Afibercept-Related Sterile Inflammation

Within the first 3 months after approval of afibercept (Eylea; Regeneron, Inc., Tarrytown, NY) by the US Food and Drug Administration on November 18, 2011, a cluster of injection-related sterile intraocular inflammation was reported, raising safety concerns. The American Society of Retina Specialists formed a Therapeutic Surveillance Subcommittee as an independent taskforce to monitor and report such events to the greater ophthalmology community.

The Therapeutic Surveillance Subcommittee surveyed retina specialists regarding event details (Tables 1–3; available at http://www.aaojournal.org). The survey, collected from February 2012 until the end of March 2012, identified 15 cases of presumed sterile inflammation after intravitreal afibercept injection. All but 1 case occurred in patients treated for neovascular age-related macular degeneration, its only US Food and Drug Administration-approved indication during that time. Consistent with this demographic, the majority of patients were elderly, Caucasian, and pseudophakic. One patient had a history of postoperative uveitis in the fellow eye after vitrectomy. No other patients had a history of uveitis, which may be associated with injection-related sterile inflammation.

All injections were performed with standard techniques based on survey responses. Povidone-iodine 5% was applied before injection in all cases. Thirty of 15 eyes were administered topical anesthesia, and 2 eyes were given subconjunctival lidocaine. All eyes were injected with the Becton Dickinson (Franklin Lakes, NJ) 1-ml Luer-Lok syringe included in the afibercept packaging. The majority of eyes were injected in the superotemporal quadrant (12 of 15 eyes) and with a 32-G needle (13 of 15 eyes), while the remainder were injected in the inferotemporal quadrant (3 of 15 eyes) and with a 30-G needle (2 of 15 eyes). These differences likely represent individual practice pattern differences and are not an implication of these techniques.

Five physicians practicing in the Northeast, the Southeast, and the Southern United States reported cases of sterile inflammation. Three physicians practiced in the same retina group, and 9 of 15 cases (60%) were reported by a single retina specialist in this practice, consistent with a clustering pattern previously reported with other intravitreal therapies. All cases were attributed to 5 separate drug lots, with 3 lots accounting for 13 of 15 cases. All but 1 patient experienced symptoms within 3 days. Visual acuity generally recovered to baseline levels with nearly identical mean visual acuities at baseline (0.4 logarithm of the minimum angle of resolution) and after resolution (0.32 logarithm of the minimum angle of resolution) and a mean time to resolution of 30 days. No patient lost >1 Snellen line of visual acuity.

In contrast with previous reports associating sterile inflammation from other intravitreal therapies with painless loss of vision, 9 of these 15 afibercept-related cases (60%) presented with pain. Redness was noted only in eyes presenting with pain and in 6 of these 9 painful cases. It is possible that afibercept-related sterile inflammation may be associated with higher rates of pain than previously reported. Alternatively, this difference may reflect differences in the treatment cohorts. Distinguishing between infectious and sterile endophthalmitis was at the discretion of the treating physician. Although all reported cases were culture negative, some of the cases treated with intravitreal antibiotics may have represented culture-negative infectious endophthalmitis, which is associated with increased pain, and not true sterile inflammation. However, 5 of 9 cases associated with pain were treated with topical steroids only, suggesting that potential misclassification of these symptoms is not fully responsible for this difference. It is likely that patients presenting with more pain were biased toward an initial diagnosis of infectious endophthalmitis (treated with tap/antibiotic injection) compared with those patients managed with topical steroids alone.

Small sample size, clinical variation, and the limitations of voluntary reporting preclude definitive conclusions. Subgroup analysis did not detect any variables significantly affecting visual outcome or number of days to resolution (Tables 4 and 5; available at http://www.aaojournal.org). This letter serves as a descriptive case series to better understand the clinical characteristics of a cluster of afibercept-related sterile inflammation. The manufacturer reports that approximately 30 000 injections had been administered during the reporting period, corresponding with a sterile inflammation rate of approximately 0.05%. Although there may certainly be additional, nonreported cases resulting in a higher actual rate, this frequency lies within the range documented by other reports.

