

REFRACTIVE SURGERY

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At Issue: LASIK enhancement preferences

Q: *At Issue* posed the following question to a panel of experts: “What do you prefer for LASIK enhancements, lifting the flap or recutting, and why?”

A: Lifting the flap

Noel A. Alpins, MD: Re-treatments in an effective LASIK practice are not common and occur about once in every 20 or more cases. For a refractive re-treatment, flap lift is the preferred technique as it is relatively safe and simple to perform. This is optimally done within 12 months of the initial surgery, but in my experience is still achievable at 2 years and beyond.

Flap lift is performed by identification of the flap edge at the slit lamp and scoring of the marginal epithelium by a 25-gauge needle. The flap rim, viewed through the laser microscope, can then readily be separated from the bed by a spatula through 180° of arc. This enables raising of the flap, toward the hinge, with two pairs of blunt curved-toothed forceps. After ablation of the stromal bed, the flap is returned to its initial site with minimal epithelial or flap disturbance.

Infection or epithelial implantation is rare, and visual recovery is usually as rapid as after an initial treatment. Flap lifts avoid the usual risks of cutting a flap and the additional complication of creating a frail sliver of amputated tissue where there is an existing interface. Patient anxieties associated with cutting a flap are absent.

On occasions there are instances in which recutting a flap is necessary. These include when the initial LASIK treatment did not achieve a satisfactory flap thickness, or when existing corneal incisions, such as AK, perforate a flap. In these cases, because of localized adhesions, flap lifting is hazardous and should not be attempted.



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A: Depends on when you intervene

Lucio Buratto, MD: The choice depends on when the doctor decides to intervene. If the enhancement is performed within 6 months of the primary LASIK, the flap will not be firmly adhered to the underlying stroma, with the exception of the area around the cut. As a result, the flap can be easily raised.

If the enhancement is planned more than 6 months after the primary LASIK, the surgeon will be faced with a corneal flap that is well-adhered to the stromal bed. As a result, the flap will be much more difficult to raise.

With a myopic eye, the result obtained with LASIK stabilizes within 3 months (generally speaking, myopic regression is observed in the first month postoperative); the stabilization of the result of an astigmatic LASIK is also rapid. So in these cases, if enhancement is necessary, I prefer to raise the flap.

There are a number of reasons for this preference:

- The surgical technique is straightforward and safe;
- I avoid the risks associated with a second run of the microkeratome; and
- a variety of refractive errors can be corrected, and the result is predictable.

However, a disadvantage is that there is the inevitable formation of epithelial defects that can create some discomfort for the patient.

In the event of hyperopic LASIK and LASIK in severe myopia, stabilization normally requires a longer period of time. In these cases, I may have to wait for more than 6 months prior to performing the enhancement. In this case, I prefer to cut a new flap, despite the disadvantages associated with this technique:

- There are all the risks associated with the microkeratome cut;
- there is a greater risk of free or perforated flaps in comparison to the primary LASIK, given that the corneal profile has been changed and flattened (and is often less than 40 D); and
- most important, there is the risk of creating a free wedge of corneal tissue where the two flaps intersect.

I prefer to raise the flap within the first 6 months when it is clinically possible; the eye is examined under the slit lamp and the degree of scar along the cut circumference is evaluated.



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A Recut

Richard J. Duffey, MD: One of the advantages of LASIK over other forms of refractive surgery is its enhanceability, providing additional laser treatment after a stable refractive error has been obtained following the original surgery. The issue of whether to lift the original LASIK flap or cut a new flap continues to be discussed even 10 years following the inception of LASIK surgery. My experience over the past 3 years has been 100% lifting of old flaps for LASIK enhancements: however, a year and a half preceding entailed almost 100% recutting a new flap for enhancements.

Initially, I recut for three reasons: the relative ease of making a new flap; the fast, predictable nature of cutting a new flap; and the possible difficulty of blunt dissection of the original flap and risk of epithelial ingrowth associated with blunt dissection. The only significant difficulty I encountered in cutting a new flap was the occasional patient in whom a thin flap or bed remnant was created, representing the difference in depth of between the original flap and the second flap. This thin remnant often resembled a shaved cucumber, of varying shapes and sizes, which sometimes required amputation because it was not able to be replaced with precision during the surgery. In the half-dozen or so patients in whom this occurred, a clinical problem did not develop; however, I remained disenchanted by its occasional occurrence and potential for a clinically significant problem in future cases.

