



Case report

Femtosecond laser-assisted cataract surgery in patients with zonular weakness

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ABSTRACT

Purpose: To present the clinical value of femtosecond laser assisted cataract surgery (FLACS) in eyes with compromised zonules.**Observations:** We present two cases of femtosecond laser assisted cataract surgery (FLACS) in eyes with compromised zonules. Three eyes from two patients with zonular weakness and cataract underwent FLACS (Alcon LenSx Lasers Inc., Aliso Viejo, CA). One patient underwent bilateral FLACS in the setting of spherophakia with zonular weakness. The other patient had Marfan's syndrome with associated ectopia lentis. Laser assisted capsulotomy was achieved in all eyes. One eye had vitreous prolapse during surgery and required an iris-sutured lens. All eyes had a postoperative corrected distance visual acuity of 20/25 or better.**Conclusions and Importance:** FLACS is a safe and effective alternative to conventional phacoemulsification cataract surgery in patients with zonular weakness.

1. Introduction

Zonular instability remains a source of concern when proceeding with cataract surgery. Reported challenges include capsulorhexis creation, nuclear phacoemulsification and capsular bag stabilization.¹ Intraocular manipulation may further damage the zonules and complicate surgery. Femtosecond laser assisted cataract surgery (FLACS) allows surgeons to customize the capsulotomy size and location.² Reported benefits include a reduction in intraocular manipulation and less traction on the already compromised zonules.^{3,4} We report the use of FLACS for eyes with zonulopathy in the setting of spherophakia and Marfan's syndrome.

2. Findings

2.1. Case 1

A 63-year-old man with chronic progressive external ophthalmoplegia, myopia and narrow angles presents with visually significant cataracts. On exam his corrected distance visual acuity (CDVA) was 20/60 in the right eye and 20/40–2 in the left eye. His initial baseline manifest refraction $-18.50 + 0.75 \times 175$ and $-16.00 + 4.50 \times 025$ in the right and left eye, respectively. Slit lamp exam revealed 3 + nuclear

sclerosis, and the appearance of spherophakia with noticeable zonular weakness and anatomical narrow angles in both eyes.⁵ Optical biometry was performed which revealed axial lengths of 27.22mm in the right eye, and 27.40mm in the left eye, both lengths shorter than expected for the degree of manifest myopia. In both cases, femtosecond laser was used for the corneal incisions, limbal relaxing incision, capsulotomy, and lens softening. The anterior capsule was removed with capsulorhexis forceps, phacoemulsification was safely performed, and the intraocular lens was placed without complications (video 1). Postoperatively, the single piece intraocular lens was centered in the capsular bag in each eye. His uncorrected distance visual acuity (UDVA) at one year was 20/25 in both eyes.

Supplementary video related to this article can be found at <https://doi.org/10.1016/j.ajoc.2019.100483>.

2.2. Case 2

A 37-year-old female with Marfan's syndrome and bilateral ectopia lentis was referred to us for a second opinion for cataract surgery. Her CDVA was 20/600 in the left eye with a $-18.00D$ soft contact lens and there was no improvement with refraction. Slit lamp exam revealed 3 + nuclear sclerosis in her left eye with superior lens subluxation and no zonules inferiorly. Femtosecond laser was used to create a

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capsulotomy. The corneal incisions were created manually and the capsule was stained with trypan blue (D.O.R.C. International, Zuidland, the Netherlands). The anterior capsule was subsequently removed with capsulorhexis forceps (video 2). An anterior tag was noted at the inferior edge of the capsulotomy. Phacoemulsification was used to remove the nuclear fragments, but as noted preoperatively, the capsule was weakly supported inferiorly and vitreous was seen in the anterior chamber. Anterior vitrectomy was used to remove the prolapsing vitreous and remaining cortical material. An MA60MA lens was then placed in the sulcus and the haptics were sutured to the iris with 2 modified McCannel sutures using 10–0 Prolene on a CTC needle.⁶ At the conclusion of the case, there was no vitreous seen in the anterior chamber. There were no postoperative complications. The UDVA was 20/20 in the left eye at postoperative months 3 and 6.

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3. Discussion

Zonular weakness predisposes the eye to an array of intraoperative problems including the risk of anterior capsular tear, IOL decentration and anterior vitreous prolapse.¹

FLACS may be of benefit when dealing with patients that have zonular damage as it allows the surgeon to modify treatment parameters prior to surgery, including the position and size of the capsulotomy, and the lens fragmentation pattern.² Another benefit is that the capsulotomy can be created with minimal traction or manipulation to the anterior capsule, thus reducing further damage to the already weakened zonules.^{3,4} In the event that unwanted air bubbles form in the capsular bag during use of the laser, viscoelastic injection and gentle hydrodissection allows the bubbles to safely leak out from the capsular bag and the anterior chamber.

In our cases, the use of femtosecond laser allowed for the creation of capsular openings with minimal traction on the zonules. Vitreous prolapse was noted in one case during surgery, but there were no cases of nuclear loss or need for further surgery. The patient with Marfan's syndrome required a sutured lens; however, she was noted to have severe zonular instability preoperatively and we did not observe further zonular damage from the surgery. All cases resulted in a postoperative CDVA of 20/25 or better. It is our experience that femtosecond laser assisted creation of the capsulotomy is easier than manual capsulotomy in cases with zonular weakness (video 3).

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In conclusion, these case reports demonstrate that FLACS may minimize complications and improve patient outcomes as compared to

conventional cataract surgery in patients with compromised zonules.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Conflicts of interest

The following authors have no financial disclosures: (O.D., A.A., Y.D.).

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajoc.2019.100483>.

References

- Hoffman R, Snyder ME, Devgan U, Allen QB, Yeoh R, Braga-Mele R. ASCRS Cataract Clinical Committee. Challenging/complicated cataract surgery subcommittee. Management of the subluxated crystalline lens. *J Cataract Refract Surg*. 2013;39:1904–1915.
- Nagy ZZ, McAlinden C. Femtosecond laser cataract surgery. *Eye Vis(Lond)*. 2015;2:11.
- Schultz T, Ezeanosike E, Dick HB. Femtosecond laser-assisted cataract surgery in pediatric Marfan syndrome. *J Refract Surg*. 2013;29:650–652.
- Crema AS, Walsh A, Yamane IS, Ventura BV, Santhiago MR. Femtosecond laser-assisted cataract surgery in patients with Marfan syndrome and subluxated lens. *J Refract Surg*. 2015;31(5):338–341.
- Rao DP, John PJ, Ali MH, et al. Outcomes of lensectomy and risk factors for failure in spherophakic eyes with secondary glaucoma. *Br J Ophthalmol*. 2018;102(6):790–795.
- Stutzman RD, Stark WJ. Surgical technique for suture fixation of an acrylic intraocular lens in the absence of capsule support. *J Cataract Refract Surg*. 2003;29:1658–1662.