

SELECTION OF MARKERS FOR ACTIVE SEARCH OF ENDOPTHALMITIS AFTER CATARACT SURGERY

Seleção de marcadores para a busca ativa de endoftalmite após cirurgia de catarata

Selección de marcadores para la búsqueda activa de endoftalmitis tras cirugía de catarata

Reginaldo Adalberto Luz^{1*}, Tadeu Cvintal², Edney Cabral Silva², Maria Clara Padoveze³

ABSTRACT: Objective: To identify potential markers to assist in the active search of endophthalmitis after cataract surgery. **Method:** Retrospective, descriptive, and longitudinal study, conducted through review of medical records of patients who underwent cataract surgery. **Results:** The sample included 20 patients (study group - SG) who developed postoperative endophthalmitis and 309 patients (control group - CG) who did not have endophthalmitis. The data were analyzed to identify the clinical and epidemiological markers with a percentage difference $\geq 30\%$ between groups. In comparison with the CG, the SG demonstrated frequency $\geq 30\%$ in established postoperative signs and symptoms (pain, anterior chamber reaction, hypopyon, corneal edema, conjunctival hyperemia, and vitreous opacity); more than four postoperative appointments; and administration of an intravitreal antibiotic injection. **Conclusion:** The selected markers are suggested for incorporation into the active search for post-operative endophthalmitis, in order to facilitate the operation of the epidemiological surveillance system.

Keywords: Infection control. Nursing. Cataract Extraction. Endophthalmitis. Surgical wound infection.

RESUMO: Objetivo: Identificar marcadores potenciais para auxiliar na busca ativa de endoftalmite após cirurgia de facectomia. **Método:** Estudo retrospectivo, descritivo e longitudinal, realizado por meio da revisão de prontuários de pacientes submetidos à cirurgia de catarata. **Resultados:** A amostra incluiu 20 pacientes (grupo de estudo — GE) que desenvolveram endoftalmite pós-operatória e 309 pacientes (grupo controle — GC) que não apresentaram endoftalmite. Os dados foram analisados para identificar os marcadores clínicos e epidemiológicos com uma diferença percentual $\geq 30\%$ entre os grupos. Em comparação com o GC, o GE teve frequência $\geq 30\%$ em: sinais e sintomas pós-operatórios definidos (dor, reação da câmara anterior, hipópio, edema da córnea, hiperemia conjuntival e opacidade vítrea); mais de 4 retornos pós-operatórios; e realização de injeção de antibiótico intravítreo. **Conclusão:** Os indicadores selecionados são sugeridos para incorporação na busca ativa das infecções pós-operatórias de endoftalmite, visando à facilidade operacional do sistema de vigilância epidemiológica.

Palavras-chave: Controle de infecções. Enfermagem. Extração de catarata. Endoftalmite. Infecção da ferida cirúrgica.

RESUMEN: Objetivo: Identificar marcadores potenciales para auxiliar en la búsqueda activa de endoftalmitis tras cirugía de facectomía. **Método:** Estudio retrospectivo, descriptivo y longitudinal, realizado por medio de la revisión de prontuarios de pacientes sometidos a la cirugía de catarata. **Resultados:** La muestra incluyó 20 pacientes (grupo de estudio — GE) que desarrollaron endoftalmitis pos-operatoria y 309 pacientes (grupo control — GC) que no presentaron endoftalmitis. Los datos fueron analizados para identificar los marcadores clínicos y epidemiológicos con una diferencia porcentual $\geq 30\%$ entre los grupos. En comparación con el GC, el GE tuvo frecuencia $\geq 30\%$ en: señales y síntomas pos-operatorios definidos (dolor, reacción de la cámara anterior, hipopión, edema de la córnea, hiperemia conjuntival y opacidad vítrea); más de 4 retornos pos-operatorios; y realización de inyección de antibiótico intravítreo. **Conclusión:** Los indicadores seleccionados son sugeridos para incorporación en la búsqueda activa de las infecciones pos-operatorias de endoftalmitis, buscando la facilidad operacional del sistema de vigilancia epidemiológica.

Palabras clave: Control de infecciones. Enfermería. Extracción de catarata. Endoftalmitis. Infección de la herida quirúrgica.

¹Master's degree from the Nursing School at Universidade de São Paulo (USP); professor at Faculdade de Ciências Médicas of Santa Casa de São Paulo - São Paulo (SP), Brazil.

