The Effect of Blue-light Filtering Intraocular Lenses on the Development and Progression of Macular Atrophy in Eyes With Neovascular Age-related Macular Degeneration

ASAF ACHIRON, OMER TRIVIZKI, BORIS KNYAZER, URI ELBAZ, IDAN HECHT, SOHEE JEON, PIOTR KANCLERZ, AND RAIMO TUUMINEN

• PURPOSE: To assess the effect of blue-light filtering (BLF) intraocular lenses (IOLs) on the development and progression of macular atrophy (MA) in eyes with neovascular age-related macular degeneration (nAMD).

• DESIGN: Retrospective, clinical cohort study.

• METHODS: The study included patients with nAMD with anti-vascular endothelial growth factor (VEGF) injections who underwent uneventful cataract surgery between 2007 and 2018 with follow-up until June 2023. Subsequent MA rates were compared between subjects who received a BLF IOL or a non-BLF IOL. All optical coherence tomography scans were manually reviewed in a masked manner regarding patient baseline variables and IOL status by an experienced research technician. By using Heidelberg software, the area of MA was manually evaluated and calculated (mm^2) by the program. The overall risk of developing new-onset MA and the effect of IOL type on disease progression were assessed. Death was included as a censoring event.

• RESULTS: Included were 373 eyes of 373 patients (mean age, 78.6 ± 6.7 years at surgery; 67.4% were female). BLF IOLs were implanted in 206 eyes, and non-BLF IOLs were implanted in 167 eyes with comparable follow-up times (3164 ± 1420 days vs 3180 ± 1403 days, respectively, $P = .908$) and other baseline parameters (age, gender, corrected distance visual acuity, macular thickness, cumulative number of anti-VEGF injections). Nine preexisting and 77 new-onset MA cases were detected, with similar distribution between BLF and non-BLF eyes ($P = .598$ and $P = .399$, respectively). Both univariate Kaplan–Meier ($P = .366$) and multivariate Cox regression analyses adjusted for age and gender showed that BLF-IOLs were comparable to non-BLF IOLs regarding hazard for new-onset MA (hazard ratio [HR], 1.236; 95% CI, 0.784-1.949; $P = .363$). Final MA area at the last visit was 5.14 ± 4.71 mm^2 for BLF IOLs and 8.56 ± 9.17 mm^2 for non-BLF IOLs ($P = .028$), with the mean annual MA area increase of 0.78 ± 0.84 mm^2 and 1.26 ± 1.32 mm^2, respectively ($P = .042$).

• CONCLUSIONS: BLF IOLs did not show added benefit over non-BLF IOLs in terms of MA-free survival but were associated with less progression over time in a cohort of patients with nAMD. (Am J Ophthalmol 2024;266: 135–143. © 2024 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/))

Age-related macular degeneration (AMD) is the leading cause of irreversible blindness after the age of 65 years.[1] In neovascular AMD (nAMD), concurrent macular atrophy (MA) characterized by the development of atrophic areas that grow steadily over time results in corresponding scotoma and visual loss from foveal involvement.[2]

In vitro studies of human retinal pigment epithelium (RPE) cells demonstrated that blue-light exposure initiates apoptosis of RPE cells. In the Beaver Dam Eye Study, outdoor activity and sun exposure early in life were associated with the development of AMD.[3] Moreover, patients with significantly higher exposure to blue or visible light were more likely to have RPE atrophy or disciform scarring.[4]

Blue-light filtering (BLF(intraocular lenses (IOLs(are designed to approximate light filtration of the natural crystalline lens by a chromophore that absorbs short-wavelength light (400-460 nm(. Laboratory and animal models have demonstrated that short-wavelength light po-

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tentially leads to phototoxic retinal damage, which a BLF-IOL can block.[5,6] BLF-IOLs were used in 1 of 4 cataract surgeries in 2011 and remain widely used.[7]

We aimed to use real-world evidence data of a cohort of patients with nAMD who received either a BLF IOL or non-BLF IOL and estimated the effect of BLF IOLs on MA development and progression after cataract surgery.

