



# Macular hemorrhage after laser in situ keratomileusis (LASIK) with femtosecond laser flap creation

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## Purpose

To report the first case of macular hemorrhage following laser in situ keratomileusis (LASIK) with femtosecond laser flap creation.

## Design

Observational case report.

## Methods

A 36-year-old woman underwent uncomplicated, bilateral, simultaneous LASIK procedures for correction of moderate myopia (−5.00 diopters OD and −6.00 diopters OS). LASIK flap creation was performed using the IntraLase femtosecond laser.

## Results

On postoperative day 1, the patient's uncorrected and best-corrected visual acuities were 20/20 OD and 20/40 OS. A dilated fundoscopic examination revealed a one-third disk diameter macular hemorrhage OS. An intravenous fluorescein angiogram ruled out the

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presence of predisposing macular pathology. Two months after LASIK, the macular hemorrhage had cleared, and 6 months later, the BCVA improved to 20/25 OS.

## Conclusions

Macular hemorrhage may occur after LASIK, even in the absence of previously identified risk factors, such as high myopia, pre-existing choroidal neovascularization, lacquer cracks, and sudden changes in intraocular pressure associated with microkeratome-assisted flap creation.

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## Article Outline

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Macular hemorrhage is a rare event after laser in situ keratomileusis (LASIK).<sup>1, 2, 3, 4</sup> and <sup>5</sup> Reported predisposing conditions include high myopia, choroidal neovascularization, lacquer cracks, and sudden significant changes in the intraocular pressure.<sup>1, 2, 4</sup> and <sup>5</sup> However, we present a case of unilateral macular hemorrhage in a patient with a moderate degree of myopia and no macular pathology after bilateral simultaneous uncomplicated LASIK in which flap creation was performed using the IntraLase femtosecond laser (IntraLase Corp., Irvine, California, USA) with its low-pressure suction ring.

A 36-year-old woman who developed a macular hemorrhage in the left eye one day after bilateral LASIK procedures was referred to one of us (K.W.S.) for evaluation. Preoperative refractive errors were  $-5.50 + 1.00 \times 105$  OD and  $-6.25 + 0.50 \times 90$  OS with best-corrected visual acuity (BCVA) of 20/20 OU. The LASIK surgeon reported that a preoperative dilated fundus examination was unremarkable and that the procedure was uneventful. In each eye, the IntraLase femtosecond laser was used to create superiorly hinged flaps of 110  $\mu$ m in thickness, and the stromal ablation was performed with the VISX Star S4 laser (VISX Inc, Santa Clara, California, USA).

Immediately after the surgery, the patient noticed blurred vision in the left eye. On postoperative day 1, uncorrected and BCVA was 20/20 OD and 20/40<sup>-3</sup> OS. A dilated fundus examination revealed a focal hemorrhage in the left fovea, seen as a one-third disk diameter hypofluorescent region on fluorescein angiography ([Figure 1](#), left and right). No evidence of a choroidal neovascular membrane or lacquer crack was observed. Two months postoperative, the BCVA remained 20/20 OD and 20/40<sup>-3</sup> OS. As no anatomic corneal abnormality was noted, and topography demonstrated well-centered myopic ablations OU, the decreased BCVA OS was attributed to the previous macular hemorrhage, although the retinal examination and fluorescein angiogram were unremarkable ([Figure 2](#)). Six months later, the examination remained unchanged, although the BCVA in the left eye improved to 20/25.

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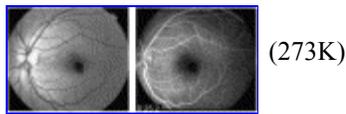


FIGURE 1. (Left) Red-free fundus photograph of left eye on postoperative day 3 after LASIK demonstrating a macular hemorrhage. (Right) Fluorescein angiogram of the left eye on postoperative day 3 after LASIK, demonstrating a focal blocking defect, secondary to an intraretinal hemorrhage.

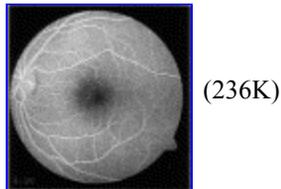


FIGURE 2. Fluorescein angiogram of the left eye 2 months after LASIK surgery, demonstrating resolution of the macular hemorrhage.

Although retinal complications have been reported after myopic LASIK,<sup>1, 2, 3, 4</sup> and <sup>5</sup> the incidence is comparable to that in the myopic population. Macular hemorrhage can occur spontaneously in highly myopic eyes, with predisposing lesions such as chorioretinal atrophy and lacquer cracks conferring an increased risk. The development of a macular hemorrhage after LASIK surgery has been reported in approximately six patients, each of whom was highly myopic (range,  $-10.00$  -  $-18.00$  diopters) and several of whom demonstrated lacquer cracks or choroidal neovascular membranes, or both.<sup>1, 2, 3, 4</sup> and <sup>5</sup> However, none of these predisposing risk factors was present in the patient in our report. In each of the reported cases of macular hemorrhage after LASIK surgery, flap creation was performed using a mechanical microkeratome, with the associated sudden increase in intraocular pressure (IOP) to 60 to 70 mm Hg, followed by a rapid IOP decrease upon suction release. The rapid IOP changes have been theorized to result in a mechanical stress that may rupture Bruch membrane in susceptible eyes, leading to subsequent hemorrhage.<sup>2</sup> and <sup>5</sup> This theory does not explain the origin in the patient in our report, however, as the IOP is only raised to approximately 35 to 40 mm Hg during flap creation with the femtosecond laser. Thus the cause of the macular hemorrhage in this patient remains enigmatic. As this report demonstrates that a macular hemorrhage may occur even in the absence of previously identified risk factors, all patients undergoing LASIK surgery should be advised of the possibility of rare but potentially visually significant vitreoretinal complications, such as macular hemorrhage, after surgery.

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