Case report

Femtosecond laser-assisted cataract surgery in a patient with posterior chamber phakic intraocular lens

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A B S T R A C T
We describe a case of modified femtosecond laser settings for cataract extraction in a patient with a posterior chamber phakic intraocular lens (PIOL), to avoid incomplete treatment patterns and treatment displacement. Modification of laser settings (increased depth for the capsulotomy, increased vertical spot spacing for the capsulotomy and increased anterior and posterior capsule safety margins for lens fragmentation) seems to make femtosecond laser-assisted cataract surgery feasible in patients with posterior chamber PIOLs, as complete treatment patterns are achieved.

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1. Introduction

The femtosecond laser platforms utilize imaging and software technologies in order to create a three dimensional reconstruction of the cornea and the crystalline lens [1]. After image acquisition, the treatment plan is overlaid on the three dimensional reconstruction and the surgeon may customize the corneal incisions, capsulotomy and lens fragmentation pattern [1]. After image acquisition and treatment planning, laser delivery occurs; the femtosecond laser energy is absorbed by the ocular tissues (cornea, crystalline lens and capsular bag), resulting in plasma formation. This plasma of free electrons and ionized molecules rapidly expands, creating cavitation bubbles [1]. The force of the cavitation bubble creation separates the tissue through a process known as photodisruption [1] and the resultant gas is disseminated into the anterior chamber.

The presence of a posterior chamber phakic intraocular lens (PIOL) could affect both imaging and laser delivery during femtosecond laser-assisted cataract surgery (FLACS), because of a change in the refractive index introduced by the PIOL or due to its high refractive power [2]. Furthermore, the PIOL could block gas diffusion in the anterior chamber, with subsequent accumulation of gas bubbles beneath it and gas interference with laser delivery leading to possible incomplete treatment patterns.

We describe modified laser settings in a patient with PIOL undergoing femtosecond laser assisted cataract surgery (FLACS), to avoid gas accumulation beneath the PIOL and possible treatment displacement in order to achieve complete treatment patterns and increase the safety of the procedure.

2. Materials and methods

2.1. Case report

A 69-year-old male presented to our institute complaining of decreased vision in both eyes. The patient had history of bilateral implantation of posterior chamber PIOLs, to correct high myopia eight years prior to presentation (The Visian® ICL, STAAR Surgical Company, Ca, USA). The patient’s uncorrected distance visual acuity (UDVA) at presentation was 20/40 in both eyes; while the corrected distance visual acuity (CDVA) was 20/25 in both eyes with a manifest refraction of –1.25 sph + 0.75 cyl × 2 (right eye) and –1.25 sph + 0.75 cyl × 10 (left eye). Corneal topography kerometric (K) values of the right eye were K steep 43.89 @ 86° and K flat 42.48 @ 176° corneal cylinder of 1.41 @ 86°. Slit lamp
evolution of FLACS [3]. FS lasers are used in performing various steps of the cataract procedure as a pre-treatment to traditional phacoemulsification, including clear corneal incisions, arcuate keratotomies, anterior capsulotomies and phacofragmentation. The limitations of utilizing FS technology in cataract surgery may be categorized into inability to either achieve anterior segment imaging (due to corneal opacities and small pupils [4]) and/or FS laser delivery (corneal opacities) [5].

Even though, there is no available literature about FLACS in patients with posterior chamber PIOLs, there have been anecdotal reports about cases with excessive gas accumulation beneath the PIOL that blocked laser delivery and resulted in incomplete capsulotomy treatment patterns (Video 2). Furthermore, there have been concerns about image acquisition and laser delivery, when a refractive material is placed between the laser and imaging sources and the targeted tissue [2].

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Taking into account the above, we modified the laser settings in our patient with the rationale to minimize gas accumulation under the PIOL that could block complete lasing of the capsulotomy. Furthermore, we increased the safety margins for crystalline lens fragmentation to compensate possible laser focus displacement anteriorly or posteriorly that could violate the lens capsule [5]. This approach was selected to increase treatment safety and avoid possible complications.

The suggested method may not be optimal and it is not certain that the laser modifications of the routine settings are actually necessary. Furthermore, we cannot comment about the optimal settings required for other laser platforms. In conclusion, FLACS seems feasible in patients with posterior chamber PIOL. Concerns for imaging acquisition and laser delivery should be studied in the future in order to optimally modify FLACS settings if necessary.

6. Conclusions

In conclusion, FLACS seems feasible in patients with posterior chamber PIOL. Concerns for imaging acquisition and laser delivery should be studied in the future in order to optimally modify FLACS settings if necessary.

Conflict of interest

None declared.

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