Endophthalmitis Reduction with Intracameral Moxifloxacin Prophylaxis

Analysis of 600,000 Surgeries

Aravind Haripriya, MD,1 David F. Chang, MD,2 Ravilla D. Ravindran, MD1

Purpose: To compare the postoperative endophthalmitis rate before and after initiation of intracameral (IC) moxifloxacin prophylaxis for both phacoemulsification and sutureless, manual small-incision cataract surgery (M-SICS), as well as in patients with posterior capsular rupture (PCR).

Design: Retrospective, clinical registry.

Participants: All cataract surgeries (617,453) performed during the 29-month period from January 2014 to May 2016 at the 10 regional Aravind eye hospitals were included.

Methods: The electronic health record data for all study eyes were analyzed. Endophthalmitis rates before and after moxifloxacin were statistically compared for all eyes and separately for both phacoemulsification and M-SICS, and for the eyes complicated by PCR.

Main Outcome Measures: The postoperative endophthalmitis rates before and after initiation of IC moxifloxacin prophylaxis.

Results: Overall, 302,815 eyes did not receive IC moxifloxacin and 314,638 eyes did, and there was a significant decline in the endophthalmitis rate, from 0.07% (214/302,815) to 0.02% (64/314,638) ($P < 0.001$), with moxifloxacin. For the 194,252 phacoemulsification eyes, the endophthalmitis rate was 0.07% (135/192,149) without IC moxifloxacin prophylaxis, compared with 0.02% (52/2,222,508) with moxifloxacin ($P < 0.001$). For the 414,657 M-SICS eyes, the endophthalmitis rate was 0.07% (135/192,149) without IC moxifloxacin prophylaxis, compared with 0.02% (52/2,222,508) with moxifloxacin ($P < 0.001$). Approximately half of the 8479 eyes that had PCR received IC moxifloxacin, and half did not. Without IC moxifloxacin, PCR increased the endophthalmitis rate nearly 7-fold to 0.48% (20/4186); IC moxifloxacin reduced the endophthalmitis rate with PCR to 0.21% (9/4293) ($P = 0.034$). No adverse events were due to IC moxifloxacin.

Conclusions: Routine IC moxifloxacin prophylaxis reduced the overall endophthalmitis rate by 3.5-fold (3-fold for M-SICS and nearly 6-fold for phacoemulsification). There was also a statistical benefit for eyes complicated by PCR, and IC antibiotic prophylaxis should be strongly considered for this high-risk population. These conclusions are strengthened by the high volume of cases analyzed at a single hospital network over a comparatively short time frame. Considering the association of hemorrhagic occlusive retinal vasculitis with vancomycin and the commercial unavailability of IC cefuroxime in many countries, moxifloxacin appears to be an effective option for surgeons electing IC antibiotic prophylaxis. Ophthalmology 2017;124:768-775 © 2017 by the American Academy of Ophthalmology

Supplemental material available at www.aaojournal.org.

The use of intracameral (IC) antibiotic prophylaxis for cataract surgery is increasing. A 2014 survey of American Society of Cataract and Refractive Surgery (ASCRS) members found that 36% of the 1147 global respondents were injecting an IC antibiotic at the conclusion of surgery compared with 14% in the 2007 survey; another 11% of the 2014 respondents planned to initiate IC injections within 6 months.1,2 In terms of antibiotic choice, the efficacy of IC cefuroxime for endophthalmitis prophylaxis has been confirmed by multiple retrospective studies published since the 2006 prospective, randomized European Society of Cataract & Refractive Surgeons (ESCRS) study.3-16 Although a commercially approved cefuroxime formulation (Aprokam; Thea, Newcastle under Lyme, UK) is available in many European countries, it is largely unavailable outside of the European region.17-19 This may explain why the 2014 ASCRS survey found that cefuroxime (26%), vancomycin (37%), and moxifloxacin (33%) were comparable preferences among those using IC antibiotic prophylaxis.4 However, unlike for cefuroxime, there is a paucity of published clinical evidence regarding the efficacy of moxifloxacin or vancomycin for IC antibiotic prophylaxis.20