²Ophthalmologist at Instituto de Oftalmologia Tadeu Cvintal - São Paulo (SP), Brazil.

³PhD Professor in the Nursing Department of Collective Health at USP Nursing School - São Paulo (SP), Brazil.

*Corresponding author: reginaldo.enfermeiro@gmail.com

Received: 01/05/2018 – Approved: 04/21/2018

DOI: 10.5327/Z1414-4425201800030005

INTRODUCTION

Cataract surgery is associated with several postoperative complications, including an intraocular infection known as endophthalmitis. Clinical signs of endophthalmitis are frequently observed in the first seven days after surgery^{1,2}. The most common signs and symptoms are: anterior chamber reaction, hypopyon, eyelid and corneal edema³⁻⁵, conjunctival hyperemia, and vitreous haze^{1,4,6}. In many cases, patients complain of ocular pain or low visual acuity^{3-5,7}.

The mean incidence of postoperative endophthalmitis (POE) is 0.13%^{1,8-11}. However, its occurrence in an outbreak scenario could be devastating, due to the large number of cataract surgeries typically performed in a single day, which would expose the patients to similar risk factors¹²⁻¹⁴. Most patients who develop endophthalmitis evolve to visual disability or blindness^{1,5,7,13,14}. In those cases, the need to remove the eyeball or its internal content through procedures of enucleation¹⁴ or evisceration^{13,15}, respectively, is not rare.

In many health facilities that perform cataract surgery, the professional in charge of the endophthalmitis surveillance system is a nurse. POE surveillance is often challenging for two main reasons: first, many surgeons do not report infection cases; second, characteristics of the clinical presentation of endophthalmitis can be similar to those of the Toxic Anterior Segment Syndrome^{16,17}; and some cases may not be correctly diagnosed, leading to inaccurate rates.

It is important to develop structure and work processes for epidemiological surveillance to prevent the underreporting of endophthalmitis, as well as select markers that point to suspected cases and increase the sensitivity and specificity in case detection.

OBJECTIVE

To identify the clinical and epidemiological characteristics of postoperative endophthalmitis after cataract surgery, in order to indicate the most appropriate markers to assist the active search for cases of endophthalmitis.

METHOD

This is a retrospective, descriptive and longitudinal study, conducted through the review of medical records of patients who

underwent cataract surgery. The study was conducted at a philanthropic institution that provides medical care solely for patients of the Brazilian public health system (SUS), located in the city of São Paulo, Brazil.

The medical records of 329 patients were classified into two groups: control group (CG; n=309), which included patients who underwent cataract surgery from May to June of 2013 without POE; and study group (SG; n=20), which included patients who underwent cataract surgery from April of 2010 to February of 2013 with POE. SG demanded a greater period of data collection, in comparison with CG, due to the low incidence of POE.

To calculate the sample's size, the diagnosis of POE was chosen as the primary outcome. The number of CG participants needed to be 15 times higher than SG ones, in order to detect clinical variables with a percentage difference greater than or equal to 30% between groups. The researchers arbitrated the value of the percentage difference to select only those variables with greater relevance. With the definition of a significance level of 5% and power of the test of 85%, the sample's size required 20 SG patients and 309 patients in the CG to detect the established difference.

Data Collection

The demographic characteristics of patients were collected from all selected records, using a standard form. Clinical data for group comparisons were collected from the first day after surgery to approximately two months later. In this period, patients come back for three scheduled appointments to monitor cataract surgeries postoperative.

Case definition

POE was defined as an intraocular infection diagnosed in up to six weeks after surgery. Its characteristics include the occurrence of at least three of the following signs or symptoms: reduced visual acuity, ocular pain, hypopyon, anterior chamber reaction, vitreous haze, or conjunctival hyperemia.

The routine of postoperative follow-up

The surgical team evaluated all patients on the first day after surgery, nine days after the first appointment, and one month after the second. A retina specialist confirmed

the clinical diagnosis of endophthalmitis after the differential diagnosis of Toxic Anterior Segment Syndrome. The visual acuity measurement was performed using the Snellen chart. According to this test, 20/20 represents 100% of central vision, 20/40 represents 85%, 20/200 represents 20%, and 20/400 represents 10%. For a central vision worse than 10%, the following categories were applied, from highest to lowest vision acuity: counting fingers (that is, the ability to count fingers at a certain distance, reported in meters), hand movement, perception of light and no light perception¹⁸. An infection control nurse recorded data from suspected cases of endophthalmitis using a standard form.

