which is within the expected age range for RDs locally. We have shown that age is a risk factor for RD after laser refractive surgery. It is known that the vitreous undergoes syneresis between 40 and 60 years of age, and a syneretic vitreous is a prerequisite for the occurrence of posterior vitreous detachment and subsequent RD. It would have been interesting to establish the occurrence of posterior vitreous detachments after laser refractive surgery, but we were unable to do so with the limitations of a retrospective study.

With longer axial lengths, the myopic eye has a greater tendency to lattice degeneration and PVD, predisposing to retinal tears and detachments.[7–9] The incidence of RD in myopes has been reported to range from 0.71% to 3.20%, increasing to 6.7% in high myopia.[10–13] The overall mean refractive errors at SNEC are -4.43 ± 1.83 D for PRK and -6.37 ± 2.80 D for LASIK. The patients who had RD after PRK and LASIK had mean preexisting SE of -8.53 ± 2.71 D and -9.02 ± 3.33 D, respectively. These results suggest that severity of myopia is a significant risk factor for RD after refractive surgery.

Retinal detachments have been reported after laser refractive surgery, and the rates are low in general, ranging from 0.05% to 0.25%.[14–17] Our rate of 0.078% similarly falls within the reported range. It must be noted, however, that these rates depend on the duration of follow-up after the laser procedure and the severity of myopia that was treated. In addition, by analyzing the data of patients who returned to SNEC for management only, we were unable to determine the patients, if any, who received surgery for RD post laser refractive surgery at another hospital.

Laser refractive surgery by PRK or LASIK is associated with low incidence of RD development. Retinal detachment is encountered in the natural history of myopia and should be considered an expected event, not entirely consequent to the laser procedure. However, the effect of vacuum suction and acoustic shockwaves of the laser may predispose the older high myopes to a higher risk for PVD and RD. Ophthalmologists who perform refractive surgery need to have a higher index of suspicion for RD when these patients are past 40 years of age and have a higher degree of myopia.

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Coma-like wavefront artifact induced by a posterior staphyloma and high refractive error

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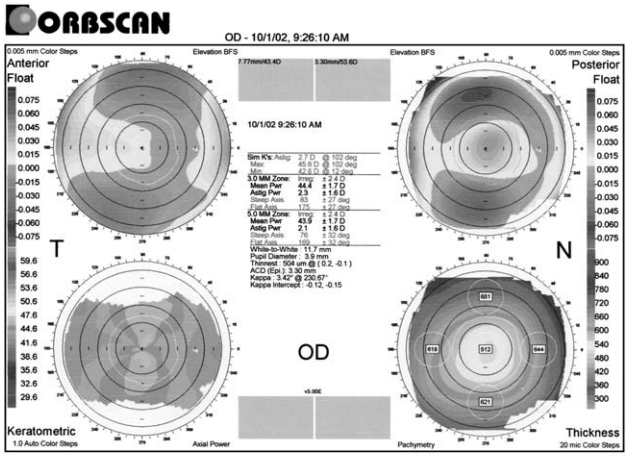
Wavefront aberrations are known to be induced from anterior segment pathologies and structures. Patients with keratoconus[1] or pellucid marginal degeneration[2] may show increases in coma aberration. Nuclear cataracts can induce spherical and tetrafoil aberrations, and cortical cataracts may result in coma and tetrafoil aberrations.[3,4] We present a patient in which a posterior staphyloma and high refractive error induced a coma-like wavefront artifact.

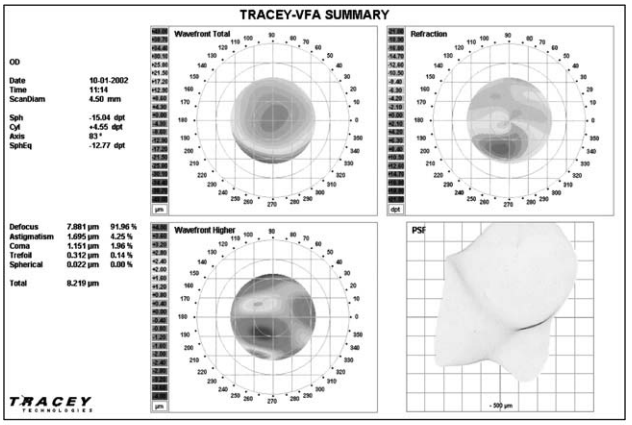
CASE REPORT

A 40-year-old man was self-referred for poor vision in his right eye for the past 3 to 4 years. His best spectacle-corrected visual acuity was $20/25^+$ in the right eye and $20/20^+$ in the left eye, with manifest refractions of $-12.75 + 3.00 \times 076$ and $-3.50 + 3.00 \times 084$, respectively. Placement of a rigid, gas-permeable contact lens did not improve visual acuity in the right eye. Manual keratometry was normal bilaterally with nondistorted mires.

