

The Zyoptix XP: An Advance in Mechanical Microkeratome Technology

Robert K. Maloney, MD

Despite challenges from surface ablation and laser flap-making devices, advances in mechanical microkeratome technology ensure these devices continue to offer advantages to both patients and surgeons.

As a long-time (and satisfied) Hansatome user, I was hesitant when offered the opportunity to try its successor, the Zyoptix XP (Bausch & Lomb). I had been using the Hansatome since 1998 and was comfortable with it. Indeed, a number of new microkeratomes have come on the market since 1998, but I have never been tempted to try them. After all, the Hansatome is a highly refined piece of technology, and it is very difficult to significantly improve an already excellent device. Switching to an equally good microkeratome would be a waste of time, effort, and money—and there was a real chance that a new keratome would not measure up to the Hansatome.



The Zyoptix XP microkeratome. (Photo courtesy Bausch & Lomb)

The Hansatome simply set the bar too high.

I am now gaining experience with the Zyoptix XP and find that it more than equals the Hansatome in safety and is clearly superior in terms of ease of use and convenience.

Advances

The Hansatome produces an extremely smooth stromal bed, but occasionally I would see a faint ridge, suggesting that there might have been a shift in the position of the eye during the microkeratome pass. I do not find this with the Zyoptix XP. In addition, with the Hansatome an eye would sometimes shift very slightly when suction was engaged. That happens much less frequently with the Zyoptix XP, and so it offers more precise centration.

One nice enhancement with the Zyoptix XP is that the new heads cut the labeled thickness. That is, with the Hansatome, the 160-micron head typically cut an approximately 120-micron flap. With the Zyoptix XP, the 120-micron head cuts a flap that is, on average, almost exactly 120-microns, with a very low standard deviation (Table I). One of the touted advantages of a laser keratome is the ability to cut thin flaps, but the XP with the 120-micron head gives a flap that is about as thin as one can safely cut and be comfortable that Bowman's layer will not be touched.

Because the Hansatome had such low rate of flap complications, it will take some time to compare it with the Zyoptix XP; however, the smoothness of the bed made by the new microkeratome is a strong indication that buttonholes will be seen even less frequently than they were with the Hansatome. (Bed smoothness correlates with absence of buttonholes because, I believe, bed irregularity is a sign that the keratome was not cutting in a constant plane; and any change of plane carries the risk of cutting all the way to the surface. Thus, the fewer changes of plane, the less chance of a buttonhole.)

With the Hansatome, I had a flap complication rate of approximately 1 per 1,700 eyes, so it was clearly a safe device. The studies performed so far suggest that the accuracy of the Zyoptix XP (in terms of flap thickness and predictability) is better than the Hansatome. On the Zyoptix XP, the standard deviation of blade extension has been reduced from 22 microns to 8 microns. One result is that with the XP flap thickness reproducibility is in the range of 15-17 microns, on a par with the femtosecond laser—without either the difficulties or the potential complications of that device.

Safety

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ADVANCES IN THE ZYOPTIX XP

- ✓ Better flap-thickness reproducibility
- ✓ Smoother stromal beds
- ✓ Absence of external gears
- ✓ Left/right selector
- ✓ Fully sterilizable
- ✓ Ability to vary hinge position
- ✓ 100% interchangeable parts
- ✓ Heads cut at the labeled thickness

Except for the motor, the entire Zyoptix XP can be sterilized in the autoclave, which reduces anxieties about infection. This is also time-saving and convenient. The gears are now completely covered, so they won't engage the eyelashes or eyelids. This ensures against the occasional time when the keratome jams or bruises a patient's eyelid.

Convenience Enhancements

A nice touch with the Zyoptix XP is that the surgeon can now switch from the right to left eye just by flipping a switch, instead of disassembling and reassembling the instrument. This is also a safety advantage, because it eliminates the small risk that the reassembly won't be done properly. In addition, the suction ring has been elevated, allowing surgeons who want to do so to vary hinge position.

Unlike the Hansatome, all of the parts of one Zyoptix XP are fully interchangeable with the parts of every other Zyoptix XP. When a new part is needed, it's no longer necessary to ship the whole unit back to the manufacturer.

Surface Ablation

In the current climate, the refractive surgeon looking to upgrade his or her flap-making technology may want to consider several factors. One of these is the growing popularity of surface ablation.

Although I did a considerable amount of surface ablation in the mid-1990s, I now do very little of it in my own practice. I prefer LASIK to surface ablation. I would add that, to me, epi-LASIK and LASEK are simply variants of PRK, and I tend to think of them all under the single heading of surface ablation. The only real difference among them is in how the epithelium is removed, and my personal belief is that the way you remove the epithelium is of little consequence. Essentially, no matter how it's done, the results are the same, the recovery time is the same, and the pain is the same.

