

SUPERFICIAL KERATECTOMY: A VERSATILE IN-OFFICE PROCEDURE



Patient education, prompt referral, and careful comanagement are keys to success with this approach.

BY REBECCA BRAUNSDORF, OD, AND SARAH BELL, OD

Superficial keratectomy (SK) is a surgical procedure that can be performed in-office by a corneal specialist or, in some states, an optometrist, to treat a variety of ocular surface and anterior corneal pathologies when medical management is inadequate. Outcomes include improved vision, reduced irregular astigmatism, prevention of progressive scarring, improved ocular surface integrity, and improved keratometry for refraction or planning cataract surgery.

Before scheduling patients for this treatment, it is important to set them up for success by educating them on the procedure, its use in the

treatment of concurrent disease, and potential postoperative outcomes.

INDICATIONS AND VARIATIONS

SK involves removing the most anterior layer of the cornea, the epithelial tissue, without disrupting Bowman layer (Figure 1).¹ Commonly, a diamond-tip burr is used after epithelium removal to polish Bowman layer, creating a surface on which hemidesmosomes can better anchor to the basal epithelium.¹ The procedure can be performed at the slit lamp. Patients with severe blepharitis, collarettes, or heavy makeup are best pre-treated with eyelid wipes infused

with tea tree oil or hypochlorous acid. After the patient's eye has been numbed (we prefer using 0.5% tetracaine drops or 1% lidocaine gel), a lid speculum is used to keep the eyelids open and reduce contamination of the ocular surface. The condition being treated will determine the next step in the procedure. Below are some common conditions for which SK is indicated, distinguishing differences in each conditions' protocols.

Anterior Basement Membrane Dystrophy

The most common corneal dystrophy, anterior basement membrane

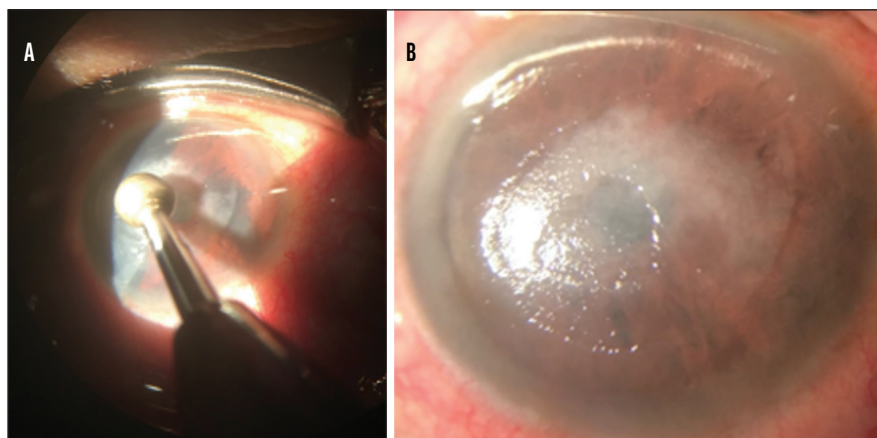
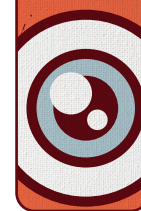


Figure 1. SK can be accomplished with a diamond tip burr (A). Post-procedure, some patients may experience residual anterior stromal scarring (B).

