Prevalence and Associations of Epiretinal Membranes

The Blue Mountains Eye Study, Australia

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Purpose: The purpose of the study is to determine the prevalence and associations of epiretinal membranes in a defined older Australian population and to assess their influence on visual acuity.

Methods: Three thousand six hundred fifty-four persons 49 years of age or older, representing 88% of permanent residents from an area west of Sydney, underwent a detailed eye examination, including stereo retinal photography. Epiretinal membranes were diagnosed clinically and from photographic grading.

Results: Signs of epiretinal membranes were found in 243 participants (7%; 95% confidence interval [CI], 6.1, 7.6), bilateral in 31%. The prevalence was 1.9% in persons younger than 60 years of age, 7.2% in persons 60 to 69 years of age, 11.6% in persons 70 to 79 years of age, and 9.3% in persons 80 years of age and older, with slightly higher rates in women. Two stages were identified: an early form without retinal folds, termed "cellophane macular reflex" present in 4.8%, and a later stage with retinal folds, termed "preretinal macular fibrosis" (PMF), found in 2.2% of the population. Preretinal macular fibrosis, but not cellophane macular reflex, had a small, significant effect on visual acuity. Preretinal macular fibrosis was significantly associated with diabetes, after age–gender adjustment, in subjects without signs of diabetic retinopathy (odds ratio, 3.2; 95% CI, 1.4, 7.2). Preretinal macular fibrosis also was associated with increased fasting plasma glucose (odds ratio, 1.2; 95% CI, 1.1, 1.3). Epiretinal membranes were found in 16.8% of persons who had undergone cataract surgery in one or both eyes (including PMF in 3.7%), in 16.1% of retinal vein occlusion cases (PMF in 12.5%), both significantly higher rates than in subjects without these conditions ($P < 0.0001$), and in 11% of persons with diabetic retinopathy (PMF in 3.6%), not significantly higher ($P = 0.17$).

Conclusions: This study has documented the frequency and mild effect on vision of epiretinal membranes in an older population. Diabetes was associated significantly with idiopathic cases, whereas well-known associations with past cataract surgery and retinal disease were confirmed. *Ophthalmology 1997;104:1033–1040*

Epiretinal membranes involving the inner retinal surface at the macula are observed frequently in association with a variety of ocular diseases[1–3] or after cataract,[1] retinal detachment,[4] laser, retinal cryopexy, or other eye surgery.[1] For most cases, however, they occur independent of specific disease processes other than posterior vitreous

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detachment[5–13] and are termed "idiopathic."[13–15] In most cases, epiretinal membranes cause only minor or no effect on vision, although in some cases membrane contraction may exert tangential traction on the macular retina, causing significant loss of visual acuity.[10,12,16] These membranes then may require vitrectomy and membrane "peeling" to restore vision.[14,17–19] Epiretinal membranes may cause abnormal retinal vascular tortuosity,[20] cystoid macular edema,[9,20] foveal ectopia, and lamellar[11,21] or, rarely, full-thickness macular holes.[16] Many past descriptive terms include "macular pucker,"[17,22,23] "preretinal macular fibrosis"[6,11,24,25] or "gliosis,"[9,10,15] "surface wrinkling retinopathy,"[26] or "cellophane maculopathy."[12] In many previous studies, case series from referral practices have reported a higher frequency of epiretinal membranes in retinal vascular diseases, particularly diabetic retinopathy and retinal vein occlusion, after retinal tears or detachment, trauma, posterior uveitis, or intraocular infection, after cataract surgery and in high myopia.[1,6,25]

Epiretinal membranes are proliferations at the vitreoretinal junction, and their pathogenesis has been explored in detailed histopathologic and immunohistochemical studies. Histopathologic studies have examined membranes removed at postmortem or enucleation[26,27] and, more recently, at vitrectomy surgery.[2,28] Experimental epiretinal membranes have been provoked by macrophage[29,30] or chondroitin sulfate[31] injection into the vitreous.

