

## REVERSING THE BREAK POINT: MANAGEMENT OF OCULAR SURFACE AFTER ANTERIOR SEGMENT SURGERIES

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### ABSTRACT

#### Background and Objective

Anterior segment surgeries such as trabeculectomies are staple procedures when managing a patient with long-standing glaucoma. However, they also come alongside an increased risk of conjunctival erosion, a complication with its detriments. Erosion can be repaired surgically and topically, yet no standard treatment algorithm guides clinicians on how to deal with this issue.

#### Methods

We present 3 cases in which a treatment algorithm utilizing strategic artificial tear selection successfully managed the ocular surface in patients with postoperative conjunctival erosion.

#### Results

Our evidence suggests the importance of effectively choosing adequate artificial tears to address the underlying issue causing conjunctival erosion. Additionally, this evidence can direct clinical judgment when managing a patient's ocular surface issues. Future research is needed to compare these outcomes against alternative measures for dealing with conjunctival erosions.

*Keywords:* Ocular Surface, Conjunctival Erosion, Anterior Segment Surgery, Treatment Algorithm, Artificial Tears

## INTRODUCTION

There are many examples of anterior segment surgeries, such as bleb-forming procedures, trabeculectomy, stents or shunts, corneal grafts, pterygium excision with or without conjunctival autografts, superficial keratectomy or fixated scleral interocular lens (IOL). However, a severe adverse event of anterior segment surgeries is conjunctiva erosion. The incidence of conjunctiva erosion and exposure to the underlying drainage implant is 2% over a mean follow-up time of 2 years.<sup>1</sup> Patch graft thinning and conjunctival erosion with exposure to the silicone tube is a complication that may occur in the late postoperative period in 2–7% of eyes after glaucoma drainage device implantation.<sup>2–5</sup> As these surgeries are both necessary and practical, clinicians must become comfortable dealing with these postoperative complications. Conjunctiva erosion can lead to exposure to the drainage implant, which might lead to infection and potentially endophthalmitis with subsequent eye loss.<sup>6</sup> Preservative-containing artificial tears have also been shown to aggravate conjunctival erosion. The exposure of the ocular surface to these toxic preservatives decreases the integrity of the epithelial cells, compromising the barrier and further impairing healing after invasive surgery. It also increases conjunctival inflammatory cells while reducing the presence of goblet cells – all factors imperative in maintaining an optimal ocular surface to prevent associated complications with its degradation.<sup>7–8</sup> Considering these factors, a clinician must consider many variables when avoiding severe postoperative complications. A case series has shown that oral doxycycline is a potential non-surgical treatment for conjunctival erosion by inhibiting collagenolysis and restoring Meibomian gland function, thereby preventing tissue breakdown and promoting healing.<sup>9</sup> Further research is needed to validate these findings. Therefore, a simplistic treatment algorithm that achieves superior outcomes in patients suffering from conjunctival erosion is much needed. As this is not well documented, we present 3 cases of patients who achieved excellent outcomes

post valve-implant surgery through a treatment algorithm that includes optimizing the ocular surface of patients using a strategic but simplistic choice of preservative-free lubricating drops.