METHODS

This was a retrospective registry-based cohort of consecutive cataract surgeries performed between September 2007 and September 2018 at the Ophthalmology Unit of the Kymenlaakso Central Hospital (Kotka, Finland), who had concomitant nAMD and were treated with intravitreal anti-vascular endothelial growth factor (VEGF) injections. The rationale to study an nAMD cohort was the availability of consecutive optical coherence tomography (OCT) follow-ups of every patient, which is retrospectively not applicable among non-nAMD patients. All cases (aged ≥50 years) underwent uneventful phacoemulsification surgery and in-the-bag implantation of a BLF-IOL (SN60WF, Acrysof, Alcon Laboratories Inc) or a non-BLF IOL (ZA9003 and ZCB00, Tecnis, Abbott Medical Optics Johnson & Johnson Vision, Inc). The patients were followed until June 2023, and death was considered as a censoring event. The method for MA measurement was OCT based. This report follows the STROBE reporting guidelines for observational studies.[8] A waiver for Institutional Review Board approval was granted by the Helsinki University Hospital Regional Committee on Medical Research Ethics. In Finland, medical research must comply with the provisions of the Medical Research Act (488/1999). Research based purely on documentation or registered materials does not need to be reviewed by the regional ethics committees. The study was approved by the Research Director and the Chief Medical Officer of the Kymenlaakso Central Hospital and adhered to the tenets of the Declaration of Helsinki.

• **MAIN OUTCOME MEASURE AND EVALUATION OF MA:** The primary outcome measure was MA-free survival, and the secondary outcome measure was the MA progression rate between the BLF IOL and non-BLF IOL cohorts. All OCT scans were manually reviewed in a masked manner regarding patient baseline variables and IOL status by our experienced research technician, who otherwise works in the Unit as a full-time ophthalmic nurse. By using Heidelberg software, the area of MA was manually evaluated and calculated (mm^2) by the program (Supplemental Figure 1). The first scan after cataract surgery was considered the baseline for OCT scans for evaluating preexisting MA. In patients with new-onset disease, the baseline MA area and date were set according to the first MA that was detected in the OCT scans. Progression of MA was calculated using the mean difference of area (Δmm^2/year) until the last timepoint with OCT scans during the follow-up.

• **IOL TYPES SELECTION:** The IOL type was assigned at the discretion of the operating surgeon and was not randomly allocated. The patients had no choice in the type of lenses implanted, and there were no financial considerations in selecting between the BLF and non-BLF IOLs. The clinical practice of the Unit was to use the same IOL type for the contralateral eye. No other guidelines were given in the Unit regarding the chosen IOL type. Both IOL types (BLF and non-BLF) were used constantly and throughout the study period. Both IOL types are acrylic and of similar design, making them proper candidates to assess the associations of the BLF aspect, which is the key difference between them.

• **CLINICAL CARE OF NAMD:** All patients with nAMD (International Classification of Disease 10 code H35.31) within the Hospital District were diagnosed, treated, and followed at the Department of Ophthalmology, according to the national Current Care Guidelines for nAMD.[9] To improve follow-up precision, patient mortality was incorporated so that both death and the end of the follow-up were used as censoring events.

The diagnosis of wet AMD was confirmed by a physician who specialized in diagnosing and treating retinal diseases. Clinical examination included corrected distance visual acuity (CDVA) testing, slit-lamp biomicroscopy, tonometry, and fundus examination. Spectral-domain OCT (Heidelberg Engineering GmbH) was recorded before anti-VEGF treatment and on every visit thereafter, except between anti-VEGF induction phase injections, by an experienced ophthalmic technician. Follow-up 30-frame scans were performed with AutoRescan software (Heidelberg Eye Explorer Version 1.9.10.0 and HRA Spectralis Viewing Module Version 6.0.9.0, Heidelberg Engineering GmbH), and the OCT analyses were compared with the previous exams. Fluorescein angiography was performed when necessary.

Patients with nAMD were treated with the treat-and-extend regimen protocol. Anti-VEGF treatment was initiated with 3 loading doses of the primary drug, bevacizumab, given 4 weeks apart. After adequate treatment response was achieved, the treatment interval was lengthened gradually by 2 weeks up to 12 weeks or shortened by 2 weeks at a time if the examination showed any signs of recurrence on OCT scan or slit-lamp biomicroscopic examination, and when experiencing worsening of subjective vision and CDVA in ambiguous cases by OCT. Aflibercept was used as second-line anti-VEGF drug in nonresponders to bevacizumab.

