

Laser in Situ Keratomileusis for the Treatment of Refractive Errors in Patients with Multiple Sclerosis

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Abstract

Purpose: To assess the outcomes of laser in situ keratomileusis (LASIK) in patients with multiple sclerosis (MS)

Methods: 15 eyes of 8 patients with MS (2 men and 6 women) who referred for myopia treatment (with or without astigmatism) were undergone LASIK. After refractive and visual acuity examinations, topographic and pachymetry screening, intraocular pressure (IOP) measurement, biomicroscopy and retinal examination, those eligible for the LASIK surgery were included in the study. Patients with any signs and symptoms of optic neuritis in at least 6 months prior to the surgery were excluded. The patients were followed-up between 6 months (one patient) to 5 years after surgery. Mean spherical equivalent (SE), uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) of the patients were recorded at 6 month after surgery. Follow-ups were done at the same day of the surgery and a week, 1, 6 months, and on annual basis after surgery.

Results: Mean age of the patients was 28.88 ± 6.38 years and the MS diagnosis in patients dated back to 5.31 ± 3.83 years before the study. The first episode of attacks happened 1.04 ± 0.59 years after surgery. Mean SE of patients was -4.10 ± 1.67 D before surgery that improved to -0.27 ± 0.29 D after it. Mean UCVA of the patients was 0.11 ± 0.07 before surgery and improved to 0.86 ± 0.18 after surgery. Mean BCVA of the patients was 0.89 ± 0.18 before and after surgery. Paired Sample T-test showed significant differences between mean SE and mean UCVA differences both before and after surgery.

Conclusion: In our study, LASIK seems to be a safe surgery in MS patients.

Keywords: Multiple Sclerosis, Laser in Situ Keratomileusis, Myopia, Spherical Equivalent

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Introduction

The number of refractive error surgeries has increased in the past decade due to advances in techniques and devices for these surgeries.¹ Today, a wide range of patients with different diseases are eager to have their refractive error corrected using these methods. A group of these people are those with multiple sclerosis (MS) and most commonly they are young adults.² MS is an immune-mediated demyelinating disease characterized clinically by involvement of the central nervous system and expresses a various forms of pathogenesis and clinical implications.^{3,4}

Optic nerve, cerebral white matter, brain stem, cerebellum and spinal cord are the most affected areas causing a set of classic features. MS presents most commonly in young adults (20-40 years) and women are affected more commonly (2-3 times) than men.²

In about 25% of MS patients, optic neuritis is often the initial presentation of MS. Hence, in addition to MRI, visually evoked potential (VEP) is a valuable routine diagnostic method.^{2,5} This method can detect an affected optic nerve even in patients with no complaint of reduced vision. The MS diagnosis is definite in 70% of cases and probable in 60% of the remaining cases. Uveitis and changes in retinal veins are other ocular disorders, which occur higher than expected in MS patients.^{2,6} Prephlebitis, Pars Planitis, and sometimes peripheral neovascularization of the retina are also common.² There was no report in medical literature in prohibition of refractive surgery procedures for MS patients. However, there was no report on the results of these types of surgeries on MS patients neither. So it was decided to review the laser in situ keratomileusis (LASIK) surgery results in MS patients who were applying for this type of surgery.

Methods

We carried out a cross sectional study with simple random sampling. Between 1997 and 2003, 15 eyes of 8 patients with MS (2 men and 6 women) who referred for myopia treatment (with or without astigmatism) were undergone LASIK surgery. Inclusion in the study was made after refractive error tests, cycloplegic refraction test, corrected and

uncorrected visual acuity (UCVA) and visual field examinations, topographic and pachymetry screening, intraocular pressure (IOP) measurement, biomicroscopy, retinal examination and neurologic assessment. Those eligible for the LASIK surgery were included in the study. Except for biomicroscopic and fundoscopic examinations that were done by an ophthalmologist who was informed of the study, the rest of the tests were performed by an optometrist who was not informed of the study. Neurologic consultations were given to the patients before the surgery. Only those patients who did not show any obvious signs and symptoms of optic neuritis at least sixth months prior to the surgery and had a $20/30$ corrected vision or better were enrolled in the study.

All patients were informed on ambiguity in terms of prognosis due to the limitations of knowledge about the outcomes of the surgeries and signed informed consents were obtained. In addition, this study was approved by the ethical Board of Noor Ophthalmology Research Center. To measure neural outcomes, the MS patients were followed-up between 6 months (one patient) to 5 years after surgery. Mean spherical equivalent (SE) and UCVA of the patients were recorded at 6 month after surgery. The surgeries were performed by two surgeons, 10 eyes by one and 5 eyes by the other. Hansatome microkeratome was used to remove the flap. Eleven and 4 surgeries were performed using Nidek EC-5000 and Technolas, respectively. No flap removal complications were reported in any of the patients. Betamethasone and chloramphenicol drops were prescribed for one week and three days after surgery, respectively. Follow-ups were done at the same day of the surgery and a week, 1, 6 months, and on annual basis after surgery.

Results

Mean age of the patients was 28.88 ± 6.38 years and the MS diagnosis in patients dated back to 5.31 ± 3.83 years before our study. The last time the patients had experienced an episode of MS attacks was 1.25 ± 0.96 year on average.