Slitlamp biomicroscopy demonstrated a normal tear film and anterior segment examination bilaterally. Specifically absent were signs of corneal ectasia or lenticular opacities. Dilated funduscopic examination revealed a posterior staphyloma involving the macula of the right eye with associated retinal pigment atrophy. The left funduscopic examination was normal. Axial lengths (IOLMaster, Carl Zeiss Meditec AG) measured 27.39 mm in the right eye and 23.25 mm in the left eye, and B-scan echography confirmed the posterior staphyloma of the right eye.



A



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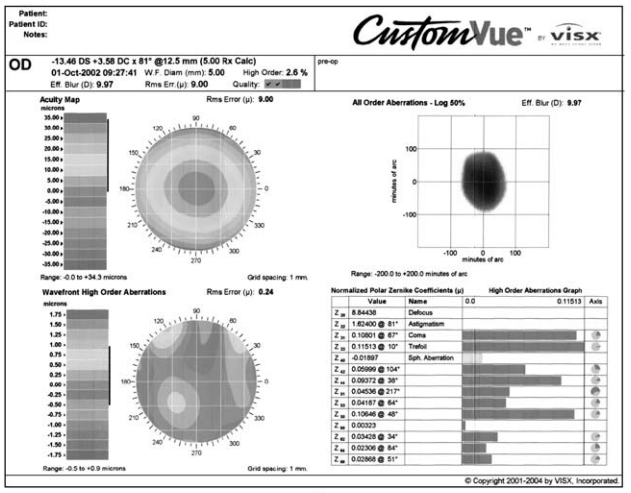

C

Figure 1. *A*: Corneal topography (Orbscan IIz) shows no signs of corneal ectasia in the right eye. *B*: Ray-tracing wavefront analysis (Tracey VFA) shows markedly higher comalike aberrations in the right eye. *C*: Hartmann-Shack wavefront analysis (VISX Wavescan) does not detect abnormal amounts of coma aberration in the right eye.

Corneal topographic examination was normal bilaterally by both Orbscan IIz (Bausch & Lomb, Inc.) (Figure 1, *A*) and Zeiss Humphrey Atlas (Carl Zeiss Meditec AG). Wavefront analysis with a ray-tracing device (Tracey VFA, Tracey Technologies, LLC) showed increased coma aberration of the right eye (1.151 µm) (Figure 1, *B*) relative to the left eye (0.128 µm). Other higher-order aberrations were similar between the 2 eyes. A Hartmann-Shack device (VISX Wavescan) did not detect higher levels of coma aberration (Figure 1, *C*).

DISCUSSION

In the evaluation of wavefront data, a typical assumption is that the reported optical aberrations are a consequence of the tear film and anterior segment structures. In this patient, who had a normal anterior segment and topographic examination, asymmetric comalike artifact was identified due to a unilateral posterior staphyloma located in the macula of the right eye.

Many wavefront measurement devices depend on reflected light from the retina and assess the outgoing wavefront.[5] In this case, the ray-tracing device sequentially displaces a scanning beam parallel to the visual axis. An imaging system focused on the retinal plane measures the lateral deviation of each point from its predicted location in an aberration-free eye (ie, the foveal pit). The software that converts this information to wavefront inclination assumes a normal retinal geometry. With asymmetric retinal geometry, as in this case, the incoming scanning beam traverses a longer course in certain aspects and is interpreted as a wavefront error. This effect is compounded by the high refractive error and could theoretically be diminished by placing a highly myopic trial lens or contact lens in front of the eye during measurement. The Hartmann-Shack device, which functions on a different principle, did not produce the same artifact. It is possible that other retinal structural abnormalities that alter the position of reflected or imaged light, such as macular edema, subretinal fluid, choroidal neovascularization, and pigment epithelial detachments, could also create measurable artifacts.

In summary, we report a case in which aberrant retinal geometry combined with high refractive error to interfere with the wavefront measurement by a ray-tracing device. This case illustrates the importance of a careful ophthalmic, and especially funduscopic, examination in the presence of unexpected wavefront error.

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