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Outcomes of epiretinal membrane surgery in highly myopic eyes: a case–control study

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ABSTRACT

Aims To evaluate the outcomes of epiretinal membrane (ERM) surgery in highly myopic eyes and to compare them with those from non-highly myopic eyes.

Methods Retrospective nested case–control study from a cohort of 1776 consecutive patients (1776 eyes) who underwent surgery for ERM. Fifty-seven highly myopic eyes (with axial length longer than 26 mm) were included in the study group and were matched for preoperative visual acuity and duration of symptoms with 57 non-highly myopic control eyes selected from the same cohort. The best-corrected visual acuity (BCVA), the relationship between axial length and visual improvement, the central macular thickness (CMT) and the surgical complications were analysed.

Results The mean axial length was 27.3±1.1 mm in highly myopic eyes and 23.1±1 mm in controls ($p<0.001$). At the 1-year final examination, the mean BCVA significantly improved from 0.62±0.23 logarithm of minimal angle of resolution (logMAR) to 0.27±0.21 logMAR in the study group ($p<0.001$) and from 0.61 ±0.22 logMAR to 0.25±0.15 logMAR in the control group ($p<0.001$). Similarly, the mean CMT significantly decreased in both groups ($p<0.001$). The two groups did not differ statistically in terms of visual and anatomical changes as well as surgical complications. There was no significant correlation between axial length and visual recovery.

Conclusions ERM surgery resulted in similar anatomical and functional outcomes in both groups. Longer axial length does not seem to affect visual improvement and the complication rate.

INTRODUCTION

Idiopathic epiretinal membrane (ERM) is a common disorder affecting 2.2–28.9% of the population.[1–5] Surgery for ERM in patients with significant symptoms has become a well-established procedure for many years with visual improvement of more than two Snellen lines in 70–80% of cases.[6–9] However, despite effective removal of the membrane, some cases show poor visual recovery after surgery.[6 8] Several factors such as preoperative visual acuity, duration of symptoms and presence or absence of the inner/outer segment junction in optical coherence tomography (OCT) have been identified as prognostic factors influencing postoperative visual recovery.[6 8 9–11] In contrast, consensus is lacking that high myopia and longer axial length are related to poorer visual outcomes, as has been demonstrated for idiopathic macular hole.[12] Only one case–control study has compared the outcomes of ERM surgery between highly myopic and non-highly myopic eyes, finding no difference in terms of anatomical and visual outcomes.[13] Indeed, recent studies have reported an association between high myopia and idiopathic ERM.[1 3 5] Furthermore, high myopia may be associated with an abnormal peripheral retina and vitreoretinal interface, core vitreous liquefaction, vitreoschisis, posterior staphyloma and chorioretinal atrophy that might influence surgical outcomes.[14 15] The purpose of this study was to evaluate the anatomical and functional outcomes of idiopathic ERM surgery in highly myopic eyes and to compare them with the outcomes for matched non-highly myopic control eyes.

MATERIALS AND METHODS

Patients and study design

We conducted a case–control study nested in a retrospective cohort of 1776 consecutive patients who underwent surgery for ERM by two surgeons (J-PB, IH) between January 2002 and December 2011 at Nancy University Hospital. All patients had symptomatic visual loss caused by an ERM detected by biomicroscopic examination and confirmed by OCT. All patients had complete information on the risks and benefits of the surgical procedure and gave their written consent before surgery.

The inclusion criteria for the high myopic group were(1) a diagnosis of idiopathic ERM without other macular abnormalities, except for the presence of retinal thickening or cystoid macular oedema on OCT; and (2) an axial length of 26 mm or more. Each study eye was matched with a control eye that was operated on immediately before or after and selected using the following criteria: (1) a diagnosis of idiopathic ERM without other macular abnormalities, except for the presence of retinal thickening or cystoid macular oedema on OCT; (2) an axial length <26 mm; (3) a similar duration of symptoms between the two eyes (difference <3 months); (4) a similar preoperative visual acuity between the two eyes (difference <0.02 logarithm of minimal angle of resolution (logMAR)); and (5) the two eyes underwent an identical surgical technique.

