Making the case for thin flaps

by Maxine Lipner Contributing Editor

Three surgeons outline what is known

While everyone gets an occasional thin flap, some doctors think laser in-situ keratomileusis may be a bit flabby and have gone on a steady diet of thinner flaps, believing them to be preferable to their 160-µm counterparts. However, others believe fuller-figured flaps should remain the status quo and think thin flaps are straining LASIK's safety profile.

Modeling the thin approach

Thin flaps can help practitioners avoid problems with ectasia, said Robert T. Lin, MD, in private practice in City of Industry, Calif. He said that several interesting studies have shown that microkeratomes, which are supposed to cut a specific corneal thickness, actually produce flaps of varying thicknesses.

Many microkeratomes cut 200- or 220-µm flaps, unbeknownst to the surgeon who anticipates a 160-µm flap, according to Lin.

Most microkeratomes report a standard deviation of about 30 µm. With a 160-µm mean, 95% of the flaps will be between 100 and 220 µm thick, which is a wide range. Surgeons should understand this concept when they are attempting to leave 250 to 300 µm in the bed to avoid problems with ectasia, he said. He leaves more than 300 µm in almost every case, going down to the 280-µm mark in less than 1% of cases.

Practitioners should perform intraoperative pachymetry on every patient, Lin said. Even when practitioners measure diligently, there is a margin for error. "If your pachymetry probe is not right in the center, the measurement may be a thicker measurement than what you are actually getting," he said. "Also, sometimes the laser will ablate deeper than what you anticipate because of stromal dehydration." Practitioners also need to measure immediately after the cut and make sure there is no bed of fluid.

Otherwise the stromal bed will swell and they will overestimate the stromal thickness and underestimate flap thickness, Lin said.

Consequently, Lin said, practitioners should try to save residual stroma and try to cut thinner flaps. He advises against going too thin, however, down to 70 µm, where the margin for error is very small. He aims for flaps of 90 to 110 µm, using the Nidek MK 2000 microkeratome, which he finds to be reliable, with a standard deviation of just 14 µm.

Perry S. Binder, MD, associate clinical professor, Department of Ophthalmology, University of California, San Diego, also prefers a thinner flap in most cases.

He considers the thin-flap profile as less than 130 µm and more than 95 to 100 µm. He said thin flaps have several advantages over their thicker counterparts. “The number 1

reason is to leave the most tissue available for the laser to remove and thereby leave the patient with the thickest possible residual cornea. The second reason is to treat patients that you couldn’t fully correct with a standard flap — this allows you to treat larger-diameter pupils and higher refractive errors.” Thin flaps can also be helpful for patients who have relatively thin corneas, with low or moderate errors. Such patients would otherwise have to undergo photorefractive keratectomy, Binder said.

There can, however, be additional problems with thin flaps. “Thin flaps can push the limits so that there’s an increased risk of getting a buttonhole,” Binder said. This is particularly true with instruments such as the Automated Corneal Shaper (ACS) microkeratome, which simultaneously applanates and cuts the tissue. However, this is not true for all microkeratomes. For example, Binder has not had a buttonhole problem with the SKBM. He typically uses the two SKBM thin-head microkeratomes — the RH head for hyperopic eyes, which creates thin flaps with a mean of 122 µm and large diameters, and the 1F head, with a mean of 111 µm. “In general, there is a risk of buttonholes when you attempt to create a thin flap. You just have to know what your microkeratome does to know if it’s going to fit into the particular parameter that you want to achieve.”

> *“I think they’re a necessity to assure the most residual tissue possible for any given correction.”*
>
> *— Perry S. Binder, MD*

Thin flaps can also require special handling. “Thin flaps can easily tear, so you have to be careful,” Binder said. “When you lay them back down, you can’t manipulate them like you would thicker flaps.” Binder uses a very gentle technique, involving smooth irrigation underneath the flap and, if the flap is less than 100 µm thick, allowing it to oxygen-dry. He avoids touching it with a moist sponge. “With thin flaps, you have to be careful in realigning them — do the least amount of manipulation possible.”

Lin also handles thin flaps with care. He recommends every dry technique. “If a flap gets hydrated, it doesn’t stay in place and when it dries, you get wrinkles in the flap,” he said.

