

TASS and Intraocular Ointment

Clinical and laboratory findings show how oil-based ophthalmic drugs may lead to anterior segment inflammation after cataract surgery.

BY LILIANA WERNER, MD, PhD

Several studies have identified substances and toxins that cause toxic anterior segment syndrome (TASS) after phacoemulsification and the implantation of IOLs. This article shares a series of cases in which this inflammatory syndrome was associated with the postoperative use of ophthalmic ointment.

A REVIEW OF THE LITERATURE

The penetration of ointments after ocular surgery is a recognized complication. In 1973, Fraunfelder and Hanna¹ published the results of a survey sent to 400 randomly selected ophthalmologists. Of the 327 responses, 65 (20%) reported seeing ointment trapped in 95 anterior chambers after ocular surgery. Twenty-five of these patients had developed glaucoma or uveitis thought to be a result of the ointment.

In 1999, Garzosi et al² described a patient treated with ophthalmic ointment after RK who later presented with a bubble floating in his anterior chamber. They observed anterior uveitis and elevated IOP in this eye during the early postoperative period as well as at 41 and 61 months after the procedure.

In another case, Aralikatti et al³ observed a white substance in the anterior segment of a patient's eye 1 day after he underwent phacoemulsification through an oblique, self-sealing, clear corneal incision. The researchers assumed the substance they saw overlying the patient's pupil was ointment that had entered the anterior chamber and adhered to the newly implanted IOL. More recently, Riedl et al⁴ described ointment entering the

anterior chamber after cataract surgery through a temporal corneal incision. In this case, the patient was noted to have vitreous and "pieces of cortex" in the anterior chamber 5 weeks after surgery, followed by inflammation and elevated IOP.

The aforementioned cases demonstrate that the penetration of ointment into the anterior chamber may cause toxic complications, a finding confirmed in an experimental study by Scheie et al.⁵ When the investigators injected bases of common ophthalmic ointment into the anterior chambers of rabbits' eyes, they found that the amount of ointment instilled was a major predictor of the severity of the eye's intraocular reaction.

TASS OUTBREAK

Recently, my colleagues and I⁶ analyzed eight cases of TASS that were associated with an oily substance in the anterior chambers of patients treated at the Department of Eye Medicine and Surgery of Hamilton Health Sciences in Hamilton, Ontario, Canada. The substance was later identified as an ointment instilled in the patients' eyes after uneventful phacoemulsification.

A single surgeon had implanted the same three-piece silicone IOL into the eyes of all patients through clear corneal incisions. The procedures took place between May and October 2003.

Solutions and agents used during the procedure included BSS (Alcon Laboratories, Inc., Fort Worth, TX), epinephrine, pilocarpine hydrochloride, Amvisc Plus (Bausch & Lomb,

Rochester, NY), and vancomycin. Postoperative medications included combination gentamicin/betamethasone ophthalmic ointment (Garasone; Schering-Plough, Kenilworth, NJ) and pilocarpine gel. After he applied the ointment, the surgeon attached tight patches to each eye at the end of the procedures.

DETECTION AND TREATMENT

On the first postoperative day, four patients presented with diffuse corneal edema and elevated IOP. Upon examination, the surgeon observed a filmy coating on the corneal epithelium of the eyes within the anterior chambers (Figure 1A). The same material was observed in another eye's anterior chamber, but this patient did not develop corneal edema until the second postoperative week. The three remaining patients developed an oily bubble floating inside their anterior chambers (Figure 1B). The bubble was later found to be ointment coating the IOL.

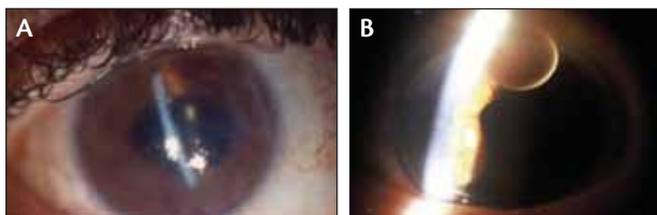


Figure 1. Pictured are slit-lamp clinical photographs taken during the first postoperative week from two of the eight TASS cases. The oily material coated the corneal endothelium and caused edema (A). The material can be seen as a large bubble floating in the anterior chamber (B). (Reprinted with permission from Werner L, Sher JH, Taylor JR, et al. Toxic anterior segment syndrome and possible association with ointment in the anterior chamber following cataract surgery. *J Cataract Refract Surg.* 2006;32:227-235.)

Most of the affected patients needed more than one additional surgical procedure to resolve the complications resulting from TASS. These operations included penetrating keratoplasty, IOL explantation and exchange, aspiration of the oily bubble and polishing of the IOL, vitrectomy and washout of the anterior chamber, trabeculectomy for uncontrolled IOP, and Nd:YAG laser to remove the ointment from the IOL's surface. Table 1 lists the procedures performed on individual patients.

LABORATORY ANALYSIS

To rule out reusable ophthalmic instruments and other factors as the source of the contaminants that caused TASS in the patients from Hamilton Health Sciences, my colleagues and I analyzed the substance retrieved from the surface of six explanted IOLs. Gross examination and light microscopy of two IOLs confirmed there was an oily residue over large areas of the lens' optical surfaces (Figure 2).

