Guest Editorial

Learning curve in femtosecond laser-assisted cataract surgery

Femtosecond laser-assisted cataract surgery (FLACS) is a fascinating advancement which has revolutionized the approach to modern day cataract surgery. As with other procedures, an initial learning curve is present. This is less steep for practitioners proficient with conventional phacoemulsification and prior experience with the femtosecond laser. It is imperative to be aware of the challenges unique to this technology to prevent complications and ensure a smooth transition.

Initial challenges include difficulty in obtaining an ideal dock, extension of unnoticed capsular tags and cortical aspiration.[1] Transitioning surgeons need to recognize problems peculiar to FLACS and modify surgical steps to manage them appropriately.

I appreciate the efforts made by the Christy and associates to elucidate the difficulties encountered in the initial 100 eyes by surgeons unfamiliar with the femtosecond technology, which is published in this issue of Indian Journal of Ophthalmology.[2] In my opinion, patient selection is extremely critical in the early cases. I would recommend cooperative patients with well-dilated pupils and the ability to remain still through the laser application. Avoid patients with deep seated eyes, prominent brows and fixation difficulties.[3] Counseling the patient to keep both eyes open relaxes the orbicularis and facial muscles, allowing easy insertion of the patient interface.

I agree with the authors that avoiding tilt is crucial to reduce the risk of suction loss and incomplete capsulotomies. A well-centered patient interface allows accurate anterior segment imaging, identification of capsular planes and precise well-centered incisions.[4] The ideal placement of the eye should be perpendicular to the docking axis and parallel to the patient bed. The patient's nose should be moved sideways by tilting the head to the opposite side. One should look for signs of a creeping meniscus and conjunctival encroachment to avoid an impending suction loss.

Another challenge specific to the femtosecond laser system is postdocking pupillary miosis.[4-6] The release of prostaglandins and inflammatory cytokines subsequent to laser delivery has been hypothesized as the cause. Preoperative nonsteroidal anti-inflammatory administration counters the action of inflammatory mediators and prevents pupillary constriction.[7] In pupils with suboptimal dilatation the capsulotomy and nucleotomy can be manually adjusted within the confines of the pupillary diameter.[8]

Limbal corneal incisions have limited laser penetration, hence the incision placement should be clear corneal. Moreover, the intended width should be slightly larger than a manual incision as the femtosecond-assisted wound architecture affords a tighter fit leading to subsequent wound hydration and reduced visibility. The use of trypan blue helps identification of incomplete capsulotomy areas and aids subsequent removal. In addition, with the advent of liquid optics and softer applanating interface, the corneal distortion is less enabling free floating capsulotomies. A dimple down technique entails a downward push at the center to separate the capsulotomy peripherally. Microadhesions can be released using a microforceps or cystitome and pulling in a circumferential fashion. A gentle hydrodissection following the escape of air bubbles is recommended to prevent excessive buildup of intracapsular pressure and capsular block.[8,9]

A more closely arranged grid pattern reduces effective phacoemulsification time in dense nuclear cataracts. A combination of softening and segmentation pattern helps to achieve an adequate hold in the uncut areas and enables greater ease of chopping. Cortical aspiration poses a challenge as the clean cut of the laser ensures that there are no cortical tags beyond the edge of the anterior capsule. Therefore, aspiration in a circumferential pattern rather than a radial pull is recommended.

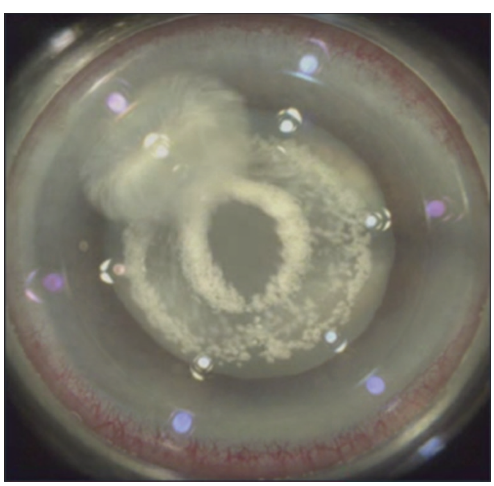

Figure 1: Plume of liquefied lens material following initiation of femtosecond capsulotomy in a hypermature cataract

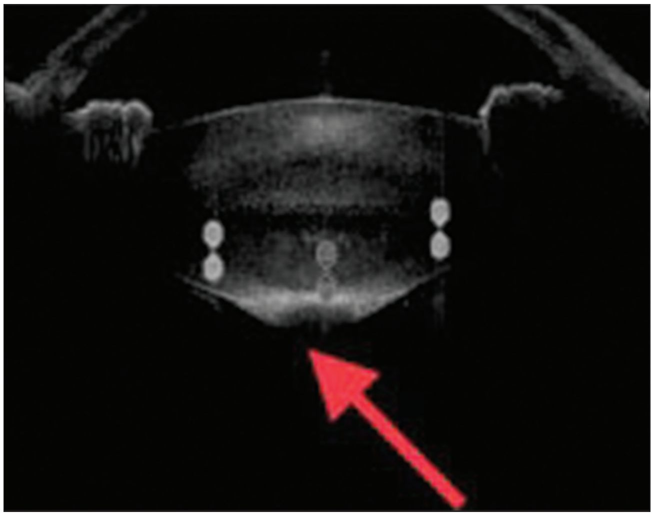

Figure 2: Posterior capsular dehiscence with polar plaque on anterior segment optical coherence tomography