The first episode of attacks happened 1.04 ± 0.59 year after surgery. Mean SE of

patients was -4.10 ± 1.67 D before surgery that improved to -0.27 ± 0.29 D after it. Mean UCVA of the patients was 0.11 ± 0.07 before surgery and improved to 0.86 ± 0.18 after surgery. Mean best corrected visual acuity (BCVA) of the patients was 0.89 ± 0.18 before and after surgery.

Paired Sample T-test showed significant differences between mean SE and mean UCVA differences both before and after surgery (Table 1).

Table 1. Mean differences of mean spherical equivalent and uncorrected visual acuity before and after laser in situ keratomileusis surgery

	Mean	95% Confidence interval of the difference	
		Lower	Upper
Spherical equivalence before LASIK - Spherical equivalence after LASIK	-3.93	-4.79	-3.07
UCVA before LASIK - UCVA after LASIK	-0.75	-0.84	-0.67

LASIK: Laser in situ keratomileusis
UCVA: Uncorrected visual acuity

Discussion

Our discussion is divided into two parts: First, we discuss the possible impacts of stress and trauma of the surgery on the disease. Second, we discuss the impact of MS disease on safety and results of LASIK surgery.

The relationship of trauma and stress with multiple sclerosis

Trauma and multiple sclerosis

Only injuries to head, neck and upper spinal cord are considered to cause the onset of MS or be a risk factor to exacerbate MS symptoms.⁷ This hypothesis is built on the information that a change in the Blood-Brain Barrier (BBB) is an important stage of the onset of MS presumably because the trauma causes the disruption of BBB.⁸ However, the hypothesis has not been proven yet and is a matter of controversy. In a population based cohort study, Kurland showed that there is no relationship between head injuries and lumbar disk surgery with the onset or exacerbation of MS attacks.⁹ In a 5-year study on 170 MS patients, Sibling et al reported no significant difference in MS attacks between groups of people with and without a physical trauma record at 3-6 months after trauma.¹⁰ MS has

unpredictable and variable clinical symptoms. In a review article pointing out some of the errors of other previous studies, Goodin et al reported that there is not still sufficient evidence to show the relationship between physical trauma and the onset or exacerbation of MS attacks.¹¹ Except for some case reports, some uncontrolled studies and some controlled ones with small sample size, we did not find any controlled study with appropriate sample size and epidemiologic standards to show reliable cause and effect relationship between the head and neck trauma and onset or exacerbation of MS attacks. In the first three month, there was only one case of optic neuritis among our patients. Mean onset of attacks after surgery was 1.04 ± 0.59 year. Considering different clinical variations of the disease, no final comments can be made about our results. However, it seems unlikely that they were exceptional.

Stress and multiple sclerosis

The mechanisms by which stress induces inflammatory diseases, like MS as an autoimmune disease, are not yet fully understood. The stimulation of Hypothalamic-Pituitary-Adrenal axis and the sympathetic system can have a significant effect on stimulated inflammatory function of lymphocytes (By stimulating production of cytokines and expression of lymphocytes adrenergic receptors).¹² Like physical trauma, the study of the effects of stress on the onset or exacerbation of MS attacks is difficult due to the following reasons:

1. Determination of the type and severity of stress
2. Assessment of the stress effects by different people
3. The existing bias between patients and physicians on the old belief that there is a relationship between stress and MS as the patient easily sees a stress factor as the reason for exacerbation of his illness
4. MS variability and unpredictability

Gold et al believed there are several documents supporting the relationship between a stressful life and intensification of MS attacks.⁴ In a study on 73 MS patients, Buljevac et al also showed a relationship between stress and the increase of MS attacks.¹² Reviewing several class II studies lead Goodin and his colleagues to the point that there is a correlation between stress and the onset or exacerbation of MS attacks.

However, these studies had serious limitations.¹¹ Nisipeanu et al studied 32 MS patients of the Gulf War and reported that in comparison to a period of 2 years before the war, the number of attacks during the war and two month after that was actually decreased and suggested that stress sometimes reduces the number of attacks.¹³

Although there are more evidence of the correlation between stress and MS (compared with the correlation between physical trauma and MS), small sample size, short period of the study and other confounding factors actually decrease the validity of the studies.

Although in our cases only in one case MS attacks was seen 3 months after surgery, the lack of evidences makes it hard to relate the onset of MS attacks with surgery trauma. However, we are aware that our study sample size was small.

MS effects on refractive surgery outcomes

As mentioned, optic neuritis is the most common ocular finding among MS patients.² On the other hand, many other patients with no history of optic neuritis or vision disorders may also show visual pathway complications

that is diagnosable with varied detailed examinations.⁵

Towler et al reported a wide range of uveitis patterns that could be symptomatic and result in impaired vision. To achieve the best possible vision in MS patients, diagnosis and treatment of these conditions has been emphasized.⁶ No tissue healing complications after trauma or surgery has been reported for MS patients in previous studies. Also, no refractive complications have been reported for these patients. However, because of small sample size and lack of control group, no definite statistical conclusion can be made here. Nevertheless, postoperative refraction stability, improvement of UCVA and SE of patients were obvious. No tissue healing complications or ocular sensory impairment was found and none of the patients had diffuse lamellar keratitis (DLK).

Conclusion

In our patients, LASIK seems to be a safe surgery with appropriate outcomes in MS patients. However, controlled studies with more cases are recommended for more reliable findings.

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