The exclusion criteria were an ERM secondary to diabetic retinopathy, venous occlusion, retinal detachment or retinal tear, uveitis or trauma, or associated with myopic traction maculopathy (ie, macular hole, macular detachment or foveoschisis).[16] Patients were also excluded from the study if they had a history of intraocular surgery, except for cataract surgery. All patients underwent a detailed ophthalmological examination before and after surgery, including best-corrected visual acuity (BCVA) measured with projected-light Snellen charts, axial length measurement using IolMaster (Carl Zeiss), biomicroscopy with anterior segment

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evaluation, fundus, careful peripheral retina examination and macular OCT with determination of central macular thickness (CMT) (Stratus OCT III, Carl Zeiss Ophthalmic Systems, Humphrey Division, Dublin, California, USA, before 2010 and spectral-domain OCT thereafter (Heidelberg Spectralis-OCT, Heidelberg Engineering, Heidelberg, Germany)). Patients were examined the day after surgery and then at 1 month, 3–6 months and at least 1 year postoperatively.

Surgical technique

All patients underwent the same surgical technique: a minimal three-port pars plana vitrectomy using 20-gauge instrumentation until the end of 2006 then 23-gauge instrumentation. If posterior vitreous detachment (PVD) was not already present, the posterior hyaloid was lifted either with the vitreous cutter probe or with active suction through a blunt cannula. If core vitreous was liquefied, we identified the presence of vitreoschisis based on whether a thick and elastic layer of cortical vitreous adherent to the ERM could be grasped with the microforceps. If not, the microforceps was used to lift the edge of the ERM. If no edge was identified, the membrane was grasped directly approximately 2 mm from the fovea and detached circularly. Then the internal limiting membrane was systematically searched for and intentionally removed without dye until the end of 2007. We systematically used Brilliant Blue G dye (Brilliant Peel, Fluoron Gmbh, Neu Ulm, Germany; 306 mOsm/kg H_2O, pH=7.52) from 2008 onwards. Combined phacoemulsification with posterior chamber intraocular implantation was performed in all patients over 60 years of age and in case of cataract in younger patients.

Preoperative and intraoperative data

Preoperative data included patient age and sex, the eye affected, axial length, existence of posterior staphyloma, duration of symptoms before surgery, BCVA, lens status and CMT. Intraoperative data including combined cataract extraction, induction of PVD, cortical vitreous peeling in case of vitreoschisis, use of Brilliant Blue G and complications were noted.

Outcomes

Postoperative data included BCVA and CMT measured with OCT at the 1-year follow-up visit. All serious postoperative complications were recorded. We also analysed the relationship between axial length and functional outcomes.

Statistical analysis

Statistical analysis of data entered into an Excel database was performed using Minitab 16 software. Snellen visual acuity was converted to logarithm of minimal angle of resolution (logMAR) units for statistical analysis. Continuous variables were expressed as mean±SD, and categorical variables were expressed as numbers and percentages. Differences in continuous values were assessed for statistical significance using Student t test. For categorical variables, differences were evaluated for statistical significance using Fisher's test or χ^2 test. The relationship between visual changes and axial length was determined by Pearson's correlation. The threshold for statistical significance was set at $p<0.05$.

RESULTS

From the initial cohort (n=1776), we identified 57 highly myopic patients and 57 non-highly myopic patients forming the control group.

Baseline characteristics and intraoperative data

Baseline characteristics and intraoperative data for both groups are given in table 1.

The mean age of highly myopic patients was significantly younger than controls, 64.5±10.4 years compared with 71.6 ±5.7 years (p<0.001, Student t test), and than the remaining patients of the cohort, 72.3±7.4 years (p<0.001, Student t test). The mean age of the control group did not differ from

Table 1 Baseline characteristics and intraoperative data of patients undergoing epiretinal membrane surgery in highly myopic eyes (study group) and non-highly myopic eyes (control group)

