters, deposition of yellowish-brown pigment in lens that in turn decreases diffusion of light on retina present at the eye's back. Cataract is diagnosed by an eye examination or by visual acuity test⁵.

Opacification of the posterior capsule, also called as secondary cataract are observed to be the commonest and most long-lasting cataract surgery complication (modern extra capsular surgery). Reduction in visual acuity, disability to glare, impairment of contrast sensitivity and monocular diplopia are some general adverse events that might occur in consequence to opacification of posterior capsule (PCO) that needs to be further treated. At present, the typical management of PCO is posterior capsulotomy using Nd: YAG laser, known to be successful procedure and having a success rate of above 95%⁶.

Since the mid 1970s, Europe has been developed the Nd-Yag Laser. Nowadays Nd-Yag LPC has become a very useful procedure for after cataract¹⁰. Before the Nd-Yag L came into use, the capsulotomy was performed. The Nd-Yag L is a choice of procedure because it is non-invasive and chances of infection are less. The main complication is a temporary rise in IOP 1-3 hrs. after the treatment of Nd-Yag LPC⁷. Sometimes, the pressure rise is high enough can lead to serious injury to the optic nerve, so that monitoring of the IOP is very important and proper procedures should be taken if needed. In order to restore vision, Nd-Yag L is applying as a safe procedure. On the other hand, in normal eyes, a slightly rise of IOP is of no significance because it usually settles down within 24 hours particularly with the usage of anti-glaucoma drugs before and after laser therapy. However, in eyes already having diagnosed with glaucoma, greater incidences of IOP elevation and its duration is longer than in otherwise normal eyes. Sometimes, glaucomatous eyes may therefore need an additional glaucoma medication for several weeks after Nd-Yag LPC⁸. So, it is very significant to monitor the change in IOP level particularly in case of glaucoma with damage to optic nerve and field loss as these eyes are more vulnerable to raises even a small pressure for still a short period of time. Irreversible damage can cause by even a single rise to 40 mmHg for a few hours resulting in damaged optic nerve and leads to permanent visual loss, leading to complete vision loss if left untreated⁹.

Mechanism for rise in IOP is unidentified; many explanations have been presented to give details of the temporary rise in IOP after Nd-Yag LPC it may be caused by Trabeculitis that is secondary to the radiating shock-wave¹⁴. Infrequently, pupillary block is responsible to rising of IOP post Nd-Yag LPC has change the position of the anterior vitreous face. Narrow angle glaucoma is also responsible for rising of IOP post-laser capsulotomy and these patients may be good responders to steroids and it is probably diagnosed by an ibopamine provocative test¹⁰⁻¹².

It is important to determine and assess the rise in IOP in post-laser capsulotomy and improve the rates of complication in patients so that the overall success rate of laser therapy can be increased.

The principle aim of the current research is to assess IOP changes at 24 hour and 1 week post Nd-Yag Laser posterior Capsulotomy.

Patients and Methods

This retrospective research by using convenient sampling technique was carried out at Eye Department of Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Sindh Government General Hospital, Karachi. The ethical approval for study was taken from Institutional Research and Ethical Committee SMBBMCL and SGLGH, Karachi. Duration of the study is about 6 months from 1st January 2020 to 30th June 2020. Written and informed permission was sought from both patients as well as their guardian. 50 eyes of were chosen for there search in which 20 were males and 30 were females. Data was collected from the patients.

In this study, inclusion criteria were patients whose age older than 20 years of either sex, having PCO after cataract surgery more than 6 months of duration, capsular fibrosis and visual distortion due to wrinkling. Only patients with posterior chamber IOL or without IOL, no previous history of asthmatic bronchitis or glaucoma or any sort of intraocular surgery in both eyes other than cataract surgery, cleared cornea. No significant uveitis (already persisting), no usage of systemic drugs like beta-blocker or prostaglandin medicines were enrolled for the study. Patients were excluded if their age younger than 20 years, anterior chamber's involvement, previous use of glaucomatous medications or history of trabeculectomy in past 6 months, retinal detachment due to peripheral retinal degenerations, those individuals based on systemic or topical steroid medications, history of cataract surgery in last 6 months was also excluded from the study. Furthermore, the purpose of this study was that to analyze the changes of intra ocular pressure after

laser capsulotomy. Each patient underwent slit lamp examination in order to determine PCO type, IOL positioning, examination of fundus, measurement of IOP and check-up or pre-procedure status of refractive index. Pupils were dilated through topical administration of 1% tropicamide drops and PCO was recorded.

