MEDICONCEPT

HydroLASIK

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INTRODUCTION

In his final of his four lectures, Dr. Kershner discussed the HydroLASIK procedure he developed and some of the technology that contributes to it's success.

ADVANCES IN LASIK

Surgeons who want to expand there surgical services to patients cannot ignore refractive surgery. Cataract surgeons can and do transition to LASIK, since cataract surgery is the most common refractive procedure performed in the world today. Dr. Kershner discussed some of the advanced technology now available for treating refractive error, including the Amadeus II microkeratome, as well as various new methods and procedures.

Amadeus II

Earlier microkeratomes were not designed for performing LASIK; the majority were intended for keratomileusis. As a result, those instruments had a lot of pinching, grabbing, and jamming due to improper design and inappropriate application. The Amadeus II is the latest generation microkeratome manufactured by AMO **(Fig. 1)**. It — like the first generation Amadeus — was designed specifically for creating a LASIK flap, and has some important built-in features, such as safety checks, that ensure it works without problems. It is safe, simple to use, and is quite precise and predictable. Dr. Kershner finds that the combination of this newer microkeratome together with the VISX Star S-4 laser platform provides excellent, consistent flaps. He reassured colleagues hesitant to get into this field because of microkeratome concerns, that the learning curve for creating a flap is short. The design of the instrument itself is easy to use, the assembly is basically foolproof, and there is a box designed to do everything for the surgeon before the cut is made, by providing both visual and auditory feedback. In underscoring the simplicity of the procedure, Dr. Kershner stated that successful cataract surgery is 90% surgery and 10% pre- and postoperative follow-up, while LASIK is 10% surgery and 90% pre- and postoperative follow-up. The Amadeus II uses a disposable blade, as well as an integrated blade loading system that makes it simple to achieve the desired flap thickness when using heads of different sizes. A nice feature is that it only assembles one way, so that the blade cannot accidentally be assembled "backwards", as with other microkeratomes; the device simply will not work if there are assembly errors. It fits comfortably in the hand, visibility of the flap bed is excellent, and there is even a battery back-up to safeguard against power outages and the resulting loss of vacuum that could occur if the power was interrupted unexpectedly.

Increased Control

The surgeon may select either fully automatic or manual set-up for controlling flap size and hinge location. The Amadeus II has one-pedal operation, two motors, to translate the excursion and make the cut. Other microkeratomes use one motor to move the keratome across the eye and oscillate the blades; if resistance was met, the motor would slow down and, consequently, create an uneven flap. There are no exposed gears, wheels or tracks where a simple eyelash can cause the device to jam. Cutting takes place only in the forward direction, so damaging the flap in the reverse direction is no longer a problem. Since there is no on-eye assembly, the fear of dropping something or incorrectly assembling the unit is eliminated.

FLAP FORMATION

There remains some controversy about flaps, and some suggest that PRK should simply be performed instead, removing the epithelium and allowing the laser to breach Bowman's membrane. Dr. Kershner feels strongly that the membrane is an important structure that should never be removed, it prevents scarring and is also the anchor to which the epithelium attaches. He prefers performing a flap where Bowman's is left intact, and then removing the tissue from within the stroma. To test the benefits of the new Amadeus II, Dr. Kershner performed a study that looked at flap quality and consistency.

Flap Characteristics

Thick or thin? Wet or dry? Dr. Kershner suggests that the best flap is one that has enough structure to hold it's shape (thick) and is best handled wet. He feels strongly that the thicker flaps reduce the risk of wrinkling and displacement that occurs with thinner flaps. Flap predictability with the Amadeus II is excellent, when the head says 180 microns, it is pretty close to 180 microns. Dr. Kershner found that the Amadeus II tends to undercut a little, but that overall the flap consistency and thickness was excellent with this device.

Dr. Kershner believes flaps should be kept wet when created and replaced. A wet flap is easier to reposition, and ensures a cleaner interface and faster adherence, so it really makes little sense to put a flap down dry. Flap irrigation helps eliminate contaminants and interface opacities. Based upon his studies, Dr. Kershner found that a wet flap results in better outcomes. The excimer laser application damages tissue and creates heat. Irrigation with chilled balanced salt solution (BSS) cools the ablated area and helps to prevent subsequent inflammation.