Known or postulated risk factors for idiopathic epiretinal membranes include age,[16] diabetes, diabetic retinopathy, and vascular risk factors such as hypertension.[3,24] In a study of 380 patients without prior ocular surgery or any concurrent ocular disease,[25] eyes with idiopathic preretinal macular fibrosis were more likely to have posterior vitreous detachment (75%) than were fellow eyes (61%). Bilateral involvement was more likely if diabetes, hypertension, or high myopia was present.

Although many large case series of epiretinal membranes have been published,[11,25] the only population-based report is from the Beaver Dam Eye Study.[32] This study found that epiretinal membranes were present in an least 1 eye (11.8%) of 4802 participants 43 to 86 years of age and were bilateral in 110 (19.5%) of these subjects. The majority of membranes consisted of a "cellophane reflex" only, whereas a "cellophane reflex with retinal folds" was found in one or both eyes in 2.3% of subjects. Epiretinal membranes were associated with past cataract surgery and proliferative diabetic retinopathy. After excluding 549 participants who had associated retinal disease or a history of cataract surgery, the overall prevalence was 464 of 4253 subjects (10.9%). The aim of the current report is to describe the prevalence, associations, and effect on vision of epiretinal membranes in a representative older Australian population.

Methods

Population Studied

The Blue Mountains Eye Study is a population-based survey of vision and common eye diseases in an urban population comprising two postcode areas in the Blue Mountains region, west of Sydney. The population is representative of Australia for income and education[33] and was described in previous reports.[34,35] In brief, after a door-to-door census, all permanent residents with birthdates before January 1, 1943, were invited to attend for a detailed eye examination at a local clinic during 1992 and 1993. Nursing home residents are not included in this report. The number of eligible residents found differed from that of the Australian Census conducted 3 months earlier by only 6 persons (0.15%).[33] Of 4433 eligible persons, 3654 (82.4%) participated in the eye study, and their age–gender profile is shown in Figure 1. Among 778 nonparticipants, 501 persons (11.3%) refused, of whom 353 (8%) permitted a brief interview, whereas 148 persons (3.3%) refused both examination and interview. When the coordinator contacted eligible households for appointments, 68 persons (1.5%) had died and 210 (4.8%) had moved. Thus, 278 persons (6.3%) could not be examined; after their exclusion, the response was 87.9%.

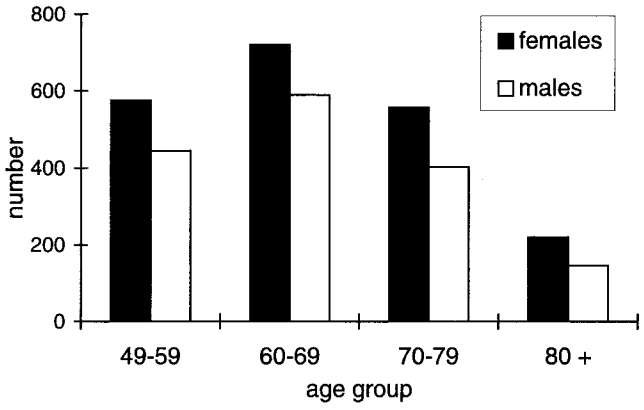

Figure 1. Age-gender distribution of 3654 participants attending the Blue Mountain Eye Study, 1992–1994.

Procedures and Definitions

At the clinic visit, a detailed medical and ophthalmic history was taken, including a history of hypertension, diabetes, and systemic vascular disease. All subjects examined underwent a detailed eye examination, which included subjective refraction using a log of the minimum angle of resolution (LogMar) chart[36] and Zeiss FF3 30° stereo retinal photographs (Carl Zeiss, Oberkochen, Germany). Photographs of Diabetic Retinopathy Study fields 1 (disc), 2 (macula), with nonstereo photographs of fields 3 (temporal to macula), 4, and 5 (upper, lower vascular arcades), and a field nasal to the disc[37] were taken. Blood pressure, height, weight, and applanation intraocular pressures were measured. Participants were asked to return for fasting blood tests and 88% complied. Diabetes was diagnosed from history or a fasting plasma glucose greater than or equal to 7.8 mmol/l. Spherical equivalent refractive error was calculated as (sphere + [cylinder/2]) in diopters.

