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Do Treatment Patterns for Endophthalmitis after Cataract Surgery Follow the Endophthalmitis Vitrectomy Study Recommendations?

An Academy IRIS® Registry Analysis

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Objective: To evaluate whether treatment patterns for endophthalmitis after cataract surgery in American Academy of Ophthalmology IRIS® (Intelligent Research in Sight) Registry patients are in line with evidence-based guidelines established by the 1995 Endophthalmitis Vitrectomy Study (EVS), which showed that patients who present with light perception (LP) vision have better visual outcomes with immediate vitrectomy (VIT) compared with vitreous tap with antibiotic injection (TAP).

Design: Retrospective cohort study.

Subjects: Intelligent Research in Sight Registry patients undergoing cataract surgery between 2014 and 2022 (identified by Current Procedural Terminology codes), presenting with endophthalmitis (identified by International Classification of Diseases 10 codes) within 42 days postcataract surgery, and having a record of being treated with VIT or TAP on the same or 1 day after endophthalmitis diagnosis were identified.

Methods: Potential covariates of age, sex, race, ethnicity, geographic region, insurance status, and visual acuity on the day of endophthalmitis diagnosis were evaluated using multivariable logistic regression.

Main Outcome Measures: Treatment with VIT or TAP.

Results: Of the 2425 patients who met the inclusion criteria, 14% (345) underwent VIT and 86% (2080) underwent TAP. Notably, 80% of patients (1946) presented with endophthalmitis within 14 days from cataract surgery (median = 6 days). Notably, 66% (173/263) of the patients presenting with LP vision underwent TAP instead of VIT. In a multivariable logistic regression model, receiving VIT instead of TAP was positively associated with poor vision at endophthalmitis presentation (LP − odds ratio [OR] = 5.4; confidence interval [CI], 2.9−10.6; counting fingers, hand motions − OR = 1.9; CI, 1.1−3.6) versus (20/20−20/40) vision; Asian versus White race (OR = 2.6; CI, 1.3−5.2); Hispanic versus non-Hispanic ethnicity (OR = 1.9; CI, 1.1−3.2); living in the West (OR = 1.6; CI, 1.1−2.2) and Midwest (OR = 1.5; CI, 1.1−2.0) (vs. South), but not with age, sex, and insurance coverage ($P > 0.05$).

Conclusions: In the IRIS Registry, treatment patterns for postcataract surgery endophthalmitis did not match evidence-based recommendations of the EVS, a randomized controlled clinical trial. More work is needed to evaluate whether the current treatment patterns are optimal for patients with postcataract surgery endophthalmitis.

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Cataract surgery is one of the most frequently performed surgical procedures worldwide.[1] A feared complication after cataract surgery is postoperative endophthalmitis, an infectious ocular condition that, if untreated, may result in severe visual impairment or even loss of the eye.[2]

The Endophthalmitis Vitrectomy Study (EVS) was a prospective, randomized clinical trial that investigated the management of acute postoperative endophthalmitis after cataract surgery with intraocular lens placement.[3] Endophthalmitis Vitrectomy Study patients presenting

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with endophthalmitis up to 42 days postcataract surgery were assigned to receive either immediate vitrectomy (VIT) or a vitreous tap with antibiotic injection (TAP). The study's major finding was that patients presenting with a visual acuity (VA) of light perception (LP) have better VA outcomes with early vitrectomy than those treated with TAP alone. No other presenting VAs were found to differ in vision outcomes between VIT and TAP in these patients with postsurgery endophthalmitis. The EVS results established this treatment algorithm (use of VIT in patients with LP vision) as the standard treatment for postcataract surgery endophthalmitis since its publication in 1995.[3,4]

Years after this landmark clinical trial, improvements in sterilization procedures,[5] less invasive surgical techniques,[6,7] and novel antibiotics[8,9] have helped to reduce the risk of postcataract endophthalmitis. Some studies have proposed using microincisional vitrectomy in patients with better vision at the time of endophthalmitis diagnosis,[10] whereas others supported complete and early vitrectomy in all cases.[11] Rather than VA, another study has proposed using inflammation scores as a severity marker to guide treatment.[12] Although these and other studies have reported improved VA outcomes in the treatment of endophthalmitis over time, no prospective randomized clinical trials have been conducted since the EVS to rigorously validate these alternative hypotheses.

