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Point/Counterpoint: Which Type of LASIK Flap Do You Prefer? (Part 1)

Thicker flaps aid in the avoidance of corneal irregular astigmatism.

by **Lee T. Nordan, MD**

Choosing the thickness of a LASIK flap is based on a desire to balance the risk of inducing corneal irregular astigmatism or corneal ectasia. The thinner the LASIK flap is, the greater will be the chance of inducing irregular astigmatism, especially as the myopic refractive error to be corrected increases. The thicker the flap is, the less chance there will be to induce irregular astigmatism; however, there is a greater chance for undercorrection and corneal ectasia, because there is less residual recipient bed remaining to withstand the relentless force of intraocular pressure.

In all cases of myopic LASIK, the surface area of the bed is smaller than the surface area of the flap. Therefore, the flap needs to “wrinkle” at least slightly in order for it to fit its central dome onto the bed. Faceting of the epithelium can smooth out approximately 5 to 8 μm of irregularity and provide an excellent refractive surface. Without the faceting phenomenon of the epithelium, LASIK and PRK would not provide a functional result. The greater the level of myopia, the greater the chance of wrinkling of Bowman’s layer, as a result of the flap/bed mismatch. Hyperopic LASIK tends not to create irregular astigmatism because the flap surface area is less than that of the bed. This disparity causes the flap to stretch over the bed and remain smooth, but at the cost of increasing regular astigmatism as a result of the crowding of the corneal tissue in the midperiphery.

In my experience, LASIK flaps of 140 μm or thicker will not yield irregular astigmatism with a refractive error up to -12 D, assuming an excellent keratectomy is performed with well-centered ablation. Therefore, I routinely use a flap of 160 μm , and if IOP variation and flap diameter yield a slightly thinner flap, an excellent result will still be very likely.

I routinely use a 180- μm flap thickness for refractive error under 3 D and the results are excellent, with very quick recovery and stability. Flap striae are never seen.

Bowman’s membrane scars when it is incised. The posterior aspect of Bowman’s membrane is 80 μm from the superficial epithelial surface. Therefore, attempting to obtain 80- to 100- μm flaps is dangerous from a standpoint of both scarring and irregular astigmatism. A 120- μm flap might be acceptable for low myopia, but a prudent surgeon should leave a little cushion for flap variability based on IOP and flap diameter. However, LASIK for low myopes doesn’t require a thin flap, so why take any risk in this situation?

Therefore, the thinnest flap thickness goal, even in high myopia, should be 140 μm , and if 130 or even 120 μm is obtained, then the chance of an excellent result is still very high in mild and moderate myopia. If a LASIK surgeon can see striae in a well-placed LASIK flap, then the flap is too thin. Striae are folds in Bowman’s membrane that create irregular astigmatism.

Optical zones greater than 6 mm and pure flying-spot lasers require that more tissue per diopter (20 μm versus 12 μm per diopter) be removed than in the past. A residual bed limit of 250 μm is reasonable, but not absolute. It may be better to leave a residual bed of 230 μm , than to create a flap of 100 μm and have to fix corneal irregular astigmatism, which is very difficult. In the past, when I performed myopic keratomileusis (MKM), I routinely created a 330- to 380- μm flap, which left a residual bed of about 140 to 190 μm . It is a very interesting clinical situation that after 20 years of observing about 2,000 MKM eyes, that I am aware of only two patients who have experienced ectasia; the ectasia was bilateral and both patients were -15 D before surgery, and 260 μm of corneal stroma had been removed in order to correct the high refractive error.

In summary, there is no reason for the LASIK surgeon to play so close to the line that there is no margin for variation in flap thickness. If a surgeon does so, then it is likely that an unnecessarily high number of patients will experience corneal irregular astigmatism. If a smaller optical zone must be used, so be it. The surgeon may also elect to purposely undercorrect the surgery, such as a -12 D patient ending up with a final refraction of -1.5 D. The other possibility is to not perform the surgery and wait for an intraocular solution.

Avoiding corneal irregular astigmatism by means of a reasonably thick LASIK flap is the best policy. A 0.50-mm thick cornea simply cannot be reshaped to provide adequate postoperative strength, no irregular astigmatism, full correction, and no loss of contrast sensitivity in all cases. Compromises in LASIK are often necessary, but there should never be a compromise in proper flap thickness, because corneal irregular astigmatism completely defeats the purpose of the LASIK surgery itself, which is excellent visual function.

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