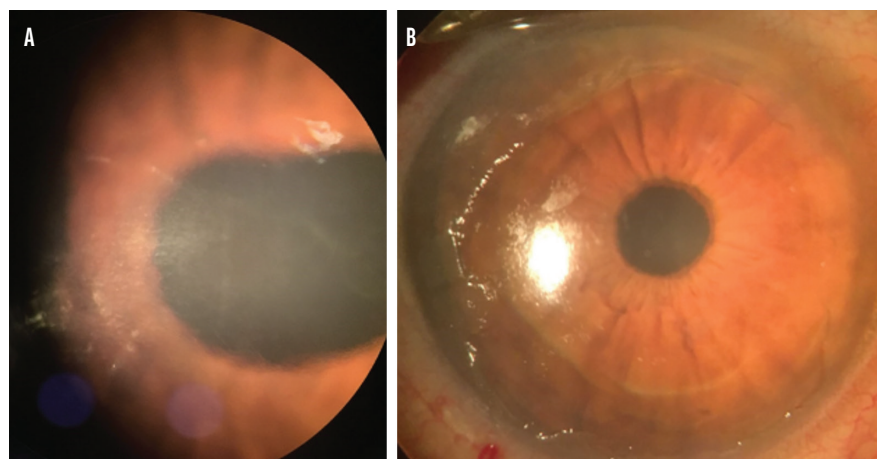


Figure 2. For patients with ABMD (A), consider referring for SK (B).

dystrophy (ABMD), is an autosomal dominant condition that affects 2% to 3% of the population.⁶ ABMD is

characterized by irregular thickening of the basement membrane and subsequent hemidesmosome damage,

leading to an irregular anterior corneal surface with microscopic elevations and depressions (Figure 2).^{6,7} ABMD is associated with recurrent corneal erosions (RCEs) in 19% to 29% of patients (Figure 3).⁸ The most common cause of an RCE is a history of trauma that mechanically abrades the corneal epithelial tissue (45% to 64%).⁹ In our clinic, severe dry eye and nocturnal exposure are underrecognized triggers of RCE. The weakened epithelial basement membrane adhesions allow epithelial tissue to be easily debrided during SK with a sterile sponge or cotton-tipped applicator.

Salzman Nodules

Elevated gray or whitish lesions, called Salzman nodules, overly a damaged area of Bowman layer (Figure 4).⁹ They occur primarily in the midperipheral and peripheral corneal tissues, often with adjacent lactoferrin deposition, indicating chronic inflammation.^{2,9} They may be caused by prolonged ocular surface disease (OSD), resulting in mechanical friction, contact lens wear, or previous surgeries.² For removal of a Salzman nodule, 0.12 or diamond-dusted jeweler forceps are used to dissect down to Bowman layer adjacent to the nodule. Dissection is then carried across Bowman layer to find the plane under the nodule and peel it off the corneal surface. Clinicians should avoid dissecting directly down through the nodule or sharp dissection with a blade because it is easy to pass through Bowman layer into stroma and remove too much tissue. Poor technique can result in excessive corneal thinning and scarring.

Band Keratopathy

Band keratopathy is a chronic degeneration of the corneal tissues characterized by whitish-gray opacities formed from calcium deposits in the subepithelium, Bowman layer,

AT A GLANCE

- ▶ Set your patients up for success with superficial keratectomy (SK) by educating them on the procedure, its use in the treatment of concurrent disease, and postoperative outcomes.
- ▶ There are few complications following SK, making it a relatively safe minor surgical procedure.
- ▶ Reduce postoperative complications by pre-treating underlying ocular surface disease to avoid delayed healing times, infection, anterior stromal haze, and untimely recurrence of the condition.

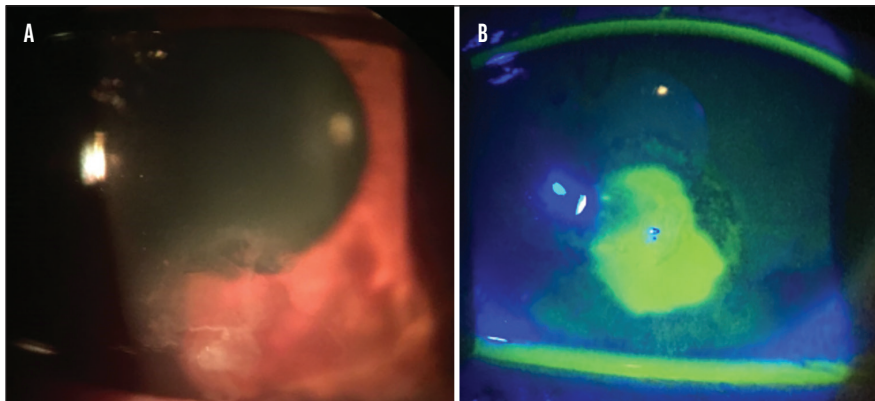
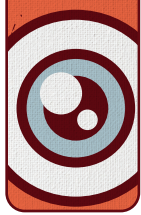


