

CASE REPORT : Nd:YAG LASER FOR POSTERIOR CAPSULE OPACIFICATION AFTER CATARACT SURGERY

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ABSTRACT

The most common late occurrence after cataract surgery is Posterior Capsule Opacification (PCO). Posterior Capsule Opacification also known as secondary cataracts is a “cataract” that occur due to the formation of fibrous tissue on the remaining lens left behind. Capsular opacification stems from the continued viability of lens epithelial cells that remain after removal of the nucleus and cortex. Opaque secondary membranes are formed by proliferating lens epithelial cells, fibroblastic metaplasia, and collagen deposition. The Neodymium Yttrium Aluminium Garnet laser (Nd:YAG laser) is used to treat secondary opacification of the posterior capsule and/ or contraction of the anterior capsule. This case report highlights benefit of Nd:YAG laser as an effective and safe treatment for PCO that can restore visual acuity after the treatment done.

Keywords: Posterior Capsule Opacification, Cataract, Nd:YAG Laser

INTRODUCTION

Lens epithelial cells proliferate in several patterns. Sequestration of nucleated bladder cells (Wedl cells) in a closed space between the adherent edges of the anterior and posterior capsule results in a doughnut-shaped configuration, referred to as a Soemmering ring. If the epithelial cells migrate out of the capsular bag, translucent globular masses resembling fish eggs (Elschnig pearls) form on the edge of the capsular opening. These pearls can fill the pupil or remain hidden behind the iris. Histologic examination shows that these “fish eggs” are nucleated bladder cells, identical to those proliferating within the capsule of a Soemmering ring but usually lacking a basement membrane (American Academy of Ophthalmology, 2021).

The reported incidence of PCO varies widely but has been diminishing as a result of modern IOL designs and placement. Older studies reported that the frequency of Nd:YAG laser capsulotomy varied between 3% and 53% within 3 years of cataract surgery. More recent clinical series with a 3 to 5 year follow-up of cases with either hydrophobic acrylic or silicone square-edge design show PCO rates up to 5%. IOL design is now considered the dominant factor both in inhibiting posterior migration of lens epithelial cells and in influencing the rate of PCO. The IOL material also has a modest effect on opacification rates. Hydrogel IOLs are associated with the highest rate, followed by PMMA, then silicone. IOLs made of hydrophobic acrylic material are associated with the lowest rate. Compared to round-edge optics, the truncated square-edge optic design is associated with lower rates of PCO in both silicone and acrylic IOLs,

although these lenses may increase the incidence of undesirable optical reflections and positive dysphotopsias (American Academy of Ophthalmology, 2021).

Posterior Capsule Opacification also known as secondary cataracts is a “cataract” that occur due to the formation of fibrous tissue on the remaining lens left behind. Capsular opacification stems from the continued viability of lens epithelial cells that remain after removal of the nucleus and cortex. Opaque secondary membranes are formed by proliferating lens epithelial cells, fibroblastic metaplasia, and collagen deposition. The Neodymium Yttrium Aluminium Garnet laser (Nd:YAG laser) is used to treat secondary opacification of the posterior capsule and/ or contraction of the anterior capsule (Suryani I, *et al*, 2022).

CASE PRESENTATION

A woman 79 years old came to eye clinics with complaints of left eye blurry vision after years cataract surgery. Vision getting haze and her eyeglasses did not help. From examination her Best Corrected Visual Acuity (BCVA) on right eye 1.0 F2 and on left eye 0.4 no improvement with pin hole. From slit lamp examination, anterior segment both eyes were normal, with Posterior chamber Intra Ocular Lens (PC IOL) in bag right and left eye (RLE). With slit light examination, Posterior Capsule Opacification (PCO) seen on left IOL as a whitish layer behind the IOL. Funduscopy examination was found normal. Intraocular pressure was 9/10 mmHg. Patient was diagnosed with RLE Pseudophakia + LE PCO. Patient

was informed that treatment for PCO is only Nd-YAG Laser, and agreed to planned at the same day.

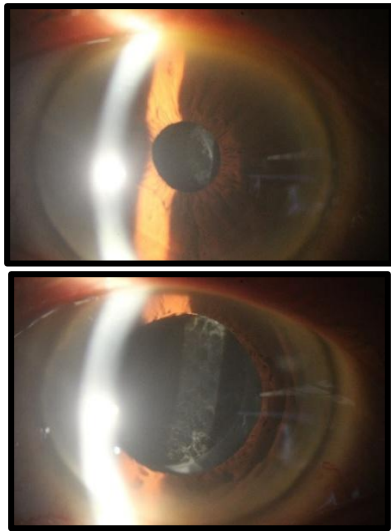


Fig. 1. Slit lamp examination of IOL on left eye, PCO appear to be whitish layer behind IOL

Patient was given anesthetic eyedrops before laser performed. After eyes feel numbed, patient was positioned sitting in front of the slit lamp equipped with Nd-YAG Laser device. Head was fixated with strap, and patient instructed to focus to look forward. When doctor ready to perform Laser patient was instructed to hold her blink and follow doctor instruction.