This retrospective cohort study using data from the American Academy of Ophthalmology IRIS® (Intelligent Research in Sight) Registry, a large national clinical registry, was designed to examine if treatment patterns for postcataract endophthalmitis across the United States are in line with the evidence-based guidelines established by the EVS study.

Methods

This study was conducted in accordance with the Declaration of Helsinki.[13] Given the use of deidentified patient data, this study was exempted from review by the Wills Eye Hospital Institutional Review Board.

Primary Data Source

The IRIS Registry, a centralized data repository and reporting tool that can be used for research purposes, was the source of data for this retrospective cohort study. Data in the registry are deidentified electronic health record data[14] and the investigator does not have access to study identifiers. Version Chicago_amc_2023_04_21 last modified on April 21, 2023, was used. Data were queried from the IRIS Registry using PostgreSQL 8.0.2, and all analyses were performed within the Amazon Web Services Virtual Private Cluster environment (Amazon).

Study Population

The clinical inclusion and exclusion criteria were selected to match the criteria followed for the EVS clinical trial.[3] Thus, all patients undergoing cataract procedures between 2014 and 2022 with a diagnosis of endophthalmitis in the same eye as the cataract procedure within 42 days postcataract procedure, and with a record of undergoing VIT or TAP on the same day or the day after a diagnosis of endophthalmitis were included in these analyses. Additionally, patients were required to have been in the IRIS Registry for >6 months before their first cataract procedure. Patients were excluded if, before cataract surgery, they had a record of ocular surgery, prior penetrating ocular trauma, retinal detachment, choroidal detachment, or anti-VEGF injections up to 42 days before cataract surgery. A list of all Current Procedural Terminology, International Classification of Diseases (ICD) 9, and ICD-10 codes used to define the inclusion and exclusion criteria are presented in Table S1 (available at www.ophthalmologyretina.org). Patients with missing or invalid dates (e.g., onset or documentation dates that were earlier than the date of birth), unknown laterality, unknown sex, or unknown state of residence (or who resided in the US territories) were also excluded.

Patient age (years) was computed at endophthalmitis diagnosis and grouped by age categories of ≤60, 61 to 70, 71 to 80, and >80 years. Race and ethnicity, as documented by practices in their electronic health records, were categorized as Asian, Black, other, unknown, and White, and Hispanic (includes Latino), non-Hispanic, and unknown, respectively. Patients documented as "Native American, Alaska Native," "Native Hawaiian or other Pacific Islander" were aggregated and included in the "other" category for race. Geographic regions (South, Midwest, Northeast, and West) were based on the patient's state of residence. Finally, patients were required to have VA data matching the endophthalmitis laterality at presentation. If patients had >1 VA observation on the same date, the best VA for that day was selected. The VA values were categorized into the following groups: better than 20/40 (≥20/40), worse than 20/40 to 20/100 (<20/40 to ≥20/100), worse than 20/100 to better than counting fingers (CF) (<20/100 to <CF), CF and hand motions (HM), LP, and no LP. Patients presenting with no LP were excluded from the analysis. Finally, insurance was defined as the health care coverage a patient had at the closest visit before, or on the date of, endophthalmitis diagnosis and was grouped into the following 4 categories: commercial (commercial, military, Medicare Advantage, and miscellaneous), Medicare/Medicaid (i.e., public insurance), no insurance, and unknown.

Statistical Analyses and Covariates

Chi-square tests were used to compare the distribution of categorical variables between the VIT and TAP groups. A multivariable logistic regression model including sociodemographic (age, gender, race, ethnicity, geographic location of residence, and insurance coverage) factors and VA at presentation was used to evaluate factors associated with VIT or TAP and to estimate odds ratios (OR) and 95% confidence interval (CI). The final model was determined using a backward elimination process starting with all factors and iteratively discarding the least significant one, until only statistically significant factors are left. Statistical analysis and descriptive statistics were performed using R Version 4.1.2 (https://www.r-project.org/) and Python Version 3.9 (Python Software Foundation, http://www.python.org). A P value <0.05 was considered statistically significant.