	Study group n=57	Control group n=57	p Value
Right eye, n (%)	30 (52.6%)	23 (40.4%)	0.189*
Women, n (%)	26 (45.6%)	33 (57.9%)	0.107*
Age, years (mean±SD)	64.5±10.4	71.6±5.7	<0.001†
Mean axial length, mm (mean±SD)	27.3±1.1	23.1±1	<0.001†
Preoperative BCVA, logMAR (mean±SD)	0.62±0.23	0.61±0.22	0.922†
Preoperative CMT, μm (mean±SD)	440.4±101.9	438.2±73.9	0.900†
Duration of symptoms, months (mean±SD)	14.8±12.1	15.5±11.5	0.751†
Phakic eyes, n (%)	52 (91.2%)	55 (96.5%)	0.438‡
Posterior staphyloma, n (%)	8 (14%)	–	
Combined surgery, n (%)	46 (88.5%)	51 (92.7%)	0.519‡
Diameter of vitrectomy system, n (%)			0.372*
20-gauge	15 (26.3%)	11 (19.3%)	
23-gauge	42 (73.7%)	46 (80.7%)	
Induction of PVD, n (%)	22 (38.6%)	16 (28.1%)	0.233*
Vitreoschisis peeling, n (%)	9 (15.8%)	1 (1.8%)	0.032‡
ILM peeling using BBG dye, n (%)	31 (54.4%)	31 (54.4%)	1*

*χ^2 test.
†Student t test.
‡Fisher's exact test.
AL, axial length; BBG, Brilliant Blue G; BCVA, best-corrected visual acuity; CMT, central macular thickness; ILM, internal limiting membrane; LogMAR, logarithm of the minimum angle of resolution; PVD, posterior vitreous detachment.

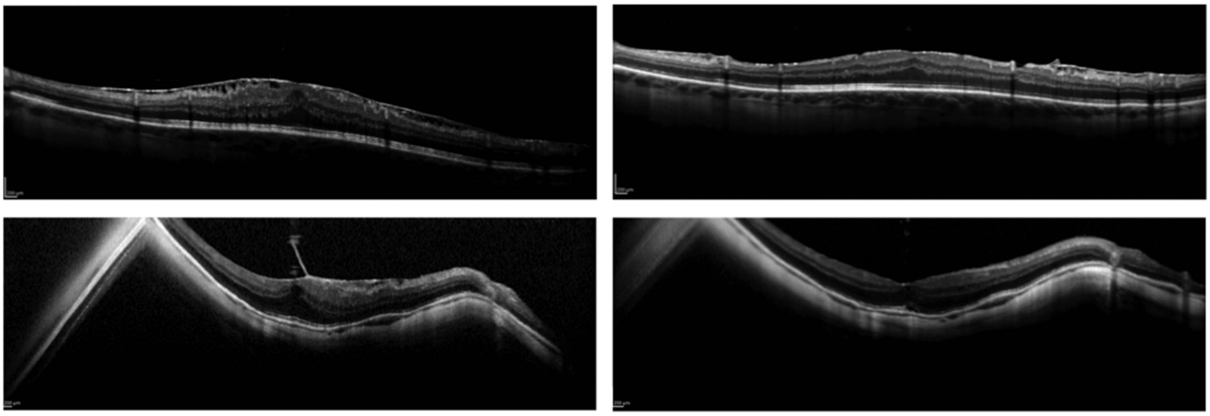

Figure 1 Representative images of spectral-domain optical coherence tomography (OCT) before and after epiretinal membrane (ERM) surgery in two highly myopic patients. (Top left) Preoperative OCT images from the right eye of a 73-year-old patient with an axial length of 26.5 mm showing ERM with diffuse retinal thickening. The best-corrected visual acuity (BCVA) was 20/40 and the central macular thickness (CMT) was 503 μm. (Top right) 1-year postoperative OCT images from the same patient showing significant removal of ERM. BCVA improved to 20/25 and CMT to 400 μm. (Bottom left) Preoperative OCT images from the right eye of a 65-year-old patient with an axial length of 32.8 mm showing ERM with posterior staphyloma and some remnant cortical vitreous layer without foveal schisis or foveal detachment. BCVA was 20/70 and CMT was 422 μm. (Bottom right) 1-year postoperative OCT images from the same patient showing complete removal of ERM. BCVA improved to 20/30 and CMT to 358 μm.

that of the whole cohort (p=0.492, Student t test). The mean axial length was significantly longer in the study group (27.3 ±1.1 mm in highly myopic eyes compared with 23.1±1 mm in control eyes, p<0.001, Student t test). In the study group, ERM was associated with diffuse macular thickening (figure 1) in 52 (91.2%) eyes and with cystoid macular oedema in 5 (8.8%) eyes. A posterior staphyloma was found in 8 of 57 (14%) highly myopic eyes, one of which had an axial length of 30 mm or more. None of the patients had choroidal neovascularisation or macular atrophy.