Figure 3. RCEs, seen here without (A) and with fluorescein dye (B), are a common finding with ABMD.

and the most anterior layer of the stroma (Figure 5).³ These deposits are mostly found in the intrapalpebral zone growing from the periphery to the central cornea.³

To treat band keratopathy, a Weck-cel surgical sponge (BVI) or diamond-tip burr can be used to gently debride the overlying loose epithelium. Calcium removal is facilitated by continuously placing fresh ethylenediaminetetraacetic acid on the surface to chelate with the calcium and remove it from the epithelium. Occasionally, patients may have concomitant corneal scarring that would benefit from gentle diamond-tip burr polishing (Figure 6).³

Once the cornea is clear, a bandage contact lens is placed, and the patient is prescribed postoperative antibiotics and NSAIDs. An NSAID is used in the

first 5 days to decrease surface inflammation that is upregulated by matrix metalloproteinase-9 (MMP-9), a substrate activated during corneal wound healing. Topical NSAIDs are also effective at controlling postoperative pain, eliminating the need to prescribe oral narcotics. For protection against infection, a broad-spectrum antibiotic drop is administered four times daily for 2 weeks.

Postoperatively, regardless of the underlying condition, the patient will wear the bandage contact lens for 2 weeks to allow complete healing of the epithelium and for hemidesmosome attachments to form in the final phase of epithelial wound healing.⁵ During corneal healing, migration of squamous and wing cells may take 24 to 48 hours to create an intact corneal surface, but

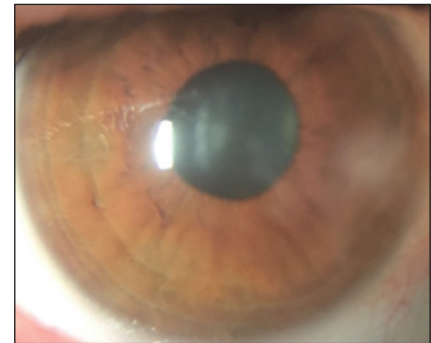


Figure 4. Nasal Salzmann nodules such as the one pictured here can be removed during an in-office SK procedure.

tight junction and hemidesmosome attachments may take 4 to 6 weeks.⁴ Most patients will be healed at 2 weeks and should continue artificial tears four times daily for another 2 to 4 weeks until healing is complete. After the lens is removed they start the artificial tears. Patients with more severe OSD may require serial bandage contact lenses for 6 to 8 weeks to allow complete healing.

COMPLICATIONS

There are few complications following SK, making it a relatively safe minor surgical procedure. One common complication is a poorly fitting bandage contact lens. A tight or excessively loose contact lens may cause redness, tearing, pain, and photophobia, either from oxygen deprivation (tight lens) or an unstable surface for reepithelization (loose lens). This may be difficult to differentiate from normal postoperative symptoms. The

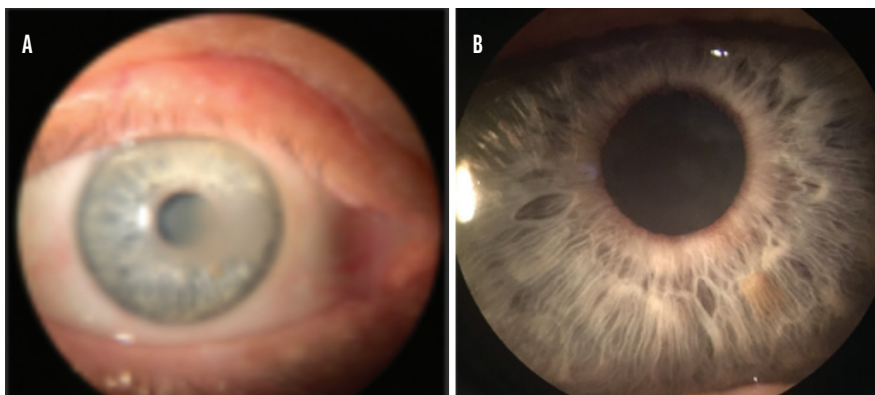


Figure 5. Patients with band keratopathy (A) may do well with the SK procedure (B).