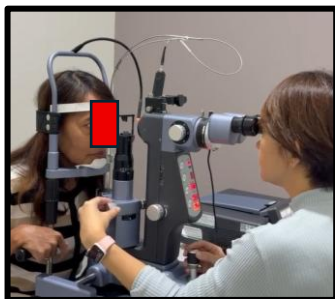


Fig. 2. Nd-YAG Laser performed on left eye

Nd-YAG Laser was performed on left, focused beam on posterior capsule behind the implant lens, with power 5.0mJ. Identified the opacification, circular pattern laser 200 shots and avoid the visual axis to creates a large fragment, continue to shots laser at floating tissue that still approachable to avoid big floaters after Nd-YAG. After laser completed, patient was observed at outpatient department for 10 minutes to check eye pressure. Intraocular pressure (IOP) with Non Contact Tonometry (NCT) measured 10mmHg and allowed to go home. Patient was prescribed Ilevro eyedrop BID (twice a day) in left eye, and Vitrolenta eyedrop QID (four times a day) in left eye, and suggest to return to clinic in 1 week to check

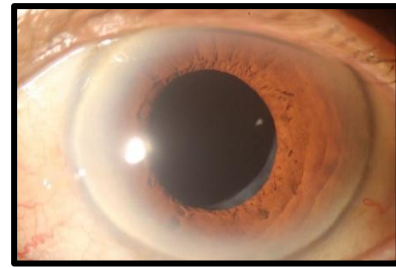


Fig. 3. Slit lamp examination of IOL on left eye after Nd-YAG Laser, IOL seen clear

Patient return on first week to follow up, visual acuity on right eye 1.0 F2, and on left eye 1.0 F1. On slit lamp examination RLE cornea was clear, lens was clear, and no PCO found. Patient not seeing floaters on left eye since 3rd day, and no other complain since then.

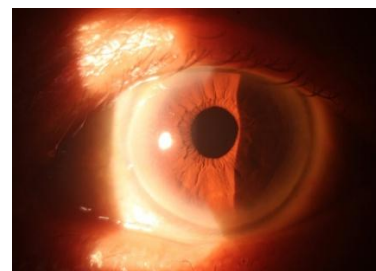


Fig. 4. Slit lamp examination left eye on 1st week after Nd-YAG laser

DISCUSSION

Nd-YAG (neodymium-doped yttrium aluminium garnet) is a crystal that is used as a lasing medium for solid-state lasers. The dopant, triply ionized neodymium, Nd(III), typically replaces a small fraction (1%) of the yttrium ions in the host crystal structure of the yttrium ions in the host crystal structure of the yttrium aluminium garnet (YAG), since the two ions are of similar size. Laser operation of Nd-YAG was first demonstrated by J.E. Geusic *et al.* at Bell Laboratories in 1964. Nd-YAG lasers typically emit light with a wavelength of 1064nm, in the infrared. Nd-YAG lasers are used in ophthalmology to correct posterior capsule opacification and peripheral iridotomy. Frequency-doubled Nd-YAG lasers (wavelength 532 nm) are used for pan-retinal photocoagulation in patients with diabetic retinopathy. (Geusic *et al.*, 1964).

The reported incidence of PCO varies widely but has been diminishing as a result of modern IOL designs and placement. Older studies reported that the frequency of Nd:YAG laser capsulotomy varied between 3% and 53% within 3 years of cataract surgery. More recent clinical series with a 3- to 5- year follow-up of cases with either hydrophobic acrylic or silicone square- edge design show PCO rates up to 5%. The IOL material also has a modest effect on opacification rates. Hydrogel IOLs are associated with the highest rate, followed by PMMA, then silicone; IOLs made of hydrophobic acrylic material are associated with the lowest rate (Ayuningtyas, *et al.*,

2015) PCO formation was found mostly in younger patients. Age is an important factors to PCO formation according to Wormstone, et al study (Wormstone *et al*, 2009).

The center of the visual axis, usually 3–4 mm in diameter, is the desired site for posterior capsulotomy. Capsulotomy can be performed in a spiral, cruciate, or in verted D-shaped pattern, beginning in the periphery to reduce the likelihood of central optic pitting until ideal energy levels and focus have been established. Occasional IOL dislocation into the vitreous has been reported after capsulotomy, particularly with silicone plate-haptic lenses. The diameter of the capsulotomy should not exceed that of the IOL optic. Any PCIOIOL can be damaged by laser energy, but the threshold for lens damage appears to be lower for silicone than for other materials (American Academy of Ophthalmology, 2021).

Transient elevation of IOP occurs in a substantial number of patients, with pressure levels peaking 2–3 hours after surgery. This elevation is likely due to obstruction of the outflow pathways by debris scattered by the laser treatment. It is more common in eyes with vitreous prolapse, those without in-the-bag fixation of the IOL, or those with preexisting glaucoma. Such elevation responds quickly to topical glaucoma medications, which can be continued for 3–5 days after the procedure (American Academy of Ophthalmology, 2021). In this case, PCO were diagnosed through physical examination, and treated with Nd:YAG Laser. Patient achieve good visual acuity after laser done and no complications were reported.

CONCLUSION

Posterior Capsule Opacification is not a complication of cataract surgery, it is a treatable late occurrence after cataract surgery. Treatment with Nd:YAG laser posterior capsulotomy is needed to clear the visual axis. Patient will achieve their best visual acuity like after cataract surgery done.

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