The mean preoperative BCVA was 0.62±0.23 logMAR in the study group and 0.61±0.22 logMAR in the control group; this difference was not statistically significant (p=0.922, Student t test). There was also no significant difference between the two groups in terms of duration of symptoms (p=0.751, Student t test) and mean CMT (p=0.900, Student t test). There were 52 (91.2%) phakic eyes in the study group and 55 (96.5%) in the control group (p=0.438, Fisher's exact test). A combined surgery was performed in 46 of 52 (88.5%) highly myopic eyes and in 51 of 55 (92.7%) control eyes (p=0.519, Fisher's exact test). PVD was induced in 22 (38.6%) eyes in the study group and in 16 (28.1%) eyes in the control group (p=0.233, χ^2 test). Vitreoschisis was found in 9 of 57 (15.8%) eyes of the study group and in only 1 of 57 (1.8%) eyes of the control group (p=0.032, Fisher's exact test). Cryotherapy was performed in four (7%) eyes in the study group and in three (5.3%) eyes in the control group because of the occurrence of retinal breaks during surgery (p=1, Fisher's exact test).

Outcomes

Anatomical and functional outcomes for both groups are summarised in table 2.

The mean follow-up duration was 20.7±11.5 months in the study group and 20.8±10.5 months in the control group (p=0.980, Student t test). The mean BCVA improved significantly from 0.62±0.23 logMAR and 0.61±0.22 logMAR at baseline to 0.27±0.21 logMAR and 0.25±0.15 logMAR at 1 year in the study group (p<0.001, Student t test) and in the control group (p<0.001, Student t test), respectively. The mean BCVA improvement at 1 year was 0.34±0.22 logMAR (corresponding to a mean increase of 3.4 lines) in the study group and 0.36±0.19 logMAR in the control group (corresponding to a mean increase of 3.6 lines). There was no significant difference between the two groups in terms of final postoperative BCVA (p=0.535, Student t test) and mean visual changes (p=0.657, Student t test). No statistical correlation was found between axial length and mean BCVA improvement (r=−0.017, p=0.858, Pearson's correlation) (figure 2). In total, 54 of 57 (77.2%) highly myopic eyes and 47 of 57 (82.5%) control eyes gained two or more lines in visual acuity. None of the eyes lost more than two lines as compared with baseline visual acuity in both groups. At the end of the follow-up, 51 of 57 (89.5%) eyes in the study group and 53 of 57 (93%) eyes in the control group were pseudophakic.

Functional outcomes according to the use of Brilliant Blue G and the presence of posterior staphyloma are given in table 3.

We observed no relationship between the use of Brilliant Blue G and the mean visual changes in either of the groups (p=0.413 and 0.171, Student t test). In the study group, the mean BCVA improvement was slightly lower in eyes with posterior staphyloma (0.29±0.16 logMAR compared with 0.35±0.22

Table 2 Anatomical and visual outcomes of epiretinal membrane surgery in highly myopic eyes (study group) and non-highly myopic eyes (control group)

	Study group n=57	Control group n=57	p Value
Final CMT, μm (mean±SD)	338.4±53.9	329.8±41.3	0.341*
CMT improvement, μm (mean±SD)	102±97.6	108.5±68.3	0.681*
Final BCVA, logMAR (mean±SD)	0.27±0.21	0.25±0.15	0.535*
Visual improvement, logMAR (mean±SD)	0.34±0.22	0.36±0.19	0.657*
Change in visual acuity, n (%)			0.468†
Improved, ≥2 lines	44 (77.2%)	47 (82.5%)	
Unchanged, <2 lines	13 (22.8%)	10 (17.5%)	
Worsened, ≥2 lines	0	0	

*Student t test.
†χ^2 test.
BCVA, best-corrected visual acuity; CMT, central macular thickness; LogMAR, logarithm of the minimum angle of resolution.

