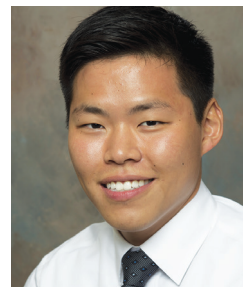


Complications of Cosmetic Eye Whitening

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RESIDENT PEARL

- Cosmetic eye whitening has severe and vision-threatening complications that should be aware to all cosmetic surgeons.

Introduced in 2008 and subsequently popularized in South Korea, cosmetic eye whitening has been offered as a treatment of chronic conjunctival hyperemia. Patients undergo conjunctivectomy with topical mitomycin C (MMC) 0.02% application to achieve a whitened appearance from bleaching of avascular sclera. Much speculation has arisen from this procedure given the limited available evidence on its efficacy and safety. A literature search was performed to review common complications of cosmetic eye whitening, including chronic conjunctival epithelial defects, scleral thinning, avascular zones in the sclera, dry eye syndrome, and diplopia requiring strabismus surgery. Informing the general public of the risks of this procedure is of great importance for dermatologists and other cosmetic surgeons.

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First introduced in 2008 as a surgical treatment of chronic conjunctival injection, cosmetic eye whitening became popularized in South Korea¹ and has been performed in more than 1800 patients in the United States.¹⁻³ Individuals with healthy eyes who elect to undergo this procedure often present with concerns of hyperemia, undesirable ocular pigmentation, or pingueculas. An initial report from Kim⁴ described 571 patients who underwent regional conjunctivectomy for persistent irreversible hyperemic conjunctiva with a 94.6% postoperative

satisfaction rate. In contrast, over the last 5 years, various reported permanent complications raised concerns of the risk-benefit ratio of this cosmetic procedure.

The procedure involves performing a localized conjunctivectomy with or without removal of the Tenon capsule.⁴ Brimonidine tartrate is given for vascular constriction. When conjunctivectomy is performed in the right eye, the medial conjunctiva is incised from the 2-o'clock to 5-o'clock positions and the lateral conjunctiva is incised from the 10-o'clock to 7-o'clock positions. After the conjunctiva and Tenon capsule are excised, hemostasis is achieved with electrocauterization. Postoperative management may consist of topical mitomycin C (MMC) 0.02% 4 times daily for 2 to 5 days along with topical steroids. The addition of bevacizumab 1.25 mg/mL also has been described.⁵

In this report, we provide a comprehensive review of the complications of cosmetic eye whitening based on a review of the literature. Clinicians in both aesthetic practice and ophthalmology should be aware of the potential complications to accurately educate their patients about the possible risks and benefits of this procedure.

Methods

A review of PubMed articles indexed for MEDLINE (January 2009 to July 2017) using the search terms *cosmetic eye whitening*, *cosmetic wide conjunctivectomy*, *I-Brite*, and *chronic hyperemic conjunctiva* was conducted to evaluate the number of reports of complications from cosmetic eye whitening. A total of 10 articles were included in the study based on a review of abstracts. Non-English-language abstracts were not reviewed.

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Results

Based on a review of 10 articles commenting on the complications of cosmetic eye whitening, a total of 2400 patients had undergone a cosmetic conjunctivectomy with various postoperative complications and recurrences (Table).⁴⁻¹³ The most commonly recurring complications based on the reported frequencies in the articles included chronic conjunctival epithelial defects, scleral thinning, calcific plaques, dry eye syndrome, diplopia (sometimes requiring strabismus surgery), and elevated intraocular pressure.

Kim⁴ was the first to report this surgical technique for irreversible hyperemic conjunctiva (N=1815). The reported success rate in South Korea was overwhelmingly high at 94.6%. In a mean (SD) follow-up time of 12.9 (7.8) months (range, 2–27 months), less than 20% of patients required surgical revision. During this time, the most common postoperative complications included elevation in intraocular pressure (17.2%), conjunctival granuloma (8.4%), transient vision decrease (7.5%), pigment deposition (5.3%), scleral calcifications (3.9%), and diplopia secondary to conjunctival adhesions (1.6%). No permanent defects were reported, and complications improved with surgical and medical management.⁴