Ethical considerations

The Research Ethics Committee of the Nursing School from Universidade de São Paulo, Brazil, approved the study (approval number CAAE 01039912.3.0000.5392). The patient anonymity was maintained.

Statistical analysis

Descriptive analysis was carried out using the software Epi Info, version 7.1.2.0 (Centers for Disease Control and Prevention, Atlanta, Georgia, United States). Data were expressed as averages, minimum and maximum values, and standard deviation (SD). Student's t-test was used to compare means, when applicable.

RESULTS

Control group: characterization

The CG (n=309) consisted of 192 (62.1%) women and 117 (37.9%) men. The mean age was 68.3 years (range, 41-95; SD, 9.6); 140 (45.3%) of them were older than 70 years. The mean number of postoperative follow-up visits for patients without endophthalmitis was 3.2 (range, 3-7; SD, 0.6), with 297 (96.1%) of them requiring, at most, 4 follow-up visits within 2 months after surgery. Three patients needed surgical revision due to postoperative complications other than endophthalmitis, including the repositioning of intraocular lens, corneal suture, or anterior vitrectomy.

Control group: postoperative evolution

On the first day after surgery, more than half of the patients presented anterior chamber reaction, corneal edema, conjunctival hyperemia, and Descemet membrane folds; 138 (44.7%). Cloudy cornea was observed in 138 (44.7%), and 98 (31.7%) had eyelid edema. Another less common complication was ciliary injection (0.3%); less than 2% of patients presented hypopyon; and none showed signs of vitreous haze. 82 (26.5%) patients reported ocular pain (Table 1).

The second follow-up visit occurred, on average, 9 days after surgery (range, 5-17; SD, 2), with patients showing fewer signs and symptoms when compared to the follow-up appointment on the first postoperative day. The most common complications were: Descemet membrane folds (n=108; 35%) and cloudy cornea (n=105; 34%), followed by corneal edema (n=62; 20.1%) and anterior chamber reaction (n=57; 18.4%). Less than 2.5% of patients presented other complications (Table 2). At the end of the postoperative follow-up

Table 1. Observed signs and symptoms reported by patients on the first day after cataract surgery. São Paulo, 2017 (n=329).

Signs and symptoms	Yes		No		NI	
	n	%	n	%	n	%
ACR	251	81	48	16	10	3.2
Ciliary injection	47	15	228	74	34	11
Nebula	138	45	156	51	15	4.9
Conjunctival hyperemia	184	60	119	39	06	1.9
Corneal de-epithelization	22	7.1	270	87	17	5.5
Corneal edema	209	68	98	32	02	0.6
DMF	159	52	148	48	02	0.6
Ocular pain	82	27	221	72	06	1.9
Eyelid Edema	98	32	200	65	11	3.6
Hyphema	04	1.3	302	98	03	1
Hypopyon	05	1.6	303	98	01	0.3
IM in the IOL	06	1.9	297	96	06	1.9
Keratic precipitates	05	1.6	298	96	06	1.9
Seidel	15	4.9	281	91	13	4.2
Vitreous haze	-	-	303	98	06	1.9
Vitreous wick syndrome	01	0.3	303	98	05	1.6
Vitritis	-	-	304	98	05	1.6

NI: not informed; ACR: anterior chamber reaction; DMF: Descemet membrane folds; IM: inflammatory membrane; IOL: intraocular lens.

period, 221 (71.5%) patients presented a final visual acuity (FVA) of 20/50 or better.

Study group: characterization

The SG (n=20) included 12 (60%) women and 8 (40%) men. The mean age was 67.5 years, (range, 47-83; SD, 8.8); 13 (65%) patients were over the age of 65. The average number of postoperative follow-up appointments for patients with endophthalmitis was 14.5 (range, 8-25; SD, 4.6). Among the necessary interventions for endophthalmitis' treatment, all patients received intravitreal antibiotic injection administered at a surgical center. Thirteen (65%) patients needed two surgical revisions, and three needed more than two surgical revisions.