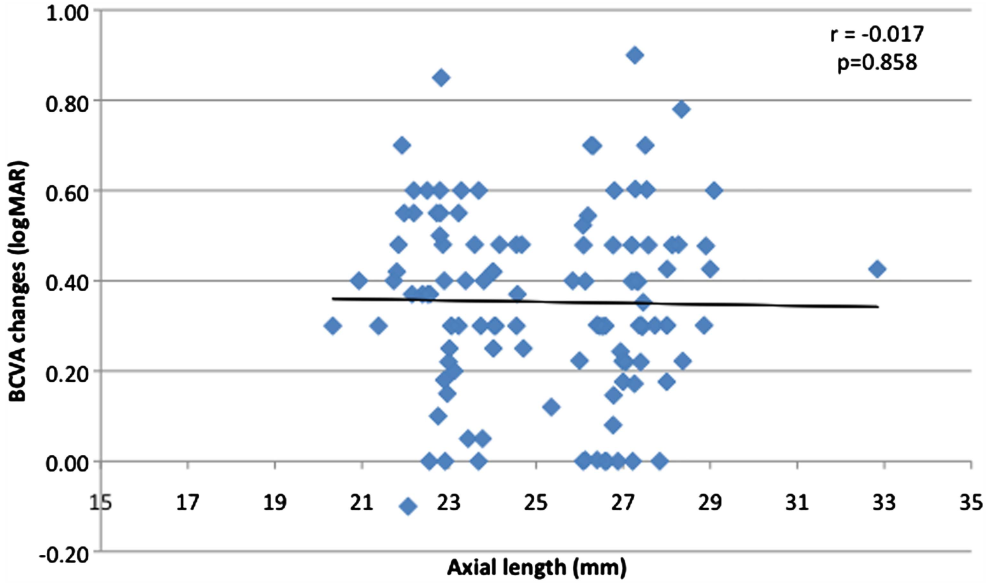

Figure 2 Linear regression of BCVA changes expressed in logMAR after epiretinal membrane surgery with axial length: the slope of −0.017 indicates no correlation between visual changes and axial length. BCVA, best-corrected visual acuity; logMAR, logarithm of minimal angle of resolution.

logMAR in eyes without posterior staphyloma), but this difference was not statistically significant (p=0.460, Student t test).

The mean CMT decreased significantly from 440.4 ±101.9 µm and 438.2±73.9 µm at baseline to 338.4±53.9 µm and 329.8±41.3 µm at 1 year in the study group (p<0.001, Student t test) and in the control group (p<0.001, Student t test), respectively. The mean change in CMT was 102 ±97.6 µm in the study group and 108.5±68.3 µm in the control group (p=0.681, Student t test).

Complications

One retinal detachment occurred after surgery in both groups and was successfully treated with gas tamponade. We did not observe any cases of endophthalmitis or recurrence of ERM.

DISCUSSION

Recent epidemiological studies have found that myopia and increasing axial length were significant risk factors for ERM.[1 3 5] Furthermore, in the Beijing Eye Study, You *et al*[17] reported that ERM was the greatest macular change in highly myopic eyes with a negative effect on visual acuity. The present study demonstrates that ERM surgery in highly myopic eyes resulted in satisfactory outcomes with a mean BCVA improvement of 0.34±0.22 logMAR and a mean CMT decrease of 102±97.6 µm. These outcomes were comparable to those obtained in control eyes both functionally and anatomically, confirming El Sanharawi *et al*'s[13] findings. In their case–control study comparing 32 highly myopic eyes and 64 non-highly myopic eyes, mean anatomical (119 and 125 µm, respectively) and visual (0.29±0.20 logMAR and 0.32 ±0.25 logMAR, respectively) improvements were also similar in the two groups.[13] Their slightly lower functional results may be explained by the greater percentage of phakic eyes at the end of the follow-up in their study (40.6% and 48.4% phakic eyes compared with 10.5% and 7% in our series).[13] Indeed, nuclear sclerotic cataract progression is the most common complication of ERM surgery, which frequently leads to cataract extraction within 2 years after vitrectomy.[18 19] Moreover, in a multicentre retrospective comparative case series, we demonstrated that combined and consecutive surgeries for ERM resulted in comparable outcomes with, however, faster visual recovery with the combined procedure.[19] In this study, combined phacoemulsification was performed in 46 of 52 (88.5%) highly myopic eyes and in 51 of 55 (92.7%) non-highly myopic eyes, which may explain the good visual outcomes. In total, 44 of 57 (77.2%) highly myopic eyes and 47 of 57 (82.5%) control eyes achieved visual recovery of more than two Snellen lines, in agreement with the results of

