原　　著

ONE-YEAR OUTCOME OF MYOPIC LASIK AT THE TOKUSHUKAI MATSUBARA HOSPITAL

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Abstract: We report the first year outcome of laser in situ keratomileusis (LASIK) for myopia at the Tokushukai Matsubara Hospital.

Twenty-eight eyes of 15 patients underwent myopic LASIK between March 2001 and March 2002. The average age of the patients was 32 (range 24 to 61) years. The mean follow-up period was 4.3 months. The average preoperative spherical equivalent of refraction was -4.30 (range -1.50 to -8.50) D. The surgery was performed using NIDEK MK-2000 microkeratome and VISX STAR S2 Excimer laser.

The average postoperative spherical equivalent of refraction was -0.06 (range -1.13 to +1.50) D. 79% of eyes (n=22) were within ±1.0 D of emmetropia. 100% of eyes were within ±1.5 D of emmetropia. The postoperative uncorrected visual acuity was ≧20/20 in 57% (n=16), ≧14/20 in 75% (n=21), and ≧20/40 in 86% (n=24) of eyes.

In the early postoperative period there was a case of epithelial ingrowth, in which the vision temporarily decreased by two lines. By surgically removing the mass of the ingrowth, the visual acuity was recovered.

These results indicate that our first-year experience of myopic LASIK was equivalent to other previously reported results.

Key words : LASIK, early experience, postoperative refraction

INTRODUCTION

Photorefractive keratectomy (PRK) and laser in situ keratomileusis (LASIK) are now the most common refractive surgery techniques[1].

It is estimated that twenty to thirty thousands patients annually undergo refractive surgery in Japan (personal communication with a NIDEK employee).

The safety and predictability of the procedure has been well established. No major complications leading to blindness have been reported. In many past reports, approximately 90% of postoperative patients obtained ±1.0 diopter (D) of emmetropia and 20/20 of uncorrected vision[2-4].

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We started LASIK in the Matsubara Tokushukai Hospital in March 2001. To avoid surgical mistakes and incorrect refractive outcome due to the learning curve5), we had prepared by operating on numerous porcine eyes.

The LASIK nomogram had been originally provided by the Miyata Eye Hospital. We gradually refined the nomogram to improve predictability and avoid hyperopia that resulted from overcorrection. We report our first-year experience of myopic LASIK.

PATIENTS AND METHODS

Patients

In this retrospective study, 28 eyes of 15 patients with myopia and myopic astigmatism (11 women and 4 men with a mean age of 32 years (range 24 to 61 years) were included. Inclusion criteria were a best spectacle-corrected visual acuity (BSCVA) of 20/40 or better, a stable refraction for at least 2 months, 20 years of age or older at the time of surgery, and normal intraocular pressure (10 to 20 mmHg). Exclusion criteria were pregnancy or a systemic disease that could interfere with wound healing or the synthesis of connective tissue, or previous ocular surgery, disease, or injury. Hard contact lenses were discontinued 4 weeks before the preoperative examination and soft contact lenses, 2 weeks before. All patients provided informed consent to the operation after at least three sessions of preoperative examination.

Surgical procedure

All surgeries were performed alternately by two surgeons (N.Y. and M.H.) who attempted to correct the entire refractive error in each eye. The MK-2000 microkeratome (NIDEK) was used to perform the lamellar cut. The flap diameter was 8.5mm with a depth of 130 or 160 μ m. The VISX STAR S2 excimer laser ablated the cornea. The diameter of ablation was 6mm. The repetition rate was 10 Hz and the energy density 160 mJ/cm2.

Assessment of refraction

All refractions were assessed by a well-trained orthoptist. The objective refraction was measured with an auto-refractometer. At least five measurements of each eye were taken and the values automatically averaged. The subjective refraction was determined by assessing BSCVA, using standard lens-exchange method. The procedures were performed separately in each eye; all refractive measurements were done with and without cycloplegia. The refraction was measured at least three times on separate days. The least amount of myopia detected by subjective refraction was employed and inserted into the nomogram. The nomogram had been formatted with MS-Excel and originally provided by the Miyata Eye Hospital. It had been installed into a personal computer that runs with Windows 98. The nomogram included age, sex, corneal refractive power, refraction of the whole eye, and axial length and calculated desirable amount of actual laser ablation for each patient. The operator entered the calculated amount of laser ablation into the computer of the excimer laser.