Study group: postoperative evolution

The most common signs and symptoms (>50%) at the time of diagnosis were: anterior chamber reaction, cloudy cornea,

corneal edema, conjunctival hyperemia, and hypopyon. Vitreous haze and Descemet membrane folds were present in 50% and 40% of the cases, respectively. Less than 30% of patients presented keratic precipitates, inflammatory membrane in the intraocular lens, eyelid edema, among others. 14 (70%) patients reported ocular pain (Table 2).

The average number of days between the date of surgery and the endophthalmitis diagnosis was 7.5 (range, 1-30; SD, 8.7). Most patients (n=11; 55%) were diagnosed after the third postoperative day. Postoperative visual acuity was better than 20/60 for only 4 (20%) patients, and in 8 (40%) cases, it ranged between 20/60 and 20/200; 8 (40%) patients had visual acuity equal to or worse than the ability to count the evaluator's fingers (CF). The FVA evaluated two months after surgery was worse than 20/50 for 17 (85%) patients. Seven (35%) of all cases had FVA equal to or worse than CF. Vitreous samples were collected from 14 (66.7%) patients. Positive culture results were found in 6 of the 14 vitreous samples, as follows: Coagulase-negative *Staphylococcus* (n=3), *Streptococcus* spp. (n=2) and *Staphylococcus aureus* (n=1).

Table 2. Observed signs and symptoms reported by patients after cataract surgery according to the presence or absence of endophthalmitis. São Paulo, 2017 (n=329).

Signs and symptoms	Patients with endophthalmitis* n=20						Patients without endophthalmitis† n=309						Difference‡ (%)
	Yes		No		NI		Yes		No		NI		
	n	%	n	%	n	%	n	%	n	%	n	%	
ACR	17	85	01	5	02	10	57	18	236	76	16	5.2	66.6
Ciliary injection	03	15	12	60	05	25	01	0.3	33	11	275	89	14.7
Nebula	17	85	03	15	-	-	105	34	191	62	13	4.2	51
Conjunctival hyperemia	12	60	06	30	02	10	07	2.3	29	9.4	273	88	57.7
Corneal de-epithelization	01	5	15	75	04	20	02	0.6	57	18	250	81	4.4
Corneal edema	14	70	05	25	01	5	62	20	217	70	30	9.7	49.9
DMF	8	40	10	50	02	10	108	35	145	47	56	18	05
Ocular pain	14	70	06	30	-	-	01	0.3	273	88	35	11	69.7
Eyelid Edema	04	20	12	60	04	20	01	0.3	31	10	277	90	19.7
HypHEMA	01	5	16	80	03	15	-	-	83	27	226	73	05
Hypopyon	12	60	08	40	-	-	-	-	217	70	92	30	60
IM in the IOL	05	25	12	60	03	15	04	1.3	92	30	213	69	23.7
Keratic precipitates	05	25	11	55	04	20	01	0.3	90	29	218	71	24.7
Seidel	01	5	19	95	-	-	-	-	263	85	46	15	05
Vitreous haze	10	50	10	50	-	-	01	0.3	274	89	34	11	49.7
Vitreous wick syndrome	04	20	16	80	-	-	03	1	131	42	175	57	19
Vitritis	01	5	18	90	01	5	01	0.3	134	43	174	56	4.7

NI: not informed; ACR: anterior chamber reaction; DMF: Descemet membrane folds; IM: inflammatory membrane; IOL: intraocular lens; *related to the day of diagnosis (mean=7.5 days; CI 1-30; SD=8.7); †related to the second follow-up appointment (mean=9.1 days; CI 5-17; SD=2); ‡(% found in endophthalmitis cases) - (% found in control).

Differences between groups

The signs and symptoms observed in the SG with a percentage difference greater than or equal to 30% in the second postoperative follow-up appointment — in comparison with the CG — were: ocular pain, anterior chamber reaction, hypopyon, conjunctival hyperemia, corneal edema, and vitreous haze (Table 2).

Other differences found were: higher number of postoperative follow-up appointments in the SG ($p < 0.001$) and the need for intravitreal antibiotic injections, which were only administered in SG patients.

DISCUSSION

Although the clinical presentation of POE is well known, the differential diagnosis of Toxic Anterior Segment Syndrome can be difficult¹⁶ and lead to underreporting of cases. Thus, it is essential to develop tools for the active search of endophthalmitis cases with high sensitivity and specificity for proper epidemiological surveillance.