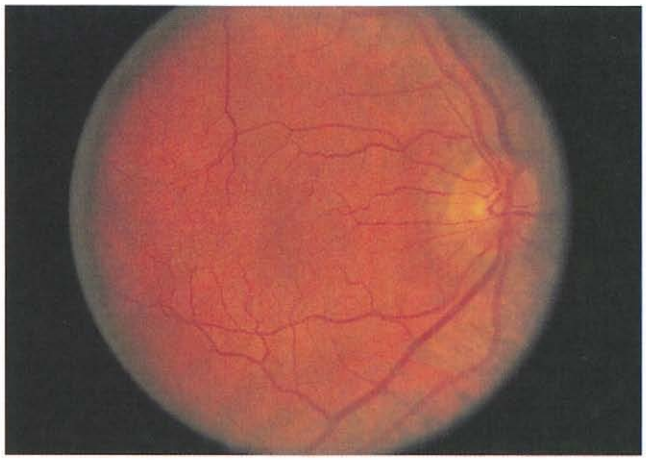

Figure 2. Right fundus of participant with cellophane macular reflex only, best seen temporal to fovea. Visual acuity of 20/20.

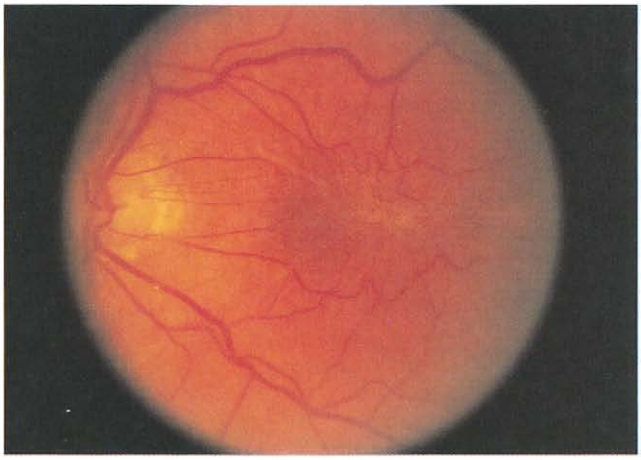

Figure 3. Left fundus of participant with preretinal macular fibrosis, with radial folds from focus temporal to fovea. Visual acuity of 20/30.

The diagnosis of epiretinal membrane was confirmed during masked grading of all photographs taken of participants and was found to be highly reproducible on regrading of a random sample. The site of the epiretinal membrane was classified using a grid developed for grading age-related maculopathy.[38] The grid radius is 3000 μm, corresponding to the anatomic macula,[39] and was placed over one of the stereo pair when grading. For the purpose of this report, epiretinal membranes wholly outside the grid were not graded as present. Glaucoma was diagnosed by the finding of matching optic disc cupping and rim thinning (cup–disc ratio $\geq$0.7 or cup–disc asymmetry $\geq$0.3), with characteristic visual field defects shown on automated perimetry.[40] Ocular hypertension was diagnosed when no characteristic glaucomatous optic disc or visual field changes were present, but intraocular pressure was elevated to greater than or equal to 22 mm in either eye. Cases of rubeotic, secondary, or angle closure glaucoma were excluded. Late age-related macular degeneration was defined as the presence of either geographic atrophy or exudative maculopathy in either eye. Early age-related maculopathy was defined as the presence of indistinct soft drusen or distinct soft drusen with associated retinal pigmentary abnormalities in either eye.[34,38,41]

Classification of Epiretinal Membranes and Subjects Included

Various grading systems have been proposed.[16] A classification similar to that used by Klein et al[32] was adopted for the current study. Two types of epiretinal membrane were identified. The first or earliest stage consisted of a "cellophane macular reflex" (CMR) only, described by Wise[6] as a "glinting, water–silk, shifting light reflex," due to a thin layer of preretinal cells, at first causing little distortion of the retinal surface, as shown in Figure 2. The second or later stage occurs, according to Wise, "as the membrane thickens and contracts, with the appearance of superficial retinal folds or traction lines, becoming opaque and gray." This stage was termed "preretinal macular fibrosis" (PMF) and is shown in Figure 3. Subjects with both CMR and PMF present (Fig 4) were allocated to the PMF group.

