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ARTICLE

Prevalence and predictive factors for posterior vitreous attachment in eyes undergoing epiretinal membrane surgery

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BACKGROUND: To report the prevalence of posterior vitreous attachment (PVA) in patients with idiopathic epiretinal membrane (iERM) and to determine associated preoperative predictive factors.
METHODS: Retrospective observational case series of 408 eyes who underwent surgery for iERM without vitreomacular traction. The status of the posterior hyaloid was assessed intraoperatively. Predictive factors were analysed using univariate and multivariate logistic regression. We also evaluated the effect of PVA on the anatomical and functional outcomes of surgery.
RESULTS: Eighty-two (20.1%) eyes were found to have an undetached posterior hyaloid during vitrectomy. In multivariate analysis, axial length (AL) and lens status were strongly associated with the posterior vitreous status ($p = 0.031$ and $p = 0.048$). The odds of having a PVA decreased by a factor 0.81 per mm of AL (95% CI, 0.66–1.00). Phakic eyes had a 2.88-fold increased risk of exhibiting PVA compared to those with previous cataract extraction (95% CI, 1.10–7.52). The presence of PVA did not have any effect on postoperative anatomical and functional outcomes. In contrast, we found that eyes with shorter axial length, low preoperative visual acuity and disruption of the ellipsoid zone exhibited worse visual recovery ($p = 0.006$, $p < 0.001$ and $p = 0.037$).
CONCLUSION: PVA was observed in 20.1% of eyes undergoing vitrectomy for iERM. Shorter AL and phakic status were strong predictive factors of PVA in those eyes. However, the morphological features and the surgical prognosis of iERMs with PVA did not differ from those with posterior vitreous detachment.

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INTRODUCTION

Idiopathic epiretinal membrane (iERM) is a common retinal disorder characterised by fibrocellular proliferation on the inner surface of the macula, resulting in varying degrees of vision loss and distortion.[1] Its prevalence in adults ranges from 2.2 to 28.9% depending on diagnostic criteria and methods of assessment and increases with age [1–4].

The pathogenesis of iERMs is still not fully understood. Two mechanisms have been proposed, both of which have posterior vitreous detachment (PVD) as the critical event leading to iERM formation [5–8].One theory is that PVD avulses or causes micro-breaks in the internal limiting membrane, allowing microglial cells to migrate and proliferate onto the retinal surface [8, 9]. The other involves the unifying concept of anomalous PVD where collapse of the vitreous body without sufficient concurrent dehiscence at the vitreoretinal interface results in splitting within the posterior vitreous cortex, leaving some segments of cortical vitreous attached to the macula that may serve as a nidus for subsequent epiretinal proliferation [5, 10]. However, iERMs are occasionally observed without PVD in 10–56% of eyes, suggesting the existence of distinct pathophysiologic events [6, 11–14].

Surgery for visually significant iERMs has been a well-established procedure for many years with a low complication rate and functional improvement in 70–80% of cases [15–17]. Nevertheless, despite effective removal of the membrane, visual outcomes may still be disappointing in some cases [17, 18]. It seems therefore important to determine variables that may influence visual recovery following surgery. Several prognostic factors have been identified in the literature, the most significant being duration of symptoms, preoperative visual acuity and integrity of the photoreceptor layers on spectral-domain optical coherence tomography (SD-OCT) [19–21]. In contrast, only a few studies have investigated the relationship between preoperative vitreous status and visual recovery [1, 6, 11]. Some authors reported that eyes with undetached or incompletely detached posterior vitreous had poorer visual acuity as a result of chronic weak vitreous traction on the macula while others did not find any difference compared to eyes with preexisting PVD [1, 6, 11, 22]. Thus, it is still not clear whether or not the absence of PVD has any consequence on the course and surgical prognosis of iERMs. Furthermore, there is relatively little information available on factors associated with posterior vitreous attachment (PVA) in patients with iERM. Yet, this question seems of utmost importance to understand the pathophysiology of this condition and to clearly determine the effect of PVA on visual recovery.