The Aravind Eye Care System (AECS) system is a network of 11 regional eye hospitals in southern India, which annually performs more than 260,000 cataract operations.
Because of the backlog of cataract blindness among poor communities in southern India, approximately 60% of our cataract surgeries are performed for little or no cost to the patient. We and others have shown that sutureless, manual small-incision cataract surgery (M-SICS) provides good outcomes at reduced cost in the developing world, and this method is used for 95% of our “charity” patients.21–26 Most of our “private” paying patients undergo phacoemulsification with a foldable intraocular lens (IOL). Every AECS facility uses the same standardized surgical protocols, and all outcome data are recorded in a standardized electronic record.

In an earlier study, we documented a significant reduction in the rate of infectious endophthalmitis with M-SICS after initiating routine IC moxifloxacin prophylaxis for charity patients at one of our hospitals (Madurai).27 On the basis of these findings, we instituted routine IC moxifloxacin prophylaxis for all cataract surgeries throughout the entire AECS. We sought to analyze the efficacy of IC moxifloxacin prophylaxis for both phacoemulsification and M-SICS in this expanded patient population. We also sought to determine whether IC moxifloxacin had any effect on the infection rate among those patients with vitreous loss.

### Methods

#### Study Design

This is a retrospective, clinical registry—based study. The study protocol was conducted according to the principles described in the Declaration of Helsinki, and institutional review board/ethics committee approval was obtained. The study population comprised all charity and private patients who underwent cataract surgery between January 1, 2014, and May 31, 2016, at the 10 established regional AECS hospitals. Data from our newest center (Coimbatore, City Center), which did not open until November 2014, were not included in the analysis. The charity population included patients who were screened at outreach camps and then transported to a regional hospital for surgery, as well as those who presented to a regional hospital and underwent surgery for a small or no fee. Private patients paid market rates to undergo surgery at a regional hospital.

During the study period, all AECS patients received topical ofloxacin preoperatively and postoperatively. No IC antibiotic prophylaxis was used until August 14, 2014, when routine IC injection of 0.1 ml of moxifloxacin 0.5% w/v (Auromox; Aurolab, Tamil Nadu, India) at the conclusion of cataract surgery was instituted for all charity patients at the Madurai hospital. On the basis of a favorable preliminary analysis of endophthalmitis rates in this population, routine IC moxifloxacin prophylaxis was instituted for all patients undergoing cataract surgery at each of the other 10 AECS hospitals between April 9, 2015, and July 1, 2015. We retrospectively determined that starting in January 2014, approximately 300,000 cataract surgeries without IC moxifloxacin prophylaxis were performed within the AECS. To compare a similar number of cases performed with IC moxifloxacin prophylaxis, we included all cataract surgeries performed through May 31, 2016, in our analysis.

Auromox is manufactured by our affiliated pharmaceutical company, Aurolab, and is commercially available in India. It is also exported to countries such as Nepal, Bolivia, Azerbaijan, Madagascar, and Iraq. One milliliter of Auromox containing 5 mg of preservative-free moxifloxacin hydrochloride is packaged in sterile glass vials. The pH ranges from 6 to 7.5, the osmolality ranges from 260 to 320 mOsm, and no mixing or dilution is required. Each sterile 1-ml vial provided sufficient drug for 6 different patients by using a fresh needle and syringe to withdraw 0.1 ml from the vial for each case. The dose of moxifloxacin (0.5 mg/0.1 ml) was based on calculations targeting an anterior chamber concentration of moxifloxacin that would exceed the minimum inhibitory concentration for susceptible bacteria.28

All cataract surgeries were performed using 1 of 3 methods: phacoemulsification, M-SICS, or manual large-incision extracapsular cataract extraction. The cataract procedures were performed by full-time staff, fellows, residents, and visiting trainee surgeons, representing the entire spectrum of surgeon experience.

