Unilateral toxic anterior segment syndrome after immediate sequential bilateral phakic intraocular lens implantation

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Introduction: The requirement to perform immediate sequential bilateral cataract surgery (ISBCS) is controversial. Most surgeons who do not adhere to this approach cite the possibility of bilateral complications occurring.

Patient and Clinical Findings: A 35-year-old woman underwent bilateral implantation of phakic intraocular lenses the same day. She complained of pain and significantly decreased quality of vision in her right eye 12 hours postoperatively and was immediately examined. Physical examination of the right eye showed significant corneal edema extending from limbus to limbus and a dilated fixed pupil unresponsive to light.

Diagnosis, Intervention, and Outcomes: Physical examination showed toxic anterior segment syndrome ensued in one eye. The complication was timely managed, preventing further damage to the eye. The contralateral eye showed no signs of complication.

Conclusions: This case highlights that, when performed with utmost care, protocols designed to avoid bilateral occurrence of complications in same-day surgeries can work in the real-world settings. This is further evidence that ISBCS may not pose an additional risk to patients.

Patient Consent Statement
Written consent was obtained from the patient to publish the details of the case.

CASE REPORT

The issue of whether to perform immediately sequential bilateral cataract surgery (ISBCS) routinely is still an unresolved debate. Many controversies of ISBCS are underpinned by ethical and legal dilemmas, especially surrounding the extremely low, but potentially devastating, risks for bilateral blinding complications such as endophthalmitis and toxic anterior segment syndrome (TASS).1

Although sufficient evidence supports that performing ISBCS does not pose an additional risk for complications when compared with staged surgery, some surgeons may remain uncomfortable with the risk of complications extending to both eyes when surgeries are performed on the same day.2 Nevertheless, protocols have been designed to avoid this possibility, and when performed with utmost care, the risk for experiencing bilateral complications becomes almost negligible.3

This article presents a unilateral occurrence of TASS in a patient who underwent same-day immediate sequential bilateral phakic intraocular lens implantation. It provides further evidence that, when performed correctly, protocols will help keep potentially blinding complications restrained to 1 eye only.
to go forward with a bilateral phakic intraocular lens implantation.

Immediate sequential bilateral phakic intraocular lens implantation was performed by the first author (K.B.) under intracameral anesthesia at a top-level surgical facility (Quirófanos El Tesoro) in Medellín, Colombia, using a standardized and already published protocol. For both eyes, the surgical protocol was similar: the periocular area was cleaned and the patient was drapped; then, a 1.2 mm paracentesis and a 2.8 mm main incision were created, and the anterior chamber was filled preservative-free lidocaine. After allowing 30 seconds for the anesthetic to take effect, it was replaced with a sodium hyaluronate 2.4% ophthalmic viscosurgical device (OVD). The phakic intraocular lens (EyeCryl Phakic Toric, Biotech Vision Care) was mounted and injected inside the anterior chamber and then behind the iris over the ciliary sulcus. Then, the OVD was removed with the help of bimanual cannulas, and preservative-free acetylcholine 1% (OQ-MIOT, oftalmoquímica SA) was injected intracameraly to achieve proper pupillary miosis.

In accordance with the recommendations of the International Society of Bilateral Cataract Surgeons, each eye was treated as a separate independent procedure with re-scrubbing of lids, new instruments, packs, gloves, gowns, drapes and different lot numbers for all pharmaceuticals and OVDs used.

She complained of pain and significantly decreased quality of vision in her right eye 12 hours postoperatively and was immediately examined. Physical examination determined a significant corneal edema extending from limbus to limbus and a dilated fixed pupil unresponsive to light (Figure 1). Visibility inside the eye was nearly impossible but no other complications could be determined. The left eye had a clear cornea and a well-positioned intraocular lens. An anterior segment optical coherence tomography showed a marked corneal edema with no Descemet membrane detachment. Scheimpflug tomography with a Pentacam AXL Wave (Oculus Optikgeräte GmbH) demonstrated a profound corneal edema (Figure 2, D). A unilateral case of TASS was diagnosed and the patient was quickly started on hourly 1% prednisolone acetate (Predilab), oral prednisolone at a dose of 1 mg/kg/d split every 12 hours, and preservative-free dorzolamide 2% + timolol 0.5% + brimonidine 0.2% (Krytantek PF) every 12 hours.

The patient was evaluated every 48 hours, and the corneal edema eventually subsided after a couple of weeks (Figure 2, A–C), with prednisolone being subsequently tapered over the course of a month. Specular microscopy and macular optical coherence tomography showed no consequences of the inflammatory process. Upon final examination, the right eye had an uncorrected distance visual acuity of 20/40 (logMAR 0.3) with a refraction of +0.50 sphere. The pupil was dilated and fixed, and there was a small anterior subcapsular cataract (Figure 3). The left eye never showed any signs of complication (Figure 4) and ended up with an uncorrected vision of 20/40 due to amblyopia.