The grading of PCO is divided into 4 grades. In grade 0 there is a no indication of PCO. In grade 1 PCO is confined to periphery while having clear central part. In grade 2 there is a diffuse opacity seen on slit lamp and there is a mild fundal obscuration. In grade 3 opacification of posterior capsule along with marked fundal obscuration, while in grade 4 there is a total thickness of posterior capsule with no fundus glow.

Data collection commenced after ethical approval from the IRB and after taking informed consent from the patients. All patient data was kept anonymous and confidential. Data was analyzed by SPSS version 20 and presented in the table by calculating mean standard mean and deviation for quantitative data and frequency and percentages for qualitative data.

Results

From total of 50 eyes studied, 22 were Right eyes and 28 were Left eyes with mean age of 59.08 ± 5.84 years and mean pre-operative IOP 13.28 and 13.12 mmHg of right and left eye respectively (Table 1). At 2 hours after laser therapy, the mean IOP was 16.84 ± 3.63 mmHg and after one week it became 12.48 ± 2.0 mmHg. Base line measurement of pre-laser IOP and slit lamp examination was done prior to surgery. Table 2 shows that individuals that had gone for laser capsulotomy having a systemic disease like diabetes, coronary artery disease and hypertension so extra care should be taken.

Evaluation of IOP was carried out immediately after the surgery, followed by two hours after surgery and then one week after procedure. Along with IOP measurement immediate post-procedure, slip

lamp examination and bio-microscopy was done for determining capsulotomy size, refractive shift and examination of fundus. Table 3 shows slit lamp examination in which 10% patients showed cells in anterior chamber, 14% shows mild IOL pitting and 10% showed raised IOP while 33% shows normal anterior segment after laser therapy.

Table IV shows the fundus examination of both eyes in which 28% patients shows normal fundus while 11% of patients showed hazy fundus view due to thick PCO before laser therapy. Non proliferative diabetic retinopathy (NPDR) was present in 26% of patients these increase in number may be due to clear fundus view after laser therapy. No considerable change in dry AMD and vascular attenuation.

Table 1. General description of patients (n=50)

Variable	Mean±SD/ n(%)
Age (years)	59.08±5.84
Gender	Male 20(40.0%) Female 30(60.0%)
Pre-laser Right IOP	13.28±2.67
Pre-laser Left IOP	13.12±2.59
Post-laser Right IOP	14.72±3.51
Post-laser Left IOP	13.0±2.59
IOP Baseline	16.84±3.63
IOP 1st Week	12.48±2.0

Table 2. Monitoring of systemic disease

Variable	N	(%)
Hypertension	Yes	30 60.0
	No	20 40.0
Diabetes	Yes	22 44.0
	No	28 56.0
Coronary Artery Disease	Yes	12 24.0
	No	38 76.0
Family History Hypertension	Yes	23 46.0
	No	27 54.0
Family History Diabetes	Yes	17 34.0
	No	33 66.0

Table 3. Pre and Post Laser changes on Slit Lamp Examination (n=50)

Variables	Right Eye		Left Eye		Total Cases B/E	
	Pre-Laser	Post-Laser	Pre-Laser	Post-Laser	Pre-Laser	Post-Laser
PCO Grade 0	0	0	0	0	0 (0.0%)	0 (0.0%)
PCO Grade 1	0	0	0	0	0 (0.0%)	0 (0.0%)
PCO Grade 2	8	0	12	0	20 (40.0%)	0 (0.0%)
PCO Grade 3	9	0	10	0	19 (38.0%)	0 (0.0%)
PCO Grade 4	5	0	6	0	11 (22.0%)	0 (0.0%)
NAD	0	15	0	18	0 (0.0%)	33(66.0%)
Cells Present	0	2	0	3	0 (0.0%)	5 (10.0%)
IOL Pitting	0	3	0	4	0 (0.0%)	7 (14.0%)
Raised IOP	0	2	0	3	0 (0.0%)	5 (10.0%)

Table 4. Pre and Post Laser Fundus Examination (n=50)

