

When and How to Abandon LASIK

It is important to have the courage to stop the procedure when necessary.

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In LASIK surgery, abortion of the procedure is often perceived by the surgeon as a defeat and by the patient as a great disillusionment. Although these feelings may compel surgeons to want to continue a procedure after a problem has occurred, we should be brave enough to stop and to tell the patient that surgery must be completed on another occasion. If the patient was informed preoperatively about this possibility, he or she will understand.

Most procedures are abandoned during or after flap creation. We tell patients before surgery that flap creation is like digging the foundations of a house: if the foundation is poorly dug, it is better to fill it back up with dirt and to start fresh to dig a good one later. This article explores some of the most frequently encountered reasons for halting a LASIK procedure and how to manage these cases.

PRETEST FOR DEEP-SET EYES

LASIK may be abandoned before surgery if we cannot fit the microkeratome ring on the eye. This happens most often in hyperopic eyes, which are small and commonly present with small lid apertures. However, myopic eyes can also be small, with narrow lids, making the use of a microkeratome difficult. In one such case, we had to perform a lateral canthotomy to allow the procedure to go forward.

For this reason, we always pretest deep-set eyes in the surgical setting days in advance, when the laser is off and the patient is relaxed. Should any problem occur, measures



Figure 1. Corneal bleeding and incomplete cut were caused by microkeratome ring displacement.

can then be put in place to overcome the inconvenience at surgery. Alternatively, a different surgical procedure can be selected.

INTRAOPERATIVE DISCONTINUATION

Flap-cutting complications are the main reason for abandoning LASIK.¹ Improvements in microkeratome design, construction, and maintenance have led to a substantial reduction of flap complications in recent years. Additionally, we have learned to consider specific eye characteristics, such as abnormal corneal curvature and size, presence of peripheral vessels, or previous corneal surgery, as possible risk factors for flap complications.



Figure 2. An incomplete cut can lead to postoperative high astigmatism and other optical aberrations if the procedure is continued.

Therefore, complications such as corneal bleeding with incomplete flap cut (Figure 1) are rare at this time. Usually bleeding can be controlled with the use of weak vasoconstrictors and a drying sponge and does not prevent completion of the procedure.

In contrast, however, incomplete cuts should prompt the surgeon to stop the procedure, not only when the cut is only half completed but also in cases in which the central part of the cornea has already been traversed by the blade (Figure 2). In such cases, the need to protect the flap from laser exposure will lead to an asymmetric ablation, with resulting postoperative astigmatism and coma in the pupillary area. More than 15 years ago, sometimes we completed an incomplete cut with a crescent knife, but this approach is no longer acceptable today.

Incomplete cuts may happen because of suction loss, which causes the microkeratome to stop and reverse the movement of the head. Inadvertent surgeon or personnel movement, strong lid closure by the patient, and distorted limbal or conjunctival anatomy can also be causes.

Flap destruction can occur when we attempt a thin flap in a flat cornea. Whenever we are dealing with a flat cornea, whether previously operated or not, a thick microkeratome head or a femtosecond laser should be employed for flap creation. After selecting a 110- μm head and a pivoting microkeratome for a 39.00 D cornea, an outcome such as is seen in Figure 3 may be encountered. There is no option in such a case but to try to reposition the flap pieces, apply a bandage soft contact lens, and wait for flap repair. If the surgeon is lucky, transepithelial PRK will save such eyes from serious visual problems and the surgeon from serious legal problems.



Figure 3. The flap is damaged beyond repair. Nothing can be done except to abandon the procedure and apply a bandage contact lens.

In the past, buttonholes were also a frequent reason for abandoning LASIK.² Buttonholes may occur in curved corneas. They develop because of invagination of the central cornea during the cut, and they present as holes 2 to 3 mm in diameter, usually at the center of the flap. Buttonholes are more frequent in the second eye when bilateral surgery is planned, probably because corneal debris from the first eye that remains on the microkeratome surfaces causes thinning of the second cut. It has been demonstrated that rather dense haze will develop if the procedure is continued, and therefore most surgeons prefer to abandon LASIK and to recut a deeper flap months later. PRK with mitomycin C application has also been employed. In every case, a bandage contact lens is applied to keep the damaged flap in position, to smooth the corneal surface as much as possible, and to relieve pain.

When we have to abandon a procedure because of flap complications, we must inform the patient immediately that a problem occurred, that this problem will

TAKE-HOME MESSAGE

- An incomplete cut should prompt the surgeon to stop the procedure.
- Deep haze is likely to develop if LASIK is continued after a buttonhole occurs.
- Whenever a procedure is abandoned, the surgeon must inform the patient immediately that a problem occurred.
- In the event of a postoperative flap complication, flap amputation may be the best solution.



Figure 4. Flap fold that developed after interstitial keratitis, causing strong visual disturbances.

cause a delay in the completion of surgery, and that abandoning the procedure is the best way to proceed for the best result. The patient will be doubly disappointed—because of the problem and because of the delay—and may ask for second eye surgery if the problem occurred in the eye operated by first. Preoperative informed consent is mandatory to address this difficult situation. Postoperative medical and psychological assistance is of great help in reducing patient disappointment and anxiety.

