

Today's news from the 2008 ESCRS meeting brought to you by EyeWorld magazine.

Tuesday's main symposium focused on the femtosecond laser and therapeutic corneal surgery. Experts from all over Europe discussed current uses of the femtosecond laser as well as many novel applications. Attendees also had the opportunity to learn about topics such as phaco fluidics & power modulation, aspheric IOLs, and refractive surgery during paper sessions throughout the day.

Femtosecond laser and therapeutic corneal surgery

Helene Proust, M.D., began today's main symposium by reviewing the mechanism of femtosecond lasers and the four major femtosecond lasers currently available: IntraLase (Advanced Medical Optics, AMO, Santa Ana, Calif.); Femtec (Perfect Vision, Heidelberg, Germany); Visumax (Carl Zeiss, Dublin, Calif./Jena, Germany); and the femtoLDV (Ziemer, Port, Switzerland). She noted that all femtosecond lasers can be used for LASIK but only two, the IntraLase and the Femtec, can create a variety of cuts, enabling multiple functionalities with these lasers. In addition to LASIK, these lasers can be used for corneal surgery, more specifically, penetrating keratoplasty (PKP), anterior lamellar keratoplasty (ALK), and endothelial keratoplasty (both Descemet's stripping—DSEK, and deep lamellar endothelial keratoplasty—DLEK). Dr. Proust reviewed study data indicating the efficacy of the decagonal cut, which maximizes contact between the donor and recipient tissue, thereby reducing astigmatism and minimizing endothelial cell loss. The IntraLase and the Femtec can also be used for intracorneal ring segments (ICRS, channel creation) as well as for arcuate keratotomy.

The femtosecond laser for the ICRS creates precise tunnel dissection, precise keratotomy depth, precise width and location, as well as a uniform 360 degree channel. Dr. Proust summarized her presentation by noting the infinite treatment options afforded the ophthalmic surgeon by the femtosecond laser. She added femtosecond technology will provide the foundation for innovative therapies that would otherwise have never been realized with the standard manual approach.



Sheraz Daya, M.D., delved into the topic of femtosecond-enabled keratoplasty. He began by providing the rationale for using the femtosecond laser, including its ability to provide precise trephination as well as formed cuts. Formed cuts provide improved mechanical stability, better wound healing, and reduced astigmatism. The "tongue and groove" mechanism of the geometric flaps provides a close interface for wound healing. Dr. Daya reviewed several geometric cut patterns, noting that the 'zig zag' cut was excellent for patients with keratoconus. He continued on by explaining a novel geometric pattern he was currently evaluating: the 'zig square'. He said this cut provides the same advantages as the 'zig zag': excellent anterior apposition, no over or under-wide which reduces astigmatism, watertight incision which protects the endothelium, and larger posterior diameter but unlike the 'zig zag', the 'zig square' is not as close to the limbus, perhaps reducing the risk of rejection.



Rudy Nuijts, M.D., discussed the role of the femtosecond laser in lamellar keratoplasty and DSEK. He began by citing current problems with penetrating keratoplasty (PKP): immunological rejection incidence of 15%, slow endothelial decompensation, uncontrolled IOP, suture events (risk factor for rejection, infection, and wound dehiscence), and high astigmatism (greater than 4D). Dr. Nuijts continued by discussing his study comparing femtosecond (FS) –DSEK versus PKP. The purpose of this randomized controlled trial was to evaluate the feasibility and safety of the femtosecond laser for the preparation of posterior lamellar discs, to evaluate the clinical results of FS-DSEK versus PKP, and to evaluate vision-related quality of life and patient satisfaction of FS-DSEK. The minor complications associated with FS-DSEK which occurred included donor tissue dislocation (27.8% of patients; 10/36); primary graft



failure (8.3% of patients, 3/36), folding of the lamellar disc (2.8% of patients, 1/36), and elevated IOP (5.6%, 2/36) . Among the twelve month results, patients who underwent FS-DSEK experienced lower astigmatism and comparable patient satisfaction and vision-related quality of life. Best corrected visual acuity was limited by wound healing at the interface and the learning curve of the various surgeons who participated in the study.

Ionnis Pallikaris, M.D., Ph.D., discussed using the femtosecond laser for making corneal flaps and tunnels. He began by citing the advantages of the femtosecond laser, which include decreased energy necessary to excise tissues, minimal thermal damage to surrounding tissues, accurate and safety of a procedure which is highly repeatable, the lack of contact during the procedure, and the potentially infinite applications. LASIK is the most common application for the femtosecond laser, with over 1 million procedures performed each year (Source: MarketScope, 2007). The advantages of using the femtosecond laser (over a microkeratome for LASIK) include the accuracy of the laser, thickness of the flap, and minimized risk of corneal ectasia. The femtosecond laser also makes clear flaps with no debris, no sterilization, and minimal risk of infection. The flap architecture of the planar flap (created by the femtosecond laser) results in minimally induced aberrations, less corneal flattening, and better hyperopic treatments. The disadvantages of the femtosecond laser (compared to the microkeratome): the size of the machine, the expense of the procedure, difficulty of retreatment, lack of the ability to make an ultra-thin flap (as a microkeratome can), and relatively newer complications like vertical gas breakthrough. Dr. Pallikaris concluded his presentation by discussing use of the femtosecond laser for inserting ICRS.