Results

Study Population

In the period from 2014 to 2022, there were 9 498 677 cataract surgeries and 3542 cases of postcataract endophthalmitis with an overall incidence of 0.03% treated with VIT or TAP (Fig 1). Of these, 2425 unique patients with postcataract endophthalmitis

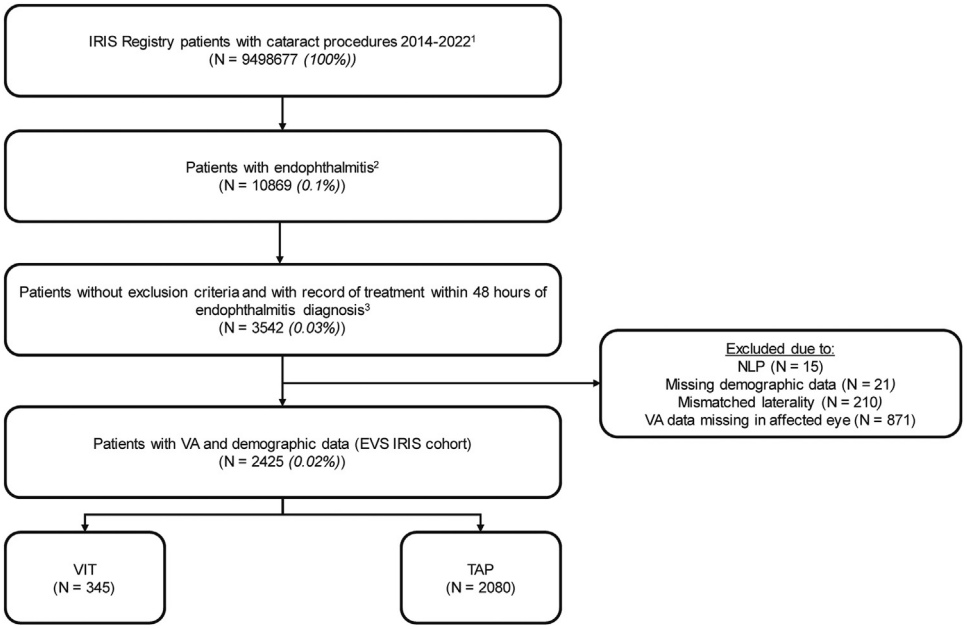

Figure 1. Flowchart of the cohort selection. [1]CPT codes: 66825, 66830, 66840, 66850, 66920, 66930, 66940, 66982, 66983, 66984, 66985, 66986, 66989, 66991. [2]Diagnosis within 42 days of cataract surgery. Codes ICD-9: 360.0x,360.1x; ICD-10: H44.0x, H44.1x. [3]Exclusion criteria include previous ocular surgery, prior penetrating ocular trauma, retinal or choroidal detachment, or anti-VEGF injections up to 42 days before endophthalmitis diagnosis (CPT codes are detailed in Methods section). Treatment codes: CPT: 67015, 67025, 67028, 67036. CPT = Current Procedural Terminology; EVS = Early Vitrectomy Treatment Study; ICD = International Classification of Diseases; IRIS = Intelligent Research in Sight; NLP = no light perception; TAP = vitreous tap with antibiotic injection; VA = visual acuity; VIT = early vitrectomy.

met the study criteria for inclusion (Fig 1). Immediate vitrectomy was performed in 345 of these patients (14.2%), whereas the most patients underwent TAP (n = 2080; 85.8%). Overall, eligible patients were an average (standard deviation) age of 71.8 (9.0) years, 53.2% (1292/2452) were women, and most identified as White race (80.8%). More than half (53.3%) of included patients had poor VA (CF or worse) at diagnosis (Table 2).

The distribution of characteristics in VIT and TAP patients differed significantly by race ($P = 0.03$), ethnicity ($P = 0.03$), geographic region ($P = 0.01$), and VA at endophthalmitis diagnosis ($P < 0.001$) but not by age, sex, or insurance coverage. The proportion of Black (6.7% vs. 5.5%), Asian (3.8% vs. 1.5%), and Hispanic patients (7.8% vs. 4.9%) had a higher proportion of VIT compared with TAP patients. In addition, a higher percentage of VIT patients compared with TAP had VA of CF or worse at diagnosis (73.9% vs. 49.9%) (Table 2).