All patients with cataract received topical ofloxacin eye drops (0.5 mg/5 ml, Aurolox Aurolab) according to a standardized regimen: every 3 hours the day before surgery and twice the morning of surgery. Topical povidone-iodine was used to prep the periorbital area and the conjunctival cul-de-sac in the operating room immediately before surgery. Topical ofloxacin drops were instilled 3 times per day for the first 15 days postoperatively. In addition, a topical combination solution of gatifloxacin (3 mg/10 ml) and dexamethasone (1 mg/10 ml) (Gatiflox DM; Sun Pharma, Mumbai, India) was administered 8 times per day for the first 3 days.
postoperative week and then tapered over the next 4 to 6 weeks. All patients were examined on the first postoperative day and approximately 1 month postoperatively.

The AECS electronic health record system was developed internally and has been used at all of our hospitals and clinics since 2008. Along with basic demographic information, it records preoperative, intraoperative, and postoperative data for every AECS patient who undergoes cataract surgery. Additional study data were drawn from the medical records database and from microbiology department records. We reviewed and analyzed the electronic health record for any study patient with a coded diagnosis of endophthalmitis, toxic anterior segment syndrome, or corneal decompensation occurring during the 6-week postoperative period. Patients undergoing combined procedures, such as trabeculectomy or penetrating keratoplasty, were not included in the study. Patients with endogenous endophthalmitis, traumatic endophthalmitis, and endophthalmitis with onset later than 6 weeks after surgery also were excluded from the study.

The diagnosis of endophthalmitis was based on the examining ophthalmologist’s clinical judgment during the normal course of postoperative care during the 6-week period immediately after surgery. The diagnosis required confirmation by a senior medical officer, who was usually the chief medical officer of the hospital when available. If endophthalmitis was suspected, a vitreous tap was performed for culture and simultaneous antibiotic injection. In some cases, a vitrectomy was performed instead of a vitreous tap.

All cases of postoperative infectious endophthalmitis reported to the population who did and did not receive IC moxifloxacin prophylaxis. We also separately analyzed the endophthalmitis rates before and after moxifloxacin for patients undergoing phacoemulsification and for those undergoing manual extracapsular cataract extraction or M-SICS. We also evaluated endophthalmitis rates before and after moxifloxacin at each individual AECS regional hospital. Finally, a subanalysis was made of the endophthalmitis rates among patients experiencing posterior capsular rupture (PCR) who did or did not receive IC moxifloxacin.

**Table 2. Comparison of Cataract Surgery Volume and Endophthalmitis Rates with and without Intracameral Moxifloxacin Prophylaxis for Each Major Regional Hospital**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Without IC Moxifloxin</th>
<th>With IC Moxifloxin</th>
<th>Total (10 hospitals)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surgeries, n</td>
<td>Endophthalmitis</td>
<td>Surgeries, n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rate, n (%)</td>
<td></td>
</tr>
<tr>
<td>Madurai</td>
<td>87 879</td>
<td>59 (0.07)</td>
<td>143 854</td>
</tr>
<tr>
<td>Coimbatore</td>
<td>80 515</td>
<td>68 (0.08)</td>
<td>52 544</td>
</tr>
<tr>
<td>Pondy</td>
<td>52 158</td>
<td>29 (0.06)</td>
<td>48 203</td>
</tr>
<tr>
<td>Tirunelveli</td>
<td>43 084</td>
<td>37 (0.09)</td>
<td>33 199</td>
</tr>
<tr>
<td>6 smaller hospitals pooled</td>
<td>39 179 21 (0.05)</td>
<td>36 838 5 (0.01)</td>
<td>76 017 26 (0.03)</td>
</tr>
<tr>
<td>Total (10 hospitals)</td>
<td>302 815 214 (0.07)</td>
<td>314 638 64 (0.02)</td>
<td>617 453 278 (0.05)</td>
</tr>
</tbody>
</table>

IC = intracameral.
*Theni, Salem, Tuticorin, Uduemelpet, Tirupur, and Dindigul.
1P value between 2 groups (chi-square/Fisher exact test).}

