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Laser Refractive Surgery

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Refractive surgery has its roots in corneal transplant surgery, first performed in 1905, where the damaged or diseased cornea of a living individual is replaced by donated corneal tissue taken from a recently deceased individual. Since the cornea has no blood supply, there is no danger of organ rejection. Recognizing the exceptional healing power of corneal tissue, ophthalmologists began to explore methods of reshaping the cornea to improve the visual acuity of patients suffering from myopia, hyperopia, and astigmatism. In 1964, a procedure known as keratomileusis was introduced. In 1974, radial keratotomy (RK) was introduced. In 1981, excimer laser surgery was discovered by the speaker and his IBM Research colleagues. In 1983, the excimer laser was used to create clean, precise incisions in the cornea of enucleated calf eyes, derived from slaughter, launching the era of laser refractive surgery, with more precise and safer techniques to correct myopia, hyperopia, and stigmatism. This talk will describe the widely practiced surgical procedures known as photorefractive keratectomy (PRK) and laser-assisted in situ keratomileusis (LASIK), which have improved the visual acuity of more than 35 million people. Most patients undergoing PRK or LASIK end up with uncorrected vision better than 20/20. In 2007, development commenced on a new procedure known as small incision lenticule extraction (SMILE), employing a femtosecond laser and no excimer laser. SMILE is promoted as minimally invasive and combining the advantages of PRK and LASIK. However, long term stability of visual acuity following SMILE surgery is yet to be determined.