The mean (SD) bilateral interval among all patients was 26.1 (28.0) months (range, 0-122 months). The difference between the unilateral and bilateral groups was not significant (.63).

The sex distribution, age at onset in the first eye, and axial length in the first eye were not significantly different between the unilateral and bilateral groups (Table). We defined the interval between the onset of the first and that in the second eye as the bilateral interval. If the second eye developed an MH within 1 month of onset in the first eye, the bilateral interval was set to 0. The mean (SD) bilateral interval among all patients was 26.1 (28.0) months (range, 0-122 months). The difference in the mean bilateral interval between men and women was not significant (P=.38). The age at onset of an MH in the first eye and its axial length were not significantly correlated with bilateral interval.

The risk of the fellow eye developing an MH estimated by the Kaplan-Meier method was 11.6% at 5 years and 16.7% at 10 years. The cumulative incidence of bilateral interval was set to 0.

Comment. Earlier retrospective studies reported that the incidence of developing an MH in the fellow eye with or without a posterior vitreous detachment was 22% for a mean follow-up of 57 months (37 patients) and 13% within 48 months (340 patients). Ezra et al reported that the incidence of developing an MH in the fellow eye without a posterior vitreous detachment (114 patients) was 15.6% at 5 years by Kaplan-Meier analysis. Although the long-term incidence of developing an MH in the fellow eye may depend on the patient demographic characteristics and vitreoretinal interface features, our large-scale study showed that the cumulative incidence of bilateral was well fit by a hyperbolic function. The findings of the curve-fit analysis suggested that the estimated risk was 21.9% at 20 years and 24.5% at 30 years, although these estimates will have to be confirmed by longer longitudinal studies. Because the appearance of the vitreoretinal interface in spectral-domain optical coherence tomographic images is associated with the risk of developing an MH in the fellow eye, further studies are required to determine the long-term risk in the fellow eye based on spectral-domain optical coherence tomographic features.

Table. Baseline Characteristics of Study Patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unilateral Group (n=960)</th>
<th>Bilateral Group (n=122)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>352 (36.7)</td>
<td>42 (34.3)</td>
<td>.63</td>
</tr>
<tr>
<td>Female</td>
<td>608 (63.3)</td>
<td>80 (65.7)</td>
<td></td>
</tr>
<tr>
<td>Age at MH onset in first eye, mean (SD), y</td>
<td>64.4 (8.6)</td>
<td>64.5 (6.1)</td>
<td>.98</td>
</tr>
<tr>
<td>Axial length in first eye, mean (SD), mm</td>
<td>23.5 (1.4)</td>
<td>23.3 (1.4)</td>
<td>.42</td>
</tr>
</tbody>
</table>

Abbreviation: MH, macular hole.

Figure. The cumulative incidence of macular hole (MH) bilaterality can be described by a hyperbolic function, \( y = 2.6 + 29.8x/(130.1 + x) \), with \( R^2=0.99 \). Curve-fit analysis showed that the estimated risk of MH in the fellow eye was 12.5% at 5 years and 16.9% at 10 years.

Nine hundred sixty patients (88.7%) remained with a unilateral MH (unilateral group) and 122 patients (11.3%) developed an MH in the fellow eye (bilateral group). The sex distribution, age at onset in the first eye, and axial length in the first eye were not significantly different between the unilateral and bilateral groups (Table). We defined the interval between the onset of the first MH and that in the second eye as the bilateral interval. If the second eye developed an MH within 1 month of onset in the first eye, the bilateral interval was set to 0. The mean (SD) bilateral interval among all patients was 26.1 (28.0) months (range, 0-122 months). The difference in the mean bilateral interval between men and women was not significant (\( P=.38 \)). The age at onset of an MH in the first eye and its axial length were not significantly correlated with bilateral interval.

The risk of the fellow eye developing an MH estimated by the Kaplan-Meier method was 11.6% at 5 years and 16.7% at 10 years. The cumulative incidence of bilaterality can be described by the following hyperbolic function: \( y = 2.6 + 29.8x/(130.1 + x) \), with \( R^2=0.99 \) (Figure). Curve-fit analysis showed that the estimated risk of the fellow eye developing an MH was 12.0% at 5 years and 16.9% at 10 years.

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Author Contributions: Dr Kumagai had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Financial Disclosure: None reported.