Treatment Patterns by Sociodemographic Characteristics

Varying treatment patterns for VIT patients by race, ethnicity, and geographic region were also observed (Table 2). By race, 28.9% of Asian patients were treated with VIT, with lower percentages of VIT performed in Black (16.7%) and White (13.6%) patients. Patients of Hispanic ethnicity were treated with VIT in 21.1% of the cases, compared with 13.4% of patients who were not Hispanic. By geographic region, patients in the West and Midwest were more likely to receive VIT than those in the South and Northeast; in comparison, patients in the South and Northeast were more likely to receive TAP (Table 2).

VIT and TAP Treatment by VA at Endophthalmitis Diagnosis

Most patients received TAP regardless of Snellen VA level at the time of endophthalmitis diagnosis. The proportion of patients undergoing VIT increased with worsening VA, ranging from 8.5% in patients with VA ≥20/40 (n = 13 VIT vs. n = 140 TAP) to 34.2% in the LP group (n = 90 VIT vs. n = 173 TAP). Notably, 65.7% (173/263) of patients presenting with LP vision underwent TAP instead of VIT (Table 2 and Fig 2).

Endophthalmitis Temporal Presentation

Of the 2425 patients included in the study cohort, 80.2% (1946) presented with endophthalmitis within 14 days of cataract surgery (median = 6 days). The time to endophthalmitis presentation did not differ when stratified by treatment group (Fig 3).

LP Patients with Vitrectomy after TAP

Thirty LP patients who initially were treated with TAP underwent a vitrectomy sometime after the 24-hour window after the vitreous biopsy and injection of antibiotics. Notably, 43% (13/30) had the vitrectomy within 3 days, 63% (19/30) within 5 days, and 100% (30/30) within 16 days.

Risk Factors Associated with VIT

After backward elimination, age, sex, and insurance coverage were not significantly associated with treatment group, whereas race, ethnicity, region, and VA were retained in the final multivariable model (Fig 4).

Table 2. Postcataract Surgery Endophthalmitis Patient Characteristics by Immediate Vitrectomy and Vitreous Tap with Antibiotic Injection Treatment: IRIS Registry 2014–2022

Characteristics	Endophthalmitis		Treated with VIT			Treated with TAP			P Value[d,*]
	n	%[e]	*n*	%[e]	*% Treated with VIT (vs. TAP)*[c]	*n*	%[e]	*% Treated with TAP (vs. VIT)*[c]	
Overall	2425	100	345	*100*	***14.2***	2080	*100*	***85.8***	
Age (y)									
Mean (SD) age	71.8 (9.0)			71.9 (9.4)			71.8 (9.0)		NS[†]
51–60	233	9.6	36	*10.4*	***15.5***	197	9.5	***84.5***	NS
61–70	780	*32.2*	102	*29.6*	***13.1***	678	*32.6*	***86.9***	
71–80	1010	*41.6*	148	*42.9*	***14.7***	862	*41.4*	***85.3***	
81+	402	*16.6*	59	*17.1*	***14.7***	343	*16.5*	***85.3***	
Sex									NS
Females	1291	*53.2*	176	*51*	***13.6***	1115	*53.6*	***86.4***	
Males	1134	*46.8*	169	*49*	***14.9***	965	*46.4*	***85.1***	
Race									**0.03**
Asian	45	*1.9*	13	*3.8*	***28.9***	32	*1.5*	***71.1***	
Black	138	*5.7*	23	*6.7*	***16.7***	115	*5.5*	***83.3***	
Other	23	*0.9*	2	*0.6*	***8.7***	21	*1*	***91.3***	
Unknown	258	*10.6*	40	*11.6*	***15.5***	218	*10.5*	***84.5***	
White	1959	*80.8*	267	*77.4*	***13.6***	1692	*81.3*	***86.4***	
Ethnicity									**0.03**
Hispanic or Latino	128	*5.3*	27	*7.8*	***21.1***	101	*4.9*	***78.9***	
Not Hispanic or Latino	1879	*77.5*	252	*73*	***13.4***	1627	*78.2*	***86.6***	
Unknown	418	*17.2*	66	*19.1*	***15.8***	352	*16.9*	***84.2***	
Region									**0.01**
South	1041	*42.9*	135	*39.1*	***13.0***	906	*43.6*	***87.0***	
Midwest	535	*22.1*	90	*26.1*	***16.8***	445	*21.4*	***83.2***	
West	462	*19.1*	78	*22.6*	***16.9***	384	*18.5*	***83.1***	
Northeast	387	*16*	42	*12.2*	***10.9***	345	*16.6*	***89.1***	
Insurance									NS
Commercial	1498	*61.8*	205	*59.4*	***13.7***	1293	*62.2*	***86.3***	
Medicare/Medicaid	762	*31.4*	120	*34.8*	***15.7***	642	*30.9*	***84.3***	
No insurance	13	*0.5*	2	*0.6*	***15.4***	11	*0.5*	***84.6***	
Unknown	153	*6.3*	17	*4.9*	***11.1***	136	*6.5*	***88.9***	
Visual acuity									**0.00001**
Better than 20/40	153	*6.3*	13	*3.8*	***8.5***	140	*6.7*	***91.5***	
Worse than 20/40 to 20/100	563	*23.2*	42	*12.2*	***7.5***	521	*25*	***92.5***	
Worse than 20/100 to better than CF	416	*17.2*	35	*10.1*	***8.4***	381	*18.3*	***91.6***	
CF, HM	1030	*42.5*	165	*47.8*	***16.0***	865	*41.6*	***84.0***	
LP	263	*10.8*	90	*26.1*	***34.2***	173	*8.3*	***65.8***	