Therefore, 3½ years ago I began lifting the original flaps using multiple techniques, which evolved over time to the use of an Updegraff spatula that made for a much smoother dissected edge. I start the dissection preoperatively at the slit lamp with the tip of a 30-gauge needle placed bevel down (facing the inside of the eye) and parallel to the iris. At the slit lamp, this allows me to easily identify and lift the edge of the flap. Under the laser microscope, a Sinsky hook is then used at the time of surgery to “unzipper” the edge of the flap for approximately 2 clock hours. The remainder of the flap edge is dissected and lifted with the Updegraff spatula. This technique has served my patients well and I have not seen an increase in epithelial ingrowth that other physicians have reported following enhancements that are done by lifting the original flap.

The only difficulty I have encountered has been in larger flaps, particularly in previous hyperopes where the flap edge encroaches upon the limbus, especially if a micropannus is present. These flap edges tend to be much more vigorously healed, making their lifting more difficult and fraught with some bleeding. Despite that, however, I have not been unsuccessful to date in lifting even these larger flaps for enhancements.

One other advantage of lifting the original flap versus recutting is the decreased risk of new suction and microkeratome problems associated with an enhancement, plus the financial savings of no additional microkeratome blade required for lifting a flap. One modification over the past 2 years that has been helpful has been the use of air drying (blown oxygen at 2 L/min through a cannula) to dry the flap edge following flap lifting. The need for a bandage contact lens for bluntly dissected flap edges has been almost eliminated and I am not seeing an increase in foreign body sensation after lifting flaps for LASIK enhancements with this technique.



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A Lifting the flap

Peter S. Hersh, MD: I perform virtually all of my LASIK enhancements by manually lifting the flap, notwithstanding the length of time from original surgery. We recently reviewed our re-treatment experience. Of our last 2,485 cases, there were 288 re-treatments for an incidence of 11.5%. Reoperations were done up to 3 years after the original surgery. In 285 of these 288 cases, the flap could be lifted manually. The three patients in whom I was unable to lift the flap ranged from 525 to 961 days after the primary LASIK.

In my technique, I scratch through the epithelium over the flap edge for a length of approximately 1 mm using a Hersh LASIK re-treatment spatula (AE-2766, ASICO). I then flatten the spatula out and break the junction for a length of approximately 4 mm, taking

care not to introduce the spatula too far under the flap to avoid trauma and implantation of epithelial cells. I then use Hersh LASIK re-treatment forceps (AE-4366) to grasp the edge and gently peel the flap back. These forceps are double-pronged to distribute tension evenly over the flap. They also have non-toothed edges with Pearce-style tips to gently grasp the flap edge. Care is taken at all times to leave the posterior surface of the flap as well as the bed of the cornea undisturbed.

I find that a manual technique is easy to use, even years after primary surgery. It avoids the potential complications inherent in using the microkeratome and seems itself to be safe. In addition, a manual technique avoids trauma to the first flap when recutting a second flap with the microkeratome. These complications can include separation of the first flap from the second, especially at the edge, and a "double cut" circumferential scar at the flap periphery. In addition, I prefer ablating the original bed rather than another lamellar plane, as would occur with a second flap. Using our manual technique, both epithelial implantation and flap trauma from the spatula are minimized. The double prongs of the forceps also avoid undue tension when lifting the flap; there were no cases of flap striae in our re-treatment series.



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A: Always lift a normal LASIK flap

Michael C. Knorz, MD: I will always lift a normal LASIK flap. I stopped recutting in 1995 because I observed a thin and irregular lamella in two eyes, which resulted in significant visual loss in both cases and the necessity of a penetrating corneal graft in one of them. I have since taught that recutting is too unsafe to do and should not be performed as a routine procedure. I feel encouraged today by the fact that most high-volume surgeons switched from recutting to lifting because of these significant complications, as presented by Roy Scott Rubinfeld, MD, during the 2001 Refractive Surgery Subspecialty Day in New Orleans.

It is almost always possible to lift a flap, even years after the procedure. Strong scars occur only in areas where limbal vessels were cut. As these areas are usually circumferential and at the very edge of the flap only, I recommend the use of a thin blade, such as a 15° knife, to cut these adhesions in the event that they cannot be dissected with the spatula. The only indication for recutting is an abnormal flap, such as a buttonhole; an incomplete cut; or a very thin flap. In these cases we have no other choice, but we should try to cut a thicker flap than in the initial surgery.