**Table 3. Endophthalmitis Rate without and with Intracameral Moxifloxacin for Phacoemulsification, Manual Small- Incision Cataract Surgery, and Large- Incision Extracapsular Cataract Extraction Cases**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Without IC Moxifloxin</th>
<th>With IC Moxifloxin</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surgeries, n</td>
<td>Endophthalmitis</td>
<td>Surgeries, n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rate, n (%)</td>
<td></td>
</tr>
<tr>
<td>Phacoemulsification</td>
<td>104 894</td>
<td>75 (0.07)</td>
<td>89 358</td>
</tr>
<tr>
<td>M-SICS</td>
<td>192 149</td>
<td>135 (0.07)</td>
<td>222 508</td>
</tr>
<tr>
<td>ECCE</td>
<td>5772</td>
<td>4 (0.07)</td>
<td>2772</td>
</tr>
<tr>
<td>Total</td>
<td>302 815</td>
<td>214 (0.07)</td>
<td>314 638</td>
</tr>
</tbody>
</table>

ECCE = extracapsular cataract extraction; IC = intracameral; M-SICS = manual small-incision cataract surgery.

Boldface indicates statistical significance.

*P value between 2 groups (chi-square/Fisher exact test).
the population who did (66%) (Fig 1; Supplementary Table S1, available at www.aaojournal.org). Table 1 shows that both groups had comparable rates of surgical complications, such as posterior capsule rupture (PCR) and vitreous loss.

After initiating IC moxifloxacin prophylaxis, the overall AECS endophthalmitis rate declined significantly from 0.071% (214/302,815) to 0.020% (64/314,638) (P < 0.001). A comparable decline was observed at each of the 4 largest hospitals individually, as well as in the pooled data from the 6 lower-volume facilities (Table 2). Separate analyses showed that IC moxifloxacin led to a 3-fold reduction in endophthalmitis for M-SICS and an approximately 6-fold reduction for phacoemulsification (Table 3).

Analysis of eyes with PCR showed that 20 of 4186 eyes that did not receive moxifloxacin prophylaxis and 9 of 4293 eyes that did receive moxifloxacin prophylaxis developed endophthalmitis. Thus, IC moxifloxacin did not prevent but did significantly reduce the rate of endophthalmitis in eyes with PCR (P = 0.034) (Table 4).

Table 5 shows that of all the clinically diagnosed endophthalmitis cases, significantly more patients were culture positive in the group that did not receive IC moxifloxacin (80/214, 37%) compared with the group that did (11/64, 17%) (P = 0.003). However, Table 6 shows that both groups were comparable in terms of visual outcome at the last visit after treatment. There were no adverse events due to the IC moxifloxacin. Specifically, no instances of toxic anterior segment syndrome or corneal decompensation were thought to be caused by the IC antibiotic.

### Discussion

Because postsurgical endophthalmitis is rare, a prospective, randomized, controlled clinical trial to determine the efficacy of antibiotic prophylaxis would necessitate an unfeasibly large study population. As required for the United States Food and Drug Administration approval, such a study would be extremely expensive to conduct and would need multiple study sites to generate sufficient enrollment.25 In addition, treating control patients with placebo raises ethical concerns. Reflecting these obstacles, the 2006 ESCR S study is the only large prospective, randomized clinical trial that has been completed.24 To date, no drug manufacturer has submitted an application for a commercial IC antibiotic to the Food and Drug Administration for approval.

Given the impracticality of a randomized prospective trial, the efficacy of IC antibiotic prophylaxis has been evaluated through multiple retrospective clinical studies11,13–15,20 (Table 7). The majority of these reported a reduction in endophthalmitis rates with routine IC cefuroxime injection. These studies, in combination with the ESCR S prospective study, led to approval of a commercial IC cefuroxime preparation in multiple European countries (Aprokam; Thea) and an increase in the number of cataract surgeons using IC antibiotic prophylaxis.11,18 Reflecting the absence of any approved commercial IC antibiotic in the United States, 52% of US 2014 ASCRS survey respondents using IC antibiotics were administering vancomycin, compared with 14% using cefuroxime and 31% using moxifloxacin.7