The spherical equivalent of refraction was used for the analysis. The preoperative (baseline) and postoperative refractive error, postoperative uncorrected and corrected vision,

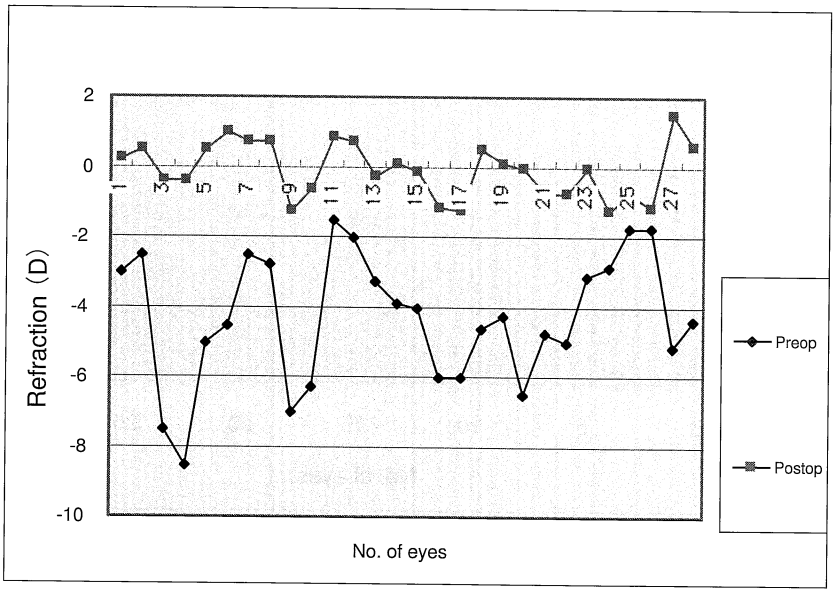

Fig. 1. Distribution of the subject refraction before and after LASIK.
Preop: Refraction before surgery Postop: Refraction after surgery
No. of eyes: The consecutive number of eyes

and significant complications were assessed.

RESULTS

Refractive errors

The mean refraction was -4.29 ± 1.86 D (range -1.5 to -8.5 D) before LASIK and -0.06 ± 0.78 D (range +1.50 to -1.25 D) after LASIK. 79% of eyes (n=22) were within ±1.0 D of emmetropia. 100% of eyes were within ±1.5 D of emmetropia. Fig. 1 shows pre- and postoperative refraction of all patients.

Visual acuity

The postoperative uncorrected visual acuity was ≧20/20 in 57% (n=16), ≧14/20 in 75% (n=21), and ≧20/40 in 86% (n=24) of patients. In all patients postoperative visual acuity was better than that measured preoperatively.

No patient had lost more than one line of best-corrected visual acuity at the final visit. Fig. 2 shows the distribution of postoperative uncorrected visual acuity of all patients.

Complications

There were no major intraoperative complications. In the early postoperative period an epithelial ingrowth occurred in one eye. The visual acuity of the eye decreased by two lines and a severe degree of against-the-rule astigmatism appeared. At three weeks after onset, the epithelial ingrowth was removed surgically, and vision was recovered. This was reported