CF = counting fingers; HM = hand motions; IRIS = Intelligent Research in Sight; LP = light perception; SD = standard deviation; TAP = vitreous tap with antibiotic injection; VIT = early vitrectomy.
*P value is based on chi-square test comparing the distributions between the VIT and TAP groups.
[†]NS = $P > 0.05$.
[c]Boldface and italicized text indicate the % treated with TAP (vs VIT) or % treated with VIT (vs. TAP)
[d]Boldface indicates statistical significance (i.e., $P < 0.05$)
[e]Italicized text indicates % values overall and for each subcategory.

Having poor vision (CF, HM, and LP) was associated with increased odds of receiving VIT (CF, HM: OR = 1.88; 95% CI, 1.06–3.60; $P = 0.04$; LP: OR = 5.37; 95% CI, 2.92–10.57; $P < 0.001$). When compared with White patients, Asian patients were more likely to receive VIT than TAP (OR = 2.62; 95% CI, 1.26–5.15; $P = 0.01$). Similarly, Hispanic patients (OR = 1.92; 95% CI, 1.09–3.24; $P = 0.02$) were also more likely to receive VIT compared with patients who were not Hispanic (Table S3, available at www.ophthalmologyretina.org). The type of procedure also varied by geographic region; compared with the South, patients living in the West or Midwest were more likely to undergo VIT (OR = 1.59; 95% CI, 1.11–2.23; $P = 0.01$; OR = 1.48; 95% CI, 1.07–2.02; $P = 0.02$, respectively).

Discussion

In this IRIS Registry analysis study of nearly 10 million cataract surgeries from 2014 to 2022, the overall incidence of postsurgical endophthalmitis treated with TAP or VIT was 0.03%. The treatment patterns for postcataract surgery endophthalmitis did not match the evidence-based

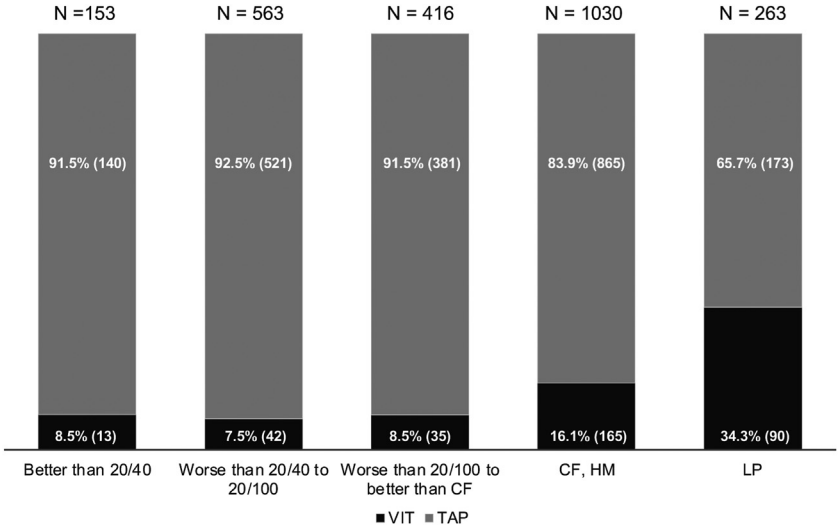

Figure 2. Distribution of VIT and TAP procedures by visual acuity at endophthalmitis diagnosis. CF = counting fingers; HM = hand motions; LP = light perception; TAP = vitreous tap with antibiotic injection; VIT = early vitrectomy.