The aim of this study was to determine the prevalence and predictive factors for PVA in patients with iERM. We also evaluated the effect of PVA on the anatomical and functional outcomes of iERM surgery.

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METHODS

Patients and study design

A retrospective review of medical records was performed on 640 consecutive patients who underwent surgery for ERM at the University Hospital of Nancy from January 2016 to April 2019. All patients had symptomatic visual loss caused by an ERM detected by biomicroscopic examination and confirmed by SD-OCT. All of them were given complete information on the risks and benefits of the surgical procedure and gave their written consent before surgery. The study adhered to the tenets of the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the French Society of Ophthalmology. Informed consent was obtained from all subjects.

The inclusion criterion was patients with visually significant iERM. Exclusion criteria were as follows: (1) patients with ERM associated with vitreomacular traction (VMT) or macular hole, (2) patients with ERM secondary to diabetic retinopathy, venous occlusion, retinal detachment or retinal tear, uveitis or trauma, (3) patients with preexisting macular pathologic features such as age-related macular degeneration or hereditary retinal dystrophies. Patients were also excluded from the study if they had a history of vitreoretinal surgery.

All patients underwent a detailed ophthalmologic examination before and after surgery, including best-corrected visual acuity (BCVA) measured with projected-light Snellen charts, axial length measurement using IolMaster (Carl Zeiss Meditec, Dublin, CA), biomicroscopy with anterior segment evaluation, fundus, careful peripheral retina examination and macular imaging using the Spectralis HRA-OCT (Heidelberg Engineering, Heidelberg, Germany). Patients were systematically examined within the first week after surgery and at various times thereafter.

Surgical procedure

All patients underwent the same surgical technique: a minimal three-port pars plana vitrectomy using 23- or 25-gauge instrumentation (EVA phacovitrectomy system, DORC, Zuidland, The Netherlands). After core vitrectomy, Brilliant Blue G (BBG) (ILM-Blue®, DORC, Zuidland, The Netherlands) was injected over the posterior pole to assess the posterior hyaloid vitreous status and to stain the macula. If PVD was not already present, the posterior hyaloid was lifted either with the vitreous probe or with active suction through a blunt cannula. The microforceps was then used to lift the edge of the iERM. If no edge was identified, the membrane was grasped directly ~2 mm from the fovea and detached circularly. Then the internal limiting membrane (ILM) was systematically searched for and intentionally removed after re-staining with BBG when needed. If so, eyes were considered as "actively peeled" (active ILM peeling) as opposed to those "spontaneously peeled" during ERM removal (spontaneous ILM peeling).

At the end of the procedure, the retinal periphery was carefully examined with a wide-angle viewing system (Oculus, Wetzlar, Germany) and scleral indentation. If a retinal break was detected, vitrectomy was completed, and the break treated with either laser photocoagulation or external cryo-application.

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.

Macular imaging with SD-OCT

Preoperatively, appearance of iERM was classified into three groups based on the findings of a previous study [23]: flat, convex and concave thickening of the foveal contour.

The ellipsoid zone (EZ) was defined as the second hyperreflective band above the retinal pigment epithelium, according to the classification proposed by the International Nomenclature for Optical Coherence Tomography panel [24]. Its integrity was assessed as follows: line not visible or disrupted in at least one scan (EZ disruption) and continuous line in the horizontal and vertical scans (intact EZ).

Postoperative cystoid macular oedema was defined as a thickening of the fovea with intraretinal cysts preventing improvement or reducing BCVA.

All qualitative OCT evaluations and measurements were performed independently by two masked readers (MSL and JBC), both unaware of the patients' visual outcomes.

Pre-, intra- and postoperative data

Preoperative data included patient age and sex, axial length (AL), lens status, BCVA and SD-OCT findings including central macular thickness (CMT), appearance of iERM, integrity of the EZ, existence of subfoveal deposit and presence of inner and/or outer retinal cysts.