Reversal of Poliosis and Vitiligo Following Vogt-Koyanagi-Harada Disease

Vogt-Koyanagi-Harada (VKH) disease is a chronic multisystem disorder characterized by an acute onset.1,2 The disease may be associated with signs of meningeal irritation and may later develop integumentary signs of poliosis and vitiligo that are valuable in the diagnosis of the disease. Poliosis and vitiligo occur as late clinical manifestations of VKH disease and help...
in making the diagnosis of complete VKH disease. Reversal of the poliosis and vitiligo has not been previously emphasized. We report reversal of poliosis and vitiligo among patients with VKH disease.

Methods. The study was approved by the institutional review board at The Eye Center, Riyadh, Saudi Arabia. A total of 22 patients with VKH disease were included. Patients had complete VKH disease as defined by the International Committee on Nomenclature. There was no history of penetrating trauma or ocular surgery preceding the onset of the disease. Patients were followed up for a mean of 8 years (range, 4-18 years). The presence of poliosis and vitiligo was assessed, and all patients were evaluated for activity of the disease.

All patients were treated with prednisone, 1 mg/kg/d, for 3 months. Patients were also treated with one of the following immunosuppressive agents for a minimum of 6 months: azathioprine sodium, methotrexate sodium with folic acid, or mycophenolate mofetil. Reversal of poliosis and vitiligo and relapse of active intraocular inflammation were the outcome measures. A relapse was defined as a flare-up of disease activity 3 or 4 months after a remission.

For overall analysis, SAS version 9.2 statistical software (SAS Institute, Inc) was used. Patient characteristics were compared using the Wilcoxon rank sum test or Fisher exact test. Differences in medians were tested with the nonparametric Wilcoxon rank sum test.

Results. There were 22 patients (16 females and 6 males). The mean age was 28 years, and the age range was 5 to 58 years. All patients had vitiligo and poliosis. Reversal of vitiligo and poliosis was complete and was noted in 6 patients at a mean follow-up of 19.6 months (range, 18-30 months) following onset of the disease (Figure 1 and Figure 2). The mean (SD) age was 15.3 (7.9) years for patients with reversal of vitiligo and poliosis compared with 34.0 (8.2) years for patients who had no reversal ($P = .004$) (Table). The median age was 14.5 years for those with reversal and 32.5 years for patients without reversal. None of the 6 patients who had reversal of their poliosis and vitiligo had relapse of uveitis at 30 months compared with 7 of the 16 patients who had no reversal of poliosis or vitiligo ($P = .04$). Systemic steroids were given for longer periods in patients without reversal compared with patients with reversal of vitiligo and poliosis ($P = .007$). Nominal $P$ values are provided for all comparisons in the Table.

Comment. The skin changes are important diagnostic features of VKH. In this series of patients, however, there was reversal of vitiligo and poliosis in patients with complete VKH disease.

The reversal of poliosis, vitiligo, and alopecia in patients with VKH has not been previously emphasized. Reversal of poliosis and vitiligo should be taken into consideration in the diagnosis of VKH disease. Following a period of immunologic dysregulation in VKH disease, reversal of poliosis and vitiligo may suggest restoration of the normal immune homeostasis.

All patients with reversal of the poliosis and vitiligo had no intraocular inflammation. The reversal of poliosis and vitiligo may indicate a good prognostic sign and may indicate remission of the disease.

Khalid F. Tabbara, MD

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Table. Age and Mode of Therapy in Patients With or Without Reversal of Vitiligo and Poliosis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reversal</th>
<th>No</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>Yes (n=6)</td>
<td>No (n=16)</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>15.3 (7.9)</td>
<td>34.0 (8.2)</td>
<td>.004</td>
</tr>
<tr>
<td>Median (range)</td>
<td>14.5 (5-28)</td>
<td>32.5 (22-58)</td>
<td></td>
</tr>
<tr>
<td>Sex, No.</td>
<td></td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Steroid treatment, mo</td>
<td></td>
<td></td>
<td>.11</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>5.0 (1.3)</td>
<td>6.3 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td>5.5 (3.0-6.0)</td>
<td>6.0 (3.0-10.0)</td>
<td></td>
</tr>
<tr>
<td>Immunosuppressive treatment, mo</td>
<td></td>
<td></td>
<td>.66</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>6.0 (0.0)</td>
<td>6.4 (2.3)</td>
<td></td>
</tr>
<tr>
<td>Median (range)</td>
<td>6.0 (6.0-6.0)</td>
<td>6.0 (3.0-11.0)</td>
<td></td>
</tr>
</tbody>
</table>
West Nile virus (WNV) appeared in the United States in 1999; ocular sequelae have been documented since 2003.\textsuperscript{3-5} Associated chorioretinitis, ischemic vasculitis, retinal hemorrhages, and choroidal neovascularization have all been reported.\textsuperscript{3-5}

**Report of a Case.** A 66-year-old man residing in a northern suburb of Chicago, Illinois, had increasing fatigue, severe headaches, confusion, and fevers for 4 days. Enzyme-linked immunosorbent assay of his cerebrospinal fluid was positive for WNV-specific IgM. The patient received supportive therapy for 2 weeks.

