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Superficial keratectomy for Salzmann nodular degeneration following laser in situ keratomileusis

Salzmann nodular degeneration is a slow progressive condition characterized by the presence of gray-white nodules anterior to Bowman's membrane on the cornea.[1] It usually affects Caucasian females in their 70s, particularly in patients with prolonged ocular surface inflammation, history of phlyctenular keratitis, vernal keratoconjunctivitis, trachoma, trauma, or previous ocular surgeries.[1-2] With the increasing popularity of LASIK and photorefractive keratectomy, a surprising number of early-onset Salzmann nodules beginning in patients' 40s have appeared in routine clinical practice.[2-5] While many responded with ocular lubrication and lid hygiene management, the disease progresses despite treatment in a small fraction of patients.[6] This case series reports successful surgical management (superficial keratectomy) of 3 cases of early-onset Salzmann nodules involving the LASIK flap edge.

Case 1

A 48-year-old female who underwent microkeratome-assisted LASIK in 1994 presented in 2005 with eye pain and dryness, along with worsening "white growth" on both corneas. A slit-lamp examination revealed Salzmann nodules bilaterally. From 2005 to 2014, despite aggressive ocular lubrication, the patient's corneal nodules expanded. Her uncorrected distance visual acuity (UDVA) was 20/40 in the right eye and 20/50 in the left eye. Corrected distance visual acuity (CDVA) was 20/20 with a refraction of -1.25 +2.75 at 105 in the right and -1.25 +2.75 at 80 in the left. A slit-lamp examination revealed Salzmann nodules bilaterally at 2−4 o'clock and 9−11 o'clock along the LASIK flap margins with scarring (Figs. 1A,1B). Corneal topography showed irregular astigmatism with keratometry of 42.5/34.5 at 106 in the right eye and 41.69/33.93 at 83 in the left.

Superficial keratectomy was performed in 2 sessions for each eye, temporally and then nasally, due to the extensive scaring. Patient was postoperatively managed with 1 week of topical antibiotics and steroids. Two months after superficial keratectomy, the patient's UDVA was 20/25 in the right and 20/30 in the left. Manifest refraction was -1.00 sphere, 20/20 CDVA in the right eye and -0.5, +0.75 at 90, 20/25 CDVA in the left. A slit-lamp exam revealed no elevated nodules, mild punctate epitheliopathy with superficial stromal scarring in both eyes. Corneal astigmatism significantly improved with keratometry reading of 42.1/39.41 at 89 in the right and 41.12/38.53 at 94 in the left.

At 2-year follow-up, she demonstrated stable CDVA of 20/20 in both eyes with the same refraction. Corneal topography and a slit-lamp exam remained unchanged. Anterior segment ocular coherence tomography (AS-OCT) confirmed no recurrence.

Case 2

A 46-year-old male who underwent successful microkeratome-assisted LASIK in 1997 followed by enhancements in both eyes, complicated by corneal ectasia of the left eye, presented in 2016 complaining of blurry vision in the left eye. UDVA was 20/50 in the left eye, CDVA was 20/20 with a refraction of -1.5 +1.75 at 180. A slit-lamp exam was remarkable for a single Salzmann nodule at 10 o'clock on the edge of LASIK flap in the left eye (Fig. 1C). AS-OCT revealed isolated corneal scarring above fragmented Bowman's layer (Fig. 1D). Corneal topography read 40.47/36.91 at 027.

Superficial keratectomy was performed on the left eye with one week of post-operative antibiotic-steroid regimen. One month later, the patient's UDVA was 20/30 and CDVA to 20/20 with manifest refraction of -1.00 +1.00 at180. A slit lamp examination showed a faint stromal flat scar with no punctate epitheliopathy. Corneal topography of the left eye showed improvement of corneal astigmatism and keratometry readings of 40.25/39.3 at 122.