The following intraoperative data were collected: instrumentation size, type of surgery (single or combined procedure), posterior hyaloid status, active or spontaneous ILM peeling and rhegmatogenous complications.

Postoperative data included the mean follow-up duration, subsequent cataract extraction, final BCVA and SD-OCT findings (CMT and EZ integrity) at the last visit and complications.

Statistical analysis

Snellen visual acuity was converted to the logarithm of the minimum angle of resolution (logMAR) units for analysis. Continuous variables were expressed as mean ± standard deviation or median and quartiles, and categorical variables were expressed as numbers and percentages.

A bivariate logistic regression was used to estimate the relationship between the potential influencing preoperative factors and the presence of PVA. Variables with $p < 0.20$ in bivariate logistic regression were included in the final multivariate logistic regression model.

The normality of the distribution was investigated with the Shapiro–Wilk test.

Differences in continuous variables were assessed for statistical significance using the Mann–Whitney–Wilcoxon test and the Kruskal–Wallis test. For categorical variables, differences were evaluated for statistical significance using the Chi-2 test and the Fisher test.

Spearman's correlation coefficients were calculated to explore the association between the final BCVA and the clinical features based on quantitative variables. The interrater agreement was determined using Gwet's first-order agreement coefficient (AC1).

The threshold for statistical significance was set at $p < 0.05$.

Statistical analysis was performed using SAS (v9.4, SAS Institute Inc., Cary, NC, USA).

RESULTS

During the study period, 640 eyes of 608 patients underwent ERM surgery. Of these, 232 were excluded for the following reasons: ERM associated with VMT and/or macular hole ($n = 112$), secondary ERM ($n = 92$) and preexisting macular pathologic features ($n = 28$). As a result, 408 eyes of 387 patients met the inclusion criteria for the study.

Baseline characteristics and intraoperative data

Of the 387 patients, 193 (49.9%) were male, and 194 (50.1%) were female, with a mean age of 71.5 ± 7.3 years. Three hundred and twenty-five (79.7%) eyes were phakic, and 83 (20.3%) pseudophakic at the time of diagnosis (Table 1).

The mean axial length was 23.9 ± 1.5 mm, with a median of 23.6 mm [21.4–30.9]. The mean preoperative BCVA was 0.5 ± 0.2 logMAR. Some cystic spaces in the outer and/or inner retinal layers, subfoveal deposits and EZ disruption were noted in 137 (33.6%), 54 (13.2%) and 42 (10.3%) eyes, respectively. The fovea was considered flat in 150 (36.8%) cases, concave in 137 (33.6%), and convex in 121 (29.6%) (Table 1). The interrater agreement for all qualitative assessments was excellent, with Gwet's AC1 ranging from 0.96 to 0.99.

Of the 325 phakic eyes, 316 (97.2%) underwent combined cataract extraction (Table 1).

Prevalence and predictive factors for posterior vitreous attachment

Eighty-two (20.1%) eyes were found to have an undetached posterior hyaloid during vitrectomy.

In the bivariate analysis, AL was the only factor significantly associated with the posterior vitreous status ($p = 0.048$). We did not find any correlation with age, sex, BCVA, SD-OCT findings or previous cataract surgery, despite a trend ($p = 0.085$) (Table 2).

Multivariate logistic regression analysis was then performed using a stepwise procedure as detailed in the Methods section. It revealed that shorter AL ($p = 0.048$) and phakic status ($p = 0.031$) were significant predictors of PVA in eyes with iERM. The odds of

Table 1. Baseline characteristics and intraoperative data of patients who underwent epiretinal membrane surgery.