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Transiency of Fleischer’s Rings in Forme-Fruste Keratoconus

Fleischer’s rings are considered pathognomonic1; however, no comment has been made regarding their relative permanency. This report describes the bilateral disappearance of Fleischer’s rings in a patient with forme-fruste keratoconus after orthokeratology.

In June 2010, a 26-year-old woman came to our clinic for an orthokeratology assessment. Ocular history was negative for allergy, trauma, and surgery. General health was excellent; she did not take any medications. There was no family history of ocular disease. Refraction and best-corrected visual acuities (BCVAs) had remained stable for 10 years: Right eye, −1.00/−0.25 × 75 (20/15); left eye, −1.00/−0.25 × 130 (20/15). Slit-lamp biomicroscopy revealed bilateral, inferonasal, paracentral corneal iron lines, consistent with Fleischer’s rings (Fig 1A, B). There were no other signs of keratoconus; retinoscopy revealed the absence of scissoring reflexes in both eyes.

Baseline corneal topography demonstrated subtle inferior-superior axial power asymmetry (Fig 1C, D). The corneal apices were decentered inferonasally, consistent with the location of Fleischer’s rings (both eyes). Videokeratographic indices were used to quantify baseline corneal asymmetry (Table 1). Central corneal thicknesses were: right eye, 535 μm; left eye, 512 μm.

Given these corneal findings, a corneal specialist assessed the patient’s suitability for orthokeratology. Ophthalmologic opinion was that the long-term refractive stability and excellent BCVAs, forme-fruste keratoconus did not contraindicate orthokeratology.

In July 2010, the patient commenced overnight-wear of Paragon CRT (Paragon Vision Sciences; Mesa, AZ) orthokeratology lenses. The corneal area inclusive of the Fleischer’s rings was overlaid by the lens optic zone (Fig 1E, F). After 3 months, unaided vision was 20/10 in the right eye and 20/10 in the left. Videokeratographic maps demonstrated large treatment zones with mild inferior displacement. Fleischer’s rings were absent; each cornea had a normal biomicroscopic appearance (Fig 2). This patient has been successfully undertaking orthokeratology without adverse event for more than 2 years; the Fleischer’s rings have not reappeared.

Superficial corneal iron lines develop in physiologic and pathologic contexts. The Hudson-Stähli line occurs in the aging cornea. Refractive procedures including radial keratotomy, intrastromal corneal ring, and LASIK can induce corneal iron lines. Ocular disease also produces characteristic pigmented corneal arcs; Stocker’s line for pterygia, Ferry’s line at filtering blebs, and Fleischer’s ring in keratoconus. Although the emergence of ‘new’ iron lines is well-documented, this is the first report describing the loss of a Fleischer’s ring.

Fleischer’s rings consist of ferritin deposits within basal corneal epithelial cells that form at sites of local discontinuity in curvature.2 Although the reported prevalence of the rings in keratoconus is 87%,3 their pathogenesis remains unclear.

Orthokeratology involves using reverse-geometry, rigid, gas-permeable contact lenses to reduce manifest refractive error.4 In myopic orthokeratology, the central zone of the lens imparts a positive hydraulic pressure to induce corneal flattening; the epithelium is compressed such that basal cells assume a rounded configuration compared with their normally elongated morphology. Both the decentered corneal apices and region possessing Fleischer’s rings were therefore remolded to a flatter curvature. Although only a low myopic correction, this degree of remodeling was sufficient to induce the necessary, and presently poorly understood, epithelial changes to reverse the iron deposition.

Should the disappearance of a Fleischer’s ring be specifically related to a reduction in corneal apical power, similar effects would be expected after corneal cross-linking for keratoconus; there are currently no published reports to this effect. A further possibility is that orthokeratology alters basal epithelial cell turnover. This hypothesis is supported by evidence that orthokeratology increases epithelial cell proliferation rates.5 Further work is required to elucidate the mechanism underlying the observation.

This case highlights that Fleischer’s rings can occur with mild topographic asymmetry, average central corneal thickness, stable refraction, normal BCVA, normal retinoscopic reflexes, and without other signs of keratoconus. This report also demonstrates that Fleischer’s rings are not permanent. Practitioners should be aware of the apparent transiency of this important diagnostic sign, in their evaluation of patients with the condition.

