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Toxic Anterior Segment Syndrome Following Pediatric Cataract Surgery

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Toxic anterior segment syndrome (TASS) is a sterile postoperative inflammatory reaction that can develop after anterior segment surgery.¹ It generally has its onset 12 to 48 hours following surgery. The most common finding associated with TASS is diffuse limbus-to-limbus corneal edema secondary to a toxic insult to the corneal endothelium. It is also commonly associated with a dilated, irregular pupil, fibrin in the anterior chamber, a hypopyon and the late onset of glaucoma secondary to damage to the trabecular meshwork. It is most commonly caused by inadequate flushing of phacoemulsification and irrigation/aspiration handpieces and reusable cannulas.² When these handpieces and cannulas are cleaned with detergents, the detergents adhere to any residual viscoelastic agent. Since autoclaving does not denature most detergents, when the handpieces and cannulas are next used the residual detergent is flushed into the anterior segment of the eye. Since even minute quantities of detergents can be toxic to the anterior segment of the eye, this can result in TASS. Other common causes of TASS include using the wrong concentration of detergents and enzymatic cleaners, using medications with preservatives in the eye, or accidentally introducing ointment into the eye.³ Once it has been determined that the inflammation is non-infectious, the recommended treatment for TASS is topical corticosteroids. While the corneal edema improves in some patients, many patients with TASS end up requiring penetrating keratoplasty and filtering procedures to lower the intraocular pressure.⁴ Frequently, the pupil remains enlarged, irregular and unresponsive.

In this issue of the *Journal of AAPOS*, Huang and colleagues⁵ report a case of TASS in an 8-year-old child following cataract surgery, intraocular lens implantation and anterior vitrectomy in China. On the first postoperative day, the child was noted to have diffuse corneal edema, fibrin in the anterior chamber and mild mydriasis. To exclude an infectious etiology, an anterior chamber tap was performed. The child was then treated with oral and topical corticosteroids, and a gradual improvement in the corneal edema occurred over the course of many months. Three months after surgery, the central corneal thickness in the operated eye was 831 μm . While the visual acuity eventually improved to 20/25, the endothelial cell count was reduced to 851 from a preoperative value of almost 3000. The authors attribute TASS in this child to inadequate rinsing of glutaraldehyde off of the vitreous cutting instrument prior to its reuse.

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A task force of the American Society of Cataract and Refractive Surgery has made a number of recommendations for cleaning and sterilizing intraocular surgical instruments.⁶ These recommendations include: 1) keeping instruments moist until they are cleaned to avoid debris and viscoelastic agents drying on the instruments; 2) rinsing reusable instruments and cannulas with copious volumes of water, as specified by the manufacturer; 3) using disposable cannulas and tubing whenever possible; 4) not reusing devices labeled for single use; and 5) not using glutaraldehyde to sterilize intraocular instruments. In this case reported by Huang and colleagues,⁵ TASS could have been avoided by not reusing the vitreous cutting instrument and by not using glutaraldehyde to clean the instruments.⁴

Cataract surgery in children differs in many respects from cataract surgery in adults. One of the major differences is that it is usually performed using general anesthesia. While the risks of dying from general anesthesia have decreased over the years as a consequence of safer anesthetic agents and improved intraoperative monitoring, a large national registry (Pediatric Perioperative Cataract Arrest registry) studying over 1 million children undergoing anesthesia still found the incidence of anesthesia related cardiac arrests to be 1.4 per 10,000 instances of anesthesia with a mortality rate of 26% following a cardiac arrest.⁷ Because of the increased risks associated with general anesthesia, in the most recent Preferred Practice Statement for Cataract Surgery in the Adult Eye by the American Academy of Ophthalmology,⁸ the need for general anesthesia in the presence of bilateral, visually significant cataracts is listed as one of the indications for performing simultaneous bilateral cataract surgery. Simultaneous bilateral cataract surgery in North America is generally only performed on infants^{9–11} who have the highest risks of anesthetic related complications.^{12, 13} However, in many developing countries, children of all ages undergo simultaneous bilateral cataract surgery because of the increased costs associated with sequential bilateral cataract surgery and the limited availability of pediatric anesthesiologists.

The most feared complication of simultaneous bilateral cataract surgery is bilateral endophthalmitis.¹⁴ To minimize the risk of this complication, most surgeons use separate sterile drapes, instrument trays, bottles of balanced salt solution, and viscoelastic agents when performing surgery in each eye. It has also been recommended that the balanced salt solution and viscoelastic agent used for each eye be obtained from different batches to minimize the risk of an infection arising from a manufacturing error.¹¹ The risk of TASS developing in both eyes is also an important consideration since clusters of TASS often occur in multiple patients at the same clinical site on the same day.² In one case series, 6 consecutive patients were reported to have developed TASS following cataract surgery. Glutaraldehyde was later implicated as the etiology of TASS in these patients.⁴ The corneas did not clear in any of these eyes and 5 underwent penetrating keratoplasty.

TASS often occurs in patients who undergo cataract surgery at high volume surgicenters that take shortcuts when cleaning surgical instruments. In contrast, pediatric cataract surgery is usually performed at hospitals that have well established protocols for cleaning surgical instruments. Nonetheless, it is imperative that pediatric ophthalmologists be familiar with the recommendations of the ASCRS Ad Hoc Task Force on Cleaning and Sterilization of Intraocular Instruments since they are ultimately responsible for the safety of their patients.⁶

It may be helpful for pediatric ophthalmologists to provide formal instruction to the operating room and central processing staff at their own hospital to ensure that the recommendations of the ASCRS Ad Hoc Task Force on Cleaning and Sterilization of Intraocular Instruments are being followed.

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