Of 3654 subjects examined, 3490 had photographs considered gradable for epiretinal membranes. Among the 164 excluded were 72 subjects who had no photographs taken,[34] 24 in which media opacities prevented accurate grading, and 68 with signs of late age-related macular degeneration in 1 or both eyes. These subjects were excluded because this disease was considered likely to confound the grading of epiretinal membranes. Epiretinal membrane formation is known to be associated with many disease processes, including past cataract surgery, retinal vascular disease, and retinal detachment.[32] Subjects with any of these conditions in one or both eyes were amalgamated into a "secondary causes" group. Included were 59 persons with retinal vein occlusion, 82 with diabetic retinopathy, and 32 with history or signs of retinal detach-

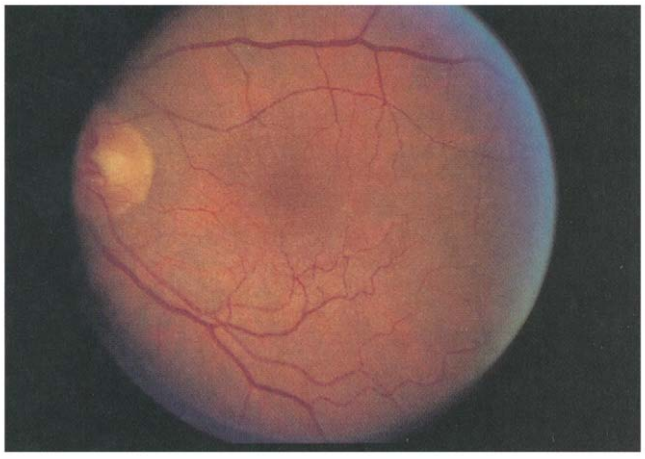

Figure 4. Left fundus of participant with combined epiretinal membrane. Retinal folds (preretinal macular fibrosis) present crossing the macula with cellophane macular reflex present inferior to the foveal area. Visual acuity of 20/20.

Table 1. Prevalence (%) of Epiretinal Membranes by Age and Sex

	Type of Epiretinal Membrane	Age Group						
						All Ages (n = 3490)		
		<60 (n = 1005)	60–69 (n = 1285)	70–79 (n = 908)	80+ (n = 292)	Females (n = 1961)	Males (n = 1529)	Both Sexes
Idiopathic epiretinal membranes (number at risk = 3158)	PMF	0.5	1.2	4.2	3.3	2.0	1.7	1.9
	CMR only	0.9	5.9	6.1	3.8	4.8	3.6	4.3
	Any	1.5	7.1	10.3	7.0	6.8	5.3	6.2
Secondary epiretinal membranes (number at risk = 332)	PMF	4.7	3.4	7.3	3.8	6.9	3.1	5.1
	CMR only	4.7	6.9	11.4	11.4	10.4	8.8	9.6
	Any	9.4	10.3	18.7	15.2	17.3	11.9	14.8
All epiretinal membranes (number at risk = 3490)	PMF	0.7	1.4	4.7	1.9	2.4	1.8	2.2
	CMR only	1.2	5.8	6.9	4.3	5.3	4.2	4.8
	Any	1.9	7.2	11.6	6.2	7.7	6.0	7.0

CMR = cellophane macular reflex; PMF = preretinal macular fibrosis.

ment or other retinal lesions, such as toxoplasmic chorioretinitis or traumatic retinopathy. Epiretinal membranes were considered idiopathic if present in subjects without a secondary cause.

Data Handling and Statistical Methods

Data were entered into computer databases. Statistical Analysis System (SAS Institute Inc, Cary, NC) was used for tabulations and statistical analyses, including chi square statistic, Mantel–Haensel chi square statistic, and logistic regression analyses. In the logistic regression, age, intraocular pressure, LogMar visual acuity, spherical equivalent, and biochemical parameters were used as continuous variables, whereas glaucoma, hypertension, and other indices of systemic disease status were used as dichotomous variables. Confidence intervals (CIs) of 95% are presented.