recommendations of the EVS study. Most of these patients were treated with a TAP regardless of presenting VA at the time of endophthalmitis diagnosis. However, a sizable portion of patients received VIT even when presenting with relatively good VAs. This observation occurred despite a relaxation of the EVS definition of surgery from primary treatment from surgery within 6 hours to include patients with same or next day surgery. The proportion of patients receiving a VIT increased as vision worsened, but of particular note was that only 34.2% of patients with LP vision were treated with VIT, in line with the recommendation of the EVS study. This deviation from the evidence-based treatment guidelines established by the EVS is marked, raising questions about the factors influencing care of these patients and views regarding the relevance of EVS results in contemporary practice.

Significant advances have been made in cataract surgery since the publication of EVS in 1995. Cataract surgical technique has changed with progression to small incision cataract surgery and foldable lenses from large incision surgery and rigid polymethylmethacrylate lenses.[15] It has become standard to sterilize the ocular surface with povidone iodine[16] preoperatively, and intracameral antibiotics[17] have become more popular and are now used by approximately 66% of cataract surgeons in the United States.[18] These advances have led to a further reduction in postcataract endophthalmitis. In an analysis of the Optum database involving 1 997 431 cataract procedures over a 22-year period, the overall rate of post cataract endophthalmitis was 0.08%, declining from 0.22% in 2000 to 0.05% by 2022 (manuscript by authors of this manuscript under review). A recent report from France also showed a similar decrease in the incidence of postcataract endophthalmitis from 0.12% in 2009 to 0.06% in 2017.[19]

One might speculate that the decreased risk of postcataract endophthalmitis over time due to such advances may have led to different patterns in underlying cause or presentation, resulting in changes in treatment decisions

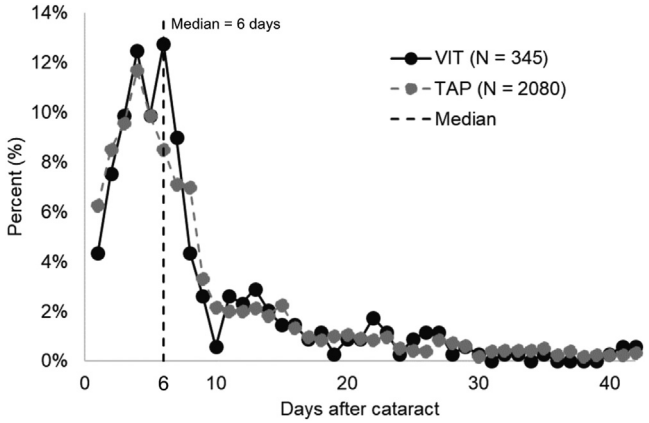

Figure 3. Distribution of endophthalmitis diagnosis up to 42 days post cataract surgery (N = 2425). Median time was 6 days (vertical line) for both groups. TAP = vitreous tap with antibiotic injection; VIT = early vitrectomy.