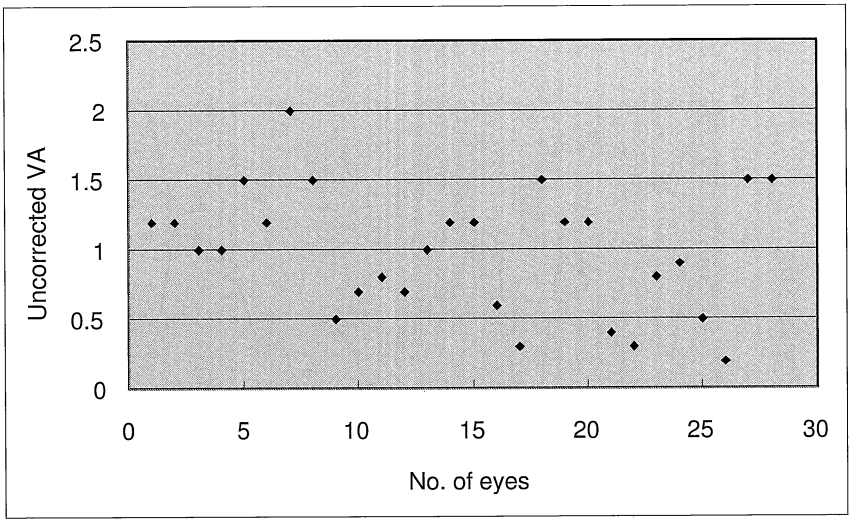

Fig. 2. Distribution of uncorrected visual acuity after LASIK at the final visit VA: Visual acuity No. of eyes: The consecutive number of eyes

in detail elsewhere[6].

DISCUSSION

Corneal refractive procedures have been refined to correct ametropia. The first most prevalent keratorefractive procedure was radial keratotomy. Millions of people underwent the surgery in the 1980's. More than half of the patients could dispence with their glasses. However, the cornea became fragile to two thirds of preoperative mechanical strength. The predictability of the surgery was such that 80% of postoperative patients were ±2 D of emmetropia[7]. This surgery is very rarely performed now.

The second prevalent keratorefractive procedure was photorefractive keratectomy with the excimer laser in the 1990's. The surgery was much easier than radial keratotomy. Postoperatively the mechanical strength of the cornea did not significantly change. 90% of the postoperative patients were ±1 D of emmetropia[8]. The shortcomings of the procedure were postoperative severe pain and slow recovery of vision. This surgery is still being widely performed.

Currently LASIK has become the most prevalent keratorefractive procedure. Postoperative visual recovery is very fast after this surgery. In many reports, 90% of the postoperative patients are ±1 D of emmetropia[1-4]. This surgery adds a lamellar cut to the photorefractive keratectomy and is technically more difficult. It is recognized that a learning curve is present with the procedure[5].

Our surgical technique is a standard one, which is widely performed in Japan (personal communication with a NIDEK employee). One of the surgeons (M.H.) was a beginner, but there were no differences in surgery time, postoperative refraction, postoperative visual

acuity, and postoperative wound recovery (data not shown) between the two surgeons. It has been reported that when a beginner performs LASIK the complication rate is high[3,5]. Lin[3] reported that flag complications occured in 6% of the first 100 surgeries. We had practiced by operating on numerous porcine eyes before starting LASIK to avoid the surgical mistakes of the early period.

In one case (1/28, 3.6%) epithelial ingrowth occurred. It has been reported that this complication is not infrequent, occurring in 1-5% of postoperative patients[2-4]. This complication is reported to increase when persistent corneal erosion occurred. We think this complication may be decreased but cannot be completely eliminated with current techniques. We believe this complication rate is not high considerd as a first year experience.

All patients were within ±1.5 D of emmetropia. This is comparable to other reports[1-5]. Individual differences in the wound healing response of the cornea, intraoperative eye movement, and inappropriate flap repositioning are probable causes of postoperative refractive errors. In other words, ±1.0 to 1.5 D of refractive error may be a limit of the recent technique. Whether this range of error is acceptable or not should be decided by the patient when informed consent is obtained.

Our important policy is to avoid postoperative hyperopia. Hyperopia is not perceived in young people, but it markedly decreases the quality of vision when they enter the presbyopic age group. In many reports of LASIK, they report postoperative percentages of people with 20/20 uncorrected visual acuity. The higher the percentage is, the more highly the surgeon may be regarded. If we are to increase the percentage, the nomogram may shift toward more hyperopic refraction. We believe that this attitude is not desirable for a conscientious ophthalmologist. Our percentage of postoperative 20/20 uncorrected visual acuity is not so high as other reports, but it is the result of avoiding hyperopia.

In conclusion, our first year experience of LASIK is comparable to other studies. We believe that LASIK can be performed with reasonable safety and predictability, after sufficiently informed consent.

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