Variables	Right Eye		Left Eye		Total Cases B/E	
	Pre-Laser	Post-Laser	Pre-Laser	Post-Laser	Pre-Laser	Post-Laser
Normal Fundus	6	8	8	11	14 (28.0%)	19 (38.0%)
Hazy View	5	0	6	0	11 (22.0%)	0 (0.0%)
Vascular Attenuation	1	1	3	3	4 (8.0%)	4 (8.0%)
NPDR	4	6	5	7	9 (18.0%)	13 (26.0%)
Few Drusen	1	1	2	2	3 (6.0%)	3 (6.0%)
Tesselatid	5	6	4	5	9 (18.0%)	11 (22.0%)

Discussion

Although, Nd:YAG capsulotomy is reliable but it could possibly cause adverse events such as increase of IOP, damaging lens, changing degree of refraction, causing retinal tears or macular edema or detachment of retina¹³⁻¹⁶. Commonest Nd: YAG laser complication include abrupt rise in IOP. After Nd:YAG laser capsulotomy 59-67% patients reported IOP rise of minimum 10 mm Hg, without anti-inflammatory or anti-glaucoma prophylaxis^{17,18}. Regardless of prophylactic treatment, different studies observed increased IOP in 15-30% patients^{19,20} that is consistent with our studies in which there is only slightly raised IOP after 24 hours of laser capsulotomy and gradually declining to a normal level after one week. On the contrary, Ozkurt et al., observed no considerable alteration in IOP post Nd:

YAG capsulotomy that was inconsistent with our studies²¹.

Additionally, our study did not report constant changing of IOP that requires any sort of intervention after patients being exposed to such levels of energy. Nonetheless, all the patients were recorded to have a temporary IOP rise 2 hours after procedure. Our study reported few patients with rise in IOP of 3 mmHg that became normal till 7 days. Thus, no considerable coordination of energy causing spike of IOP was seen in the patients.

In our study nearly all patients were found to have raised IOP 2 hours after the procedure regardless of how many shots were given to them. Therefore IOP 2 hours after the procedure can be termed as more predictive of rise in IOP persistently in comparison to immediate IOP after the procedure.

In contrast, other researchers reported that IOP rise from baseline to about 1,3,5 and 24 hours after procedure did not observe any significance after being administered with hypotensive drug topically²². However, in our study ocular hypotensive drugs were not used, but observed an IOP rise after procedure for 2 hours.

Ge et al, reported that rise in IOP was more prominent in glaucoma than non-glaucoma patients, 1 hour after capsulotomy²³. Ari et al also did not observe continuous rise in IOP. Our studies also proved that the rise of IOP was not a permanent effect it declines within a week.

IOL Damage (IOL pitting) present in eyes with pseudophakia, IOL damage, it can be diminished with the help of Nd-Yag L. It has been proved that in every patient, IOL gets slightly damaged or minor pitting which happens due to rise in intraocular pressure did not obstruct with vision. Our study revealed that only 14% patients showed an IOL pitting. A few small minute spots are not harmful. On the other hand, larger pits or cracks give indication to severe damage to the optics so it must be avoided. But these pits of the optics, even in large size, do not affect visual acuity.

Drusen get mostly deposited in optic disc's nasal half and are linked to vascular anomalies like dilated or tortuous veins. Optic disc drusen that are visible look as refractile, whitish yellow, rounded crystalline deposits surrounded within head of optic nerve. It was proved by our study that there are 6% of drusen's are obvious. Our study also revealed that non proliferative diabetic retinopathy (NPDR) was present in 26% in both eyes. With NPDR, tiny blood vessels leak, responsible for swelling of retina. This is called macular edema. If an individual has NPDR, their vision will be blurry and also increases the intra ocular pressure²⁴.

The usual complaint of temporary rise of intra ocular pressure after Nd-Yag laser posterior capsulotomy is common and the irregularity of the degree of rise and condition, in which it happens make mandatory to prevent of intra ocular pressure rise. So, it is necessary for all the patients to measure intra ocular pressure before doing laser. The patients proceeded to do Nd-Yag laser posterior capsulotomy should receive anti glaucoma therapy to control or prevent elevations in intra ocular pressure before Nd-Yag laser posterior capsulotomy. Nd-Yag laser posterior capsulotomy is a secure and successful treatment for posterior capsule opacification after planned extra capsular cataract extraction with or without intra ocular lens implant.

Conclusion

This study concludes that Nd -Yag laser capsulotomy is treatment of choice for posterior capsule opacification and associated with complications like Raised Intraocular Pressure (IOP), Intraocular lens pitting, cystoid macular oedema, retinal detachment. Raised IOP is most common complication and prescribing anti-glaucoma drugs in order to decrease intraocular pressure.

Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organization.

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