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### Table 1. Baseline Demographic Characteristics

| Pt ID | Age | Gender | Race     | Disease Treated | Eye Treated | Preinject VA | Prior Anti-VEGF? | # Prior Eye| Lens Status | Medical Conditions | Ocular Comorbidities | Fellow Eye VA |
|-------|-----|--------|----------|-----------------|-------------|--------------|-----------------|------------|-------------|---------------------|--------------------|--------------|
| 1     | 69  | F      | Caucasian| NVAMD          | OS          | 20/80        | Yes             | 0          | Phakic      | HTN, chol, afib     | None               | HM           |
| 2     | 83  | M      | Caucasian| NVAMD          | OS          | 20/40        | Yes             | 0          | Pseudo     | DM, HTN, chol       | POAG               | 20/50         |
| 3     | 79  | F      | Caucasian| NVAMD          | OS          | 20/20        | Yes             | 0          | Pseudo     | HTN, chol, COPD     | None               | 20/20         |
| 4     | 88  | M      | Caucasian| NVAMD          | OS          | 20/50        | Yes             | 0          | Pseudo     | HTN                | None               | CF 1 ft       |
| 5     | 76  | F      | Caucasian| NVAMD          | OS          | 20/40        | Yes             | 0          | Pseudo     | HTN                | POAG               | 20/30         |
| 6     | 88  | M      | Caucasian| NVAMD          | OS          | 20/70        | Yes             | 0          | Pseudo     | HTN, CAD           | None               | 20/25         |
| 7     | 79  | F      | Caucasian| NVAMD          | OD          | 20/25        | Yes             | 0          | Pseudo     | DM, afib, COPD      | POAG               | 20/40         |
| 8     | 80  | F      | Caucasian| NVAMD          | OD          | 20/40        | Yes             | 0          | Pseudo     | NIDDM, HTN          | PVD                | 20/40         |
| 9     | 85  | F      | Caucasian| NVAMD          | OS          | 20/40        | Yes             | 0          | Pseudo     | Chol, HTN          | None               | 20/30         |
| 10    | 81  | M      | Caucasian| NVAMD          | OD          | 20/50        | Yes             | 1          | Pseudo     | A6b, HTN, chol      | None               | 20/40         |
| 11    | 82  | F      | Caucasian| NVAMD          | OD          | 20/25        | Yes             | 0          | Pseudo     | NIDDM, HTN, PVD     | None               | 20/63         |
| 12    | 75  | M      | Caucasian| NVAMD          | OD          | CF 2 ft      | Yes             | 2          | Pseudo     | Chol, HTN, CAD      | None               | 20/40         |
| 13    | 80  | M      | Caucasian| NVAMD          | OD          | 20/50        | Yes             | 2          | Pseudo     | HTN, chol           | None               | 20/25         |
| 14    | 85  | M      | Caucasian| NVAMD          | OD          | 20/30        | Yes             | 1          | Pseudo     | Hypothyroid, BPH    | None               | 20/25         |
| 15    | 46  | M      | Middle Eastern| Myopic CNV | OS          | 20/25        | Yes             | 2          | Phakic     | None               | High myopia; lattice; h/o RD OD s/p repair 2009; h/o postop iritis OD | 20/200       |

afib = atrial fibrillation; BPH = benign prostate hypertrophy; CAD = coronary artery disease; CF = count fingers; chol = hypercholesterolemia; CNV = choroidal neovascularization; COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; HM = hand motion; HTN = hypertension; NIDDM = non–insulin-dependent diabetes mellitus; NVAMD = neovascular age-related macular degeneration; OD = right eye; OS = left eye; POAG = primary open angle glaucoma; pseudo = pseudophakic; RD = retinal detachment; VA = visual acuity.