Number of eyes/patients, *n*	**408/387**
Sex	
-Male, *n*(%)	193 (49.9)
-Female, *n*(%)	194 (50.1)
Age, years (mean ± SD)	71.5 ± 7.3
Preoperative lens status, *n* (%)	
-Phakic	325 (79.7)
-Pseudophakic	83 (20.3)
Axial length, mm (mean ± SD)	23.9 ± 1.5
Preoperative BCVA, logMAR (mean ± SD)	0.5 ± 0.2
Preoperative SD-OCT characteristics	
Shape of foveal contour, *n*(%)	
-Flat	150 (36.8)
-Convex	121 (29.6)
-Concave	137 (33.6)
Subfoveal deposits, *n*(%)	54 (13.2)
EZ disruption, *n*(%)	42 (10.3)
Cystic spaces in the INL and/or in the ONL, *n*(%)	137 (33.6)
Preoperative CMT, µm (mean ± SD)	443.3 ± 72.8
Retinal surgery, *n*(%)	
Combined cataract extraction, *n*(%)*	316 (97.2)
Instrumentation size	
-23G, n(%)	22 (5.4)
-25G, n(%)	386 (94.6)
ILM peeling	
-Active, n(%)	326 (79.9)
-Spontaneous, n(%)	82 (20.1)

SD standard deviation, *BCVA* best-corrected visual acuity, *logMAR* logarithm of the minimum angle of resolution, *SD-OCT* Spectral-Domain Optical Coherence Tomography, *EZ* ellipsoid zone, *INL* inner nuclear layer, *ONL* outer nuclear layer, *CRT* central macular thickness, *ILM* internal limiting membrane

having an undetached posterior hyaloid decreased by a factor of 0.81 per mm of AL (95% CI, 0.66–1.00). Eyes with AL < 23.6 mm had a 2.11 higher risk of having a PVA compared to those with AL > 23.6 mm (95% CI, 1.24–3.60) (model not shown). As regards the lens status, the probability of PVA was 2.88-fold higher in phakic eyes (95% CI, 1.10–7.52) (Table 2).

An isolated retinal tear was encountered intraoperatively in respectively 6 of 326 (1.8 %) eyes with preexisting PVD and in 2 of 82 (2.4%) eyes requiring surgical PVD induction; this difference was not statistically significant ($p = 0.664$). There was no significant difference between the two groups in terms of instrumentation size ($p = 0.784$) and active or spontaneous ILM peeling ($p = 0.193$).

Effect of PVA on anatomical and visual outcomes

Patients with a follow-up period of less than 1 month were excluded from the analysis regarding surgical outcomes.

The mean follow-up duration was 6.7 ± 7.4 months in the PVA group and 6.7 ± 8.9 months in the PVD group ($p = 0.970$). The follow-up duration was limited to 1 month and more than 6 months post-surgery in respectively 19 (26.2%) and 52 (63.4%) cases in the PVA group and in 88 (27.0%) and 186 (57.1%) cases in the PVD group ($p = 0.482$ and $p = 0.296$).

The mean CMT decreased significantly from 447.9 ± 55.6 µm and 448.8 ± 64.5 µm at baseline to 381.9 ± 37.9 µm and 386.6 ± 53.4 µm at the end of the follow-up in eyes with PVA ($p < 0.001$) and in eyes with preexisting PVD ($p < 0.001$), respectively. There was no significant difference between the two groups in terms of mean final CMT and mean change in CMT ($p = 0.741$ and $p = 0.707$). Similarly, we did not observe any difference regarding the integrity of the EZ ($p = 0.496$) or the occurrence of postoperative macular oedema ($p = 0.268$) (Table 3).

The vast majority of phakic eyes had combined cataract extraction in both groups (69/71 eyes in the PVA group and 247/254 eyes in the PVD group, $p = 1.000$). One in two eyes with PVA and one in seven eyes with PVD underwent subsequent cataract removal. At the end of the follow-up, 81 (98.8%) and 320 (98.2%) eyes were pseudophakic in the PVA and the PVD groups, respectively ($p = 1.000$). The mean BCVA improved significantly from 0.3 ± 0.2 logMAR to 0.1 ± 0.2 logMAR in the PVA group ($p < 0.001$) and from 0.4 ± 0.2 logMAR to 0.2 ± 0.2 logMAR in the PVD group ($p < 0.001$). The mean BCVA improvement was 0.2 ± 0.2 logMAR in the PVA group and 0.2 ± 0.2 logMAR in the PVD group. Both groups had comparable final BCVA and mean visual changes ($p = 0.965$ and $p = 0.568$) (Table 3).