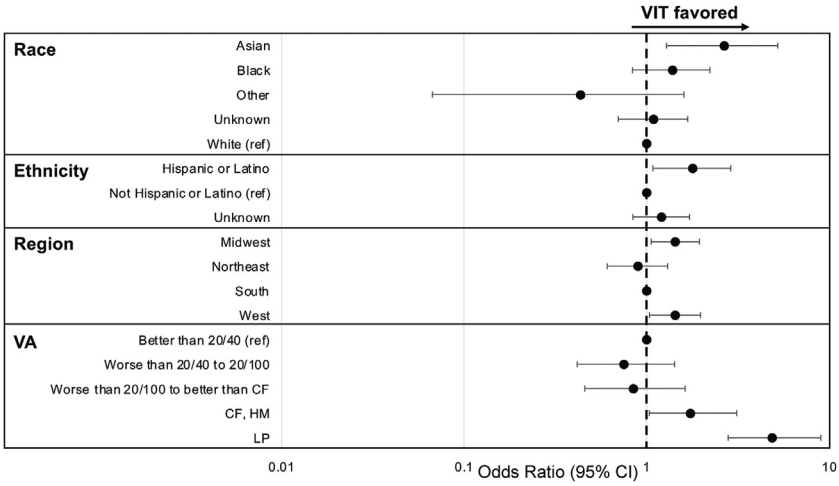

Figure 4. Factors associated with VIT versus TAP (based on reduced logistic regression model with backward elimination). CF = counting fingers; CI = confidence interval; HM = hand motions; LP = light perception; TAP = vitreous tap with antibiotic injection; VA = visual acuity; VIT = early vitrectomy. [1]Model includes race, ethnicity, geographic region, and visual acuity as covariates.

despite the evidence-based EVS guidelines. Arguments can be made as to whether results from a 30-year-old randomized clinical trial should be more influential in guiding treatment decisions when compared with more recent, but less robust evidence. Several recent studies focusing on the management of postcataract surgery endophthalmitis have argued that these advances in cataract surgery make immediate VIT less necessary. Two recent meta-analyses compared the safety, efficacy, and visual outcomes of TAP versus VIT for the treatment of endophthalmitis after cataract surgery. Mihalache et al[20] included 188 eyes in their meta-analysis and found similar safety profiles between TAP and VIT but concluded that TAP resulted in significantly best-corrected VA at final follow-up compared with VIT. Similarly, Far et al[21] included 1355 eyes that developed endophthalmitis after cataract surgery, vitrectomy surgery, or intravitreal injection in their meta-analysis and found that the relative risk of improving $\geq$2 lines with TAP was noninferior to VIT. More practical considerations for the low rate of VIT for postcataract endophthalmitis in eyes presenting with LP VA include limited geographic or temporal access to a fellowship-trained vitreoretinal surgeon, the vitreoretinal surgeon's access to the operating room, and patient preference for treatment type (desire to avoid further intraocular surgery after an adverse event). In addition, the improvement in antibiotic options may also make VIT less necessary.[22] Collectively, these practical considerations combined with advances in surgical techniques and medications seem to be influencing the management of patients with postcataract surgery endophthalmitis with initial LP VA away from the immediate VIT recommendations of the EVS.

However, the perceived reduced utility of vitrectomy may not be universal, as 75% of patients in one European report had an early vitrectomy.[23] In our study, immediate VIT was also being done more frequently than recommended by EVS for patients with better than LP VA in our study. There are several considerations for the higher rate of VIT in patients with good presenting vision. The EVS showed no difference in safety between VIT and TAP. The surgeon may therefore desire to limit the number of surgical procedures performed. Nearly 21% of TAP patients in EVS eventually underwent subsequent vitrectomy.[24] Similarly, Solborg Bjerrum et al[25] reported a higher, but not statistically significant, rate of surgical complication after TAP 36.7% versus VIT 24.2%. They did, however, note that patients who underwent TAP had a statistically significantly higher risk of late vitrectomy for vitreous opacities (10% vs. 1.1%, $P = 0.047$). Other considerations for immediate VIT include a desire for pathogen identification (especially in suspected virulent cases), debulking of infectious burden, and reduction in inflammatory cells and mediators. Experimental animal models of endophthalmitis have shown that the toxins produced by bacteria are the primary drivers for visual damage.[26] These toxins remain after bacteria are no longer detectable in the eye, resulting in host immune response and subsequent retinal damage,[27–29] arguing for early and complete vitrectomy. Clinical evidence in favor of immediate VIT includes a report showing a 50% improvement of those achieving final VA to better than 20/40 over those in whom only a TAP is performed.[30] Another report showed a benefit of VIT to those with 20/400 vision.[31] Lastly, nearly all reports of postcataract endophthalmitis outcomes fail to match the 33% of patients in EVS who achieved 20/40 or better vision, possibly correlating with the lower rates of immediate VIT.[31–37]

There were also notable geographic and demographic differences in the treatment of postcataract surgery endophthalmitis in this IRIS Registry analysis. Geographically, patients in the West and Midwest underwent more immediate VIT than those in the South and Northeast ($P = 0.01$). Several hypotheses can be generated to account for these differences, including limited access to urgent or emergent operating room time or a regional bias toward

treatment type. With regard to demographics, Asian compared with White patients (OR = 2.62; $P = 0.01$) and Hispanic ethnicity compared with non-Hispanic ethnicity (OR = 1.92; $P = 0.02$) were more likely to get a VIT (Fig 4). It is unclear why these 2 demographic groups were more likely to undergo VIT than TAP for the treatment of postcataract surgery endophthalmitis. Ascertainment bias is one possible explanation, though seemingly unlikely because the IRIS Registry receives data from approximately 80% of practices in the United States. Thus, these new observations warrant further investigation.