The endophthalmitis signs observed in the SG are consistent with previous findings of other authors, who also reported the presence of hypopyon, anterior chamber reaction, and corneal edema³⁻⁵ as the most frequent clinical characteristics, followed by conjunctival hyperemia, vitreous haze,^{1,4} ocular pain, and low visual acuity^{3-5,7}. A mild and transient inflammatory reaction of the anterior chamber observed on the first day after cataract surgery is common, according to the literature^{3,4}.

Other signs — such as corneal edema, conjunctival hyperemia, Descemet membrane folds, and cloudy cornea — were present in more than 40% of patients on the first postoperative day, making the diagnosis of endophthalmitis difficult when it is mild and in its early presentation. For this reason, it was decided to compare the differences in clinical presentation, based on the results of the second appointment of patients from the CG, avoiding the potential bias of including false-positive cases. The time to onset of symptoms showed great variability. However, diagnoses were made, on average, in up to one week after surgery^{1,9}. It is worth mentioning that not all clinically positive cases of endophthalmitis were confirmed by microbial culture. Several studies have indicated that more than 40% of vitreous samples showed

no microbial growth^{8,9}. Gram-positive microorganisms were the most common etiologic agents among cases in which agent identification was possible, a scenario consistent with the literature^{1,8,9}.

FVA showed a significant difference between groups. Most patients with endophthalmitis presented poor FVA, characterized as visual disability or blindness, which is consonant with the findings of other studies^{1,5,13,14}. After cataract surgery, CG patients needed few surgical revisions, which were not related to infectious complications. In contrast, patients with endophthalmitis underwent one to three surgical revisions as a direct consequence of case evolution, which is in agreement with studies that describe the treatment of endophthalmitis^{3,6,7,19}. The number of postoperative follow-up appointments for patients with endophthalmitis (SG) was significantly higher than that of the CG patients. However, we did not identify studies in the literature comparing the number of follow-up visits required for patients with and without POE.

Based on this study's results, the most suitable markers for active search of endophthalmitis after cataract surgery include the presence of three or more of the following postoperative signs and symptoms: ocular pain, anterior chamber reaction, hypopyon, corneal edema, conjunctival hyperemia, and vitreous haze; more than four follow-up appointments within two months after surgery; and medical indication for intravitreal antibiotic injection.

CONCLUSIONS

We suggest the incorporation of the selected markers — presence of three or more postoperatively signs and symptoms (ocular pain, anterior chamber reaction, hypopyon, corneal edema, conjunctival hyperemia, and vitreous haze); more than four follow-up appointments within two months after surgery; and medical indication for intravitreal antibiotic injection — into the active search for postoperative endophthalmitis, with the purpose of promoting operational ease of the epidemiological surveillance system, which could potentially increase its sensitivity and specificity.

Knowing the relevant signs and symptoms of endophthalmitis also favors the performance of nurses in their role of guiding and supporting patients and in their contribution to early diagnosis and treatment of this infection.