Results from the Shapiro–Wilk test revealed that final postoperative BCVA did not follow a normal distribution. Correlation analyses and nonparametric tests were therefore performed to assess the effect of other factors including age, baseline BCVA and AL as binary variables and preoperative SD-OCT findings on final BCVA. We found that preoperative BCVA > 0.3 logMAR ($p < 0.001$), AL < 23.6 mm ($p = 0.006$) and EZ disruption ($p = 0.037$) were associated with worse visual outcomes.

Complications

A retinal detachment occurred after surgery in one (1.2%) eye in the PVA group and in five eyes (1.5%) in the PVD group; this difference was not significant ($p = 1.000$).

DISCUSSION

This study confirms that iERMs may develop without preexisting PVD, hence requiring PVD induction to achieve the surgical endpoint. This information is important since iERM peeling may be risky when the posterior hyaloid is still attached.

The prevalence of PVA in eyes with iERM varies widely in the literature, ranging from 10 to 56% depending on methods of assessment [6, 11–14]. In this study, PVA was observed during surgery in 20.1% of cases. This rate is similar to that reported in three large series (22.6–25.8%) based on intraoperative findings [13, 14, 25].

Our analysis revealed that shorter AL was a strong predictive factor of PVA in iERM eyes. The risk of exhibiting an attached posterior hyaloid decreased by a factor of 0.81 per mm of AL (95% CI, 0.66–1.00). In other words, eyes with AL < 23.6 mm had a 2.11-fold increased risk of having PVA compared to those with AL > 23.6 mm. These results are concordant with those of Song et al. who found that shorter AL was associated with more extensive vitreoretinal adhesions in diabetic eyes undergoing vitrectomy [26]. Similarly, Shao et al. noted, in a large population-based cross-sectional study of 3468 subjects, that hyperopic eyes had a higher prevalence of incomplete PVD [27]. Conversely, it is well known that the incidence of complete PVD increases with axial length in myopic eyes [28–31]. Together, these findings strongly suggest that AL is an important factor responsible for the development of PVD.

Consistent with the literature, we found that pseudophakic eyes had a lower risk of exhibiting PVA. Cataract surgery has indeed been shown to induce considerable mechanical and biochemical changes in the vitreous promoting vitreous separation from the

Table 2. Predictive factors of posterior vitreous attachment in eyes undergoing idiopathic epiretinal membrane surgery: bi- and multivariate regression analyses.

	Bivariate analysis		Multivariate analysis	
	OR (CI 95%)	***p***	**OR (CI 95%)**	***p***
Age	1.02 (0.99–1.06)	0.203	-	-
Sex		0.921	-	-
-Male	1			
-Female	1.02 (0.63–1.66)			
Preoperative BCVA	2.25 (0.56–9.10)	0.254	-	-
Lens status		0.085		**0.031**
-Phakic	1.83		2.88 (1.10–7.52)	
-Pseudophakic	1 (0.92–3.64)		1	
Axial length	0.81 (0.66–1.00)	**0.048**	0.81 (0.66–1.00)	**0.048**
Foveal contour		0.848	-	-
-Convex	1			
-Flat	1.34 (0.67–2.66)			
-Concave	1.31 (0.65–2.64)			
Subfoveal deposits		0.893	-	-
-Present	1			
-Absent	1.05 (0.50–2.21)			
EZ disruption		0.658	-	-
-Present	1			
-Absent	1.21 (0.51–2.86)			
Cystic spaces in the INL and/or in the ONL		0.322	-	-
-Present	1			
-Absent	1.32 (0.76–2.28)			
Preoperative CMT	1 (1.00–1.00)	0.573	-	-