### Table 2. Injection Characteristics

| Pt ID | Injection Date | Physician | Lot # | Anesthetic Delivery | Prep           | Syringe Model | Needle Gauge | Quadrant Injected |
|-------|----------------|-----------|-------|---------------------|----------------|---------------|--------------|-------------------|
| 1     | 12/1/11        | A         | 1     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 2     | 12/6/11        | A         | 2     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 3     | 12/6/11        | B         | 2     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 4     | 12/12/11       | A         | 2     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 5     | 12/16/11       | A         | 3     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 6     | 12/28/11       | C         | 3     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Inferotemporal    |
| 7     | 13/1/12        | A         | 2     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 8     | 11/11/12       | D         | 3     | Subconjunctival     | Povidone-iodine| BD 1 mL Luer-Lok | 30G          | Superotemporal    |
| 9     | 11/3/12        | A         | 2     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 10    | 11/3/12        | A         | 3     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 11    | 11/19/12       | D         | 4     | Subconjunctival     | Povidone-iodine| BD 1 mL Luer-Lok | 30G          | Superotemporal    |
| 12    | 2/1/12         | A         | 1     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 13    | 2/1/12         | A         | 1     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |
| 14    | 2/2/12         | B         | 1     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Inferotemporal    |
| 15    | 3/23/12        | E         | 5     | Topical             | Povidone-iodine| BD 1 mL Luer-Lok | 32G          | Superotemporal    |

Lot #: 1 = 8073400005A; 2 = 8073400009; 3 = 8073400006; 4 = 73400006; 5 = 8073400014

BD = Becton Dickinson.

Note. Physician names arbitrarily assigned letter designation (A–E).
Table 3. Characteristics of Sterile Inflammation

| Pt ID | Presenting Signs/Symptoms | Days after Injection | Management    | Culture Obtained? | Organism | Days to Resolution | Final VA |
|-------|---------------------------|---------------------|---------------|-------------------|----------|-------------------|----------|
| 1     | Large floater, looking thru wax paper | 1                   | Tap/inject    | Y                 | NG       | 14                | 20/70    |
| 2     | Hazy vision               | 3                   | Tap/inject    | Y                 | NG       | 30                | 20/40    |
| 3     | Blurry vision, heavy eye, floaters | 2                   | Topical steroid | N               | —        | 35                | 20/20    |
| 4     | Curtain over vision, foggy | 1                   | Tap/inject    | Y                 | NG       | 35                | 20/50    |
| 5     | Pain, floaters, irritation, decrease vision | 30                  | Topical steroid | N               | —        | 14                | 20/50    |
| 6     | Blurry vision, pain, redness, floaters | 3                   | Tap/inject    | Y                 | NG       | 75                | 20/100   |
| 7     | Cloud over eye, pain, redness | 1                   | Tap/inject    | Y                 | NG       | 30                | 20/30    |
| 8     | Pain, decreased vision     | 2                   | Tap/inject    | Y                 | NG       | 30                | 20/40    |
| 9     | Pain, watery eyes, blurry vision, redness | 1                   | Topical steroid | N               | —        | 17                | 20/40    |
| 10    | Fog with decreased vision, pain, redness | 3                   | Topical steroid | N               | —        | 14                | 20/70    |
| 11    | Loss of vision, no pain    | 2                   | Topical steroid | N               | —        | 14                | 20/32    |
| 12    | Redness, light sensitive, sore eye | 1                   | Tap/inject    | Y                 | NG       | 28                | 20/40    |
| 13    | Cobwebs, decrease vision, floater, white blur | 3                   | Topical steroid | N               | —        | 28                | 20/40    |
| 14    | Pain, red eye, tear        | 1                   | Topical steroid | N               | —        | 56                | 20/30    |
| 15    | Floaters, decreased vision, mild ache | 1                   | Tap/inject    | Y                 | NG       | Ongoing           | 20/25    |

NG = no growth.