Two weeks after discharge, the patient had profound vision loss in his right eye. Visual acuity was counting fingers at 3 ft OD (no improvement with pinhole) and 20/20 OS with correction. Anterior segment examination showed posterior subcapsular cataract in the right eye. Fundus examination showed absence of vitreous cells in each eye. In the right eye, vasculitis, intra-retinal hemorrhages, and areas of nonperfusion were seen (Figure 1A and B). In the left eye, linear streaks of chorioretinal scarring were seen, with no vasculitis or retinal hemorrhages (Figure 1D and E). Fluorescein angiography confirmed areas of nonperfusion in the right macula (Figure 1C) and linear streaklike hyperfluorescent scars along the arcades of the left eye (Figure 1F). Spectral-domain optical coherence tomography (OCT) showed a central thickness of 415 µm OD (Figure 2A); findings from OCT of the left eye were unremarkable.

On routine eye examination for type 2 diabetes 5 months prior to hospitalization, visual acuity was 20/40 OD and 20/20 OS. There was no diabetic retinopathy, and diabetes was controlled with metformin hydrochloride (the hemoglobin A\textsubscript{1c} level was 6.8% of total hemoglobin 6 months prior to hospitalization [to convert to proportion of total hemoglobin, multiply by 0.01]). Visual acuity of 20/40 OD was attributed to the mild cataract.

The macular edema was treated with topical nepafenac in the right eye, 4 times daily. The patient returned 2 weeks later; OCT showed worsening macular edema with a thickness of 502 µm centrally (Figure 2B). Bevacizumab (1.25 mg) was injected intravitreally into the right eye. Two weeks later, visual acuity had improved to 20/150 OD and the OCT central thickness was 346 µm. During the next 2 months, macular edema in the right eye remained stable on clinical examination and OCT; the patient underwent cataract extraction with a monococular intraocular lens implant.

At the last follow-up, 7 months after the initial hospitalization, visual acuity was 20/80 OD and 20/20 OS. On dilated retinal examination, vascular sheathing was seen along the right superior arcade; macular edema and hemorrhage in the right eye had resolved. The left eye showed old, inactive pigmented streaks of chorioretinal scarring along the arcades. Spectral-domain OCT showed the right macula to have a normal thickness of 301 µm centrally (Figure 2C).

**Comment.** To our knowledge, this is the first case of WNV chorioretinitis with macular edema and the first use of intravitreal bevacizumab to treat it. Despite the patient’s history of diabetes, the patient had no diabetic retinopathy on funduscopic examination 5 months prior to acquiring WNV. The course of WNV infection, onset of visual symptoms, and detection of macular edema strongly suggest that the macular edema was the result of increased vascular permeability from WNV chorioretinitis and retinal vasculitis. Diabetes likely predisposes patients with WNV to occlusive vasculitis in the brain and retina,\textsuperscript{3} and diabetes has been implicated as an independent risk factor in WNV-related death.\textsuperscript{6} While the macular edema may have regressed on its own, the prompt resolution of the macular edema and improvement in visual acuity that followed shortly after use of bevacizumab suggest a potential use for the drug in this condition that warrants further investigation.

**Author Affiliations:** Section of Ophthalmology and Visual Science, University of Chicago Pritzker School of Medicine (Drs Afshar, Hariprasad, and Sheth) and Department of Ophthalmology, Northwestern University

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**Use of Intravitreous Bevacizumab to Treat Macular Edema in West Nile Virus Chorioretinitis**

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![Image](image-url)

**Figure 1** A 66-year-old man residing in a northern suburb of Chicago, Illinois, had increasing fatigue, severe headaches, confusion, and fevers for 4 days. Enzyme-linked immunosorbent assay of his cerebrospinal fluid was positive for WNV-specific IgM. The patient received supportive therapy for 2 weeks.

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