Because routine IC moxifloxacin prophylaxis was initiated at different time points at our various hospitals, we chose to include every consecutive cataract surgery performed throughout the entire AECS from January 1, 2014, to May 31, 2016. The 617,453 cases recorded during this period allowed comparison of more than 300,000 patients
Table 6. Corrected Distance Visual Acuity/Pinhole Vision at the Final Visit for Eyes with Endophthalmitis That Did or Did Not Receive Intracameral Moxifloxacin Prophylaxis

<table>
<thead>
<tr>
<th>CDVA</th>
<th>Without IC Antibiotic, n (%)</th>
<th>With IC Moxifloxacin, n (%)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/6–6/18</td>
<td>124 (57.9)</td>
<td>35 (54.7)</td>
<td>0.644</td>
</tr>
<tr>
<td>6/24–6/60</td>
<td>40 (18.7)</td>
<td>13 (20.3)</td>
<td>0.772</td>
</tr>
<tr>
<td>&lt;6/60</td>
<td>50 (22.9)</td>
<td>16 (23.5)</td>
<td>0.787</td>
</tr>
<tr>
<td>Total</td>
<td>214</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>

CDVA = corrected distance visual acuity; IC = intracameral.

*P value between 2 groups (chi-square/Fisher exact test).

who received IC moxifloxacin with more than 300,000 patients who did not. A drawback of nonrandomized retrospective trials is the potential for covariables to influence the results. Longer clinical trial periods generate more surgical cases but also increase the chance that differences in surgical techniques or in surgeon and patient populations could affect the infection rate. Because the largest retrospective studies have encompassed periods ranging from 4 to 14 years (Table 7), our study is unique in analyzing more than 600,000 consecutive surgeries from a multicenter institution during a period of only 29 months. Totaling this many surgeries over so short a time reduces the chance that other factors could have improved the endophthalmitis rates.

Pooling data from multiple hospitals may introduce more variables. However, the cataract surgical protocols, instrumentation, and techniques are standardized throughout all of the different AECS surgical facilities. Every AECS hospital uses the same operative drugs, irrigating solutions, viscoelastic, blades, and IOLs from the same manufacturers. Such standardization reduces potential covariables and is generally lacking in other published multicenter studies. Another potential variable is in how endophthalmitis is diagnosed and reported, and all AECS facilities use an identical electronic health record system. The uniformity of our electronic health record reporting protocols provides a large real-time registry through which we continuously monitor clinical outcomes and specific complications such as endophthalmitis and toxic anterior segment syndrome. We also looked at individual endophthalmitis rates for each of the 91 surgeons performing at least 2000 surgeries during the study period and did not find that any single individual’s results skewed the overall composite rates.

This study confirms and expands on our preliminary findings from a single hospital (Madurai) that routine IC moxifloxacin prophylaxis is effective for patients undergoing M-SICS.23 This technique accounts for a large volume of cataract surgery in developing countries where the backlog of cataract blindness necessitates a method that is cost-effective and safer for advanced white and brunescent cataracts, particularly in the hands of less-experienced surgeons.21–26,30,31 This indigent population has additional risk factors for infectious endophthalmitis, such as the use of larger sutureless incisions to accommodate inexpensive polymethylmethacrylate IOLs. Patient hygiene and compliance with topical antibiotics and postoperative follow-up may be poor. Many disposable supplies, such as gloves, gowns, tubing, irrigation bottles, and cannulae, are reused to further reduce costs.32 Despite numerous cost-saving practices that would not be allowed in North America or Western Europe, our study shows that the endophthalmitis rate in this higher-risk charity population can be lowered to 0.02% with IC moxifloxacin. Consistent with a meta-analysis of the cefuroxime literature,33 our previous study found that the additional cost of routine IC moxifloxacin prophylaxis was offset by the savings realized through a reduction in endophthalmitis cases requiring treatment.15,27

The 3.5-fold decrease in the endophthalmitis rate is highly significant, and to our knowledge makes this one of the largest single institution studies to demonstrate the

