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Traumatic Epithelial Downgrowth After Radial Keratotomy

Ajit Nemi, MD^{1,2}, Rosanna P. Bahadur, MD³, and J. Bradley Randleman, MD^{1,2}

¹Emory University Department of Ophthalmology, Atlanta, Georgia.

²Emory Vision, Atlanta, Georgia.

³Advanced Vision, Atlanta, Georgia.

Abstract

A 40 year-old Caucasian male, status post radial keratotomy OU in 1993, suffered pain, extreme photophobia, and mild loss of uncorrected visual acuity in the right eye after being struck by a nail. The patient presented with a small deep stromal lesion and was initially treated with a variety of antibiotic regimens without improvement in the lesion's appearance. Upon referral the patient had confocal microscopy performed, which clearly demonstrated epithelial cells in the deep stroma and on the endothelial surface. Upon cessation of all medications the patient's mild symptoms resolved, and his clinical appearance has remained stable without intervention for 9 months. Patients with radial keratotomy incisions are at risk for traumatic epithelial downgrowth even many years after surgery. Confocal microscopy can make the definitive diagnosis of epithelial downgrowth. Management of this condition remains controversial.

Keywords

radial keratotomy; epithelial downgrowth; refractive surgery; confocal microscopy

Prior to the advent of excimer laser surgery, radial keratotomy (RK) was the most widely utilized refractive surgical method for the correction of myopia in the US.¹ This technique required deep radial incisions that were vulnerable to rupture if exposed to trauma.^{2, 3} We report a case of traumatic epithelial cell implantation onto the endothelial surface that likely occurred many years after RK.

CASE REPORT

A 40 year-old Caucasian male, status post bilateral radial keratotomy in 1993, presented with pain, extreme photophobia, and mild loss of uncorrected visual acuity in the right eye after being struck by a nail. He did not report any sensation of fluid leakage from his eye at the time of injury. He was initially treated with broad spectrum antibiotic drops. One week after injury, he was seen by a second ophthalmologist who noted corneal edema and a corneal infiltrate paracentrally in conjunction with the 8 o'clock RK incision. Bacterial

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Address for correspondence or reprints: J. Bradley Randleman, MD, 1365 B Clifton Road NE, Suite 4500, Atlanta, GA 30322, Jrandle@emory.edu.

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cultures were performed and treatment was initiated with gatifloxacin (Zymar, Allergan Inc., Irvine, CA), and prednisolone acetate 1% four times daily. Three weeks after injury, the patient's symptoms and clinical findings were unchanged and fungal cultures were taken. Medications were changed to fortified vancomycin, fortified tobramycin, and Natacyn. Six weeks after injury, the patient reported worsening redness and photophobia. He admitted to recent use of a hot tub, so polyhexamethylene biguanide (PHMB) was added to his treatment regimen.

Three months after the initial injury, the patient was referred to Emory Eye Center for evaluation. On examination, uncorrected visual acuity was 20/25 in the right eye and 20/20 in the left eye. Slit lamp examination revealed 1+ conjunctival injection OD and discrete anterior and posterior stromal opacities along the 8 o'clock RK incision OD [Figure 1]. The anterior chamber was deep and quiet in both eyes. The rest of the examination was unremarkable. Confocal microscopy revealed a small patch of hyperreflective nuclei overlying the endothelium [Figure 2]. No cysts or hyphae were noted. The confocal findings were conclusive for the diagnosis of epithelial downgrowth.

The patient was taken off all his ocular medications and has been followed closely over the past nine months. The redness and photophobia resolved after cessation of his medicated drops and his uncorrected visual acuity remained stable. After discussion of treatment options, including observation vs. 5-fluorouracil (5-FU) anterior chamber injection, the patient has elected close observation without intervention at this time.

DISCUSSION

Epithelial downgrowth after radial keratotomy is rare but can occur if deep radial incisions splay open during trauma. In this case epithelial downgrowth may have occurred at the time of initial surgery, but most likely resulted from a microperforation with implantation of epithelial cells from a pre-existing epithelial plug in the incision site that rapidly self-sealed. Usually traumatic wound ruptures present as open globes, and this unusual presentation confounded the initial diagnosis.

Presumed epithelial downgrowth, in the form of inclusion cysts, has been rarely reported after radial keratotomy.⁴⁻⁷ To our knowledge, none of these cases presented immediately following blunt trauma, and none had definitive diagnosis of the nature of the cyst.

Confocal microscopy allows for noninvasive in vivo microscopic imaging of the cornea.^{8, 9} Confocal microscopy has been used to diagnose presumed epithelial downgrowth in a case where specular microscopy was prevented secondary to corneal edema.¹⁰ This modality allows for imaging of all layers of the cornea and has advantages over more invasive methods, such as argon laser photocoagulation or aqueous aspirate cytopathologic analysis. Argon laser photocoagulation can only be used to confirm the diagnosis in cases with iris involvement and aqueous aspirates may be falsely devoid of epithelial cells.

The confocal microscopic appearance of epithelial downgrowth shares some similar features with iridocorneal epithelial (ICE) syndrome^{11, 12}; however, the two entities can be distinguished not only by clinical presentation but also by some unique confocal features. In ICE syndrome the "epithelial-like" cells are actually abnormal, transformed endothelial cells,^{11, 12} while, as in this case, in epithelial downgrowth the actual epithelial cells can be distinguished from the underlying endothelium.^{10, 13}

Management of epithelial downgrowth remains controversial. Asymptomatic patients with unimpaired visual acuity may be observed closely over time. Anterior chamber injection of 5-FU has been described in a case of extensive epithelial ingrowth after trauma and

penetrating keratoplasty with complete disappearance and no recurrence.¹¹ Cases with extensive corneal involvement refractory to other treatment modalities may benefit from penetrating keratoplasty.

In conclusion, patients with radial keratotomy are at lifelong risk for traumatic wound rupture. If the wound rapidly self-seals then the patient will not present as a globe rupture; however, in these cases epithelial downgrowth may occur. In these cases epithelial downgrowth can be non-invasively diagnosed utilizing confocal microscopy.

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Biography

Dr. Nemi is now in Private Practice in Las Vegas, NV

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Figure 1. Right eye. Slit Beam photo showing paracentral deep corneal opacification surrounding old radial keratotomy incision. The extent of the lesion can be better appreciated at higher magnification (insert).

Figure 2.
Confocal microscopy of the right eye exhibits scattered hyper-reflective nuclei layered on the normal corneal endothelium consistent with epithelial cells.