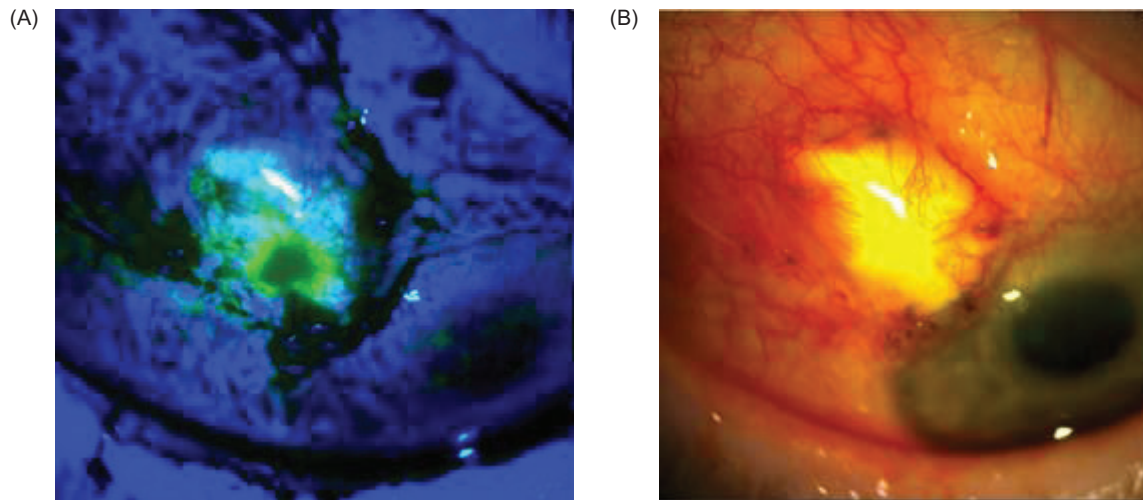
## CASE 1

The patient was an 81-year-old female with advanced pseudoexfoliative glaucoma (PXG). Her Pre-operative intraocular pressure (IOP) were 34 mmHg in the left (OS) eye. To help control pressures, the patient was on: timolol, brimonidine, brinzolamide, bimatoprost, pilocarpine 4%, and acetazolamide 125 mg qAM PO. She received an Ahmed® glaucoma valve and a donor sclera. On postoperative day (POD) 3, her IOP measured 8mm Hg, and was subsequently taken off all her glaucoma medications. However, fluorescein staining demonstrated significant dye uptake in the superior-lateral portion of the operated eye, indicating the presence of damaged conjunctiva (See Figure 1). To improve the rate at which she healed, we attempted to stop her steroid drops and instilled hydraSense® Q2H when awake. Unfortunately, there was no further progress in the repair of her conjunctiva over the next three days. Further alternatives to address this issue include switching artificial tears, add different topical medications or surgical measures such as conjunctival flap or amniotic membrane instillation. We weighed each measure's risks and benefits, and ultimately, opted to change hydraSense® to Thealoz® Duo q1H when awake and Ocunox™ ointment qhs. At the 2-week follow-up, a significant reduction in fluorescein staining was noted, suggesting substantial conjunctival healing (See Figure 2).