OR odds ratio, *CI* confidence interval, *BCVA* best-corrected visual acuity, *EZ* ellipsoid zone, *INL* inner nuclear layer, *ONL* outer nuclear layer, *CRT* central macular thickness.

retina [32, 33]. Thus, Ripandelli et al. reported that a PVD developed between 2 days and 26 months after uneventful cataract extraction in 148 of 188 (78.7%) eyes without preoperative PVD [34]. Furthermore, Chung et al., in their study comparing the characteristics of iERM according to the posterior vitreous status, observed that PVD was more frequent in eyes from which the lens had been removed [23]. However, caution should be taken in interpreting our finding as we were not able to determine whether or not PVD was present before cataract surgery.

In addition to AL and lens status, the prevalence of PVD is known to increase with age in the general population, reaching up to 57% over 80 years of age depending on the series [27, 30, 31, 35, 36]. In the present series, we did not find any relationship between age and posterior hyaloid status in patients with iERM. This is consistent with the study by Kraus et al. which reported no difference in the mean age of patients with or without detachment of the posterior hyaloid [6]. In contrast, Chung et al. found that ERM cases with PVA had a particular association with younger patients <60 years [23]. Likewise, Kakehashi et al. noted that iERM eyes without PVD were younger than those with complete or partial PVD [11]. This discrepancy may be explained by differences in the study population. Indeed, contrary to their series, we included patients with high myopia in our analysis. Yet, many authors have demonstrated that PVD occurs at a younger age in highly myopic patients and similar results might have been found if these patients had been excluded from our study [30].

Contrary to Chung et al.'s study, the morphological features of iERM, and notably the shape of foveal contour on SD-OCT, were not found to be different in eyes with PVA [23]. The reason for this difference remains unclear and could, again, be attributed to our inclusion of highly myopic eyes.

Some authors have reported that spontaneous iERM separation may occur concurrently with a PVD, regardless of its cause (physiological or surgical), suggesting that the membrane itself is the thickened posterior hyaloid [23]. This hypothesis has been further supported by the elegant histopathological study by Heilskov et al. which noted the presence of native vitreous collagen in iERMs with PVA [37]. Chung et al. have thus proposed to regard these ERM cases as a kind of VMT syndrome, rather as idiopathic membranes [23]. Interestingly, the presence of iERM in eyes with VMT has been associated with more severe intraretinal changes and poorer visual outcomes in comparison with cases of VMT without iERM, possibly because of increased tractional forces on the macula [38, 39]. Our analysis did not reveal any difference regarding the retinal structure between the two groups, which suggests that the anterior-posterior forces exerted over the retina are limited in iERMs with PVA.

Similarly, the presence of PVA was not found to have a negative effect on the anatomical and functional prognosis. We noted that surgery resulted in satisfactory outcomes with a mean BCVA improvement of 0.2 ± 0.2 logMAR and a mean CMT decrease of 61.8 ± 46.9 µm. These outcomes were comparable to those obtained in eyes with PVD both functionally and anatomically, confirming the findings of two previous studies [6, 23]. In contrast, Kakehashi et al. reported that cases with iERM and partial PVD had a worse visual prognosis than those with no PVD or complete PVD

Table 3. Anatomical and functional outcomes of idiopathic epiretinal membrane surgery according to the intraoperative posterior hyaloid status.

	PVA group *n* = 71	PVD group *n* = 274	*p*[a]
Final BCVA, logMAR (mean ± SD)	0.1 ± 0.2	0.2 ± 0.2	0.965
Visual improvement, logMAR (mean ± SD)	0.2 ± 0.2	0.2 ± 0.2	0.568
Final CMT, μm (mean ± SD)	381.9 ± 37.9	386.6 ± 53.4	1.000
CMT improvement, μm (mean ± SD)	61.8 ± 46.9	58.5 ± 46.9	0.558
Postoperative macular oedema, *n*(%)	4 (5.6)	27 (9.9)	0.268
Postoperative EZ disruption, *n*(%)	4 (5.6)	22 (8.0)	0. 496

