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Nd:YAG Laser Capsulotomy for Treating Posterior Capsule Opacification

Gregor Hawlina, Brigita Drnovšek-Olup
Eye Hospital, University Medical Centre Ljubljana, Grabloviceva 46, 1525 Ljubljana, Slovenia

SUMMARY

Posterior capsule opacification (PCO) is the most common visually disabling consequence of modern cataract surgery and has important medical, social and economic implications[1].

The reported incidence of PCO varies widely. Analysis of multiple reports has found the visually significant PCO rate overall to be approximately 28% at 5 years[2].

At present, the most effective treatment of PCO is Nd:YAG laser capsulotomy. The procedure involves clearing of the visual axis by creating a central opening in the opacified posterior capsule[3,4] by focusing a Nd:YAG laser pulse, with energy of few millijoules and duration of a few nanoseconds, just behind the posterior capsule.

Adverse effects following Nd:YAG laser capsulotomy reported in literature include intraocular pressure elevation and glaucoma, cystoid macular oedema, endothelial cells reduction and damage, retinal tears and detachment[5-7] and, most commonly, intraocular lens (IOL) damage, or so-called pitting[8]. Some authors reported that side effects were more pronounced when higher single-pulse energy rather than higher total energy was used[9-14]. Numerous studies have analyzed the damage rate and damage thresholds of different lens material[8, 15-24]. All have proposed that the procedure should be performed at the lowest possible energy level in order to avoid IOL damage.

The purpose of this study was to observe the total energy delivered while performing the Nd:YAG laser capsulotomy using a cruciate pattern with a size of 4 mm and single-pulse energy of 1.6 mJ.

All procedures were performed by the same ophthalmologist (G.H.) with an Nd:YAG laser (OptoYAG, Optotek d.o.o., Slovenia), emitting laser light at 1064 nm with a pulse duration of 4 ns.

Nd:YAG capsulotomies were performed taking into account the survey of UK practices and recommendations published by Gomaa and Liu[25]. The pupils were dilated and the capsulotomy aimed at a size of 4.0 mm. The procedure was started by setting the laser power slightly above damage threshold (1.6 mJ) with a backfocus of 150 μm. As a precaution, the aiming beam was initially focused slightly posterior to the capsule towards the retina. If no visible damage occurred on the posterior capsule or if the laser-induced breakdown (LIB) seen as a spark appeared too posteriorly to the capsule, the aiming beam was cautiously moved backward nearer to the posterior capsule until visible damage on the capsule was seen. The CGPL lens (Haag Streit) was used in all procedures. To avoid IOL pitting, a centrally cruciate pattern starting from upside down was used[26-29]. The total number of pulses used to create the Nd:YAG posterior capsulotomy was recorded. High-risk patients (glaucoma, high myopia, higher total energy used) received 125 mg of acetazolamide two times on the treatment day. All patients received dexamethasone eyedrops (Maxidex®) 3 times per day for a week and were reexamined one week after the treatment by their personal ophthalmologists.

This study included all patients with biomicroscopically detectable PCO who were referred for Nd:YAG laser capsulotomy by their personal ophthalmologists. The patients were selected according to the reduction of visual acuity due to capsule opacity, complaints of glare or monocular diplopia. 53 eyes (44 patients) were included in the study (25 men and 19 women). The patients ranged in age from 59 to 89 years (average age 76.49). All procedures were performed with an energy level of 1.6 mJ. The average total energy used was 104.72 mJ, ranging from 27.2 mJ to 320 mJ. The average number of pulses used was 65.5, ranging from 17 to 200.

Nd:YAG laser capsulotomies can be successfully performed with an energy level of 1.6 mJ, but at the expense of higher total energy used. Based on the recommendations of some published articles, a lower single-pulse energy (but higher total energy) was used[15, 30] in our study. The total amount of energy delivered to the treatment site can be decreased by using higher single-pulse energy, but this may potentially lead to a higher incidence of adverse effects.

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