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A: Prefer lifting the flap in most cases

Hiroko Bissen-Miyajima, MD: I prefer lifting the flap in most cases for LASIK enhancement, because of the frequency that I see complications such as flap folds or epithelial ingrowth. To achieve good results, I pay more attention to the flap management during the enhancement procedure. First, I try to minimize the irregular epithelium when I peel the flap edge. Marking is necessary to replace in the right position, which avoids unnecessary folds. When I lift the flap with flap forceps, special caution is paid to avoid folds and excessive dryness of the flap. We often see narrow palpebral fissures in Japanese eyes, and lifting the flap does not require a wide opening of the lids as in initial LASIK. Thus, this procedure gives less stress to both surgeon and patient.

However, I prefer recutting for cases such as thin flaps and larger optical zone when needed for the enhancement. We routinely measure the flap thickness and flap diameter during the LASIK procedure. If the flap thickness is expected to be less than 100 μm , the flap itself is fragile and may break during lifting. I would recut using the microkeratome, cutting deeper than the previous flap. If a large optical zone is needed for enhancement, a larger flap size may be needed. Then I recut the flap.



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A Clearly prefer relifting the flap

Prof. Dr. med. Thomas F. Neuhann: I clearly prefer relifting the flap. The main reason is that I can be sure to treat within the same interface each time. I have relifted flaps as long as 2 years after LASIK.

I would reserve recutting for exceptional cases, such as more than 18 to 24 months postop or an initially extremely thin flap.

The only complication I have ever had in the hundreds of relifts were occasional epithelial invasions around the margin, which were treated without any problem. Also, these occurred at the beginning of the learning curve and have virtually disappeared thereafter. In the very beginning I also encountered one flap perforation in a case where the initial flap thickness was nominally 140 μm , and probably in reality was considerably thinner. This caused scar formation that was ultimately treated with a lamellar allograft; the patient regained full vision.



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A Must be customized for each patient

Ioannis G. Pallikaris, MD: The issue of LASIK enhancements for regression and undercorrections after LASIK is crucial, as these are significant complications after LASIK, especially after high attempted corrections. LASIK enhancements can be performed either by recutting the cornea or lifting the existing flap. The choice of which approach is better must be customized for each patient separately.

An important parameter is the postoperative time at which the re-treatment must be done. After 1 year, the procedure of lifting the flap may cause technical problems.

Another important issue is the flap's parameters. A thin or total flap is difficult to manipulate (especially for non-expert surgeons), so recutting the cornea is a preferable approach. In cases in which epithelial ingrowth has developed under the flap, I suggest lifting the flap and carefully clearing the interface before ablation is performed. Of course, lifting the flap increases the risk of epithelial ingrowth recurrence, but the meticulous cleaning of epithelial cells from the interface and careful flap replacement decreases the incidence of epithelial ingrowth. When the flap has striae, I suggest lifting the flap in order to treat the striae and afterward correcting the residual refractive error.

Another issue that must be taken into consideration is that recutting the cornea contributes in a way to further corneal attenuation. Because regression (and enhancements) usually occur after high myopic corrections in which the cornea has already attenuated and is predisposed to corneal ectasia, lifting the old flap is preferable when possible.

In conclusion, the decision of which approach is better for LASIK enhancements is not simple and must be individualized separately for each patient, because there are several issues to be evaluated.



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A Recommends waiting to reach refractive stability

Matteo Piovella, MD: Attention must be given to the fact that often LASIK enhancements lead to results similar to or even poorer than simply avoiding another surgery. Therefore, I would recommend waiting for at least 6 months to reach refractive stability before performing enhancements.

In my experience, only a small percentage of patients really need enhancements. Six months after surgery, more than 40% of patients successfully adapt their lifestyle to a little myopic defect and do not ask for further surgery.

Furthermore, in my experience, it is possible to lift the flap 1 year or more after initial LASIK and also to recut a previously incomplete cut. Flap lifting often leads to epithelialization, and it may be more difficult to manage epithelialization than complications due to recutting.

Usually when I lift the flap I like to use a surgical microscope rather than the laser microscope.

Therefore, I like to perform recutting 6 months after initial surgery. In my experience, this approach proved to be safe independently from initial flap thickness or hinge position.



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A: Lift the flap

Emanuel S. Rosen, MD: Invariably my preference when performing LASIK enhancements is to lift the flap. I do this without difficulty even months after LASIK treatment by simply using a Sinsky hook to find the edge, traversing the interface and separating the flap from the underlying stroma, breaking the epithelial seal all around with the shaft of the Sinsky hook.