Results

Prevalence and Characteristics of Epiretinal Membranes

Epiretinal membranes were observed in 317 eyes of 243 participants (7%; CI, 5.9–7.8) and were present bilaterally in 74 cases (31%). Prevalence rates were similar for right and left eyes. Age-specific prevalence rates are listed in Table 1 and shown in Figure 5. Rates were considered separately for the idiopathic group, for subjects with secondary causes, and for all participants.

For all subjects, the prevalence was 1.9% in persons younger than 60 years of age, 7.2% for persons 60 to 69 years of age, 11.6% for persons 70 to 79 years of age, and 9.3% for persons 80 years of age or older. This age-related increase was significant ($\Omega^2_{trend} = 58.8$, 1 degree of freedom, $P < .0001$). The increased odds of epiretinal membranes for persons 70 years of age or older compared with those of persons younger than 60 years of age were 7.4. The overall prevalence was 7.7% in females and 6% in males, the difference of borderline significance after age adjustment, odds ratio (OR), 1.4 (CI, 1–1.8). Early epiretinal membranes, termed cellophane macular reflex, and advanced epiretinal membranes, termed preretinal macular fibrosis, are considered separately in Table 1. Cellophane macular reflex was found in 4.8% (CI, 4.1–5.5) and PMF in 2.2% (CI, 1.7–2.7) of subjects with the peak prevalence seen for persons 70 to 79 years of age. Both PMF (2.4%) and CMR (5.3%) were more frequent in women than men (1.8% and 4.2%, respectively; OR, 1.3) for both epiretinal membrane types, not significant after age adjustment. Cellophane macular reflex was more frequently bilateral (38%) than PMF (15%).

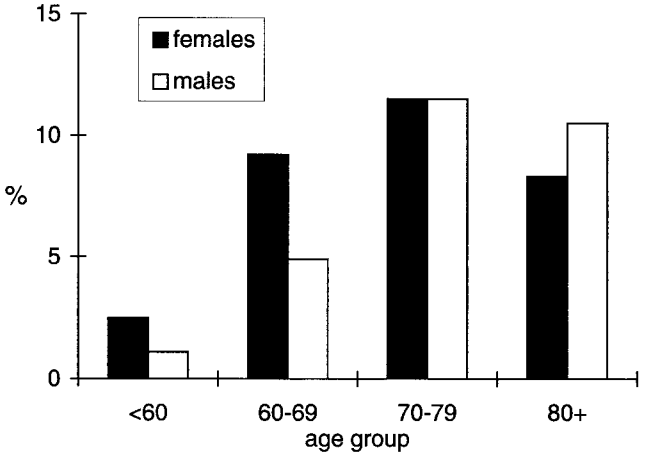

Figure 5. Prevalence of epiretinal membranes by age and gender in 3490 participants with gradable retinal photographs.

Table 2. Relationship of Preretinal Macular Fibrosis to Selected Characteristics, after Excluding Cases with Diabetic Retinopathy and Other Known Secondary Causes (n = 3161)