Gas chromatography-mass spectrometry (GC-MS) of the remaining four explanted IOLs revealed that the implants' surfaces were covered with a mixed-chain hydrocarbon that was consistent with the topical antibiotic/steroid ointment that was applied to the eyes after surgery.

Under the same experimental conditions, we performed GC-MS on the silicone sleeves used to protect the phaco tips during the autoclaving process as well as on the lidocaine and pilocarpine gel used during or after cataract surgery. The substance did not match the material that we retrieved from the explanted IOLs. We concluded that the ointment applied after cataract surgery was the most likely cause of TASS in these cases.

TABLE 1. INTRAOCULAR OINTMENT AFTER CATARACT SURGERY

| Patients | Clinical Signs | | Additional Surgical Procedures | | | | | |
|----------|--------------------------|---------------------------------|--------------------------------|---------------------------|--------------------------|-------------------------------------|----------------|--------------------------------|
| | Film in Anterior Chamber | Oily Bubble in Anterior Chamber | Penetrating Keratoplasty | IOL Explantation/Exchange | Aspiration/IOL Polishing | Vitrectomy/Anterior Chamber Washout | Trabeculectomy | Nd:YAG on Intraocular Ointment |
| 1 | X | | X | X | | | | |
| 2 | | X | | X | | | | |
| 3 | X | | X | X | | X | | |
| 4 | X | | | X | | | | X |
| 5 | | X | | | X | | | |
| 6 | X | | X | X | | | | |
| 7 | X | | X | X | | X | X | |
| 8 | | X | | | X | | | |

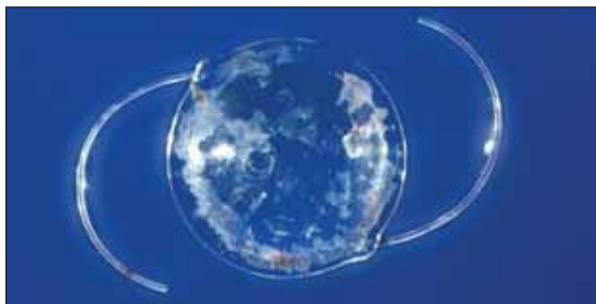


Figure 2. When this IOL was explanted from one of the patients with TASS, large areas of the lens' anterior and posterior surfaces were coated with an oily material.

CLEAR CORNEAL INCISIONS

The mechanism by which ophthalmic ointment entered the anterior chambers of the eight patients reviewed in our study may be related to how the surgeon bandaged their eyes after cataract surgery.

Experimental studies with cadaveric eyes demonstrated that the self-sealing properties of unsutured clear corneal wounds can be compromised by variations in IOP or the application of external pressure.⁷ When IOP measurements were low, the edges of the corneal wound tended to gape. In a retrospective study, Shingleton et al⁸ found that a significant percentage of eyes that underwent clear corneal phacoemulsification had an IOP of 5mmHg or lower 30 minutes after surgery. By patching the patients' eyes tightly after cataract surgery, the surgeon at Hamilton Health Sciences may have created a gaping wound through which the ointment gained access to the anterior chamber. Other postoperative factors, including changes in IOP as well as manipulation of the eye by blinking or rubbing, have also been implicated as compromisers of the clear corneal wound's integrity.

DELAYED ONSET OF TASS

Typically, TASS appears approximately 24 hours after surgery, but my colleagues and I recently analyzed a case in which a patient developed problems related to intraocular ointment much later in the postoperative period.⁹ Eight months after uneventful, bilateral phacoemulsification followed by the implantation of three-piece silicone IOLs, the patient developed recurrent anterior chamber inflammation. At first, the physician suspected the patient's IOLs were unstable and performed two lens positioning procedures 11 and 13 months after the IOLs' initial implantation. Eighteen months after cataract removal (5 months after the last surgical procedure), the patient presented with a greasy film on his IOL. His doctor initiated anti-inflammatory and antibiotic treatment, but the patient's clinical outcome did not improve.

Twenty-seven months after the IOLs' initial implantation, the patient's silicone lenses were replaced with new lenses made of a hydrophilic acrylic material. GC-MS analysis of the explanted lens detected compounds that matched one of the ointments with which the patient was treated postoperatively.

Chen et al¹⁰ reported similar findings in a case where they observed an oily material in a patient's anterior chamber 34 months after cataract surgery. Fourier transform infrared and confocal Raman microspectroscopy identified this material as ointment.

CONCLUSION

To prevent topical ointments from entering the anterior chamber and causing TASS after cataract surgery, surgeons should be aware of the dynamics of self-sealing clear corneal incisions as well as of the associated risks of using postoperative ointments and eye patches. They also should anticipate the possibility of intraocular penetration when using any kind of ointment after other penetrating procedures.

Another potential cause of TASS is the introduction of oily materials into the eye by devices or equipment during cataract surgery. Any kind of lubricating material used during the sterilization of instruments, cannulas, or phaco tips should be considered a potential source of contamination, although this did not appear to contribute to the eight cases at Hamilton Health Sciences. Regardless, the surgeons at that facility did not see additional cases of TASS after replacing the ointment with topical drops after cataract surgery. ■

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