Table 3 Visual changes according to the use of BBG and presence of posterior staphyloma after epiretinal membrane surgery in highly myopic eyes (study group) and non-highly myopic eyes (control group)

	N		Visual improvement, logMAR (mean±SD)		p Value	
Group	Study	Control	Study	Control	Study	Control
BBG					0.413*	0.171*
With	31	31	0.37±0.23	0.39±0.20		
Without	26	26	0.32±0.20	0.32±0.18		
Posterior staphyloma					0.460*	–
Present	8	–	0.29±0.16	–		
Absent	49	–	0.35±0.22	–		

*Student t test.
BBG, Brilliant Blue G; LogMAR, logarithm of the minimum angle of resolution.

other studies that reported visual improvement after ERM surgery in 70–80% of patients.[6–9] It should be noted that the mean axial length of highly myopic eyes in our study was 27.3 ±1.1 mm and that none of them had severe myopic maculopathy such as choroidal neovascularisation or macular atrophy, which may also explain our good functional outcomes. Several studies have indeed demonstrated that higher myopic refraction and longer axial length were risk factors for the presence and progression of severe myopic macular degeneration, subsequently leading to visual impairment.[17 20 21] In this series, eight (14%) highly myopic eyes had posterior staphyloma and achieved a mean BCVA improvement of 0.29±0.16 logMAR, which was slightly lower than those obtained in other highly myopic (0.35 ±0.22 logMAR, p=0.460) and control eyes. This difference tended to confirm the findings of these studies. Exploration of this point probably requires a larger number of patients to reach significance. Similarly, we found no significant correlation between axial length and visual recovery after ERM surgery.

El Sanharawi *et al*[13] found that highly myopic patients suffer from ERM at a younger age than controls, which is confirmed in our study with a mean age of 64.5±10.4 years in the study group and 71.6±5.7 years in the control group. Early changes within the vitreous of highly myopic eyes, particularly advanced liquefaction, may explain the earlier development of PVD in these eyes and the difference in age at the onset of ERM.[14 22] Indeed, several studies have suggested that anomalous PVD and vitreoschisis might play a role in the pathogenesis of ERM and macular hole.[23–25] Thus, PVD was present preoperatively in 35 (61.4%) and 41 (71.9%) eyes of the study and the control group, respectively. We also found that core vitreous was liquefied and associated with a vitreoschisis in 9 of 57 (15.8%) highly myopic eyes and in 1 of 57 (1.8%) non-highly myopic eyes.

We acknowledge several limitations to our study: its retrospective design and the use of time-domain OCT in the majority of patients. Spectral-domain OCT actually gives much more information than time-domain OCT, especially regarding the photoreceptor layer, a feature that would have been particularly useful to consider in the functional outcomes analysis.

In conclusion, ERM surgery in highly myopic eyes results in satisfactory anatomical and functional outcomes comparable to those obtained in controls. Longer axial length does not affect visual improvement and the complication rate.

Contributors J-BC, IH and J-PB conceptualised and designed the study. VC, CF and FT performed chart abstractions. J-BC, CF and JS performed statistical analyses. J-BC and J-PB drafted the manuscript. All authors were involved in critical revision of the manuscript.

Competing interests None.

Ethics approval The Ethics Committee of the French Society of Ophthalmology. The study adhered to the tenets of the Declaration of Helsinki.