Characteristic	Preretinal Macular Fibrosis			
	Crude Association		*Adjusted for Age, Sex*	
	OR	CI	OR	CI
LogMar visual acuity	0.95	0.93, 0.97*	0.95	0.93, 0.98*
Early age-related maculopathy	1.94	0.87, 4.34	1.86	0.84, 4.16
Glaucoma	0.67	0.16, 2.79	0.71	0.17, 2.98
Ocular hypertension	0.70	0.22, 2.31	0.71	0.22, 2.31
Intraocular pressure (mm)	1.00	0.95, 1.06	1.01	0.95, 1.07
Refractive error (diopters)	1.00	0.87, 1.14	0.98	0.86, 1.12
Diabetes (history)	2.62	1.03, 6.68†	2.68	1.05, 6.86†
Diabetes (history or blood)	3.13	1.39, 7.03*	3.21	1.43, 7.23*
Plasma glucose (mmol/l)	1.19	1.07, 1.34*	1.20	1.07, 1.34*
Hypertension (history)	1.29	0.77, 2.17	1.24	0.74, 2.09
Hypertension (history or examination)	1.34	0.80, 2.26	1.29	0.76, 2.17
Stroke (history)	0.80	0.19, 3.32	0.78	0.19, 3.24
Angina (history)	1.43	0.70, 2.92	1.41	0.70, 2.03
Myocardial infarct (history)	0.37	0.09, 1.53	0.38	0.09, 1.55
Body mass index	1.01	0.96, 1.05	1.01	0.97, 1.05
Smoking (past or current)	0.79	0.47, 1.33	0.80	0.47, 1.38
Alcohol use (current)	0.67	0.39, 1.13	0.71	0.41, 1.23
Serum creatinine (mmol/l)	1.00	0.99, 1.01	1.00	0.99, 1.02
Serum cholesterol (mmol/l)	1.00	0.78, 1.28	0.99	0.77, 1.28
Serum HDL-cholesterol (mmol/l)	1.08	0.59, 1.99	1.06	0.55, 2.03
Plasma fibrinogen (g/l)	1.11	0.88, 1.41	1.09	0.95, 1.07

OR = odds ratio; CI = confidence interval; HDL = high density lipoprotein.

* Significant at $P < 0.01$.

† Significant at $P < 0.05$.

The prevalence of epiretinal membranes in 332 subjects with potential secondary causes (14.8%; CI, 10.9–18.6) was significantly higher than for all subjects. This increase was present for both PMF (5.1%; CI, 3–8.1) and CMR (9.6%; CI, 6.7–13.3). The overall prevalence was higher in females (17.3%) than males (11.9%), not significant (OR, 1.4) after age adjustment.

Epiretinal membranes in 3158 participants without known predisposing causes were considered idiopathic and prevalence rates for this group assessed separately (Table 1). The overall prevalence of epiretinal membranes in the idiopathic group was 6.2% (CI, 5.3–7.1), slightly lower than for all participants, as was the prevalence of CMR (4.3%; CI, 3.6–5) and PMF (1.9%; CI, 1.4–2.4). Females (6.8%) were affected more frequently than were males (5.3%), not significant (OR, 1.3) after age adjustment. Epiretinal membranes were found in 16.8% (CI, 11.5–22.1) of 191 subjects who had undergone cataract surgery in one or both eyes, including PMF in 3.7% and CMR in 13.1%. Among 56 persons with signs of a retinal vein occlusion in 1 or both eyes, epiretinal membranes were found in 16.1% (CI, 7.6–28.3), including PMF in 12.5% and CMR in 3.6%, the highest PMF rate for any subgroup. In subjects with diabetic retinopathy, epiretinal membranes were found in 11%, including PMF in 2.4% and CMR in 8.6%. For both cataract surgery and retinal vein occlusion, the rates were significantly higher than in the idiopathic group by chi square analysis ($P < 0.001$). For diabetic retinopathy, the rate was higher, but this was not statistically significant ($P = 0.17$). For the 32 subjects with other retinopathies, epiretinal membranes were present in 2 cases (6.7%), both cases of past retinal detachment with PMF with associated retinal pigment dispersion.

There were no significant regional differences for distribution of PMF within the inner or outer sectors of the 3000-μm radius grid centered on the fovea. In cases with PMF, the central 500-μm radius circle was involved (20% or more of area covered) in 87% of affected eyes. An epiretinal, lamellar, or pseudohole[42] at the macula was present in six subjects (8% of cases) with associated PMF. An idiopathic, full-thickness macular hole[43] was present in four right and two left eyes of six persons (four women, two men), a population prevalence of 0.2%. An epiretinal membrane (CMR) was found in only one of these six cases.

