Michael Knorz

Newsmaker Interview… Michael Knorz

The changing face of laser refractive surgery

The innovative practice of using a femtosecond laser to create LASIK flaps has profoundly changed laser refractive surgery. While the idea was slow to catch on in Europe, many surgeons are now converting to all-laser LASIK. Michael Knorz MD was one of the first to make the transition to all-laser LASIK in Europe. *EuroTimes* editor Sean Henahan discussed the advantages of the approach with Dr Knorz.

ET: *What role does all-laser LASIK now play in your practice?*

Dr Knorz: I now use all-laser LASIK in 90 to 95 per cent of my patients. It has completely replaced conventional LASIK in my practice. The only other procedure I'm using is surface ablation in those corneas that are a little funny looking or which are definitely too thin for LASIK.

ET: What convinced you to make the transition to the femtosecond laser?

Dr Knorz: We refractive surgeons are very curious about the latest high-tech developments. As soon as this technology became available I jumped on the bandwagon. I started with an IntraLase 15 kHz laser. At first I was still using microkeratomes and the IntraLase because the results were not really better with the IntraLase. Then I continued with the 30 kHz and the 60 kHz versions, and I did see better results. So, curiosity made me try it and then the results convinced me that this was a superior technology. When I say results I mean the patients see better and faster, and there are definitely fewer complications. I've never seen any flap-related problems with the femtosecond laser, whereas I have seen, though rarely, microkeratome complications such as incomplete flaps and buttonholes.

ET: *What advantages do you see from using the femtosecond laser to create LASIK flaps?*

Dr Knorz: There are several technical advantages. First of all, with an IntraLase laser we get a planar flap, which is different than conventional microkeratomes. This has been shown by Prof John Marshall and others to cause less significant weakening of the cornea, so we maintain a more stable cornea. We have also learned that edge design does play a role. If you look at microkeratomes or some femtosecond lasers, they have a very narrow angle, which means the edge is very thin and facing outwards. However, the IntraLase laser in standard pattern produces an almost vertical edge, at 70 to 90 degrees, I was able to show in a rabbit study that the IntraLase flap is about 2.5 times stronger than a microkeratome flap. I assume this is related to the edge design, although this is hard to prove. We then went further and created inverted edges, of 150 degrees, which means there is actually an overlap of the peripheral cornea over the flap edge. This created an even stronger flap in the rabbit model, about 3.5 times stronger than a microkeratome flap. I postulate based on current knowledge that flap adhesion is determined by the edge design.

This brings up another advantage of the femtosecond laser. Only a femtosecond laser can have an individually designed edge. This is not possible with the microkeratome.

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When we talk about thin flaps, with a microkeratome we always have to have this thicker part at the midperiphery, and have, because of the higher standard deviation, the risk that thin might be too thin and we could end up with a buttonhole in the centre. Because of the much lower flap thickness variation with an IntraLase laser, we can safely go to thin flaps. This weakens the cornea much less.

ET: *It seems as if the femtosecond laser may be changing the very definition of LASIK.*

Dr Knorz: I do feel that what we call LASIK today has little to do with the historical LASIK. Historically, we were dealing with rather thick, meniscus-shaped flaps. We were doing standard ablations using small ablation zones, and seeing a lot of spherical aberration. Today some are calling what we now do SBK. I don't like this term too much because sub-Bowman's is everything, even a thick flap is sub-Bowmans, I prefer the term thin-flap LASIK, or all-laser LASIK,

In addition to thin flaps, modern lasers provide modern ablation profiles. VISX for example, is 100 per cent customised. The WaveLight system compensates for spherical aberration. We now have much better ablation algorithms, which cause much fewer aberrations, and therefore better vision; it is a new kind of LASIK.

ET: *What platform are you using in your clinic? What does the patient experience?*

Dr Knorz: When the patient comes to us we first perform the wavefront measurement using the WaveScan aberrometer. This gives us an individual measurement of the eye without the need for pupil dilation. It provides the refraction and the higher order aberrations. It takes several measurements, which we review and take the best. This will be used to create the ablation profile, which we will programme into the laser.

