Evolving Fluoroquinolone Resistance Among Coagulate-Negative Staphylococcus Isolates Causing Endophthalmitis

Endophthalmitis is a serious, sight-threatening condition resulting in substantial morbidity. With the widespread use of fluoroquinolone antibiotic eyedrops as a prophylactic agent, there is concern regarding increased frequency of fluoroquinolone resistance. We report the evolution of fluoroquinolone resistance among coagulate-negative Staphylococcus endophthalmitis isolates at the Bascom Palmer Eye Institute.

Methods. The study was approved by the Institutional Review Board of the University of Miami School of Medicine Medical Sciences Subcommittee for the Protection of Human Subjects. This was a retrospective, noncomparative, consecutive case series. We reviewed the microbiological and medical records of all patients with culture-proven endophthalmitis (positive cultures from the vitreous cavity) caused by coagulate-negative Staphylococcus at the Bascom Palmer Eye Institute between January 1, 1990, and July 1, 2011. Susceptibility testing of the intraocular isolates was performed using an automated system—the VITEK automatic microbial system (Biomerieux, Inc) or the E test (AB Biodisk NA, Inc and Remel Products). Frozen isolates were reconstituted as needed to evaluate sensitivities of earlier cases to newer-generation fluoroquinolones.

Results. During the 21.5 years of the current study, 168 patients were identified as having culture-proven endophthalmitis caused by coagulate-negative Staphylococcus. The increasing resistance rates are shown in the Figure for 1990 to 1994 (n = 29), 1995 to 1999 (n = 23), 2000 to 2004 (n = 26), and 2005 to 2011 (n = 89). The respective resistances (in percentages) of the first 3 periods are the following: ciprofloxacin resistance, 10.3%, 17.4%, and 38.4%; levofloxacin resistance, 0%, 17.0%, and 38.4%; moxifloxacin resistance, 0%, 21.8%, and 26.9%; and gatifloxacin resistance, 0%, 21.8%, and 30.7%. The mean resistance rates for January 1, 2005, through July 1, 2011 (n = 89), were 60.5% for ciprofloxacin, 38.6% for levofloxacin, 57.8% for moxifloxacin, and 60.5% for gatifloxacin (Figure).

Comment. Despite the dual mechanisms of fluoroquinolones to avoid resistance to coagulate-negative Staphylococcus, the frequency of resistance to these organisms is increasing. Recent evidence shows that repeated exposure of ocular and nasopharyngeal flora to ophthalmic antibiotics, including fluoroquinolones, creates resistant strains.1, 2 It has further been shown that resistant strains of coagulate-negative Staphylococcus may be associated with greater ocular inflammation, greater virulence, and increased ocular infection rates compared with susceptible strains.3-4

Fourth-generation fluoroquinolones are significantly more expensive than generic traditional antibiotic eyedrops such as gentamicin sulfate and polymyxin B sulfate/trimethoprim, which have been shown to cover endophthalmitis isolates at least as well.5 Additional recent reports demonstrate that the fourth-generation fluoroquinolones achieve subtherapeutic levels in the aqueous humor and vitreous against the most frequently identified staphylococcal endophthalmitis isolates.6 Given the frequent and increasing resistance, subtherapeutic penetration, and higher cost compared with other antibiotic eyedrops, the widespread perioperative and periprocedural use of fourth-generation fluoroquinolone antibiotic eyedrops should be reevaluated.
Long-term Follow-up of Outer Retinal Tubulation Documented by Eye-Trackered and En Face Spectral-Domain Optical Coherence Tomography

Outer retinal tubulation (ORT) is a rearrangement of the photoreceptor layer in response to retinal injury.1,2 Seen clinically with spectral-domain optical coherence tomography (SD-OCT) and confirmed on histopathologic sections, these rosette-like structures occur in a variety of retinal disorders characterized by photoreceptor disruption.2-5 On SD-OCT, ORT appears as round or ovoid hyporeflective structures with hyporeflective margins. The margins are believed to represent the inner segment–outer segment junction of the photoreceptor cells or the ellipsoid portion of the photoreceptor inner segment.6 These tubules often contain hyperreflective material thought to represent deranged photoreceptor outer segments.1,2 A branching pattern of the tubes may be detected with curved en face SD-OCT. Owing to a cystic-like appearance on OCT B-scans, ORT may be confused with cystoid macular edema related to leakage from choroidal neovascularization or other retinal diseases. We describe a patient who was treated with anti–vascular endothelial growth factor therapy for neovascular age-related macular degeneration (AMD) during a 6-year follow-up period. Eye-tracked and curved en face SD-OCT scans during 3 years of follow-up documented persistence of the ORT structures with evidence of gradual photoreceptor loss.

Report of a Case. A 76-year-old woman visited for routine follow-up of neovascular AMD. She had previously received 1 treatment of combined verteporfin photodynamic therapy and intravitreal triamcinolone acetonide (4.0 mg/0.1 mL) in September 2005 and then received 35 intravitreal injections of ranibizumab (0.5 mg/0.05 mL) in her left eye approximately every 7 weeks from October 2005 through February 2012. Visual acuity was 20/400 at the initial visit, improved to 20/70 after starting

Figure. Long-term follow-up of outer retinal tubulation (ORT). A, Color photograph and curved en face spectral-domain optical coherence tomographic image obtained in January 2009 showing the branching ORT structures in the left eye of a patient receiving intravitreal ranibizumab for neovascular age-related macular degeneration. B-E, Eye-tracked spectral-domain optical coherence tomographic B-scan images obtained in January 2009 showing ORT structures in various cuts through the central macula overlying quiescent choroidal neovascularization. F, Color photograph and curved en face spectral-domain optical coherence tomographic image obtained in February 2012 showing a small decrease in the size of the ORT structures. G-J, Spectral-domain optical coherence tomographic B-scan images obtained in February 2012, eye-tracked to the same scan lines as in B-E, showing a decrease in the size of the ORT structures.