Best-corrected LogMar visual acuity was assessed for affected right and left eyes in the 3158 subjects without known precipitating causes. Compared with eyes without epiretinal membranes, eyes with PMF had a significantly lower mean LogMar visual acuity (50.1 letters compared with 53.6 letters, $P < 0.01$), whereas the mean LogMar visual acuity of eyes with CMR (52.5 letters) was not significantly worse. Best-corrected LogMar visual acuity

Table 3. Relationship of Cellophane Macular Reflex to Selected Characteristics, after Excluding Cases with Diabetic Retinopathy and Other Known Secondary Causes (n = 3161)

	Cellophane Macular Reflex			
	Crude Association		*Adjusted for Age, Sex*	
Characteristic	*OR*	*CI*	*OR*	*CI*
LogMar visual acuity	1.00	0.98, 1.03	1.01	0.98, 1.04
Early age-related maculopathy	0.31	0.10, 0.98*	0.30	0.09, 0.94*
Glaucoma	1.60	0.39, 6.59	1.61	0.39, 6.60
Ocular hypertension	1.72	0.54, 5.49	1.73	0.54, 5.52
Intraocular pressure (mm)	0.99	0.94, 1.04	0.99	0.94, 1.04
Refractive error (diopters)	1.14	1.03, 1.26*	1.13	1.02, 1.24*
Diabetes (history)	0.20	0.03, 1.42	0.20	0.03, 1.46
Diabetes (history or blood)	0.16	0.02, 1.15	0.16	0.02, 1.18
Plasma glucose (mmol/l)	0.88	0.71, 1.08	0.90	0.74, 1.10
Hypertension (history)	1.04	0.73, 1.47	0.98	0.70, 1.42
Hypertension (history or examination)	1.12	0.79, 1.58	1.08	0.77, 1.53
Stroke (history)	1.26	0.58, 2.75	1.24	0.57, 2.71
Angina (history)	1.05	0.62, 1.79	1.05	0.61, 1.78
Myocardial infarct (history)	0.66	0.32, 1.36	0.68	0.33, 1.41
Body mass index	0.99	0.95, 1.03	0.99	0.96, 1.03
Smoking (past or current)	0.79	0.56, 1.12	0.83	0.58, 1.20
Alcohol use (current)	1.03	0.70, 1.51	1.14	0.77, 1.70
Serum creatinine (mmol/l)	1.00	0.99, 1.01	1.00	0.99, 1.01
Serum cholesterol (mmol/l)	0.96	0.81, 1.13	0.92	0.78, 1.09
Serum HDL-cholesterol (mmol/l)	1.17	0.79, 1.74	1.01	0.66, 1.55
Plasma fibrinogen (g/l)	1.18	1.01, 1.38*	1.16	0.99, 1.36

OR = odds ratio; CI = confidence interval; HDL = high density lipoprotein.

* Significant at $P < 0.05$.

was significantly worse in eyes of subjects with PMF compared with subjects without epiretinal membranes, after age–gender adjustment (OR, 0.95; CI, 0.93–0.98). Cellophane macular reflex had no significant effect on visual acuity using the same analysis (OR, 1.00; CI, 0.98–1.04). Visual acuity was reduced to 20/40 or worse in only 14 of 86 eyes with PMF, including 9 eyes with 20/40 to 20/60 visual acuity, 3 eyes with 20/80 to 20/100 visual acuity, and 2 eyes with 20/200 or worse visual acuity. In the latter two eyes, other causes were the main reason for visual loss. In 7 of the remaining 12 cases, cataract was assessed as a contributory cause.

Associations with Epiretinal Membranes

Logistic regression analyses were performed, after excluding subjects with any known secondary cause for epiretinal membranes (332) and all cases with signs of diabetic retinopathy or previous laser treatment. In this idiopathic group, after adjusting for age and gender, PMF was more frequent in persons with a history of diabetes (OR, 2.7; CI, 1.1–6.9), as listed in Table 2. The association persisted for persons with diabetes either diagnosed from history or undiagnosed previously, but with elevated fasting plasma glucose (OR, 3.2; CI, 1.4–7.2). Fasting plasma glucose, measured continuously, also was related to PMF (OR, 1.2; CI, 1.1–1.3). Diabetes and fasting glucose were, however, not significantly related to CMR or to combined PMF and CMR. A weak association was found between hyperopic spherical equivalent refractive error and CMR, but not with PMF. There was no significant association of either lesion with other parameters, as listed in Tables 2 and 3. There were nonsignificantly increased odds of PMF (OR, 1.9) and significantly decreased odds of CMR (OR, 0.3) in eyes with early age-related maculopathy.