The next step is to perform the IntraLase laser flap. We put the suction ring on the eye, and create a very thin, 100 micron flap. We then lift the flap and place the patient under the VISX excimer laser. The VISX technology uses iris registration. This means we take a picture of the eye at the time we do the wavefront measurement. The iris photo allows us to find the centre of the pupil, the visual axis, and the axis of astigmatism. This information is then programmed into the laser. With the patient under the laser we take another photo, and the computer matches the information from both pictures. With iris registration, we can achieve perfect alignment as they are treated as the same from the measurement to the treatment. It doesn't matter if you centre on the pupil, or the visual axis, it will be the same for the measurement and the treatment. Under the laser, the iris registration also compensates for the rotation of the eye, and compensates for the shift of the pupil centre. After the ablation we replace the flap, wait a few seconds and the patient goes home and is seen the next day.

ET: *Some surgeons advocate lifting the flap with forceps, what method do you prefer?*

Dr Knorz: I do believe in lifting the flap with a forceps. When you use a spatula to go under the hinge and pull downward, you are stretching the flap in two directions. First you hold it at the hinge, and then the spatula stretches it downwards. I prefer to free the edge at 6 o'clock (I use a superior hinge), and then lift the flap using a specially designed flap-lifting forceps (Geuder Co., Germany). I lift the flap from 6 to 12 o'clock. This gives me a smoother lift and fewer problems, such as small tears in Bowman's, and microfolds.

ET: *Does all-laser LASIK take much longer than when a keratome is used to make the flap?*

Dr Knorz: The basic issue is what will benefit the patient the most, even if it takes 20 minutes for one eye instead of 10. If we had two equivalent procedures and one took less time we would do the quicker one, but that is not the issue. When I do an IntraLase today it takes about seven to nine minutes, with a keratome it could take maybe one or up to two minutes less. This is not a big difference, and I believe the IntraLase approach benefits of the procedure and the safety for the patient support using the femtosecond laser.

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ET: *Do patients now come in and ask for all-laser LASIK? Is marketing driving business?*

Dr Knorz: This definitely does drive my practice. All-laser LASIK is perceived as safer, which it actually is. This is true across Germany. The high-volume LASIK practices in Germany that do about 80 per cent of all procedures in the country, now all use femtosecond technology. It took about a year and a half for them to all acquire the femtosecond lasers.

ET: *What about side effects and complications, such as opaque bubble layer (OBL)?*

Dr Knorz: OBL is a side effect that is related to the energy per pulse. The lower the energy you use, the fewer bubbles you have. With the 15 kHz laser I saw it in about 50 per cent of the patients. Now with the 60 kHz laser, you might see it in about five to10 per cent of the patients. It is typically localised at the hinge, so it is no big deal. It doesn't affect the results. Sometimes it interferes a little bit with iris registration, so if we see OBLs we just wait a little longer until we lift the flap.

The femtosecond laser has been accused of causing more DLK. This is true

if you look at the older designs, or in a more general sense if you look at high energy. The more energy you put into the cornea, the more trauma or inflammation you create, hence you see DLK. With the modern high-frequency laser you do not see more DLK than you would with a microkeratome. I haven't seen a case in more than a year, so it is rare.

Another problem can be suction loss. This is a clear advantage for the IntraLase laser. If you lose suction, nothing happens, you put the suction ring on again, start the procedure, and the laser will automatically find the same layer it cut. Then you just continue and lift the flap. This is not possible with the microkeratome.

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ET: *What do you think of the potential applications of the femtosecond laser for corneal surgery?*

Dr Knorz: The use of femtosecond laser to do corneal surgery such as corneal grafts is actually the most exciting part of this technology. This is really the first important innovation in corneal transplantation surgery since the invention of sutures. This is really a big step forward. I expect to see far more stable wounds, and far less astigmatism. There is clearly an advantage to patients, who are seeing much better, much earlier, with much less residual astigmatism. The procedure is much nicer, so much more logical to do. I think eventually mechanical transplants will become obsolete.

For an extended audio version of this interview, visit EuroTimes online at www.escrs.org/publications/eurotimes/podcast.asp.

knorz@eyes.de

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What is the most important development in corneal surgery since sutures?

Dr Michael Knorz reveals the answer in an Eye Contact podcast on www.escrs.org