• **CATARACT SURGERY:** Before the surgery, all patients underwent a complete ophthalmological examination, including CDVA evaluation, tonometry, and slit-lamp examina-

TABLE 1. Baseline Variables

	Non-BLF N = 167	BLF N = 206	*P* =
Age (y)	78.5 ± 6.9	78.6 ± 6.6	.866
Male:Female (n/%)	55:112 (33:67)	67:139 (33:67)	.933
Laterality R:L (n/%)	87:80 (52:48)	105:101 (51:49)	.829
CDVA (logMAR units)	0.69 ± 0.55	0.65 ± 0.47	.429
Foveal thickness (μm)	397.32 ± 157.75	397.13 ± 164.45	.991
CSMT (μm)	418.86 ± 135.97	417.25 ± 136.31	.913
Maximal thickness (μm)	522.06 ± 148.76	521.75 ± 163.81	.986
Cumulative anti-VEGF injections	10.0 ± 9.8	10.2 ± 8.5	.809
Total follow-up time (d)*	3180 ± 1403	3164 ± 1420	.908

Data are given as mean ± SD or absolute numbers and proportions. For 2-group comparisons, qualitative data were analyzed with the 2-factor chi-square test, nonparametric variables with Mann–Whitney *U* test, and continuous variables with the Student *t* test.

*Time (days) from cataract surgery to event (GA), death, or end of follow-up. BLF = blue-light filtering; CDVA = corrected distance visual acuity; CSMT = central subfield macular thickness; GA = geographic atrophy.

tion, including anterior segment and fundoscopy assessment.

According to the Finnish National Guidelines for cataract operations, the CDVA for cataract surgery is recommended to be 0.5 or 0.3 in the better or worse eye, respectively, or less by Snellen equivalents, except under specific circumstances (Current Care Guidelines for Cataracts; Finnish Medical Society, Duodecim).[10] The surgical technique used in this study was phacoemulsification (Infinity/Centurion Vision System, Alcon Laboratories, Inc) with a 2.4- to 2.75-mm clear corneal incision.

• **DEATH IN THE PATIENT'S MEDICAL RECORDS AND CENSORING:** When a death certificate is made, its copy is also sent to the population register (The Digital and Population Data Services Agency, Finland). As a rule, the date of death comes in a daily update and is uploaded once a week on Thursdays to the patient medical registry (Lifecare, Healthcare and Welfare, Tieto, Espoo, Finland). In this update, the data on death cover all the Hospital District's patients. When a death message appears in the daily data, the Lifecare patient medical record program automatically deletes post-death appointments and closes referrals. In the absence of mortality data or in the event of geographic atrophy (GA), censoring occurred at the end of the follow-up, on June 16, 2023.

• **STATISTICAL ANALYSIS:** To avoid biases arising from between-eye correlation, a single eye of each patient was included: the eye that was first operated on. Data are presented as mean ± SD unless otherwise specified. For categorical variables, the chi-square test was used. Clinical parameter distributions were tested for normality by the Shapiro-Wilk test. A Student *t* test was conducted for continuous variables with a normal distribution. For survival analyses, the follow-up time was counted to the first event or when censoring the data. The patients were censored at death or when the end of the follow-up was reached. Kaplan–Meier curves were generated, and multivariable Cox regression controlling for age and gender was used to estimate hazard ratios (HRs) for the development of GA. Statistical analysis was performed using IBM SPSS Statistics 27 (IBM Corp) and MedCalc Statistical Software (version 14.8.1). Visual acuity data were converted to logarithm of minimum angle of resolution (logMAR) for statistical analyses. The very low visual acuity measurements have been converted as follows: counting fingers to 1.9 and hand motion to 2.3 logarithm of the minimum angle of resolution units.[11] *P* values less than .05 were considered statistically significant.

RESULTS

• **DEMOGRAPHICS:** Included were 373 eyes of 373 patients who underwent uneventful cataract surgery. The mean age was 78.6 ± 6.7 years, and 67.4% were female, with comparable age and gender distribution between patients with BLF IOLs and non-BLF IOLs (Table 1). Furthermore, eye laterality, CDVA, macular thickness parameters, and the cumulative number of intravitreal anti-VEGF injections were comparable between the groups (Table 1).

The number of patients with MA increased from 2.4% (9/373) at baseline having a preexisting condition to 23.1% (86/373, including an additional 77 cases of 364 eyes) with new-onset condition during the follow-up period.