Discussion

Only one previous population-based study of epiretinal membranes has been reported.[32] The current study has provided these data for a similar, representative Australian population sample aged 49 or older. Systemic and ocular associations with epiretinal membranes in this population and their influence on vision also were assessed. The small number of epiretinal membrane cases with visual acuity that decreased to 20/40 or worse underlines the reasonable visual prognosis of this disorder and the infrequency of permanent visual loss. The presence of epiretinal membranes with retinal folds (termed PMF) was associated with a small, but significant decrease in visual acuity, although early preretinal membranes without retinal folds (termed CMR) had no significant effect

on visual acuity, after age–gender adjustment. These vision findings replicate those from the report of the Beaver Dam Eye Study.[32]

The age-specific prevalence rate of PMF (2.2%) in our study was similar to that found in Beaver Dam (2.8%), calculated from published right and left eye prevalence rates, assuming 20% were bilateral. However, the prevalence of CMR alone found in our study (4.8%) was only half that found in Beaver Dam (9%). Thus, the overall prevalence for any epiretinal membranes in our study (7%) was lower than that in Beaver Dam (11.8%), mainly because of the difference in the rate for CMR, which is a relatively subtle retinal sign. It is possible that systematic grading differences could have accounted for the lower prevalence of CMR found in our study.

The analysis of associations (Table 2) highlights the importance of diabetes as a systemic risk factor for PMF. The well-known clinical association of diabetic retinopathy with epiretinal membranes also was shown in the Beaver Dam population. In the current study, diabetes remained a risk factor, after subjects with any signs of diabetic retinopathy were excluded. Screening for diabetes may be worthwhile in patients presenting with PMF, in the absence of any typical retinopathy, in view of the threefold increased risk of diabetes. Optimal management of diabetes also may be important in patients presenting with an epiretinal membrane in one eye, because there is a moderate risk of second eye involvement.

As in the Beaver Dam population, no other systemic associations were found in our study (Table 2). The lack of any association with vascular risk factors (e.g., hypertension, heart disease or stroke, blood lipids) and lifestyle factors (e.g., smoking and alcohol use) also is shared with the Beaver Dam analyses. Local ocular factors such as refractive error were not significant for PMF after age–gender adjustment, although a weak association with increasing hyperopia was found for CMR. This is contrary to studies that have reported a relation to myopia.[9,25] No association was found with local factors such as glaucoma, ocular hypertension, or intraocular pressure.

In the Beaver Dam Eye Study, epiretinal membranes were associated negatively with the presence of cataract.[32] In our study, subjects with significant cataract or other media opacities were excluded from the analysis because we considered their presence would confound the grading of epiretinal membranes. Similarly, for earlier cataract, it seemed likely that some grading difficulty also could confound any association. Epiretinal membranes are relatively subtle signs in the fundus, so it is possible that the prevalence estimates described are lower than the true rates. It also is possible that the threshold for grading subtle epiretinal membranes was affected by the presence of early cataract, as an explanation for the lower prevalence rate found for persons in the oldest age group, which replicates a similar finding from Beaver Dam. The presence of early age-related maculopathy also may have increased the difficulty in grading coexistent CMR. This could explain the significantly lower odds found.

In conclusion, in an older Australian population, this study has provided age- and gender-specific prevalence estimates for significant epiretinal membranes, termed preretinal macular fibrosis, and minor epiretinal membranes, termed cellophane macular reflex, after their appearance. Preretinal macular fibrosis was significantly associated with diabetes, in subjects with and without typical diabetic retinopathy, but had only a minor effect on visual acuity. No other associations with idiopathic PMF were evident from a detailed analysis. These findings are quite similar to U.S. data reported from the Beaver Dam Eye Study and provide confidence in the findings from this earlier study.

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