That said, I have some concerns about epi-LASIK, as there is histologic evidence showing that some epikeratomes remove part of Bowman's layer. That is concerning because it means that the device may be cutting an irregular flap, and, therefore, surgeons may be lasering an irregular surface. This may impair the results or increase the risk of significant haze. I believe that epi-LASIK can be an acceptable procedure, as long the cut does not remove or damage Bowman's layer. At the same time, I don't think epi-LASIK offers any advantages over PRK, and epi-LASIK, like PRK, has some disadvantages for the patient.

Except for occasional patients (eg, with thin corneas) I do not see surface ablation replacing LASIK in its appropriate range at any foreseeable time.

Advantages of the Mechanical Microkeratome

Given the degree of interest focused on laser flap-making, it's fair to ask whether mechanical keratomes will be replaced by femtosecond laser devices. I think not.

Mechanical microkeratomes have several significant advantages over laser flap-making. With a mechanical microkeratome, LASIK is a one-laser procedure; there's no moving of patient or furniture to get from one laser to the next. The mechanical microkeratome is also faster, so there is less drying of the eye, which can affect the accuracy of the laser procedure. And with a mechanical microkeratome suction is engaged for 10-15 seconds rather than the minute or more required by the laser; less time under suction further reduces the very small risk of a severe vascular event of the retina or optic nerve. In addition, with a mechanical microkeratome, such as the Zyoptix XP, there is no need to do a manual dissection of the flap, which carries a risk of flap tears.

Much has been made of the planar flaps cut by the femtosecond laser, but I am not convinced of their superiority to the meniscus flaps cut by mechanical keratomes. For example, if a surgeon accidentally cuts a buttonhole and replaces the flap very carefully (with no la-

ADVANTAGES OF MECHANICAL MICROKERATOMES	
✓	One laser procedure not two
✓	Faster procedure (less stromal drying)
✓	Less suction time
✓	Flap dissection isn't necessary

TABLE I Zyoptix XP Precision

Surgeon	N	Std deviation of flap thickness (microns)
1	62	16.97
2	176	16.59
3	130	16.16
4	84	17.98
5	74	15.85
6	43	19.94

ser procedure), the patient returns to his or her original refraction. What this says to me is that even extremely non-planar flaps still align so as to not affect refractive error. I see no inherent reason why lasering under a flap that isn't perfectly planar would affect outcome, as long as the flap is repositioned properly.

Upgrading Technology

When comparing mechanical microkeratomes to laser keratomes, I see two issues: What will give the best results? And what is the importance of these machines for practice marketing? My personal belief is the first issue is important and the second is irrelevant.

With regard to the first issue, I see little difference between the technologies. Both give excellent patient results, with mechanical microkeratome having some advantages

in terms of speed, ergonomics, and convenience.

Based on my experience, I would suggest that as surgeons we should ignore the second issue, practice marketing. I work in a market, Los Angeles, where a number of competing surgeons use a femtosecond laser, and I am truly surprised how infrequently patients ask me about it. What that says to me is that while surgeons may have a high level of awareness of this technology, very few patients

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do. So, I don't personally believe it has marketing value for most practices.

Technology and Marketing

This is more than just my impression. We recently did a survey of new patients who called into our practice—these were all people who had had no prior contact with us. For a period of 1 week we noted for every new person whether or not they asked about the femtosecond laser. Out of 104 potential patients who called that week, only three asked us about it. We told them, “No, we don't use it.” Nonetheless, two of those three scheduled a consultation. What this says to me is that, at least among patients calling my practice, very few have heard about the femtosecond laser, and even fewer care about it.

Nor do patients often ask about other technologies. We are asked about our laser technology about as infrequently as we are about our microkeratome technology. In fact, this makes perfect sense: why should patients ask? Even though I am a physician, if I go to a radiologist for a CAT scan, do I ask who manufactured the CAT scanning device? No. I pick the best radiologist I can find, and I trust that person to make the technology decisions. I think the same thing happens with refractive surgery patients. They choose a surgeon, and leave the technology choices to the surgeon.

THE BOTTOM LINE

The Zyoptix XP microkeratome is a significant upgrade from its predecessor, the Hansatome. Advances include smoother beds, absence of external gears, the ability to vary flap position, left/right selector switch, fully interchangeable parts, a motor sleeve that can be sterilized, and tighter blade tolerances that give new microkeratome flap-thickness reproducibility on a par with laser flap-making devices. In terms of what it offers patients and surgeons, I believe that at the present moment a mechanical microkeratome offers a better option than laser as a flap-making technology.

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