Results of a study of LASIK complications that Lin and Robert K. Maloney, MD, conducted several years ago indicated a lot of irrigation during the surgery increased the chances of striae or a displaced flap by seven times. Lin uses a Chayet sponge to keep debris from collecting under the flap, so he doesn't need to irrigate excessively. He uses a double cannula to move across the flap without a lot of irrigation. Then he uses a Johnson applanator to smooth out wrinkles and push out excessive fluid. When he finishes surgery, he uses a Weck cell sponge to gently stretch the flap along the periphery and dry the center of it slightly. This way, he can make sure there's no fluid there and check the center for striae.

Slimming results

Lin has had good results with thin flaps. In a retrospective study of 1,131 eyes of 621 patients that Lin presented at the 2001 Symposium of the International Society of Refractive Surgery, he found that ultrathin flaps, in the range of 75 to 100 µm, were safe and effective. All patients in the study underwent keratectomy with a Nidek MK 2000 microkeratome with a 130-µm head.

> *"Thin flaps are good if you know what your microkeratome's capabilities are in terms of mean, standard deviation, and range."*
>
> — Perry S. Binder, MD

Of these, 40% (455 eyes) achieved 20/20 uncorrected acuity or better, 70% (798 eyes) achieved 20/25 acuity or better, and 95% (1,077 eyes) achieved 20/40 acuity or better. There were four epithelial defects, seven cases of striae, one case of diffuse lamellar keratitis, one of epithelial ingrowth, and no irregular flaps or buttonholes.

Binder has also found thin flaps reliable. Using his own Outcomes Analysis Software, he called up data on 2,387 eyes with a flap thickness of less than 125 µm, cut with a variety of microkeratomes.

The average cap thickness was 104 µm, with a standard deviation of within 15 µm. In this group, 50.6% achieved 20/20 uncorrected acuity or better, 68.8% were 20/25 or better, and 91.5% were 20/40 or better.

> *"The thinner the flap, the more tissue you preserve, but the more likely you are to have wrinkles and irregular astigmatism."*
>
> — Stephen G. Slade, MD

Thin flaps work well, provided the practitioner knows his microkeratome, Binder said. "I think that if performed properly, with proper instrumentation, your visual acuity results are going to be no different than with flaps that are over 140 µm."

Weighing in for fuller flaps

Stephen G. Slade, MD, FACS, in private practice in Houston, said thin flaps are a tradeoff. The thinner the flap is, the more difficult it is to handle, unless you decrease the diameter.

Also, thinner flaps are less forgiving of irregularities in the bed, he said. “If you have a rough surface and you cover it up with a big, thick blanket, you’re going to cover up more than if you cover it up with a piece of Saran Wrap.”

> *“I would caution people not to justify large LASIK corrections and large LASIK ablations of posterior stroma because they’re able to create a thinner flap.”*
>
> — Louis E. Probst, MD

Slade said that one must properly pick thin flap cases. “I use thin flaps all the time if I have a patient who has a higher amount of myopia or a thinner cornea to begin with, or if I’m trying to get a larger ablation zone, but my standard is to use a 160-µm flap,” Slade said. He will, however, sometimes go down to 110 µm, using the Hansatome or the ACS, both of which, he said, can successfully make thinner flaps. Slade also has the IntraLase femtosecond laser, which allows him to make whatever size flap he wants. In general, however, he opts for thicker flaps. “I think the risks outweigh the benefits to use them routinely,” he said.

Louis E. Probst, MD, medical director, TLC Vision, thinks that the thin-flap concept has a tremendous potential for abuse. He is concerned about the wide range of depths a given microkeratome will cut. With a 130-µm plate, cuts will be, on average, in 90-to-100-µm range, but some can be 70 to 75 µm. The average epithelium is in the 50-µm range, but it can be as thick as 70 µm. In such cases, the cut could penetrate Bowman’s membrane, creating an unstable flap with a greater chance of corneal haze and poor healing, Probst said.

He is also concerned about the risk of buttonholes. Microkeratomes today cut meniscus flaps, that are thicker on the edges than in the middle. “Since you’re getting that variation of flap thickness, if it turns out to be thinner, there a greater chance of it being a buttonhole, because microkeratome flaps are known to be meniscus flaps,” Probst said.

While this is not a problem with the IntraLase, which cuts planar flaps, Probst worries that practitioners will use thinner flaps as justification for performing larger LASIK corrections. With people using 250-µm zones as their upper limit of correction, there will likely be more problems of corneal ectasia, he said. Currently, the average flap is in the 120-µm range, leaving more than 250 µm in the bed.

He recommends avoiding flaps thinner than the 100 to 120 µm range. “I think we should avoid extending the limits of LASIK in terms of doing very large corrections by making thinner flaps, because I think we’re going to decrease the safety profile of LASIK,” Probst said.

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