SAFELY FLIPPING THE FLAP

The LASIK steps are simple: program the laser, ensuring that the correction measured for the patient is entered correctly into the computer, apply the microkeratome, create and lift the flap. Dr. Kershner avoids grasping the flap with a toothed forceps (which could pinch,

nick or result in a tear) almost certainly damaging tissue. Surgeons should gently move the flap out of the way without squeezing or pinching it. Since an appropriate instrument did not exist, Dr. Kershner had Rhein Medical Inc. of Tampa, Florida USA (www.RheinMed.com) make a LASIK flap forceps with highly polished tips and spatula-type blades that slide easily under the flap, flip it over and back again without ever touching or squeezing it **(Fig. 3)**.

IRRIGATE, IRRIGATE, IRRIGATE, THEN HANDS OFF!

Once the "hard" part is done in creating the flap and the laser has been applied, the flap has to be replaced precisely where it had been and it must adhere. The corneal endothelium pumps water through the cornea and into the anterior chamber by creating over 600 mm of vacuum pressure, this is why replacing the flap wet ensures adherence. Dr. Kershner hangs a chilled bag of BSS and using just the tubing, he "guns" the surface of the cornea and flap with the BSS to irrigate any potential contaminants away. By applying water to the base of the flap, the pump has something to suck against and will immediately adhere. As long as the flap is repositioned properly you can't go wrong.

Minimal flap manipulation is the secret to creating a better interface and a better result. Irrigation facilitates adhesion by priming the endothelial pump. Irrigation dilutes contaminants like soaps, cellular debris, and fibers that could potentially cause diffuse lamellar keratitis (DLK). Cold irrigation cools the ablated tissue to prevent inflammation. Epithelial in-growth, DLK, and flap striae have all been eliminated by this technique.

WHAT ABOUT LASER FLAP FORMATION?

Many people say that the microkeratome should be done away with in favor of the femtosecond laser. Creating the flap with the IntraLase laser is enticing. Unfortunately, a second laser machine takes extra time and is both expensive and requires extra room. Comparing visual outcomes with IntraLase versus Amadeus at three months, favored the Amadeus mechanical keratome. Dr. Kershner summarized his thoughts on the importance of flap creation by saying, "I don't care what laser you use, or whether you believe in wavefront or not, if your flap isn't perfect, the procedure fails. Remember, wetter is better!"

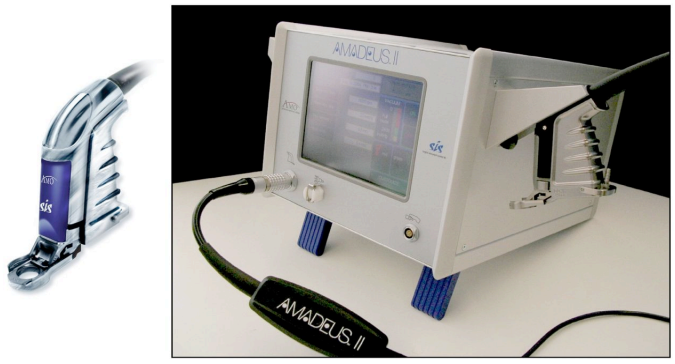

Fig. 1 Amadeus II microkeratome

Fig. 3 LASIK flap forceps specially made by Rhein Medical, Inc.

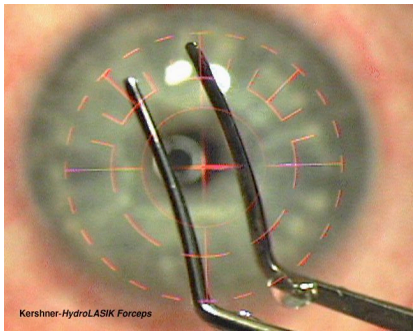

Fig. 4. Lasik Flap forceps used to carefully flip the flap.