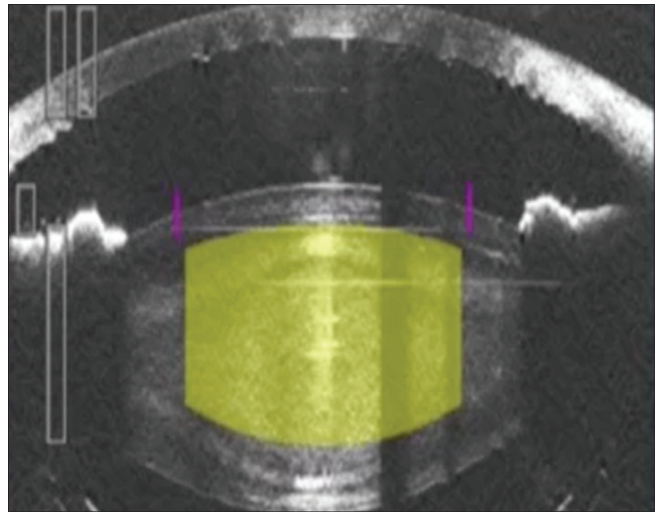

Figure 3: Increased posterior offset in a silicon oil filled eye

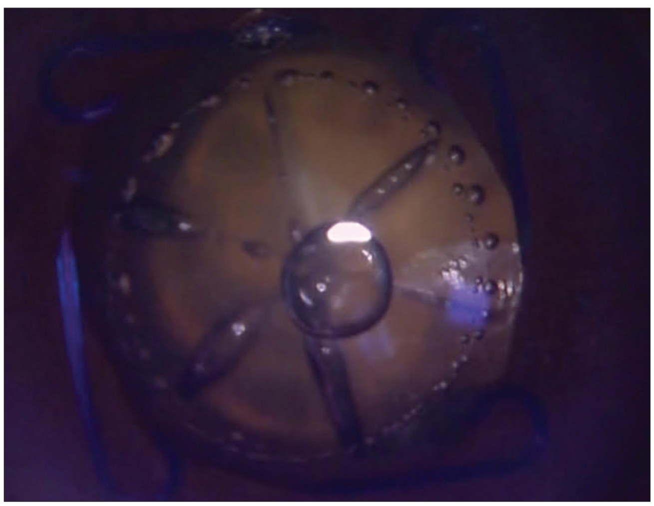

Figure 4: Femtosecond capsulotomy and nucleotomy following Malyugin ring insertion

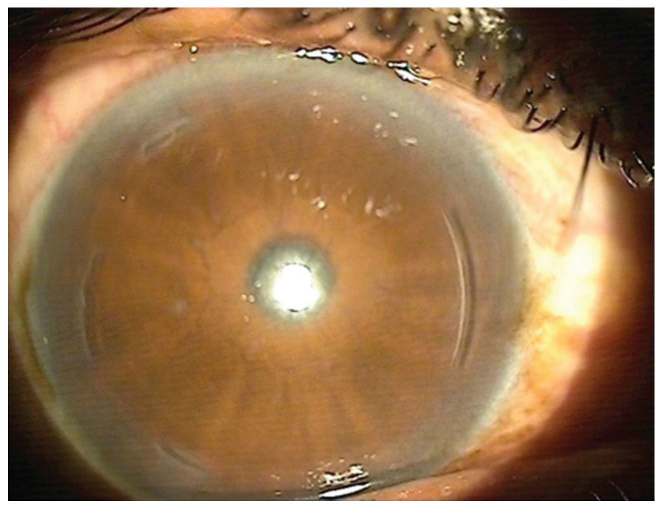

Figure 5: Femtosecond laser-assisted arcuate keratotomy

Femtosecond laser delivery in complex situations presents its own unique challenges. The laser works in a closed system delivering a precise capsulotomy in mature cataracts [Fig. 1]. However, the egress of fluid may interfere with subsequent laser delivery leading to uncut areas. The femtodelineation in posterior polar cataracts affords an epinuclear cushion for subsequent safe emulsification. The anterior segment optical coherence tomography allows differentiation from a posterior subcapsular plaque and helps assess the status of the posterior capsule [Fig. 2]. The posterior offset of nucleotomy should also be increased to prevent laser deliver close to the weak capsule in such cases and postvitrectomised eyes [Fig. 3]. The liquid optics interface enables safe laser delivery in small pupils following insertion of pupil expansion devices [Fig. 4].

The authors of the current paper did not allude to the use of arcuate keratotomies for the management of preexisting astigmatism.[10] This is a very useful facet of the femtosecond laser where one can improve the visual outcomes. I routinely treat astigmatism between 0.50 and 1.25 diopters with the use of femtosecond-assisted arcuate keratotomies [Fig. 5], while for those with astigmatism more than 1.5 D I prefer a toric intraocular lens. I open out the keratotomies at the onset of surgery, as the globe is well formed and epithelial disruptions are minimal.

In summary, FLACS is an exciting technology which can further our goal in achieving greater precision, reproducibility and safety in cataract surgery. With a greater understanding of the technology and subsequent ease with regular cataracts, FLACS can be extended to complex cases where it offers distinct advantages over conventional methods.

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