Table 7. Most Recent Retrospective Studies Comparing Endophthalmitis Rates with and without Intracameral Antibiotic
(Published Since 2012)

<table>
<thead>
<tr>
<th>Reference</th>
<th>IC Antibiotic Used</th>
<th>Without IC Antibiotic</th>
<th>With IC Antibiotic</th>
<th>Country</th>
<th>Duration (years)</th>
<th>Total (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surgery (N)</td>
<td>POE (N)</td>
<td>POE Rate (%)</td>
<td>Surgery (N)</td>
<td>POE (N)</td>
<td>POE Rate (%)</td>
</tr>
<tr>
<td>Tan et al,6 2012</td>
<td>Cefazolin</td>
<td>29 539</td>
<td>19</td>
<td>0.064</td>
<td>20 638</td>
<td>2</td>
</tr>
<tr>
<td>Barreau et al,7 2012</td>
<td>Cefuroxime</td>
<td>28 362</td>
<td>35</td>
<td>1.24</td>
<td>22 889</td>
<td>1</td>
</tr>
<tr>
<td>Rodrigúez-Caravaca et al,11 2013</td>
<td>Cefuroxime</td>
<td>6 595</td>
<td>39</td>
<td>0.59</td>
<td>12 868</td>
<td>5</td>
</tr>
<tr>
<td>Friling et al,10 2013</td>
<td>Multiple*</td>
<td>28 035</td>
<td>11</td>
<td>0.39</td>
<td>4 671 951</td>
<td>123</td>
</tr>
<tr>
<td>Matsuura et al,12 2013</td>
<td>Moxifloxacin</td>
<td>15 958</td>
<td>8</td>
<td>0.05</td>
<td>18 794</td>
<td>3</td>
</tr>
<tr>
<td>Herrinton et al,13 2016</td>
<td>Cefazolin</td>
<td>23 709</td>
<td>187</td>
<td>0.07</td>
<td>63 241</td>
<td>28</td>
</tr>
<tr>
<td>Jabbarvand et al,11 2016</td>
<td>Cefuroxime</td>
<td>193 440</td>
<td>28</td>
<td>0.014</td>
<td>25 920</td>
<td>0</td>
</tr>
<tr>
<td>Duien et al,14 2016</td>
<td>Cefuroxime</td>
<td>1 479 158</td>
<td>1393</td>
<td>0.09</td>
<td>954 850</td>
<td>548</td>
</tr>
<tr>
<td>Current study</td>
<td>Moxifloxacin</td>
<td>303 244</td>
<td>218</td>
<td>0.07</td>
<td>315 383</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>2 271 273</td>
<td>1938</td>
<td>0.08</td>
<td>1 875 934</td>
<td>778</td>
<td>0.04</td>
</tr>
</tbody>
</table>

IC = intracameral; POE = postoperative endophthalmitis.

*Cefuroxime (99%), moxifloxacin (1%).

National database.

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efficacy of IC antibiotic prophylaxis. Moxifloxacin is a fourth-generation fluoroquinolone with a broad spectrum of coverage that includes both gram-positive and gram-negative bacteria, and many anaerobes. The high aqueous concentration achieved by an IC injection should be highly effective against sensitive organisms because moxifloxacin’s bactericidal efficacy is concentration dependent. One study estimated that injecting 0.5 mg in 0.1 ml of moxifloxacin would exceed the median minimum inhibitory concentration of most endophthalmitis pathogens by 300-fold. Additional studies have supported the safety of moxifloxacin for IC prophylaxis.

Fluoroquinolone resistance rates among coagulase-negative Staphylococcus endophthalmitis isolates have been reported to be as high as 40% to 60%. However, in this study, IC moxifloxacin prophylaxis significantly reduced the number of infections caused by coagulase-negative Staphylococcus, which is the most common pathogen in our patient population (Table 5). It is possible that the extremely high aqueous concentration achieved by direct IC injection was still effective because moxifloxacin’s bactericidal efficacy is concentration dependent. This efficacy also could reflect geographic differences in the causative organisms and their antibiotic sensitivity profiles. Our culture results also showed that IC moxifloxacin was effective in reducing infections caused by Streptococcus, Nocardia, and gram-negative bacteria, all of which can cause highly virulent forms of endophthalmitis. Data from a Swedish registry showed that cefturoxime was less effective against gram-negative bacteria, and some of those surgeons reported switching to moxifloxacin because of its broader spectrum of activity.