At baseline, the MA area was 1.91 ± 2.41 mm^2 (median 0.95 mm^2, interquartile range [IQR], 0.68-2.05 mm^2) among patients with preexisting disease and 3.17 ± 4.47 mm^2 (median 1.39 mm^2, IQR, 0.54-4.21 mm^2) among those with new-onset disease. At the final follow-up, the MA area was 6.56 ± 6.98 mm^2 (median 4.16 mm^2, IQR, 1.76-9.53 mm^2).

TABLE 2. Geographic Atrophy Progression Between Non-BLF and BLF Eyes

	Non-BLF N = 167	BLF N=206	*P* =
Preexisting GA (n/%)	5 (3)	4 (2)	.598
New-onset GA (n/%)	31/162 (19)	46/202 (23)	.399
Eyes with GA			
Follow-up time (d)*	2896 ± 1166	2940 ± 1201	.866
Final GA area (mm^2) at last visit	8.56 ± 9.17	5.14 ± 4.71	.028
GA area increase per year ($\Delta mm^2/y$)	1.26 ± 1.32	0.78 ± 0.84	.042

Data are given as mean ± SD or absolute numbers and proportions. For 2-group comparisons, qualitative data were analyzed with the 2-factor chi-square test and continuous variables with the Student *t* test.

*Time (days) until the last OCT scan (last follow-up visit). BLF = blue-light filtering; GA = geographic atrophy.

The BLF IOL (SN60WF) was implanted in 206 eyes (55.2%), and the non-BLF IOL (ZCB00 and ZA9003) was implanted in 167 eyes (44.9%). The mean total follow-up time from cataract surgery to the event (MA), death, or the end of the follow-up was 3164 ± 1420 days (8.8 ± 3.9 years) for BLF IOLs and 3180 ± 1403 days (8.8 ± 3.9 years) for non-BLF IOLs ($P = .908$, Table 1), and the mean follow-up time among eyes with MA until the last follow-up visit with OCT scan was 2935 ± 1211 days (8.2 ± 3.4 years) for BLF IOLs and 2896 ± 1166 days (8.0 ± 3.2 years) for non-BLF IOLs ($P = .880$, Table 2). Among eyes with MA, anti-VEGF treatment status regarding nAMD remission, discontinued and ongoing treatment, cumulative anti-VEGF injections, use of first- and second-line anti-VEGF drugs, last anti-VEGF treatment interval, and neodymium-doped yttrium aluminum garnet (Nd:YAG) laser capsulotomy rates were comparable between those with BLF and non-BLF IOLs (Supplemental Table 1).

• **GA-FREE SURVIVAL BETWEEN THE EYES WITH BLF AND NON-BLF IOLS:** Preexisting MA was observed in 4 of 206 eyes operated with BLF IOLs and in 5 of 167 eyes operated with non-BLF IOLs ($P = .598$, Table 2). New-onset MA after cataract surgery was observed in 46 of 202 eyes (23%) with BLF IOLs and in 31 of 162 eyes (19%) with non-BLF IOLs ($P = .399$, Table 2).

Kaplan–Meier log-rank analysis showed comparable MA-free survival between the BLF and non-BLF IOL groups ($P = .366$, Figure 1). Furthermore, multivariable Cox regression analysis adjusted for age and gender showed comparable HRs for the development of MA with BLF IOLs (HR, 1.236; 95% CI, 0.784-1.949; $P = .363$, Figure 2) when compared with non-BLF IOLs.

• **GA PROGRESSION BETWEEN THE EYES WITH BLF AND NON-BLF IOLS:** During the follow-up, the area of MA increased to 6.37 ± 4.66 mm^2 among eyes with preexisting MA. The final area was 8.29 ± 6.22 mm^2 among eyes with preexisting MA and 6.46 ± 7.19 mm^2 among eyes with new-onset disease.

Among all eyes with MA, the final area of MA was 5.14 ± 4.71 mm^2 with BLF IOLs and 8.56 ± 9.17 mm^2 with non-BLF IOLs ($P = .028$, Table 2) at the last visit. The mean annual MA area increase was 0.78 ± 0.84 mm^2/year with BLF IOLs and 1.26 ± 1.32 mm^2/year with non-BLF IOLs ($P = .042$, Table 2).

DISCUSSION

Our study aimed to evaluate the effect of BLF IOLs on MA development and the progression of an existing MA. We report that BLF IOLs did not show added benefit over non-BLF IOLs in MA-free survival but were protective against its progression over a follow-up of 8 years in a cohort of patients with nAMD.

