

## SCIENTIFIC REPORT

## Relation of pre-LASIK and post-LASIK retinal lesions and retinal examination for LASIK eyes

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**Aims:** Analysis of highly myopic eyes (mean myopia  $-11$  D) with post-LASIK vitreoretinal complications (breaks, retinal detachment) that also had pre-LASIK vitreoretinal pathology (lattice, breaks).

**Methods:** Retrospective case series.

**Results:** 67 eyes in 56 patients with pre-LASIK retinal examination developed post-LASIK vitreoretinal complications. 17 of the 67 eyes (25.4%) had pre-LASIK vitreoretinal pathology. 10 of the 17 eyes that underwent pre-LASIK prophylactic retinal treatment still developed post-LASIK lesions. They developed adjacent to pre-LASIK lesions for 15 of 17 eyes (88.2%), and outside of quadrant(s) of pre-LASIK lesions for five eyes (29.4%).

**Conclusion:** Pre-LASIK retinal examination may predict locations of certain post-LASIK retinal lesions that may develop in highly myopic eyes with pre-LASIK vitreoretinal pathology, but prophylactic treatment may not prevent all post-LASIK vitreoretinal complications.

Laser assisted in situ keratomileusis (LASIK) is a highly safe and effective refractive procedure with few complications. There are relatively few reports on vitreoretinal complications in comparison with anterior segment complications associated with LASIK.<sup>1,2</sup> However, infrequent vitreoretinal complications may still have a visual impact, considering the large volume of LASIK being performed around the world today. Previously, we reported on the characteristics of retinal breaks and detachment after LASIK in a series of 60 myopic eyes with documented pre-LASIK retinal examination.<sup>1</sup> The focus of this study is on 17 eyes with both pre-LASIK and post-LASIK retinal lesions, a subset of an expanded cohort of 67 myopic eyes (an additional seven eyes to our previous report) that developed post-LASIK retinal lesions. Our previous report was limited to the comprehensive discussion of the characteristics of post-LASIK retinal lesions.<sup>1</sup> In contrast, this report presents detailed analysis of pre-LASIK retinal lesions, and their relation to the post-LASIK retinal lesions.

## MATERIALS AND METHODS

This was a retrospective survey of tertiary care of vitreoretinal complications after LASIK by worldwide vitreoretinal surgeons covering a 12 year period (1990 to 2002). Surveyed forms were mailed to them regarding their experience with treatment for eyes with retinal lesions after LASIK. In all, 1252 survey forms were mailed to the worldwide membership of the retina, macula, and vitreous societies. Of the 424 surgeons who responded, 37 (8.7%) reported tertiary care of patients with post-LASIK retinal breaks and retinal detachments (RD) referred by anterior segment surgeons. Only eyes with documented pre-LASIK dilated fundus examination were included for data analyses. Surveyed parameters

included demographics, best corrected Snellen visual acuities (BCVA), degree of myopia, pre-LASIK and post-LASIK retinal findings, interval from LASIK to retinal lesions, follow up time, and treatment outcome.

## RESULTS

Of 94 eyes in 77 patients who developed post-LASIK vitreoretinal complications (retinal breaks with or without retinal detachment), 67 eyes in 56 patients (71.3%) had documented pre-LASIK dilated fundus examination. Of the 67 eyes, anterior segment ophthalmic surgeons performed the pre-LASIK retinal examination for 57 eyes (85%), whereas retinal specialists performed the same for 10 eyes (15%). Seventeen of those 67 eyes (25.4%) had pre-LASIK vitreoretinal pathology: lattice degeneration (10 eyes), lattice degeneration and breaks (six eyes), and breaks only (one eye) (table 1). The focus of this study was on these 17 eyes. The ages of the 17 patients ranged from 22 to 63. Their mean of myopia was  $-11.0$  dioptres (D), and the range of myopia was between  $-3.5$  to  $-17$  D. The mean time interval from LASIK to retinal lesions was 8.8 months, and their mean follow up time was 9.6 months. Fourteen of the 17 eyes (82.3%) developed retinal lesions within 12 months, two eyes within 24 months, and one eye within 36 months after LASIK. The data of presenting vitreoretinal symptoms were available for eight of the 17 eyes: flashes for four eyes, floaters for two eyes, and both flashes and floaters for two eyes. Ten of 17 eyes underwent prophylactic retinal treatment before LASIK: lattice and breaks in six eyes (laser for five eyes and cryotherapy for one eye), breaks only in one eye (laser), and lattice only in three eyes (laser). The other seven eyes that did not undergo prophylactic treatment had lattice lesions only. There were no eyes with large retinal breaks ( $>1$  clock hour) or RD before LASIK.

