CASE REPORT

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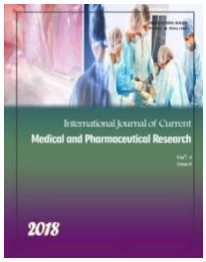

UNEXPECTED COMPLICATIONS DURING FEMTOSECOND-LASER ASSISTED CATARACT SURGERY: A CASE REPORT

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ABSTRACT

A 46 year old man with cataract had FLACS under topical anesthesia in his left eye. Anterior capsulotomy and lens fragmentation were planned with femtolaser platform. The laser signaled to correctly have completed all the planned phases, but the procedure hid some unexpected complications. The images of the treatment summary showed the presence of a bubble between suction ring and the sclera, indicating a suction loss, moreover capsulotomy was only in part performed and the grid pattern intended to defragment the lens nucleus was partially impressed on the cornea. During phacoemulsification a large posterior capsular tear whit vitreous loss was highlighted. Anterior vitrectomy was performed and a 3-pieces IOL was implanted in the ciliary sulcus. One day postoperatively, the corrected distance visual acuity was 20/20. The grid impressed into the cornea was completely resolved.

INTRODUCTION

The introduction of premium IOLs in cataract surgery, along with the ever-increasing patients expectations induced the need for an upgrade in the practice of operating cataract. The advent of the femtosecond laser in cataract surgery offers many potential benefits, promising a new level of precision. This technology lets to plan and customize important surgical steps of cataract surgery, providing accuracy and repeatability in surgical results. It allows to perform cuts and incisions of any size at any location, monitoring its extension and depth[1,2]. The main advantages of femtolaser assisted cataract surgery (FLACS) at present are: standardized corneal incisions, perfectly centered, sized and round capsulorhexis, liquefation of soft cataracts and softening of hard ones, this allowing to chop nucleus with less phaco energy and time[3,4]. The laser precision is supported by an integrated real time OCT software program, which covers the whole anterior segment up to the posterior lens capsule. A detailed summary of the type of treatment the patient received, including results of treatment and imaging is printed out at the end of procedure for clinical record. Despite the very high safety profile this advanced surgical practice is not risk-free. Indeed in some cases, unexpected challenges can occur, as suction loss, premature gas breakthrough during corneal incisions, incomplete capsulotomies, posterior capsule rupture, emulsified silicone oil bubbles in vitrectomized eyes, reverse pupillary block in phacomorphic glaucoma and lens tilt due to cavitation bubbles in dense cataracts[5]. To deal successfully with this complications is essential for the final outcome.

CASE REPORT

A 46 year old man with cataract had FLACS under topical anesthesia in his left eye. Lens opacity was classified as cortical grade 1 according to the LOCS III classification. Anterior capsulotomy and lens fragmentation were planned with Catalys laser platform (Abbott Medical Optics, Inc.). The surgeon had a baggage of about 150 FLACS. The patient revealed an anxious character, and winked repeatedly his eyes despite the many encouragements to relax. Then he was positioned on the station with the head fixated with a fastener headband. The suction ring of the interface was placed on the sclera, then the vacuum was activated. Therefore the integrated optical coherence tomography scan of the anterior segment was acquired. The treatment and safety zones were identified by the laser system and then the treatment started. The capsulotomy diameter was set at 5.3 mm, with an incision depth of 650 µm, and a pulse energy of 4.0 mJ. For lens fragmentation was applied an anterior pulse energy of 8.0 µJ, posterior pulse energy of 10.0 µJ, anterior capsule safety margin of 200 µm, posterior capsule safety margin of 500 µm, total energy applied for lens fragmentation was 7.8 J. The laser signaled to correctly have completed all the planned phases until 98%, then the treatment was stopped. Treatment summary revealed the presence of a bubble between suction ring and the sclera, indicative of a suction loss. The patient apparently not had eyes movements, and not any suction loss

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was promptly detected, so the laser continued firing almost up to the end of planned treatment. Under the operating microscope was observed only a part of the planned capsulotomy, and the grid pattern intended to defragment the lens nucleus was partly impressed on the cornea (fig 1). The capsulotomy was carefully completed whit forceps and the entire nucleus was removed without applying ultrasounds. Afterwards a large posterior capsular tear whit vitreous loss was highlighted, so phacoemulsification slowly proceeded placing the instruments between the nucleus and the capsule. Then an anterior vitrectomy was performed and a 3-pieces IOL was implanted in the ciliary sulcus. At the end of the procedure a standard therapy with antibiotics and corticosteroids was started. One day postoperatively, the corrected distance visual acuity was 20/20. The grid impressed into the cornea was completely resolved.

