Microbial contamination of ultrasound biomicroscopy probes: Evaluation of cross-infection risk

Nicholas P. Bell, MD, Aashish Anand, MD, Audrey Wanger, PhD, Thomas C. Prager, PhD, MPH

Ultrasound biomicroscopy (UBM) is being used increasingly in cataract and refractive surgery to evaluate phacomorphic lenses, dislocated intraocular lenses, misplaced haptics, sulcus-to-sulcus measurements for implantable Collamer lenses (ICLs), ciliary body cysts before ICL implantation, retained lens fragments, and anterior effusions.[1] In a previous report,[2] biometry apparatus grew pathogenic flora despite routine disinfection with alcohol swabs, suggesting the risk for cross-contamination if the equipment is not sterilized. Ultrasound biomicroscopy probes may have the same risk because of identical disinfection methods. Recently, the ClearScan cover (ESI, Inc.), a U.S. Food and Drug Administration-approved sterile bag, has been developed as a more comfortable and less traumatic alternative to the open-shell/gel technique for UBM.[3] This study investigates microbial inoculation of the sterile bag covers after single use and whether this contamination carries a realistic risk for cross-infection.

PATIENTS AND METHODS

In a cross-sectional design, UBM using the ClearScan cover was performed in 34 patients for a period of 10 minutes after active infection had been ruled out on slitlamp evaluation. Precautions were taken to avoid inadvertent contact with other biological or nonbiological surfaces. The outer surface of the covers was swabbed with a sterile applicator. The specimens were transported in collection tubes on ice and were plated within 3 hours of sample acquisition. Blood agar plates, incubated with 5% carbon dioxide at 35°C and in an anaerobic chamber, were evaluated for colony counts and identification of isolates at 72 hours. Sabouraud dextrose agar plates were evaluated for fungal colonies and microscopic morphology at 7 days.

RESULTS

A growth was observed in 28 (82%) of the bacterial plates and in none of the fungal plates. All bacterial isolates were classified as skin/ocular surface commensals. Minimal growth was seen in 57% of cultures and moderate growth in 27% (Figure 1). A comparison of isolates from the sterile bag covers and those from biometry probes in our previous study[2] is shown in Table 1. No high-virulence environmental flora were isolated from previously sterile bag covers, unlike that from "clean" biometry probes (15%); however, both bag covers and biometry probes were contaminated with surface commensals of low-to-moderate virulence.

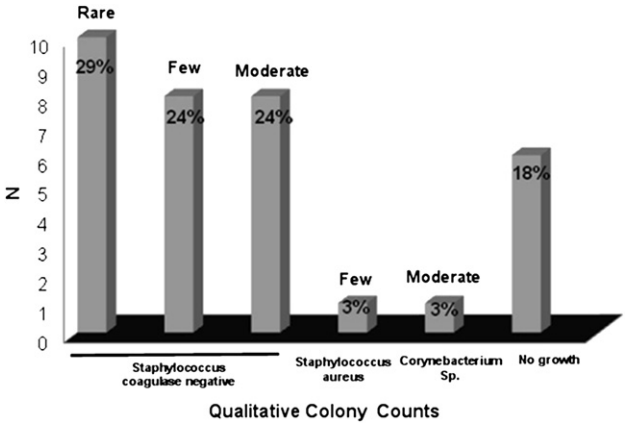

Figure 1. Growth burden measured as colony count in culture plates from the sterile bag covers for ultrasound biomicroscopy probes.

DISCUSSION

An increase in perioperative applications of UBM and increasing prevalence of methicillin-resistant *Staphylococcus aureus* and other drug-resistant flora

Table 1. Comparison of culture isolates from sterile bag covers for ultrasound biomicroscopy probes and those from ultrasound biometry probes in the same population.

Culture Isolates	Sterile Bag Covers, n (%)*	Ultrasound Biometry Probe, n (%)†,‡
Negative cultures	6 (18)	23 (68)
Environmetal	0	8 (24)
Fungal	—	4 (12)
Alternaria *sp*	—	1 (3)
Penicillium *sp*	—	3 (8)
Bacterial	—	4 (12)
Pseudomonas oryzihabitans	—	1 (3)
Burkholderia pickettii	—	1 (3)
Roseomonas sp	—	1 (3)
Acinetobacter sp	—	1 (3)
Sphingomonas sp	—	0
Commensal flora¶	28 (82)	3 (9)
Staphylococcus coagulase negative	26 (76)	2 (6)
Staphylococcus aureus	1 (3)	0
Streptococcus (not *pneumonia)*	0	0
Micrococcus sp	0	1 (3)
Corynebacterium sp	1 (3)	0
MRSA	0	0

MRSA = methicillin-resistant *Staphylococcus aureus*; Sp = species
*After single use
†After standard disinfection before next use
‡Equivalent to open shell technique of UMB after standard disinfection
¶Skin and ocular surface

Dr. Prager is a consultant to ESI, Inc., Plymouth, Minnesota, USA.