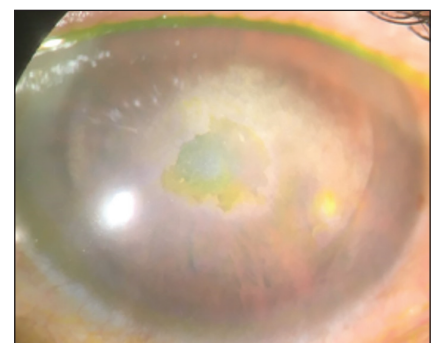
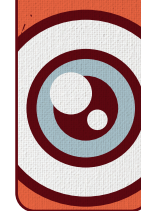


Figure 6. Patients with band keratopathy may present with anterior stromal scarring before SK.



“WHEN TOPICAL AND MEDICAL TREATMENTS ARE NOT ABLE TO CONTROL THE SIGNS AND SYMPTOMS OF ABMD, RCEs, BAND KERATOPATHY, OR SALZMAN NODULES, IT IS IMPORTANT TO MAKE A TIMELY REFERRAL FOR SK.”

contact lens may fit differently during the healing period, as the conjunctival tissues fluctuate with varying amounts of inflammation and chemosis. Empirically over time, we have found that a bandage contact lens with a base curve of 8.5 mm or 8.6 mm is a good starting point and rarely causes tight contact lens syndrome.

A more serious, but less common complication is a corneal infiltrate or ulcer. If this occurs, the lesion should be cultured and treated aggressively with antibiotics with broad-spectrum coverage, including fortified antibiotics. Monocular patients or those who may not be able to properly voice postoperative concerns should be examined every few days until healed to rule out the presence of a corneal infiltrate or ulcer.

Underlying disease may also complicate epithelial healing. In our experience, delayed wound healing may result in patients with a history of herpetic eye disease, limbal stem cell deficiency, and endothelial dystrophies. It is important that these patients are educated on the potential for prolonged healing times, up to several months, and exacerbation of their underlying disease.

THE OPTOMETRIST'S ROLE

Patient education is one of our primary responsibilities; we must discuss with patients the steps of SK to prepare them and build trust between all parties involved. Many patients mistakenly believe SK to be a painful procedure, which can delay their care, and proper reassurance is important in allaying patient anxiety.

Patients need to be aware of the 2-week postoperative healing time, as they will experience blurry vision and mild discomfort following SK. Some patients may require an updated spectacle prescription after SK, and they should know this beforehand. SK is not a curative treatment, and patients must understand that they may need retreatment. Although SK is an effective treatment to improve vision and comfort of the eye, treatment efficacy is dependent on the condition, severity, and health of the ocular surface.

We can reduce postoperative complications by pre-treating any underlying OSD to avoid delayed healing times, infection, anterior stromal haze, and untimely recurrence of the condition being treated. Stabilizing the ocular surface prior to SK with

treatments such as punctual plugs, intense pulsed light therapy, a short course of low-dose doxycycline, or lid hygiene regimens will improve short- and long-term outcomes of this procedure.

CLINICAL PEARLS

When topical and medical treatments are not able to control the signs and symptoms of ABMD, RCEs, band keratopathy, or Salzmann nodules, it is important to make a timely referral for SK. Prepare your patient by educating them on the steps of the procedure, treat their OSD to maximize outcomes, and manage their expectations for the postoperative period. Be prepared to treat any complications that may arise, including tight contact lens syndrome and sight-threatening ulcers. Overall, SK can play a vital role in your patient's care. ■

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