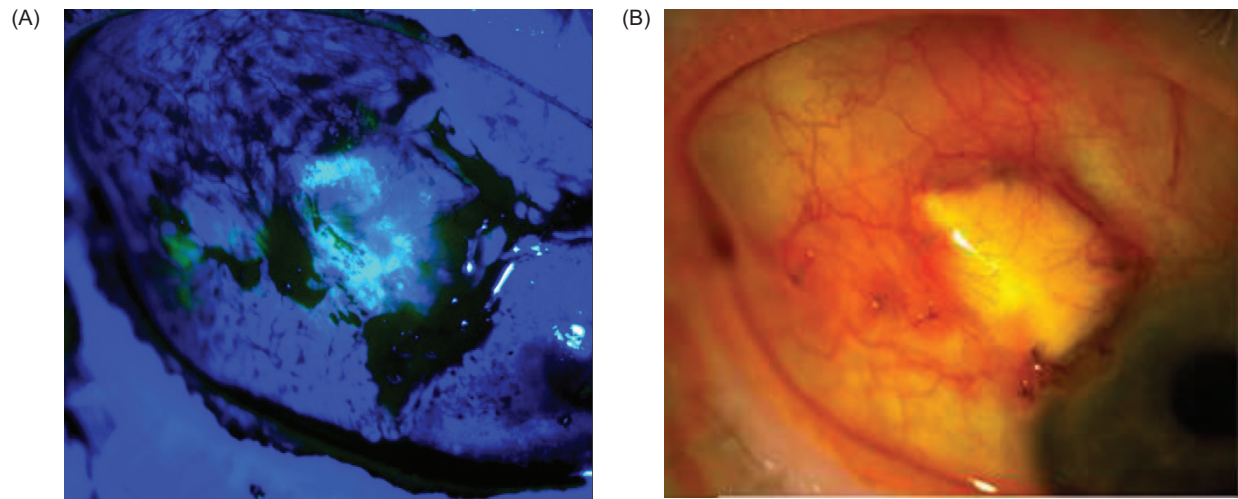
## CASE 2

The patient was an 81-year-old male with advanced primary open-angle glaucoma (POAG). This patient presented to our clinic one-month post tube shunt implant with conjunctival dehiscence of 2 × 2 mm. Additionally, his history included previous trabeculectomy and mitomycin C (Trab-MMC)

**FIG. 1.** Conjunctival damage in the operated eye is shown without (A) and with (B) cobalt blue fluorescence, subsequent to fluorescein administration, prior to the administration of hydration drops.



**FIG. 2.** Reduction in conjunctival damage 2 weeks post administration of Thealoz® Duo and Ocuvox™ ointment; shown with (A) and without (B) cobalt blue fluorescence, subsequent to fluorescein administration.



procedures, suggesting an increased risk of future procedural complications if the conjunctiva could not be healed. Due to our previous success in healing the conjunctiva using artificial tears, we placed the patient on Hylol® – Dual q1H and Ocuvox™ qhs for one week. Unfortunately, follow-up examination indicated no significant healing – as demonstrated

by the ocular surface uptake of fluorescein staining. We switched Hylol® – Dual to Thealoz® Duo q1H. After two weeks, there was still no change, so our final attempt was to switch Thealoz® Duo to Evolve™ Intensive Gel at the same frequency. Follow-up with the patient indicated full recovery of the ocular surface within three weeks.

### CASE 3

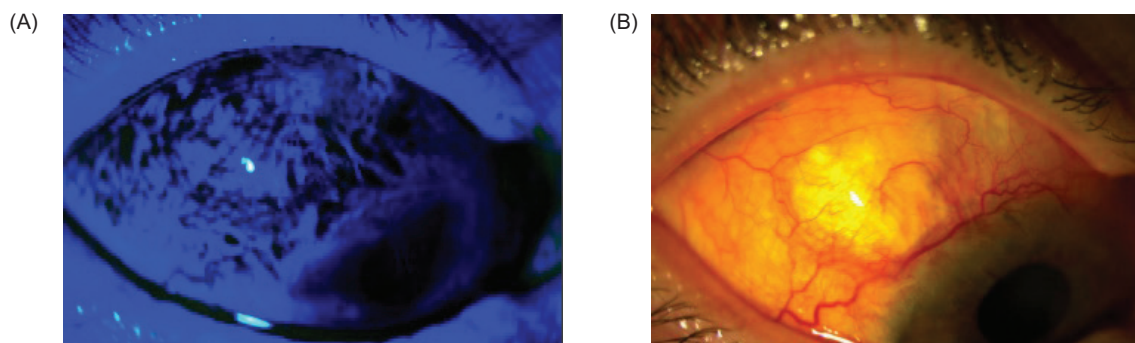
A 68-year-old female presented with advanced PXG in the right (OD) eye. She previously failed with Xen® Glaucoma treatment with MMC, and subsequent attempts to reduce her IOP involved the administration of a tube shunt with a donor sclera. Success in keeping her pressure reduced was limited by a 2mm conjunctival erosion over donor sclera as her vicryl suture was dissolving. As per our previously outlined cases, we initially tried Hylo® – Dual q1H and Ocunox™ ointment qhs, but there was no change after one week. Upon switching from Hylo® – Dual to Thealoz® Duo, the conjunctiva showed a slight improvement with healing, as the erosion reduced to 1.4 mm after one week. However, no further improvement was observed at subsequent follow-ups. To further minimize the size of the lesion, we switched Thealoz® Duo to Evolve™ Intensive Gel. After four months, this slow-healing conjunctival erosion fully resolved, as demonstrated by no fluorescein uptake (Figure 3).