These efficacy data are particularly important for countries where no commercial IC antibiotic formulation is available, and antibiotics are being mixed or compounded, or withdrawn from unpreserved topical bottles. Although IC vancomycin was the most popular antibiotic chosen for intraocular prophylaxis in both the 2007 and 2014 ASCRS surveys, new evidence regarding its association with hemorrhagic occlusive retinal vasculitis has led many surgeons to seek an alternative. Therefore, our new finding that IC moxifloxacin prophylaxis is highly efficacious for phacoemulsification is timely and important.

In terms of risk factors for endophthalmitis, trainee surgeons performed a slightly higher percentage of cases in the group receiving IC moxifloxacin, and so the improvement in this group cannot be due to more favorable surgeon selection. Posterior capsular rupture and vitreous loss significantly increase the risk of endophthalmitis, but there were no differences in the rate of these complications between the 2 groups (Table 4). In what to our knowledge is one of the largest comparison studies to date, we found that PCR, with or without vitreous loss, caused an approximately 7-fold increase in endophthalmitis in the absence of IC antibiotic. However, by comparing more than 4000 of these complicated eyes in each group, we found a statistically significant reduction in endophthalmitis with the injection of IC moxifloxacin at the end of surgery.

In conclusion, this is the one of the largest retrospective studies to show the efficacy of IC moxifloxacin prophylaxis, with a 3.5-fold reduction in the overall rate of endophthalmitis despite using the same standardized topical antibiotic regimen in all patients. Our data support the efficacy of moxifloxacin as an option for those surgeons using IC prophylaxis for phacoemulsification or M-SICS. This study does not constitute level I evidence, however, and there is no consensus that IC antibiotic prophylaxis should be the standard of care. Nevertheless, we believe that for the many surgeons who have not adopted routine IC antibiotic prophylaxis, this should be considered for higher-risk eyes experiencing PCR with vitreous loss.

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References

Footnotes and Financial Disclosures

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1 Aravind Eye Hospital, Madurai, India.
2 Altos Eye Physicians, Los Altos, California.

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Data collection: Haripriya, Ravindran
Analysis and interpretation: Haripriya, Chang, Ravindran
Obtained funding: Not applicable
Overall responsibility: Haripriya, Chang

Abbreviations and Acronyms:
AECS = Aravind Eye Care System; ASCRS = American Society of Cataract and Refractive Surgery; ESCRs = European Society of Cataract & Refractive Surgeons; IC = intracameral; IOL = intraocular lens; MSICS = manual small-incision cataract surgery; PCR = posterior capsular rupture.

Correspondence:
Aravind Haripriya, MD, Aravind Eye Hospital, 1, Anna Nagar, Madurai 625020, India. E-mail: haripriya@aravind.org.

Pictures & Perspectives

A Pseudopupil: Anterior Iris Stroma Hyperplasia

A 42-year-old African-American man presented for a routine examination, with no visual complaints. Slit-lamp microscopic examination of both eyes showed redundancy of the iris tissue arising from the collarettes. This pseudopupil was nonresponsive to mydriatics. Gonioscopic examination revealed no abnormalities of the angle. This anomaly is thought to arise from aberrant degeneration of the anterior tunica vasculosa lentis, which usually begins to resorb at 6 months during embryogenesis (Fig 1A, right eye; Fig 1B, left eye).

Mattheu F. Bakhoum, MD, PhD
John M. Alexander, MD
Henry D. Perry, MD

1Nassau University Medical Center, Department of Ophthalmology, East Meadow, New York; 2Columbia University Medical Center, Department of Ophthalmology, New York, New York; 3Ophthalmic Consultants of Long Island, Long Island, New York