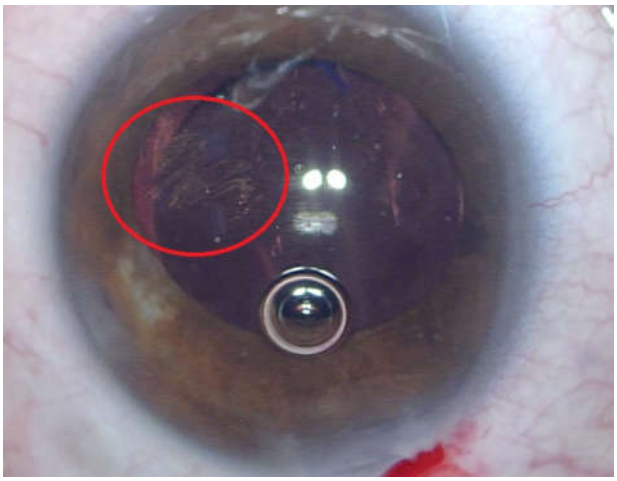

Fig 1 Grid pattern impressed to the cornea

DISCUSSION

Modern technology accompanying FLACS offers an high level of accuracy with an almost absolute precision, suitable for every single clinical case, guaranteeing an high safety profile[6]. Nevertheless it must be kept in mind that the laser is not unfailing, so FLACS can reveal unexpected difficulties, sometimes giving a hard time to the surgeon, especially if he did not have a valid training,[7]. A literaturer review conduced by M. Chen revealed a lower complication rate for the majority of the surgeons using FLACS in comparison with traditional phacoemulsification[8]. Ranjini compared the outcomes of FLACS and standard 2.2 mm clear corneal phacoemulsification, stating the superiority of FLACS to conventional phaco in the circularity of rhexis, capsular overlap, and centration of the IOL and less US Energy[9]. However, conventional phacoemulsification showed to be equivalent to FLACS in most other parameters. The most frequent reported complications with FLACS were related to suction loss and docking problems, due to the conformation of the orbit and lids, surface irregularities, comprehending pterygium or pinguecula, and not last anxiety and sudden eye movements[10]. So patient selection becomes fundamental for the best outcome; for example subjects who tend to squeeze their lids can be problematic, as the abrupt movements can cause vacuum loss and the abort of procedure[11]. Femtosecond laser needs vacuum to fixate the eye, and it is theoretically unable to fire once suction is broken, nevertheless Shultz e coll. reported the possibility that the device can sense suction even if it is lost, because conjunctiva could occlude the suction holes, preventing the platform from detecting the suction loss and allowing the laser to fire after the eye had moved[12]. The same we suspect it happened to our patient. Considering the high repetition rate of the laser system, a fraction of second after suction loss was sufficient to displace laser shots. So the late recognition of suction loss conduced to the misplacing of laser beam delivery, with realization of a discontinued capsulotomy, incomplete nucleus fragmentation and damage of posterior capsulae, and delivering a part of the grid segmentation pattern to the cornea instead of to the nucleus. A possible explanation of the displacement of the laser beam can be found in Snell's law, which states that the refraction of a light beam changes in the transition between two diopters with different refractive index. As the reported complications can occur during each phase guided either by laser platform or by human hand, the training of surgeons becomes fundamental for the best managing. This report emphasizes the need to identify patients who might present difficulties for femtosecond assisted laser treatment, in order to prevent unexpected complications, aiming to contribute to prevent and manage successfully any complications. In this case the suction loss probably occurred already in the initial phases of treatment due to the patient's ocular wringing, even if the laser platform reported only a late loss of suction. This probably determined the series of described complications. Meanwhile a more precise control system could be introduced for a more strict control of each phase.

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