In a previous report from our group, reporting the effect of BLF IOLs on the development and progression of nAMD after cataract surgery, no benefit was demonstrated to the BLF IOLs over non-BLF IOLs in a very large cohort with comparable postoperative nAMD occurrence between the groups.[12] The current study, although involving a smaller cohort, is the largest to date to investigate the role of BLF IOLs in preventing the development and progression of MA in nAMD eyes. Blue light exposure induced degeneration of the RPE along with photoreceptor and choriocapillaris loss, progressing over time.[13] The large natural Geographic Atrophy Progression study reported a mean change of 0.78 to 0.88 mm^2 at 6 months, 1.57 to 1.85 mm^2 at 12 months, and 3.14 to 3.17 mm^2 at 18 months.[14] The mean GA enlargement from the onset was reported to be 1.09 mm^2 per year (95% CI, 0.89-1.30) with a wide range between the subjects (0.02-4.05 mm^2 per year).[15] MA progression rates in our study conform to those reported in the Geographic Atrophy Progression study among patients who received non-BLF IOLs; nevertheless, slower progression rates could be demonstrated for patients who received BLF IOLs, implying a retinal protective effect probably resulting from the blue-light absorption.

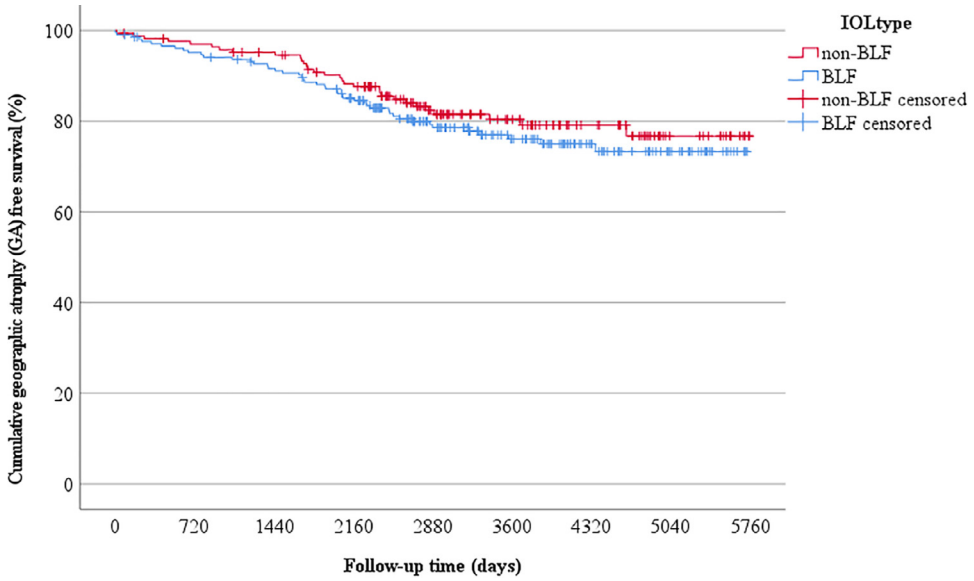

FIGURE 1. Geographic atrophy (GA)-free survival. Kaplan–Meier plot of GA-free survival according to the type of IOL. BLF = blue-light filtering; IOL = intraocular lens.