DISCONTINUING FEMTOSECOND LASIK

Flap creation with a femtosecond laser starts with applying a suction ring and docking the eye. Because no lateral or rotational movement takes place, femtosecond laser suction rings are smaller than those used with microkeratomes, and the procedure rarely has to be abandoned before flap creation. Suction loss and incomplete cuts may happen with femtosecond lasers, but the difference is that, unlike with a bladed microkeratome, there is no actual cut. The cut is obtained after the surgeon finishes the femtosecond laser procedure, by joining all the gas bubbles created by the laser within the cornea. Therefore, the procedure can be abandoned at any stage, and after virtually any bad femtosecond laser pattern, with low risk for subsequently impaired anatomy. A new laser cut will find the corneal anatomy mostly unaltered.

Additionally, immediate reapplication of the suction ring and completion of the surgical procedure is possible with femtosecond flap creation. Because of its depth precision, the second laser application will produce a set of microbubbles in the same location as the first set, and a regular cut will be obtained. This is a distinct, and



Figure 5. Flap amputation was necessary after flap ironing was unsuccessful.



Figure 6. The corneal bed showed no evident damage after flap amputation.

probably the most important, advantage of femtosecond laser over microkeratome flap creation.

POSTOPERATIVE FLAP COMPLICATIONS

A variety of postoperative complications of LASIK can occur. Sometimes these are best addressed with flap amputation, basically transforming the LASIK into a sort of PRK. The most common cause of flap amputation is the presence of a flap fold.

The fold shown in Figure 4 developed after interstitial keratitis of unknown origin, which was treated for months with topical steroid and antibiotic eye drops. The patient had irregular corneal astigmatism, coma, poor UCVA, and triple image perception. At revision surgery, we first attempted to iron the fold, but without success. Then we informed the patient of the need for

Flap creation is like digging the foundations of a house: if the foundation is poorly dug, it is better to fill it back up with dirt and to start fresh to dig a good one later.

flap removal, and he agreed. Flap amputation was easily performed with scissors (Figure 5), and this led to the uncovering of a smooth corneal bed (Figure 6). A sponge soaked with mitomycin C 0.02% was applied for 60 seconds, and a contact lens applied postoperatively for 5 days. The patient is still recovering, but his UCVA increased to 0.4 logMAR at 1 week after revision.

WHEN AND HOW TO PERFORM RETREATMENT

After abandoning a LASIK procedure, the quality of the damaged flap should be carefully evaluated for gross and fine anatomy and for any debris that may remain. Epithelial ingrowth may develop from epithelial cells entrapped during the initial surgery. The corneal surface may have lost its regularity and optical transparency, although this happens rarely. If the corneal anatomy is relatively unimpaired, a new and deeper cut may be attempted 2 to 4 months after the initial surgery, endeavoring to avoid any traction on the corneal tissue that might reopen the old cut.

Femtosecond laser flap creation should be considered after a failed microkeratome cut. If the flap anatomy is impaired, phototherapeutic keratectomy using the corneal epithelium as a smoothing factor should be considered, together with mitomycin C application.

These flap complications are unusual occurrences, and they may require consultation among surgeons to determine the best treatment.

CONCLUSION

In our experience, the key factors in abandoning a LASIK procedure are these:

- Give accurate and complete information to the patient before surgery;
- Have the courage to stop the procedure when necessary;
- Inform the patient immediately;
- Preserve the ocular surface as smooth as possible;
- Apply a contact lens postoperatively; and
- Schedule frequent postoperative visits.

The results of subsequent refractive surgery after

LASIK is abandoned are encouraging,^{3,4} and better than those in eyes in which the procedure was continued. The evolution of technologies such as femtosecond lasers and customized ablation are improving the solutions of these complications. Abandoning LASIK no longer means abandoning refractive surgery, and with proper consultation and secondary surgery we can eventually help the patient resolve his or her vision problems. ■

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1. Schallhorn SC, Amesbury EC, Tanzer DJ. Avoidance, recognition, and management of LASIK complications. *Am J Ophthalmol.* 2006;141:733-739.
2. Al-Mezaine HS, Al-Amro SA, Al-Obeidan S. Incidence, management, and visual outcomes of buttonholed laser in situ keratomileusis flaps. *J Cataract Refract Surg.* 2009;35(5):839-845.
3. Sharma N, Ghate D, Agarwal T, Vajpayee RB. Refractive outcomes of laser in situ keratomileusis after flap complications. *J Cataract Refract Surg.* 2005;31:1334-1337.
4. Al-Mezaine HS, Al-Amro SA, Al-Fadda A, Al-Obeidan S. Outcomes of retreatment after aborted laser in situ keratomileusis due to flap complications. *Middle East Afr J Ophthalmol.* 2011;18:232-237.

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