PVA posterior vitreous attachment, *PVD* posterior vitreous detachment, *BCVA* best-corrected visual acuity, *logMAR* logarithm of the minimum angle of resolution, *SD* standard deviation, *CMT* central macular thickness, *EZ* ellipsoid zone.
[a]Chi-square test, Fisher test or Mann–Whitney–Wilcoxon test.

in their 2-year observational study [11]. However, none of the eyes underwent ERM removal and it is therefore difficult to make a comparison with the findings of the present study.

Interestingly, we found that, in addition to lower preoperative BCVA and EZ disruption, shorter AL was associated with poorer visual acuity. This is consistent with the study by Minami et al. which demonstrated that AL was a strong predictive factor for functional recovery following surgery and determined 23.6 mm as a cut-off after which final visual acuity was affected [22]. They hypothesised that eyes with shorter AL might have no PVD or macula-sparing PVD, which could directly mediate vitreous tractional forces to the macula chronically [22]. In addition, they speculated that iERMs in those eyes might exhibit stronger adhesion to the retina, further increasing the tractional forces [22]. Contrary to their study, there was no difference in the occurrence of spontaneous ILM peeling between eyes with and without PVD. Taken together, our findings indicate that the effect of AL on the functional results may not be related to the posterior vitreous status, as previously suggested [22].

Vitrectomy for iERM is a well-known risk factor for retinal tear and retinal detachment, especially in eyes requiring PVD induction [25, 40]. In this series, the overall rate of intraoperative retinal tears (2.0%) and postoperative retinal detachment (1.2%) was comparable to that reported in previous studies using 25-gauge instrumentation [25, 40]. Consistent with a recent study, we did not find any association between induction of PVD and the occurrence of retinal breaks during surgery [25].

We acknowledge several limitations to the present study, mainly related to its retrospective design. First, the follow-up was not standardised and was limited to 1 month post-surgery in some patients, which may have influenced the findings regarding the surgical outcomes and the postoperative complications. However, the proportion of cases with a follow-up period > 1 month and > 6 months was not significantly different between the two groups and we believe that this disparity was unlikely to have had a major impact on our main findings, namely the effect of PVA on the anatomical and visual outcomes. The fact that some patients were still phakic at the last visit may also be regarded as an additional limitation. Nevertheless, their number was extremely limited and similar in both groups and therefore, again, most likely caused no difference in the visual results.

In summary, PVA was observed in 20.1% of eyes undergoing vitrectomy for iERM. Shorter AL and phakic status were strong predictive factors of PVA in those eyes. The morphological features and the surgical prognosis of iERM with PVA did not differ from those with PVD. However, shorter axial length was strongly associated with worse functional outcomes following surgery. Further long-term studies are required to clearly determine the role of axial length on the visual prognosis.

Summary

What was known before

- Idiopathic epiretinal membrane (iERM) is a common retinal disorder characterised by fibrocellular proliferation on the inner surface of the macula, resulting in varying degrees of vision loss.
- The pathogenesis of iERMs is still not fully understood. Several mechanisms have been proposed, all of which have posterior vitreous detachment (PVD) as the critical event triggering iERM formation.
- However, iERMs are occasionally observed without PVD, suggesting the existence of distinct pathogenic mechanisms.

What this study adds

- Posterior vitreous attachment (PVA) was observed in 20.1% of eyes undergoing vitrectomy for iERM.
- Shorter axial length and phakic status were strong predictive factors of PVA in those eyes.
- The preoperative morphological features and the surgical prognosis of iERM with PVA did not differ from those with PVD.

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AUTHOR CONTRIBUTIONS

Conception and designs: M-SL and J-BC. Data collection: M-SL and J-BC. Analysis and interpretation: M-SL, AL, NT and J-BC. Review the manuscript: NT, KA-D and J-PB. Overall responsibility: J-BC.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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