The overall reported rates of postcataract surgery endophthalmitis in the literature vary, ranging from 0.02[38] to 0.2%.[39] In our IRIS Registry analysis, the rate of endophthalmitis after cataract surgery was found to be on the lower end of this range at 0.03%. A prior IRIS Registry study of nearly 5 million patients who underwent cataract surgery between 2013 and 2017 reported the incidence of endophthalmitis to be slightly higher than our study at 0.04%.[2] This study included combined cataract surgeries with other intraocular procedures that carried a higher incidence of endophthalmitis (0.12%−0.35%), likely accounting for their increased incidence of infection.[2]

There are several limitations to our study to be considered. We used ICD and Current Procedural Terminology codes extracted from electronic health records, which may not accurately reflect the clinical chart, resulting in misclassification bias. For instance, patients were excluded if the endophthalmitis was strongly suspected to be of fungal origin, which may be irrelevant given that the antibiotic treatment was not associated with improved outcomes in patients with or without LP VA. Similarly, the IRIS Registry does not have culture data to accurately classify culture-positive endophthalmitis, rather relying on accurate clinical diagnoses and appropriate ICD coding. Additionally, the IRIS Registry database does not allow for the assessment of visually significant corneal opacity, hypopyon, and media opacity that would prohibit safe vitrectomy. It is possible that a portion of the LP eyes that were not given VIT in our study would have been excluded from the EVS trial because of media opacity. This, however, still does not explain the considerable proportion of patients with HM or better vision who received VIT without evidence of the benefit for VIT as a primary treatment. Our findings are also subject to selection bias and may not be applicable to patient populations outside of those that participate in the IRIS Registry, including patients within the Veteran Affairs health care system, physicians using paper charts, and a smaller proportion of academic medical centers than private practices, limiting generalizability. The inability to look at social determinants of health that could influence the outcome also may reduce the generalizability of our findings. Furthermore, evaluation of clinical outcomes, important in understanding the preferred treatment, was not within the scope of this report, but will be explored in our future work. Despite these limitations, the IRIS Registry carries many advantages for the study of rare or uncommon diseases, such as postcataract surgery endophthalmitis.

In conclusion, this IRIS Registry analysis showed that the treatment for postcataract surgery endophthalmitis frequently does not match the evidence-based recommendations derived from the EVS study, particularly in those with LP vision. Most patients receive TAP for the immediate management of postcataract surgery regardless of VA at the time of diagnosis. Further investigation, including the evaluation of clinical outcomes in patients treated with TAP and VIT, is warranted to determine if the EVS study recommendations, once viewed as the gold standard for postcataract endophthalmitis treatment, are still appropriate >20 years after their publication.

Footnotes and Disclosures

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HUMAN SUBJECTS: No human subjects were included in this study. This study was conducted in accordance with the Declaration of Helsinki. Given the use of deidentified patient data, this study was exempted from review by the Wills Eye Hospital Institutional Review Board.

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Author Contributions:

Conception and design: Tomaiuolo, Deaner, VanderBeek, Schuman, Hyman

Data collection: Tomaiuolo

Analysis and interpretation: Tomaiuolo, Deaner, VanderBeek, Acharya, Syed, Zhang, Schuman, Hyman

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Abbreviations and Acronyms:
CF = counting fingers; **CI** = confidence interval; **EVS** = Endophthalmitis Vitrectomy Study; **HM** = hand motions; **ICD** = International Classification of Diseases; **IRIS** = Intelligent Research in Sight; **LP** = light perception; **OR** = odds ratios; **TAP** = vitreous tap with antibiotic injection; **VA** = visual acuity; **VIT** = immediate vitrectomy.

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Cataract, Endophthalmitis, EVS guidelines, Tap and inject, Vitrectomy.

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