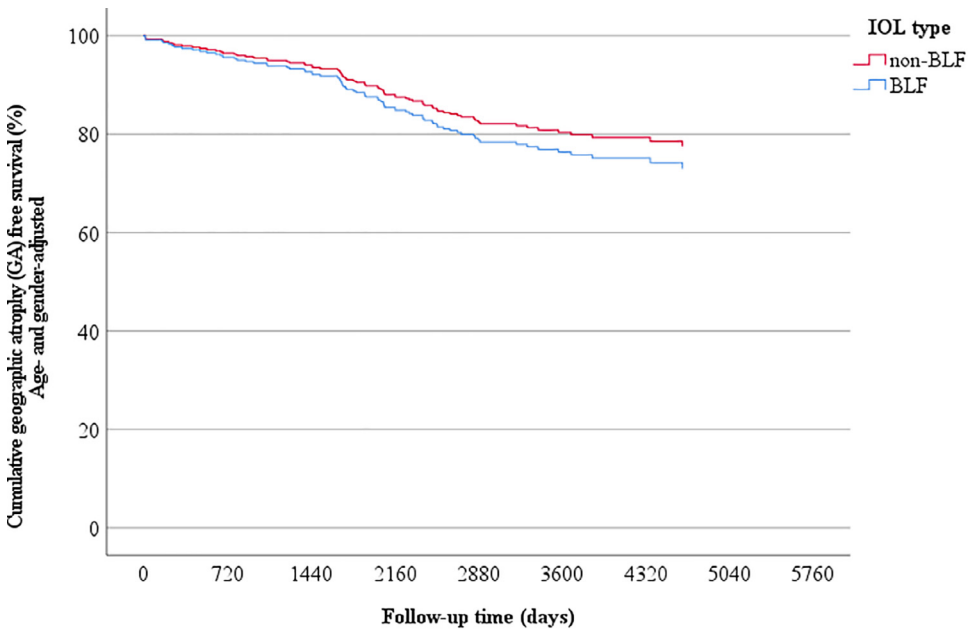

FIGURE 2. GA-free survival adjusted for age and gender. Cox regression plot of GA-free survival after cataract surgery according to the type of IOL, adjusted for age and gender. BLF = blue-light filtering; IOL = intraocular lens.

Various intravitreal drugs effectively manage nAMD, but preventive treatments for atrophy progression are scarce and related to modifiable factors such as smoking cessation, hypertension control, and antioxidant supplementation.[2,16] Likewise, although more than 50 trials are ongoing or have recently been completed on halting the GA progression rate, there are limited Food and Drug Administration–approved treatments for it.[17] Of note, Colijn and associates[15] found that the nonfoveal GA reached the fovea within a mean of 5.6 years and suggested that there may be a time window for treatment.

Of note, cataract surgery has been shown to increase the risk of AMD development and progression: In a meta-analysis of 15 studies (12 cohort studies, 2 randomized con-

trolled trials, 1 case-control study), cataract surgery was associated with the incidence of late AMD (odds ratio, 1.80; 95% CI, 1.26-2.56; $P = .001$), particularly GA (odds ratio, 3.20; 95% CI, 1.90-5.39; $P \leq .001$).[18] Among the technologies designed to prevent AMD progression in the elderly population undergoing cataract surgery are BLF-IOL and ultraviolet radiation absorption properties.[19,20] Short (400-460 nm) wavelength blue-light spectrum is not absorbed by the cornea or blocked by a non-BLF IOL, potentially leading to phototoxic retinal damage.[21-23] It has been postulated that filtering these shorter wavelengths of light using BLF IOLs could protect from nAMD development.[24-26] However, a recent review on BLF lenses and IOLs concluded a lack of consistent evidence for a large-scale introduction of these lenses in routine clinical practice, because most studies are theoretical or based on laboratory or animal experiments.[27] Recent studies by us and others concluded that cataract surgery in eyes with stable nAMD and ongoing anti-VEGF treatment do not result in progression in terms of macular thickness parameters, fluid, or treatment intervals.[28,29] Nevertheless, in humans, reports of clinical studies focusing on BLF IOL and GA or MA specifically are scarce. Therefore, we aimed at investigating whether choosing a BLF-IOL in patients with nAMD with MA to halt its progression is advantageous or whether alternative methods to BLF IOLs should be sought out through further clinical and laboratory studies.

Secondary outcomes of phacoemulsification surgery are increasingly relevant when considering new IOL designs and surgical techniques that involve younger patients seeking spectacle independence rather than the indication of surgery being extraction of the cataractous crystalline lens.[30-32] Although BLF-IOLs are common, their use is not evidence-based, and the harms and benefits remain debatable.[33,34] Of note, AMD occurs in phakic adults aged more than 60 years, although crystalline lens photoabsorption is more significant than with BLF-IOLs.[34] Thus, it was emphasized that because the crystalline lens itself does not completely prevent AMD development, it might be that BLF-IOLs do not offer clinically meaningful photoprotection.[35] A previous clinical study conducted on a Taiwanese cohort was in accordance with our results and failed to show any advantage of BLF IOLs over non-BLF IOLs in terms of incidence and progression of nAMD.[12,36] Several studies on various clinical aspects on the use of BLF devices reported noninferiority results, and no conclusive evidence supports their vast use. For instance, Kiser and associates[37] showed similar scotopic visual function or performance with and without blue-blocking filters. Likewise, Muftuoglu and associates[38] showed comparable blue color perception and contrast sensitivity under photopic and scotopic conditions between eyes with BLF and non-BLF IOLs. Risk of injuries and subjective visual performance parameters for driving were all comparable between the BLF and non-BLF IOL groups, whereas glare during nighttime driving was worse among pseudophakes with BLF IOLs.[39]