0886-3350/$ - see front matter
doi:10.1016/j.jcrs.2011.09.018

makes it imperative that all precautions be taken to reduce cross-contamination risk.[4,5] While perioperative UBM, unlike invasive procedures, may not be a direct risk factor for endophthalmitis, it carries a risk for cross-contamination with pathogenic flora. In this study, 82% of cultures from the sterile bag covers were positive after single use and 27% were read as moderate growth. The most common isolate, coagulase-negative *Staphylococcus*, is also the most common cause of postoperative endophthalmitis.[6] Other isolates, *S aureus* and *Corynebacterium sp*, are frequent and less common causes of endophthalmitis, respectively.[6,7] While the open-shell UBM technique can cause corneal abrasions and the UBM probe is not amenable to sterilization,[8] even ClearScan covers can cause serious cross-contamination unless recommendations for single use are followed, especially in the perioperative and other high-risk settings.

REFERENCES

1. Choi KH, Chung SE, Chung TY, Chung ES, Velázquez. Ultrasound biomicroscopy for determining Visian implantable contact lens length in phakic IOL implantation. J Refract Surg 2007; 23:362–367
2. Velázquez-Estades LJ, Wanger A, Kellaway J, Hardten DR, Prager TC. Microbial contamination of immersion biometry ultrasound equipment. Ophthalmology 2005; 112(3):e13–e18
3. Bell NP, Feldman RM, Zou Y, Prager TC. New technology for examining the anterior segment by ultrasonic biomicroscopy. J Cataract Refract Surg 2008; 34:121–125
4. Asbell PA, Sahm DF, Shaw M, Draghi DC, Brown NP. Increasing prevalence of methicillin resistance in serious ocular infections caused by Staphylococcus aureus in the United States: 2000 to 2005. J Cataract Refract Surg 2008; 34:814–818
5. Klevens RM, Morrison MA, Nadle J, Petit S, Gershman K, Ray S, Harrison LH, Lynfield R, Dumyati G, Townes JM, Craig AS, Zell ER, Fosheim GE, McDougal LK, Carey RB, Fridkin SK, for the Active Bacterial Core surveillance (ABCs) MRSA Investigators. Invasive methicillin-resistant Staphylococcus aureus infections in the United States. JAMA 2007; 298:1763–1771. Available at: http://jama.ama-assn.org/cgi/reprint/298/15/1763. Accessed August 16, 2011
6. Benz MS, Scott IU, Flynn HW Jr, Unonius N, Miller D. Endophthalmitis isolates and antibiotic sensitivities: a 6-year review of culture-proven cases. Am J Ophthalmol 2004; 137:38–42
7. Ferrer C, Ruiz-Moreno JM, Rodríguez A, Montero J, Alió JL. Postoperative Corynebacterium macginleyi endophthalmitis. J Cataract Refract Surg 2004; 30:2441–2444
8. Segal WA, Pirnazar JR, Arens M, Pepose JS. Disinfection of Goldmann tonometers after contamination with hepatitis C virus. Am J Ophthalmol 2001; 131:184–187

Creating a feedback loop to improve cataract surgery outcomes

Paul B. Greenberg, MD, Victoria L. Tseng, BS, Wen-Chih Wu, MD, Curtis E. Margo, MD, MPH

Numerous studies assess cataract surgery outcomes, identify risk factors for poor outcome, and define target areas that need improvement. However, these studies fail to address a more fundamental question: Is there any evidence that monitoring cataract surgery outcomes improves the quality of future care? The few studies[1–3] that have investigated this have small numbers ($N < 505$), are retrospective, and focus on residency training programs, which limits their generalizability.

The National Surgical Quality Improvement Program (NSQIP) may provide a model for how to use outcome data to improve the quality of cataract surgery. The NSQIP was initiated at the United States Veterans Heath Administration (VHA) in 1994 and is now used by the American College of Surgeons to monitor and improve surgical outcomes at major hospitals throughout the U.S.[4,A] Several key factors have contributed to the NSQIP's success, starting with standardized methods to capture, analyze, and review data. The NSQIP relies on a designated NSQIP-trained nurse reviewer to prospectively collect preoperative, intraoperative, and 30-day postoperative data. There are random third-party audits of the data to ensure the quality and reliability. This system ensures data of much better quality than self-reported or administrative data. A hospital receives regular reports of its event rates and those of the other hospitals, which serve as a foundation for action plans to improve surgical outcomes. The NSQIP also provides feedback to high and low performing medical centers, which are then asked to report possible reasons for their level of performance. This feedback in conjunction with data collected from structured site visits is used to create a list of "best practices" to distribute to NSQIP participants.[B,C]

Elements of the NSQIP can serve as a starting point for developing a system to monitor and improve cataract surgery at ambulatory surgery centers, where most cataract surgery is performed in the U.S. Such a pilot study is currently being tested in 5 medical centers in the VHA through the Ophthalmic Surgical Outcome Database[D] program, in which trained nurse reviewers collect cataract surgery outcomes data. This is a first step in the creation of a feedback loop to improve cataract surgery quality of care. This feedback loop could serve as a model for other large integrated healthcare networks or fee-for-service settings outside the VHA as long as its benefits outweigh the administrative burden of third-party monitoring of outcomes.

REFERENCES

1. Ku TK, Rutar T, Han Y, Porco TC, Naseri A. Resident-performed phacoemulsification surgery in tamulosin-treated patients. Arch Ophthalmol 2010; 128:967–972. Available at: http://archopht.ama-assn.org/cgi/reprint/128/8/967. Accessed August 17, 2011