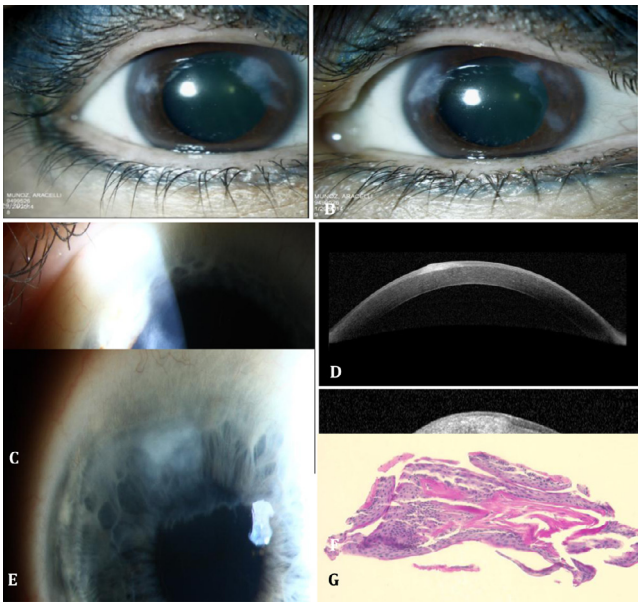

Fig. 1—A. Extensive Salzmann nodules from 2–4 o'clock and 9–10 o'clock of right eye in Case 1. B. Extensive Salzmann nodules from 2–4 o'clock and 9–11 o'clock of left eye in Case 1. C. Single Salzmann nodule at 10 o'clock of left eye in Case 2. D. Anterior segment OCT showing Salzmann nodule above Bowman's membrane in Case 2. E. Extensive Salzmann nodule from 10–2 o'clock with denser stromal opacification of right eye in Case 3. F. Anterior segment OCT showing Salzmann nodule above Bowman's membrane in Case 3. G. Mucosal epithelium with subjacent fibrocellular material consistent with Salzmann nodular degeneration in Case 3.

Case 3

A 48-year-old female who underwent microkeratome assisted LASIK in 2002 presented in 2008 with constant eye burning and "whitish growth." A slit-lamp examination showed central LASIK flap position, superior opacity from 10 to 1 o'clock, along with pannus and pinguecula in both eyes. The patient was managed with aggressive ocular lubrication for the next 8 years, but her Salzmann nodules progressed.

Immediately prior to superficial keratectomy in 2016, the patient's UDVA was 20/70 on the right and CDVA was 20/20 with a refraction of +1.00 +3.50 at 10. A slit-lamp examination revealed Salzmann nodules bilaterally at 10–2 o'clock on the right and 12–3 o'clock on the left along the LASIK flap edges, with denser stromal opacification on the right (Fig. 1E). Corneal topography revealed irregular corneal astigmatism (right greater than left) with keratometry readings of 43.69/38.32 at 011 on the right. AS-OCT showed more severe hyper-reflective changes in LASIK flaps on the right (Fig. 1F).

Superficial keratectomy was performed on the right eye with one week of post-operative antibiotic plus steroid regimen. Pathology results showed mucosal epithelium and fibrous issue, consistent with Salzmann nodular changes (Fig. 1G). One month after superficial keratectomy, UDVA was 20/30 and CDVA was 20/20 with a manifest refraction of +1.25 +1.0 at 180. A slit lamp examination revealed a well apposed LASIK flap with no elevated nodules. Corneal topography of the right eye improved to 44.07/41.18 at 10.

Discussion

To date, there have been 5 cases of Salzmann degeneration after LASIK procedures described in the literature. Four cases were treated conservatively with artificial tears, topical cyclosporine 0.05%, punctal plugs, and loteprednol.[2-4] Only 1, reported by Stem et al, was treated with superficial keratectomy, because the nodule showed extensive involvement around the entire flap circumference.[6] Similarly, the 3 treatment-resistant cases in this report had symptomatic resolution and vision restoration to 20/20 by 1 month after superficial keratectomy. With standard post-operative treatment of antibiotics and topical steroids, no post-procedural complications were reported. The patients in Case 1 and Case 3 had more extensive nodules and higher levels of irregular astigmatism than all previously reported cases, +8 and +5 cylinder diopters respectively, and yet both patients recovered with much reduced astigmatism after superficial keratectomy. At 2-year follow-up, Case 1 demonstrated stable vision with no signs of recurrence, a reassuring sign of lasting efficacy.