**DISCUSSION**

Routinely performing ISBCS is controversial among anterior segment surgeons worldwide. Although the benefits of ISBCS for patients, surgeons, and the health system have been discussed, such a procedure in routine cases has been met with resistance from a number of authors. A variable number of surgeons report performing ISBCS, from 13.9% in England to 67.2% across Europe and 86% in California. Those surgeons who choose not to perform same-day surgery report fear of bilateral complications and medicolegal issues as their 2 top reasons for the decision. Potential bilateral blinding complications arising from ISBCS include endophthalmitis and TASS. Nevertheless, no cases of bilateral endophthalmitis have been reported in which the proper aseptic technique had been followed, and the theoretical risk for simultaneous bilateral postoperative endophthalmitis with proper aseptic technique is estimated to be less than 1 in 100 000 000. No case of bilateral TASS has ever been reported.

TASS after phakic intraocular lens implantation, previously reported by our group and by others, is currently considered an extremely rare, although potentially blinding, complication after uneventful implantation of one of these devices.
What makes the case in this study interesting is not the occurrence of TASS but the occurrence of it in only 1 eye, even though both eyes were operated on the same day by the same surgical team. This clearly demonstrates that severe complications can be restricted to 1 eye after ISBCS when proper protocols are met. The International Society of Bilateral Cataract Surgeons was the first to issue guidelines for the performance of safe bilateral cataract surgery. The guidelines call for taking each eye as a completely different surgery, as if both eyes belonged to different patients. Each piece of equipment that comes in contact with the patient needs to be changed between one eye and the other. This includes, but is not limited to, bimanual irrigation/aspiration instruments, medicines, and OVDs. This is important to decrease not only the potential for infectious endophthalmitis but also the probability of a patient developing TASS.

Although a specific etiology cannot be identified in many TASS cases, instrument cleaning and sterilization are the most commonly associated factors. Enzymatic cleaners and detergents have been found to be associated with TASS when incompletely rinsed from instruments. Evaluating the case presented in this article, the patient was the first to be intervened in that day’s surgical program. As per habitual practices in most Colombian clinics, instruments are sterilized using ethylene oxide overnight to be used the next day. Therefore, those instruments that get in contact with the first eye of the first patient of the day are sterilized using ethylene oxide. After that, the instruments used for the rest of the eyes, including the second eye of the first patient, are sterilized through autoclave (STATIM G4 5000, SciCan, Inc.). Normally, the same instruments used for the first eye undergo autoclave sterilization for the second eye, a process that is performed while the patient is rescrubbed and...
draped for the second-eye surgery. When performing ISBCS, most surgeons in Colombia (including the first author of this manuscript) always start with the right eye, the one developed TASS in this patient and the one that was exposed to the irrigation/aspiration instruments after being sterilized using ethylene oxide. This appearance of TASS in the first patient of the surgical day and a correlation with ethylene oxide had already been reported in a large series of pediatric cataract surgery by Ari et al.15

Irrespective of the exact etiology of TASS in this patient, what becomes especially important is how a new flushing, cleaning, and autoclave sterilization of all surgical instruments resulted in a complete isolation of both eyes, keeping this inflammatory complication restricted to 1 eye only. In compliance with the protocol would have affected both eyes, with a potentially blinding result. Therefore, this case adds to the already significant evidence that, when protocols are followed, especially making sure that instruments for both eyes go through different sterilization cycles, performing same-day surgery in both eyes does not provide any kind of additional risks to the patient, other than those inherent to the surgery for each eye alone.

Of note, the authors are aware that the ASCRS TASS Task Force has advised against low temperature sterilization methods and prefers steam sterilization at temperatures of more than 140°C. Arousing from this case, protocols at our institution are being revisited to improve safety and diminish further the risk for the first patient of the surgical day developing TASS. Currently, instruments are being continuously sterilized overnight with ethylene dioxide method as it is mandatory by Colombian law, but instruments are profusely flushed with sterile balanced salt solution and then sterilized again using autoclave before the first patient is operated on. So far, no further cases of TASS have been reported at our institution.

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WHAT WAS KNOWN
- ISBCS is a controversial topic among anterior segment surgeons, as some authors are wary of the potential for bilateral blinding complications such as endophthalmitis and TASS.
- Quick diagnosis and prompt treatment are essential when a complication occurs; hence, close monitoring is essential after each surgical treatment.

WHAT THIS PAPER ADDS
- The case highlights that the protocols designed to keep complications isolated to 1 eye can work in a real-life scenario. In this case, ISBCS to implant phakic IOLs did not seem to pose any additional risks than compared with staged surgery.
- Surgeons should be wary of low temperature sterilization methods unless validated by the instrument manufacturer. Steam sterilization should be preferred. All intraocular procedures (especially in ISBCS cases) should comply with proper sterilization protocols.

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