The posterior vitreous status was well documented in 10 of the 17 eyes. All 10 eyes had posterior vitreous attachment (PVA) before LASIK. Eight of the 10 eyes developed a posterior vitreous detachment (PVD) along with their retinal lesions after LASIK. Nine of the 17 eyes developed retinal breaks only, whereas eight also developed RD after LASIK. Post-LASIK retinal lesions developed adjacent to the pre-LASIK lesions in 15 of the 17 eyes (88.2%), and post-LASIK lesions developed outside of the quadrants with pre-LASIK lesions in five eyes (29.4%) (table 2). Thus three of those five eyes developed both retinal lesions close to the pre-LASIK lesions, as well as separate retinal lesions outside of the quadrants with pre-LASIK lesions after LASIK. All eight eyes with RD had the RD involving the quadrants of the pre-LASIK lesions. Of the 15 eyes that developed post-LASIK retinal lesions close to their pre-LASIK vitreoretinal pathology, six eyes had only a single pre-existing patch of lattice or

**Abbreviations:** BCVA, best corrected visual acuities; LASIK, laser assisted in situ keratomileusis; PVA, posterior vitreous attachment; PVD, posterior vitreous detachment; RD, retinal detachments

**Table 1** Demographics of 17 eyes with pre-LASIK vitreoretinal pathology and post-LASIK vitreoretinal complications

Age range	22–63 years
Mean myopia	–11.0 D
Mean time interval (LASIK to vitreoretinal complications)	8.8 months
Within 12 months	14 (82.3%)
>12 months and ≤24 months	2 (11.8%)
36 months	1 (5.9%)
Mean follow up time (post-LASIK)	9.6 months
Pre-LASIK	
Lattice only	10 (58.8%)
Lattice and breaks	6 eyes (35.3%)
Break only	1 eye (5.9%)
Post-LASIK	
Breaks only	9 eyes (52.9%)
Retinal detachment	8 eyes (47.1%)
Mean preop BCVA	0.18 LOGMAR (20/30)
Mean postop BCVA	0.40 LOGMAR (20/50)
Documented vitreous status	10 eyes
Pre-LASIK PVA followed by post-LASIK PVD	8 eyes

D, dioptres; preop, preretinal repair; BCVA, best corrected visual acuity; logMAR, log (10) of reciprocal of Snellen visual acuity; postop, post-retinal repair; PVA, posterior vitreous attachment; PVD, posterior vitreous detachment.

retinal break within the same quadrant and no other lattice or breaks in either adjacent quadrant. For the remaining nine eyes, five eyes had two patches of lattice within 3–5 clock hours from each other (involving two adjacent quadrants), and four eyes had three patches of lattice within 3–6 clock hours from each other (involving three adjacent quadrants). Regardless of whether a single or multiple patches of lattice or retinal breaks were present and the number of quadrants that were involved before LASIK, all post-LASIK breaks that developed adjacent to the pre-LASIK vitreoretinal lesions were intimately close to them in the 15 eyes (within the border of a treated lattice patch in one eye, and immediately adjacent to the border of a lattice patch or pre-LASIK break in 14 eyes). Regarding the post-LASIK retinal breaks that developed outside of the quadrants with pre-LASIK vitreoretinal pathology in the five eyes, the distance of the post-LASIK lesions was at least 105 degrees (3.5 clock hours) or more from the location of the nearest pre-LASIK retinal lesions (table 3). There were no retinal lesions in three quadrants in three of those five eyes, and in two quadrants in two of those five eyes before LASIK. Details of pre-LASIK and post-LASIK retinal lesions (lattice, holes, and tears) are outlined in table 4.