Table 4. Subgroup Analysis on Change in Visual Acuity

|                          | N | Mean ΔVA (SD) | Min/Median/Max |
|--------------------------|---|---------------|----------------|
| Age (yrs)                |   |               |                |
| ≤80                      | 8 | −0.21 (0.61)  | −1.7/0/0.1     |
| >80                      | 7 | 0.06 (0.07)   | 0/0/0.15       |
| P                        |   | 0.088         |                |
| Days to resolution       |   |               |                |
| ≤28                      | 7 | −0.21 (0.66)  | −1.7/0/0.15    |
| >28                      | 7 | 0.03 (0.06)   | 0/0/0.15       |
| P                        |   | 0.595         |                |
| Lens status              |   |               |                |
| Phakic                   | 3 | 0.01 (0.07)   | −0.06/0/0.08   |
| Pseudophakic             | 12| −0.11 (0.51)  | −1.7/0/0.15    |
|                        |   | 0.648         |                |
| Prior aflibercept injections | |               |                |
| No                       | 10| 0.04 (0.07)   | −0.06/0/0.15   |
| Yes                      | 5 | −0.33 (0.77)  | −1.7/0/0.15    |
| P                        |   | 0.245         |                |
| Management               |   |               |                |
| Tap/inject              | 8 | −0.19 (0.61)  | −1.7/0/0.15    |
| Topical steroids         | 7 | 0.04 (0.08)   | −0.1/0/0.15    |
| P                        |   | 0.464         |                |

P value based on Wilcoxon test of difference between medians. max = maximum; min = minimum; SD = standard deviation.
### Table 5. Subgroup Analysis on Time to Resolution

|                          | N  | Mean Days (SD) | Min/Median/Max |
|--------------------------|----|----------------|----------------|
| **Age (yrs)**            |    |                |                |
| \( \leq 80 \)            | 7  | 25.57 (8.24)   | 14/28/35       |
| >80                      | 7  | 34.43 (23.34)  | 14/30/75       |
| **P**                    |    |                | 0.515          |
| **Lens status**          |    |                |                |
| Phakic                   | 2  | 22.00 (11.31)  | 14/22/30       |
| Pseudophakic             | 12 | 31.33 (18.28)  | 14/29/75       |
| **P**                    |    |                | 0.515          |
| **Prior aflibercept injections** |    |                |                |
| No                       | 10 | 29.4 (18.28)   | 14/30/75       |
| Yes                      | 4  | 31.5 (17.62)   | 14/28/56       |
| **P**                    |    |                | 0.829          |
| **Management**           |    |                |                |
| Tap/inject               | 7  | 34.57 (18.99)  | 14/30/75       |
| Topical steroids         | 7  | 25.43 (15.79)  | 14/17/56       |
| **P**                    |    |                | 0.242          |

*P* value based on Wilcoxon test of difference between medians.

max = maximum; min = minimum; SD = standard deviation.
| Study                  | Study Design          | #Cases/#Inj | Rate (per inj) | Intravitreal Agent | Outcome/Notes                                                                                       |
|------------------------|-----------------------|-------------|----------------|-------------------|-----------------------------------------------------------------------------------------------------|
| MARINA 2006¹           | Prospective           | 6–10/10 443 | 0.06–0.10%     | Ranibizumab       | 6 cases uveitis; 4 cases culture-negative endophthalmitis                                           |
| ANCHOR 2009²           | Prospective           | 1–3/5921    | 0.02–0.05%     | Ranibizumab       | 1 case uveitis; 1 case culture-negative endophthalmitis; 1 case inflammation                      |
| CATT 2011³             | Prospective           | 1/5449      | 0.02%          | Anti-VEGF         | 1 case pseudoendophthalmitis after ranibizumab administration                                      |
|                        | Retrospective ×36 mos | 1/3839      | 0.03%          | Ranibizumab       | Mild AC reaction; resolved without treatment                                                        |
| Chong et al 2010⁴      | Retrospective ×36 mos | 44/16 166   | 0.27%          | Bevacizumab       | 19 separate cases (0.12%) culture-negative endophthalmitis; clustering of cases noted              |
| Wu et al (PACORES) 2007⁵| Retrospective ×12 mos | 4/4304      | 0.09%          | Bevacizumab       | Uveitis                                                                                           |
| Shima et al 2008⁶       | Retrospective ×12 mos | 2/1300      | 0.15%          | Bevacizumab       | injection-related inflammation                                                                    |
| Ness et al 2010⁷        | Retrospective ×12 mos | 10–11/3357  | 0.29%          | Anti-VEGF + TA    | sterile endophthalmitis                                                                          |
| Georgopoulos et al 2009⁸| Retrospective ×18 mos | 8/2500      | 0.32%          | Bevacizumab       | severe intraocular inflammation                                                                  |
| Johnson et al 2010⁹    | Retrospective ×21 mos | 4–9/693     | 0.58–1.3%      | Bevacizumab       | 4 cases sterile inflammation; 5 cases culture-negative endophthalmitis; clustering of cases noted acute ocular inflammation |
| Wickremasinghe et al 2008¹⁰ | Retrospective ×12 mos | 14/1278     | 1.10%          | Bevacizumab       |                                                                                                    |
| Ladas et al 2009¹¹      | Retrospective ×24 mos | 38/2000     | 1.90%          | Anti-VEGF         | anterior intraocular inflammation                                                                |
| Kay et al 2011¹²        | Retrospective ×4 mos  | 7/978       | 7.20%          | Bevacizumab       | Uveitis; clustering of cases noted uveitis                                                          |
| Kay et al 2011¹²        | Retrospective ×4 mos  | 0/338       | 0%             | Ranibizumab       |                                                                                                    |
| Day et al 2011¹³        | Retrospective Medicare database analysis ×84 mos | 45/40 903 | 0.11%          | Anti-VEGF         | Medicare database analysis, not based on clinical information                                       |
| Fung et al 2006¹⁴       | International internet survey | 10/7113 | 0.14%          | Bevacizumab       |                                                                                                    |