Some of the studies, on the other hand, report conflicting results or promising outcomes in favor of BLF IOL use. Although patients who received non-BLF IOLs showed greater improvements in sleep latency and sleep disturbance scores compared with patients receiving BLF IOLs, ocular pain score at 2 and 7 months after cataract surgery improved among eyes with BLF IOLs when compared with those with non-BLF IOLs.[40] Among a large cohort of patients who underwent cataract surgery, the use of BLF IOLs was associated with advantageous glaucoma-free and glaucoma procedure-free survival rates compared with the use of non-BLF IOLs.[41] Furthermore, Pipis and associates[5] showed that subjects who received BLF IOLs (n = 27) had lower GA progression rates (0.72 ± 0.39 vs 1.48 ± 0.88 mm^2/year, $P < .001$) than subjects who received non-BLF IOLs (n = 39). Likewise, Nagai and associates[6] demonstrated that abnormal fundus autofluorescence (FAF) did not develop or progress in patients who received BLF-IOLs compared with non-BLF IOLs.

Our study has several limitations. Retrospective designs to study dry AMD and MA in patients with nAMD are fraught with problems. First, allocation to IOL type was not randomized but was at the discretion of the surgeon. No differences were observed in age, gender, and other relevant baseline parameters between the IOL types. However, due to the study's retrospective nature, residual confounding may still exist, such as smoking, sunlight exposure, nutrition, systemic comorbidities and medication, genetic predisposition, and alcohol consumption, which could not be accounted for. Furthermore, although a documented diagnosis of macular degeneration was extracted and controlled for, this was potentially under-documented in both groups. OCT angiography was not used in this retrospective cohort. OCT angiography also detects silent neovascularizations better and has increased detection of simultaneous nAMD and MA. Furthermore, FAF imaging, a gold standard for atrophy studies, was not available for this retrospective cohort. The detection threshold for MA in OCT-based analysis might be less sensitive to FAF, evidenced by the relatively low overall incidence of MA and relatively high MA area at baseline in our study. Thus, MA incidence might be underestimated regarding the eyes with small MA areas. For instance, among ranibizumab-treated patients with nAMD, MA was detected by FAF in up to 61% of eyes at 2 years and 98% of eyes at 7 years.[42-44] However, in other studies the incidence of MA was found to be far more moderate.[45,46] Although the Kymenlaakso Central Hospital is the only governmental Ophthalmological Unit in the Hospital District, it is possible that a small number of patients were followed and treated at other medical facilities. This possible bias affects both IOL types equally; therefore, we assume that it had only a limited impact on the outcomes. Other confounding factors may include concurrent use of anti-VEGFs and Nd:YAG laser capsulotomies for posterior capsule opacification. Excessive blockade of VEGF may promote the development and progression of MA among

patients with nAMD.[47-54] This concern may become even more apparent with new potent anti-VEGFs. In this study, cumulative numbers of anti-VEGFs, treatment intervals, and distribution of different anti-VEGF drugs were comparable between the 2 IOL types. Previously, Nd:YAG laser capsulotomy rates were found to be lower among Acrysof BLF IOLs compared with some of the non-Acrysof non-BLF IOLs from other manufacturers.[55,56] Here, the Nd:YAG laser capsulotomy rates were comparable between the studied IOL types. In addition, the study took place in Finland, where sun exposure is limited and seasonal compared with warmer climates, so outcomes from other geographical latitudes may differ. Finally, no fully automated image detection software was used.

To conclude, among a cohort of patients with nAMD, subjects who received BLF-IOLs did not show reduced MA incidence rates compared with those who received non-BLF IOLs. However, BLF-IOLs were associated with a lower MA progression rate over the 8-year follow-up. The results suggest that filtering the shorter wavelengths of light using BLF-IOLs could provide protection against MA progression. Further research is warranted to examine whether these findings can be generalized to a non-nAMD cohort as well.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Asaf Achiron: Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Conceptualization. **Omer Trivizki:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Boris Knyazer:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Uri Elbaz:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Idan Hecht:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Conceptualization. **Sohee Jeon:** Writing – review & editing, Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Piotr Kanclerz:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Raimo Tuuminen:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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Each of the coauthors has seen and agrees with each of the changes made to this manuscript in the revision and to the way his or her name is listed.

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