It is rare indeed that there will be a failure to find the original interface and raise the flap. I would only carry out a recut under circumstances where separation proved to be impossible.

In my experience of the last 1,000 eyes, the enhancement rate has been of the order of 3% across the board and in none of them have I found the need to recut the flap. If that situation did arise, the question that follows is, should one try and cut at the same depth, deeper, or more superficial? It is obviously highly unlikely that the blade will automatically find the interface that occurred before, and there is a danger of creating irregularities by cutting through the original stromal surface. The issue will also depend on the corneal thickness and the thickness of the original flap. I do not have a specific recommendation in this situation.



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A: Prefers lifting for enhancement rather than recutting

Olivia N. Serderavic, MD: I prefer lifting the flap for LASIK enhancements rather than recutting. In most cases, even a few years postoperatively, lifting the flap carefully can provide reliable refractive results without damage to the flap and without the risk of scarring from cutting in different planes.

For enhancements, after pressing on the flap with a moistened Merocel sponge to delineate the flap borders, I use a flap lifter with a tapered edge to facilitate sliding under and through the epithelium and opening adhesions at the flap edge. I use a tapered flap lifter rather than forceps, because it allows me to lift the flap with less risk of damage to it, even in eyes with more extensive wound healing responses. I open 180° of the flap circumferentially with an angled lifter and gently lift and fold over the flap. I then complete flap lifting with a capsulorhexis-like maneuver using a moistened Merocel sponge. When repositioning the flap, I make sure to reposition the epithelium outside the flap borders to avoid epithelial defects and reduce the risk of epithelial ingrowth. A soft contact lens is useful in some cases for better adherence.

If a larger-diameter flap is required for laser enhancement, I prefer to cut more deeply than for the initial procedure to avoid multiplanar cutting, which can increase the risk of scarring, folds and diffuse lamellar keratitis.



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A: Prefers flap lifting to flap recutting in order to avoid a double interface

Julian Stevens, MD: Whenever possible I far prefer flap lifting to flap recutting in order to avoid a double interface within the cornea. Cutting a new flap is associated with shear forces, and this may result in loss of a sliver of tissue from the original interface. Such loss of tissue in the optical region of the cornea may cause a severe reduction in best-corrected acuity and may require rigid contact lens fitting or corneal allografting in order to restore vision.

Normally it is possible to elevate a flap without excessive force within 12 months of the original LASIK and it may be possible to elevate a flap even years later. The exception to this I have found following LASIK led to a penetrating keratoplasty in the presence of keratoconus. I have noted the adhesion of the flap to the base is firm even within 3 months.

It is advantageous to advise patients that any decision to consider refinement be made within 12 months of the original LASIK procedure and minimize late requests for refractive refinement.

Reasons to cut a new flap include:

- partial original flap and aborted previous laser application;
- very thin, irregular original flap;
- small-diameter original flap so that the required ablation will extend beyond the edge of the original flap. This most often happens if a hyperopic ablation is required.

It is important to bear in mind that all further treatment involves additional risk, and both flap lifting and a recut can be associated with complications.



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Lift the flap

Maurizio Zanini, MD: Both lifting the flap and recutting can be considered safe and predictable procedures for LASIK enhancement. Nevertheless, whenever possible, I prefer to lift the flap; in most eyes this can be done up to 2 years after the primary intervention. The reason for this approach is related to the greater likelihood of complications occurring after recutting. Apart from epithelial ingrowth, the incidence of which is the same (or similar) after recutting and lifting, other complications such as free flaps and macerated flaps occur more frequently when a new flap is created. In addition, visually significant stromal irregularities have been recently described in eyes that were recut; these irregularities seem to arise when the two incisions do not merge and may be related to the presence of slivers. Lifting the flap is also recommended in all eyes that during the first procedure showed some epithelial defects immediately after the microkeratome was passed. Such defects may depend on a poor adhesion of the epithelium to the stroma and carry a higher incidence of diffuse lamellar keratitis in the early postoperative days.

Recutting remains the most suitable option in a few cases, such as when a larger flap would allow a larger optical zone. The most common example is probably represented by eyes that were overcorrected after a myopic LASIK with an 8.5-mm diameter microkeratome; in this case a 9.5-mm cut is mandatory to enlarge the optical zone as much as possible.



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