TA = triamcinolone acetate; VEGF = vascular endothelial growth factor.

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Table 7. Rates of Inflammation after Intravitreal Injection (inj) of Triamcinolone Acetonide

| Study             | Study Design | #Cases/#Inj | Rate (per inj) | Intravitreal Agent | Outcome/Notes                                                                 |
|-------------------|--------------|-------------|----------------|--------------------|------------------------------------------------------------------------------|
| SCORE 2009¹       | Prospective  | 0/1500      | 0%             | PFTA               | Noninfectious endophthalmitis; PFTA (Trivaris; Allergan, Inc.)                |
| Roth et al 2008²  | Retrospective | 6/929       | 0.60%          | TA                 | Culture-negative inflammation                                                |
| Moshfeghi et al 2005³ | Retrospective | 8/922       | 0.87%          | TA                 | Sterile endophthalmitis; 2 cases treated with topical steroids/PO abx; 6 s/p tap&inject |
| Nelson et al 2003⁴ | Retrospective | 6/440       | 1.60%          | TA                 | Noninfectious endophthalmitis                                                |
| Taban et al 2007⁵ | Retrospective | 6/310       | 1.90%          | TA                 | Culture-negative endophthalmitis                                             |
| Jonisch et al 2008⁶ | Retrospective | 11/554      | 1.90%          | TA                 | Culture-negative endophthalmitis; clustering of cases noted                  |
| Roth et al 2003⁷  | Retrospective | 7/104       | 6.70%          | TA                 | Culture-negative endophthalmitis; clustering of cases: all cases arose within 1 month period |
| Maia et al 2007⁸  | Retrospective | 5/69        | 7.30%          | TA                 | Inflammation (painful)                                                       |
| Maia et al 2007⁸  | Retrospective | 7/577       | 1.20%          | PFTA               | Inflammation (painless); PFTA (Ophthalmos Laboratories, San Paolo, Brazil) |
| Stepien et al 2009⁹ | Retrospective | 0/445       | 0%             | TA                 | Sterile endophthalmitis                                                      |
| Stepien et al 2009⁹ | Retrospective | 27/532      | 5.10%          | TA                 | Sterile endophthalmitis; clustering of cases noted                           |
| Stepien et al 2009⁹ | Retrospective | 4/308       | 1.30%          | PFTA               | Sterile endophthalmitis; PFTA (New England Compounding Pharmacy, Framingham, MA) |

abx = antibiotics; PFTA = preservative-free TA; TA = triamcinolone acetonide (Kenalog; Bristol-Myers Squibb).

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