Post-LASIK retinal treatment was successful for all treated eyes: laser (10 eyes), scleral buckling (three eyes), vitrectomy (one eye), scleral buckling and vitrectomy (one eye), pneumatic retinopexy, scleral buckling, vitrectomy, and silicone oil (one eye). One patient declined retinal repair for

**Table 2** Relation of post-LASIK to pre-LASIK vitreoretinal lesions for 17 eyes with pre-LASIK vitreoretinal pathology

Location	Number of eyes (%)
Post-LASIK retinal breaks adjacent to pre-LASIK lesions	15 (88.2)
Post-LASIK breaks outside of quadrants with pre-LASIK retinal lesions	5 (29.4)
Post-LASIK RD involving quadrants with pre-LASIK retinal lesions	8 (47.1)*
Post-LASIK RD limited only to area(s) outside of quadrant(s) with pre-LASIK vitreoretinal lesions	0 (0)

\*Same as all eyes with RD (eight of eight eyes or 100% with RD).

**Table 3** Distance of post-LASIK lesions (outside of quadrants with pre-LASIK lesions) to nearest pre-LASIK lesions in five eyes

No of eyes	Degrees	(clock hours)
1	105	(3.5)
2	120	(4)
1	150	(5)
1	180	(6)

**Table 4** Details of pre-LASIK and post-LASIK retinal lesions in 17 eyes

	Pre-LASIK lesions (no of eyes)	Post-LASIK lesions (no of eyes)
Lattice only	10	NA
Lattice and holes	5	6
Lattice and tears	1	7
Lattice, holes, tears	0	3
Holes only	0	0
Tears only	1	1

NA, not applicable.

personal reasons. There was no statistical difference between the mean preoperative and postoperative (pre-retinal and post-retinal repair) BCVA for the 17 eyes. The mean preoperative BCVA was 0.18 logMAR (20/30) and the mean postoperative BCVA was 0.40 logMAR (20/50),  $p = 0.18$ , Wilcoxon signed ranks.

## DISCUSSION

The most important finding of this report is that prophylactic treatment of vitreoretinal pathology (lattice degeneration, retinal breaks) before LASIK does not guarantee the prevention of post-LASIK vitreoretinal complications in highly myopic eyes, as demonstrated by the 10 eyes that developed post-LASIK retinal lesions in spite of pre-LASIK prophylactic retinal treatment. Thus, one cannot assume that pre-LASIK prophylactic retinal examination and treatment automatically prevent post-LASIK vitreoretinal complications. This report also shows that pre-LASIK retinal lesions predict the locations of many post-LASIK retinal lesions that may develop (88.2% of eyes), to be close to the pre-LASIK lesions. However, substantial numbers of post-LASIK retinal lesions in this study (29.4% of eyes) still developed outside the quadrants with pre-LASIK lesions. Thus, pre-LASIK retinal examination is valuable for predicting the locations of certain post-LASIK retinal lesions that may develop, for those eyes with pre-LASIK vitreoretinal pathology. The development of post-LASIK retinal complications despite pre-LASIK retinal examination and treatment in this study is consistent with previous reports of the failure of prophylactic retinal treatment to always avert vitreoretinal complications for myopic eyes not involved with LASIK.<sup>3</sup> The change of the posterior vitreous status from PVA to PVD as a marker for vitreoretinal complications in this study is consistent with previous studies on this subject, although its reliability cannot be confirmed owing to missing data on the posterior vitreous status for 41% of the eyes.<sup>4</sup> Since many eyes in this study were highly myopic (mean myopia of –11.0 D), they were at risk for vitreoretinal complications irrespective of LASIK. Thus, careful monitoring of such highly myopic eyes, including post-LASIK retinal examination, is potentially relevant. It is not known whether eyes with less myopia would have a lower risk for vitreoretinal complications. Owing to the retrospective nature of this study, its results are

limited by incomplete and missing data. This study was not designed to answer the question of any direct relation between LASIK and vitreoretinal complications, or establish the incidence of post-LASIK vitreoretinal complications. A prospective study is required to address those issues and to further evaluate the role of retinal examination and treatment before and after LASIK.

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