Contrary to the findings of Kim,⁴ a large number of complications were seen; thus, on March 4, 2011, the Korean Ministry of Health & Welfare issued a declaration to discontinue the procedure under Article 49 of the Medical Service Act. Medical records from the single clinic in Korea from November 2007 to May 2010 were reviewed.⁵ One of the largest reviews of cosmetic eye whitening complications reviewed 1713 patients who underwent conjunctivectomy plus topical MMC with or without bevacizumab injection. Pterygium and chronic conjunctival hyperemia were the most common diagnoses that prompted patients to undergo treatment. Over an average follow-up period of 10.9 months, the overall complication rate was 82.9%, with severe complications being fibrovascular conjunctival proliferation (43.8%), recurrent hyperemic conjunctiva (28.1%), intraocular pressure (13.1%), scleral thinning with calcified plaques (6.2%), scleral thinning (4.4%), and diplopia (3.6%). A total of 56.9% of patients reported being satisfied with the cosmetic outcome of the surgery.⁵

In some of the smaller case series and case reports we reviewed, more vision-threatening complications have been described. Infectious endophthalmitis, infectious scleritis, and necrotizing scleritis have all been reported as complications of cosmetic eye whitening.^{8,10}

Complications of Cosmetic Eye Whitening

Reference (Year)	No. of Patients	Reported Complications ^a
Kim ⁴ (2012)	571	Elevated intraocular pressure, conjunctival granuloma, transient subjective decrease in vision, pigment deposition, scleral calcification, diplopia secondary to conjunctival adhesions
Rhiu et al ⁶ (2012)	44	Chronic corneal epithelial defects, scleral thinning, fibrovascular adhesions, dry eye syndrome, avascular zone, diplopia, need for scleral plaque removal, abnormal vessel growth, scleral thinning requiring conjunctival flap, conjunctival adhesions, need for strabismus surgery, extraocular exposure
Lee et al ⁵ (2013)	1713	Fibrovascular conjunctival proliferation, dry eye syndrome, ocular hyperemia, conjunctival granuloma, ocular discharge, ocular irritation, elevated intraocular pressure, conjunctival pigmentation, calcific plaques, scleral thinning, decreased visual acuity, diplopia, conjunctival adhesions, headache, strabismus, keratitis, glaucoma, scleritis, symblepharon, extraocular muscle adhesion, scleral necrosis
Kwon et al ⁷ (2013)	8	Scleral thinning, calcific plaques, recurrence of scleral thinning after conjunctival flap surgery
Leung et al ⁸ (2013)	1	Necrotizing scleritis, dry eye syndrome
Shin et al ⁹ (2013)	1	Scleral thinning, calcific plaques
Vo et al ¹⁰ (2014)	17	Conjunctival epithelial defect, amniotic membrane graft for reepithelialization, limbal stem cell deficiency, infectious scleritis, diplopia, Tenon capsule scarring, scleral necrosis, infectious endophthalmitis
Moshirfar et al ¹¹ (2015)	1	Scleral thinning, calcific plaques
Jung et al ¹² (2015)	43	Scleromalacia
Saldanha et al ¹³ (2016)	1	Conjunctival epithelial defect, dry eye syndrome, scleral thinning

^aListed in order from most to least frequent.

Comment

The pathophysiology of the complications of cosmetic eye whitening stem from the disruption of the normal conjunctiva, destruction of the vascularization to the sclera, and loss of limbal stem cells. Mitomycin C is a topical antimetabolite antibiotic agent that inhibits DNA synthesis. This relatively safe and inexpensive product has decreased the recurrence rate in pterygium surgery as early as 1963.^{14,15} Complications of MMC in pterygium surgery include infectious scleritis, necrotizing scleritis, calcium formation, and even scleromalacia, occurring at incidence rates as low as 1.4%.¹⁶ These risks are balanced against the medical necessity of using MMC. Given the elective nature of cosmetic eye whitening, these complications in a cosmetic setting may not be justified.

The debate of the use of this procedure continues to occur in ophthalmologic societies. Both the Korean Ministry of Health & Welfare and the American Society of Cataract Refractive Surgery do not condone the use of regional conjunctivectomy for cosmetic eye whitening.^{5,17} Evidence shows that complications from cosmetic conjunctivectomy can be devastating and unnecessary given its elective nature. Although some complications (eg, dry eye syndrome, pain, discomfort) may be considered mild, the number of potentially serious complications brings the usefulness of the procedure into question.

This review is a launchpad to inform the medical community of the potential downside to conjunctivectomy for cosmetic eye whitening with the hope that it can initiate meaningful risk-benefit discussions between providers and physicians.

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