REFERENCES

1. Raen M, Sandvik GF, Drolsum L. Endophthalmitis following cataract surgery: the role of prophylactic postoperative chloramphenicol eye drops. *Acta Ophthalmol.* 2013;91(2):118-22. <https://doi.org/10.1111/j.1755-3768.2011.02324.x>
2. Mattos FB, Saraiva FP, Angotti-Neto H, Passos AF. Outbreak of ochrobactrum anthropi endophthalmitis following cataract surgery. *J Hosp Infect.* 2013;83(4):337-40. <https://doi.org/10.1016/j.jhin.2012.11.027>
3. Lalitha P, Das M, Purva PS, Karpagam R, Geetha M, Lakshmi Priya J, et al. Postoperative endophthalmitis due to Burkholderia cepacia complex from contaminated anaesthetic eye drops. *Br J Ophthalmol.* 2014;98(11):1498-502. <https://doi.org/10.1136/bjophthalmol-2013-304129>
4. Ji Y, Jiang C, Ji J, Luo Y, Jiang Y, Lu Y. Post-cataract endophthalmitis caused by multidrug-resistant Stenotrophomonas maltophilia: clinical features and risk factors. *BMC Ophthalmol.* 2015;15:14. <https://doi.org/10.1186/1471-2415-15-14>
5. Rishi E, Rishi P, Sengupta S, Jambulingam M, Madhavan HN, Gopal L, et al. Acute postoperative Bacillus cereus endophthalmitis mimicking toxic anterior segment syndrome. *Ophthalmology.* 2013;120(1):181-5. <https://doi.org/10.1016/j.ophtha.2012.07.009>
6. Kelkar AS, Kelkar JA, Barve PM, Mulay A, Sharma S, Amoaku W. Post-clear corneal phacoemulsification endophthalmitis: profile and management outcomes at a tertiary eye care center in western India. *J Ophthalmic Inflamm Infect.* 2016;6(1):48. <https://doi.org/10.1186/s12348-016-0115-y>
7. Vinekar A, Dogra MR, Avadhani K, Gupta V, Gupta A, Chakrabarti A. Management of recurrent postoperative fungal endophthalmitis. *Indian J Ophthalmol.* 2014;62(2):136-40. <https://doi.org/10.4103/0301-4738.128588>
8. Rahman N, Murphy CC. Impact of intracameral cefuroxime on the incidence of postoperative endophthalmitis following cataract surgery in Ireland. *Ir J Med Sci.* 2015;184(2):395-8. <https://doi.org/10.1007/s11845-014-1127-y>
9. Shorstein NH, Winthrop KL, Herrinton LJ. Decreased postoperative endophthalmitis rate after institution of intracameral antibiotics in a Northern California eye department. *J Cataract Refract Surg.* 2013;39(1):8-14. <https://doi.org/10.1016/j.jcrs.2012.07.031>
10. Kessner R, Golan S, Barak A. Changes in the etiology of endophthalmitis from 2003 to 2010 in a large tertiary medical center. *Eur J Ophthalmol.* 2014;24(6):918-24. <https://doi.org/10.5301/ejo.5000473>
11. Creuzot-Garcher C, Benzenine E, Mariet AS, de Lazzar A, Chiquet C, Bron AM, et al. Incidence of acute postoperative endophthalmitis after cataract surgery: a nationwide study in France from 2005 to 2014. *Ophthalmology.* 2016;123(7):1414-20. <https://doi.org/10.1016/j.ophtha.2016.02.019>
12. Gautam P, Joshi SN, Thapa M, Sharma A, Shah DN. Outcome of the patients with post-operative cluster endophthalmitis referred to a tertiary level eye care center in Nepal. *Nepal J Ophthalmol.* 2013;5(2):235-41. <https://doi.org/10.3126/nepjoph.v5i2.8735>
13. Bhat SS, Undrakonda V, Mukhopadhyay C, Parmar PV. Outbreak of multidrug-resistant acute postoperative endophthalmitis due to Enterobacter aerogenes. *Ocul Immunol Inflamm.* 2014;22(2):121-6. <https://doi.org/10.3109/09273948.2013.830752>
14. Buchta V, Feuermannová A, Vása M, Basková L, Kutová R, Kubátová A, et al. Outbreak of fungal endophthalmitis due to Fusarium oxysporum following cataract surgery. *Mycopathologia.* 2014;177(1-2):115-21. <https://doi.org/10.1007/s11046-013-9721-5>
15. Ng AL, Tang WW, Li PS, Li KK. Intracameral cefuroxime in the prevention of postoperative endophthalmitis: an experience from Hong Kong. *Graefes Arch Clin Exp Ophthalmol.* 2016;254(10):1987-92. <https://doi.org/10.1007/s00417-016-3473-0>
16. Lee MH, Cugley D, Atik A, Ang GS. Endophthalmitis or toxic anterior segment syndrome? *Clin Exp Optom.* 2017;100(1):94-5. <https://doi.org/10.1111/cxo.12426>
17. Luz RA, Padoveze MC, Souza RQ, Graziano KU, Cvintal T. Toxic anterior segment syndrome after cataract surgery: the implications for nursing. *Rev SOBECC.* 2015;20(2):96-103. <https://doi.org/10.5327/Z1414-4425201500020005>
18. Holladay JT. Visual acuity measurements. *J Cataract Refract Surg.* 2004;30(2):287-90. <https://doi.org/10.1016/j.jcrs.2004.01.014>
19. Jeong SH, Cho HJ, Kim HS, Han JI, Lee DW, Kim CG, et al. Acute endophthalmitis after cataract surgery: 164 consecutive cases treated at a referral center in South Korea. *Eye (Lond).* 2017;31(10):1456-62. <https://doi.org/10.1038/eye.2017.85>