Cataract surgery techniques have evolved from intracapsular cataract surgery to extracapsular cataract surgery (ECCE) to phacoemulsification, with a progressive decrease in the size of the surgical wound and increased safety and predictability of the surgical procedure. Cataract surgical techniques and intraocular lens (IOL) technologies continue to evolve to provide patients with the optimum postoperative visual outcomes.

Various lasers, including the erbium:YAG laser, have been evaluated for use in cataract surgery in different formats. The femtosecond laser has been used in corneal surgery, primarily for the creation of corneal incisions for laser in situ keratomileusis and creating keratoplasty wounds. The advantage of a femtosecond laser is the ability to create precise incisions in ocular tissue with minimal collateral damage. Currently, there is broad interest in the use of femtosecond laser technology for the performance of cataract surgery. A JCRS-sponsored symposium at the recent American Society of Cataract and Refractive Surgery (ASCRS) annual symposium in San Diego looked at the use of the femtosecond laser in various aspects of cataract surgery; ie, creation of clear corneal incisions, correction of astigmatism, creation of the capsulotomy, softening the lens nucleus to allow more efficient aspiration of a cataractous lens, and the potential use of this laser for the treatment of the crystalline lens to restore accommodation. While the early results with femtosecond technology in cataract surgery are promising, several questions have to be answered. The efficacy and safety of this technology in the various parts of cataract surgery will have to be addressed. One problem with a new technology such as the femtosecond laser is the lack of peer-reviewed studies of its use. The early results of using this technology have been presented at several meetings such as the ASCRS symposium and the European Society of Cataract and Refractive Surgeons congress. However, reports from these presentations are just beginning to find their way into the opthalmic literature.

One area in which the femtosecond laser may have an advantage over traditional cataract surgical techniques is the performance of the continuous curvilinear capsulorhexis (CCC). A well-centered properly sized CCC is important to ensure the adequate centration and positioning of an IOL. Effective lens positioning, as well as centration of an IOL is important in optimizing the IOL power. The use of so-called premium IOLs, including multifocal and accommodating IOLs, require accurate centration and fixation within the capsular bag. In this issue (pages 1189-1198), Friedman et al. describe the results of a porcine and cadaver eye study evaluating a femtosecond laser system for creation of the capsulotomy. The laser capsulotomy was also performed in 39 patients as part of a prospective randomized study. Twenty-four of the patients had a manual CCC in their fellow eyes to act as controls. The capsulotomies created by the laser were significantly more precise in size and shape than the manual CCC. The study found that the mean deviation from the intended diameter of the resected capsule was 29 μm in laser-treated eyes and 337 μm in manually treated eyes, and the mean deviation from circularity was 6% and 20%, respectively. The center of the laser capsulotomies was within 77 μm of the intended position in all eyes, and all the capsulotomies were completed without radial nicks or tears.

Friedman et al. also evaluated the strength of the femtosecond laser capsulotomies in a group of porcine eyes using varying strengths of pulse energy. They found that the strength of the laser capsulotomies decreased with increasing pulse energy: 152 mN with 3 μJ, 121 mN with 6 μJ, and 113 mN with 10 μJ. The strength of the capsulotomies at all energy levels was greater than the strength of manually performed capsulotomies, which was 65 nM. The problem with using porcine eyes for these studies is the significant difference in the lens capsule elasticity between porcine eyes and human eyes. The results will have to be confirmed in a fresh human cadaver eye study.

Studies such as this are helpful in evaluating the use of the femtosecond laser in a rigorous scientific manner. Additional studies on the use of this technology in other parts of cataract surgery will also help in evaluating the new technology.

Many issues regarding the practical use of this technology in a clinical setting also have to be addressed. These include the logistics of performing the laser treatment in a room that is separate from the surgical suite where the remainder of the cataract surgery will be performed. Another important issue is the economics of the laser technology. Specifically, who will pay for the surgical procedure? The possibility of having patients share responsibility for the payment of this technology similar to the way patients are allowed to pay for premium IOLs will have to be explored. These logistic and payment issues will be worked
out as experience in the use of this technology in a clinical setting increases.

Only time will tell whether this laser technology will be adapted into standard ophthalmic practice in the same way that phacoemulsification supplanted ECCE in the treatment of cataracts. The technology has several potential advantages in the performance of quality cataract surgery. Its adaptation to the field of cataract surgery must still be determined.

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