### INTERVENTION RATIONALE

Herein, we will describe the rationale for the three different artificial tears used while attempting to heal the ocular surface. Identical in all cases was the use of Ocunox™ ointment qhs, which contains 250 I/U of retinol palmitate (RP), the most stable

vitamin A derivative<sup>9</sup>. Vitamin A deficiency has been shown to significantly reduce the presence of goblet cells on the ocular surface. We can increase the goblet cell presence within the conjunctiva by regularly instilling RP-containing ointments.<sup>10</sup> The increased presence of these cells allows for sufficient production of mucins, which help lubricate the eye's surface, therefore eliminating the dryness that causes impaired healing of conjunctival lesions.<sup>11</sup> Thealoz® Duo is a dually medicated artificial tear containing 3% trehalose and 0.15% sodium hyaluronate (SH).<sup>12</sup> The rationale behind using this artificial tear for our patients is based on evidence suggesting that SH promotes the adhesion and migration of epithelial cells. This transition is via the CD44 receptor for hyaluronate on the corneal and conjunctival epithelium. By promoting the interaction of cytoskeletal components and proteins of the conjunctiva, SH-containing artificial tears offer a valuable repair method for ocular surface lesions.<sup>13–16</sup> Additionally, trehalose, an osmoprotectant, has been shown to stabilize the lipid bilayer, suppressing apoptosis and the expression of inflammatory and proteolytic metalloproteinase 9. Therefore, Thealoz® Duo simultaneously improves the rate at which the conjunctiva heals while inhibiting its degradation through inflammatory and apoptotic pathways.<sup>13–16</sup> Evolve™ Intensive Gel contains hyaluronate, much like Thealoz® Duo, but also contains a crosslinked carbomer 980 0.2%; a mucoadhesive

**FIG. 3.** Complete resolution of conjunctival erosion 4 months post administration of Evolve™ Intensive Gel; shown with (A) and without (B) cobalt blue fluorescence, subsequent to fluorescein administration.





polymer that acts as a net that holds water within the ocular surface.<sup>17</sup> It also contains glycerol, a polar and hydrophilic molecule that attracts moisture and regulates the surface's osmolarity. These combinations of ingredients in Evolve™ Intensive Gel maximizes physiological moisture on the ocular surface thereby optimizing healing for damaged conjunctival tissue post surgery,<sup>1</sup> giving it some advantages over Thealoz® Duo.

## CONCLUSIONS

The management of IOP in patients with glaucoma can be an overwhelming and complex task. However, this task is only further complicated by issues that arise as damage slowly occurs to the ocular surface of a patient undergoing treatment for this disease. Whether it be due to steroid use, ocular inflammation, or previous trauma due to surgery, conjunctival erosion is an issue that affects almost 2.0 +/- 2.6% of ophthalmologic patients.<sup>1</sup> Optimizing the pre and postoperative ocular surface while avoiding excessive antimetabolite and preservative exposure is crucial to avoid further complications associated with erosion.<sup>3-5</sup> We present 3 cases of patients who benefit significantly from the selective usage of preservative-free artificial tears, which optimize the ocular surface, all with superior outcomes. Additionally, our cases present a treatment algorithm suggesting a reduction of steroids and preservative-containing drops while maximizing lubricants that heal the conjunctiva after various surgical cases. Treatment with a sole preservative-containing artificial tear, such as hydraSense, may be less than optimal for wound healing. We recommend incorporating multiple preservative-free eye drops alongside Ocunox ointment from the beginning. This approach can potentially shorten the time needed to heal wounds and reduce the need for multiple follow-up visits. To our knowledge, the presentation of these patients demonstrates a first-of-its-kind attempt to avoid complications associated with conjunctival erosion through the strategic use of lubricating drops, outlining the

importance of methodical artificial tear choice when reforming a patient with significant damage to their ocular surface. Clinicians should use this evidence when deciding how they feel about best managing their patients' ocular surfaces after similar surgeries. Future research should aim to test the capability of conjunctival healing using artificial tears and compare their outcomes against alternative methods for repairing eroded conjunctivae, such as surgical repair.

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