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REFERENCES

1 McCarty DJ, Mukesh BN, Chikani V, *et al*. Prevalence and associations of epiretinal membranes in the visual impairment project. *Am J Ophthalmol* 2005;140:288–94.
2 You Q, Xu L, Jonas JB. Prevalence and associations of epiretinal membranes in adult Chinese: the Beijing eye study. *Eye (Lond)* 2008;22:874–9.
3 Duan XR, Liang YB, Friedman DS, *et al*. Prevalence and associations of epiretinal membranes in a rural Chinese adult population: the Handan Eye Study. *Invest Ophthalmol Vis Sci* 2009;50:2018–23.
4 Ng CH, Cheung N, Wang JJ, *et al*. Prevalence and risk factors for epiretinal membranes in a multi-ethnic United States population. *Ophthalmology* 2011;118:694–9.
5 Koh V, Cheung CY, Wong WL, *et al*. Prevalence and risk factors of epiretinal membrane in Asian Indians. *Invest Ophthalmol Vis Sci* 2012;53:1018–22.
6 Rice TA, De Bustros S, Michels RG, *et al*. Prognostic factors in vitrectomy for epiretinal membranes of the macula. *Ophthalmology* 1986;93:602–10.
7 McDonald HR, Verre WP, Aaberg TM. Surgical management of idiopathic epiretinal membranes. *Ophthalmology* 1986;93:978–3.
8 Wong JG, Sachdev N, Beaumont PE, *et al*. Visual outcomes following vitrectomy and peeling of epiretinal membrane. *Clin Experiment Ophthalmol* 2005;33:373–8.
9 Kim JH, Kim YM, Chung EJ, *et al*. Structural and functional predictors of visual outcome of epiretinal membrane surgery. *Am J Ophthalmol* 2012;153:103–10.
10 Suh MH, Seo JM, Park KH, *et al*. Associations between macular findings by optical coherence tomography and visual outcomes after epiretinal membrane removal. *Am J Ophthalmol* 2009;147:473–80.
11 Inoue M, Morita S, Watanabe Y, *et al*. Preoperative inner segment/outer segment junction in spectral-domain optical coherence tomography as a prognostic factor in epiretinal membrane surgery. *Retina* 2011;31:1366–72.
12 Suda K, Hangai M, Yoshimura N. Axial length and outcomes of macular hole surgery assessed by spectral-domain optical coherence tomography. *Am J Ophthalmol* 2011;151:118–27.
13 El Sanharawi M, Sandali O, Bonnel S, *et al*. Epiretinal membrane surgery outcomes in highly myopic eyes without traction maculopathy: long-term results of a case-control study. *Am J Ophthalmol* 2013;156:319–25.
14 Morita H, Funata M, Tokoro T. A clinical study of the development of posterior vitreous detachment in high myopia. *Retina* 1995;15:117–24.
15 Forte R, Manzi G, Gallo O, *et al*. Three-dimensional visualization of vitreoretinal abnormalities in high myopia. *Ophthalmic Surg Lasers Imaging* 2009;40:304–7.
16 Panozzo G, Mercanti A. Optical coherence tomography findings in myopic traction maculopathy. *Arch Ophthalmol* 2004;122:1455–60.
17 You QS, Peng XY, Xu L, *et al*. Myopic maculopathy imaged by optical coherence tomography: the beijing eye study. *Ophthalmology* 2014;121:220–4.
18 de Bustros S, Thompson JT, Michels RG, *et al*. Nuclear sclerosis after vitrectomy for idiopathic epiretinal membranes. *Am J Ophthalmol* 1988;105:160–4.
19 Dugas B, Ouled-Moussa R, Lafontaine PO, *et al*. Idiopathic epiretinal macular membrane and cataract extraction: combined versus consecutive surgery. *Am J Ophthalmol* 2010;149:302–6.
20 Hayashi K, Ohno-Matsui K, Shimada N, *et al*. Long-term pattern of progression of myopic maculopathy: a natural history study. *Ophthalmology* 2010;117:1595–611.
21 Asakuma T, Yasuda M, Ninomiya T, *et al*. Prevalence and risk factors for myopic retinopathy in a Japanese population: the Hisayama Study. *Ophthalmology* 2012;119:1760–5.
22 Akiba J. Prevalence of posterior vitreous detachment in high myopia. *Ophthalmology* 1993;100:1384–8.
23 Sebag J, Gupta P, Rosen RR, *et al*. Macular holes and macular pucker: the role of vitreoschisis as imaged by optical coherence tomography/scanning laser ophthalmoscopy. *Trans Am Ophthalmol Soc* 2007;105:121–9.
24 Yamashita T, Uemura A, Sakamoto T. Intraoperative characteristics of the posterior vitreous cortex in patients with epiretinal membrane. *Graefes Arch Clin Exp Ophthalmol* 2008;246:333–7.
25 Gupta P, Yee KM, Garcia P, *et al*. Vitreoschisis in macular diseases. *Br J Ophthalmol* 2011;95:376–80.

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