Conclusion

Based on this case series and previous publications, the development of Salzmann nodules following LASIK procedures may not be as uncommon as previously understood. Although early asymptomatic cases with mild involvement may be managed medically, this report shows that cases with more extensive flap involvement or severe irregular

corneal astigmatism may be more effectively managed with superficial keratectomy.

Disclosure: K.E. Donaldson is a consultant for Alcon, Allergan, Abbott Medical Optics, Omeros, TearLab, SUN, Shire.

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Descemet membrane endothelial keratoplasty for epithelial downgrowth after cataract surgery

Epithelial downgrowth after intraocular surgery is a rare and difficut entity to treat. Definitive treatment modalities are controversial but often require surgical intervention for debulking of epithelial tissue burden.[1] Surgical challenges in these cases relate to the presence of extensive peripheral anterior synechiae (PAS), narrow anterior chamber, pupillary irregularities, underlying glaucoma, and a high recurrence rate after treatment.

Few reports exist in the literature on the treatment of epithelial downgrowth with endothelial keratoplasty.[2–4] Given the complexity of these cases, most surgeons opt for Descemet stripping automated endothelial keratoplasty (DSAEK). Descemet membrane endothelial keratoplasty (DMEK) is generally considered to be more technically challenging with a higher incidence of intraoperative complications.[5] Tissue handling is very delicate and unfolding the scrolled graft can be tedious in complex cases.

In this case report, we report a case of epithelial downgrowth after cataract extraction successfully treated with DMEK surgery.

Case Report

A 79-year-old diabetic male presented to our clinic with ocular irritation and progressively decreased vision in the left eye for the past year. The patient had undergone uneventful phacoemulsification surgery in this eye 1 year ago. He was not known for any other past ocular history and denied any recent history of ocular or facial trauma. His best-corrected visual acuity (BCVA) was 20/80, and his intraocular pressure (IOP) was 3 mm Hg. Slit lamp examination revealed a Seidel positive main corneal wound from cataract surgery. A white retrocorneal membrane was noted on the temporal posterior cornea, originating from the corneal wound and extending to the pupillary margin, forming an ectropion uveae and secondary corectopia. His anterior chamber was quiet. There was presence of PAS peripherally over 40 degrees. A clinical diagnosis of epithelial downgrowth postcataract surgery was made. The patient was started on topical moxifloxacin 4 times a day and was booked for surgery the following day.

In the operating room, a goniosynechialysis was performed to break PAS. This was followed by a descemetorhexis to remove epithelial disease from the posterior aspect of the cornea. Intraoperative argon laser photocoagulation (250 μm spot diameter, 150 mW power, and 200 ms duration) was then applied to the membrane that was covering the iris surface and iridocorneal angle. A whitening response of the membrane after laser application was noted, confirming the diagnosis of epithelial downgrowth. Several shots were carried out on the membrane at the level of the cornea and on the anterior iris in order to decrease ectopic epithelial cell burden. Intracameral 5-fluorouracil (5-FU) (750 ug/0.15 mL) was then injected into the anterior chamber. After 15 minutes, the anterior chamber was rinsed with Balanced Salt Solution (Alcon Laboratories Inc, Fort Worth, Texas). DMEK was then performed similar to what has been previously described in the literature.[6] The graft was prestripped and marked with an "S" by the local eye bank (Hema-Quebec, Montreal, Que.). No inferior iridotomy was performed in this case. The leaky corneal incision was closed with cyanoacrylate glue after several sutures failed to close it adequately. All surgical wounds were verified to be water-tight at the end of surgery.

On postoperative day 2, the patient underwent rebubbling with intracameral injection of SF6 for partial graft detachment. At 4 months postoperatively, his BCVA had improved to 20/40. IOP was within normal limits at all postoperative