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ORIGINAL RESEARCH

Visual Outcomes and Prognostic Factors in Epiretinal Membrane Foveoschisis and Lamellar Macular Hole Surgery: A Retrospective Study

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Purpose: To assess vision outcomes, risk of complications and whether age, gender, specific OCT changes and preoperative vision affect the prognosis for postoperative vision development. We seek to clarify the prognosis of LMH after surgery and assess whether complications can be reduced with appropriate management.

Methods: This retrospective study includes consecutive Lamellar Macular Hole (LMH) surgeries at Örebro University Hospital (2013–2019), re-evaluated using the OCT-based consensus definition. Cases were classified as Epiretinal Membrane Foveoschisis (ERM-F) or LMH. Pre- and postoperative data were collected from medical records. Statistical analyses were performed with support from medical statisticians.

Results: Both the ERM-F and LMH groups showed Highly significant visual development (p-adj = 0.0010 and 0.0012 respectively), with a median visual improvement of 90% and 38%, respectively.Even the older LMH group, in which the majority (81%) exhibited pathological OCT findings, showed a median improvement of 61% and a significant visual improvement (adjusted p = 0.026).

Conclusion: The results indicate good potential for visual improvement in both groups. Even if the LMH group experiences positive vision improvement, these patients would experience further improvement without the aforementioned OCT changes. Early surgery is highly recommended, ideally before photoreceptor damage occurs; if already present, it should be performed as soon as possible to prevent further OCT pathology.

Keywords: ERM foveoschisis, lamellar macular hole, vision improvement, preoperative factor

Introduction

Gass introduced the term "lamellar macular hole" (LMH) in 1975.[1] With optical coherence tomography (OCT), the understanding of LMH improved, and diagnostic criteria were established in the early 2000s.[2] Govetto et al later proposed two LMH subtypes: degenerative and tractional.[2] In 2020, a consensus redefined these as two separate diagnoses: epiretinal membrane foveoschisis (ERM-F) and "new" (primary) LMH enabling better comparisons and further research.[3]

Previous studies considered degenerative and tractional LMH as a single entity with varying proportions, making it difficult to compare earlier findings with current results where the subtypes are analyzed separately. Findings have also been contradictory, with both positive and negative outcomes.[4,5] Previous negative outcomes in visual improvement and the associated risk of developing a full-thickness macular hole (FTMH) have contributed to some hesitation among et al regarding surgical intervention for LMH. The aim of this study has been to share our experience with LMH surgery and to alleviate concerns by demonstrating that, when performed with the appropriate technique, these procedures carry a low risk of FTMH development.

With the current consensus-based definitions, there is now a greater potential for more consistent and comparable results. An additional aim of the study is to provide greater clarity on this issue. Our hypothesis is that both ERM-F and LMH eyes benefit visually from surgery.

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Materials and Methods

Between 2013 and 2019, 85 LMH surgeries were performed according to Witkin's definition.[6]

After a reassessment using the 2020 consensus definition,[3] 25 eyes were excluded due to misdiagnosis, missing data, or complications caused by age-related macular degeneration (AMD), as illustrated in a flow chart in Figure 1.

The division between ERM-F and LMH is described in the original article as follows: ERM foveoschisis is diagnosed based on two mandatory and up to three optional OCT features, including contractile ERM and foveoschisis at the Henle fiber layer. LMH is identified by irregular foveal contour, a foveal cavity with undermined edges, and signs of tissue loss. Additional features such as epiretinal proliferation and ellipsoid zone disruption may be present.

Eyes with a history of retinal surgery, high myopia (≤ −6.0 D), or prior AMD treatment were included only if these conditions had not affected vision or if visual function had fully recovered. This was confirmed by comparing pre- and postoperative visual acuity following the previous retinal procedure.

The OCT findings in ERM-F differ from myopic Foveoschis by, among other things, thick hyperreflective ERM, retinal folds due to contraction, and the absence of staphyloma. A total of 60 eyes (58 patients) were included. The mean age was 70.8 years (range 51–84), with a mean follow-up of 31.7 months (range 1–117). Patients with short follow-up were also included, as our aim was to gather as large a dataset as possible by avoiding exclusions unless absolutely necessary.

Preoperative characteristics are presented in Table 1.

After reevaluation, 30 eyes were classified as ERM-F and 30 as LMH. Data were collected from medical records at Örebro University Hospital and referring clinics. All patients underwent thorough preoperative and postoperative examinations by a retinal specialist, including spectral-domain OCT imaging. A comprehensive analysis of the OCT scans was performed, evaluating factors such as the extent of schisis, the maximum height of foveal changes, and the

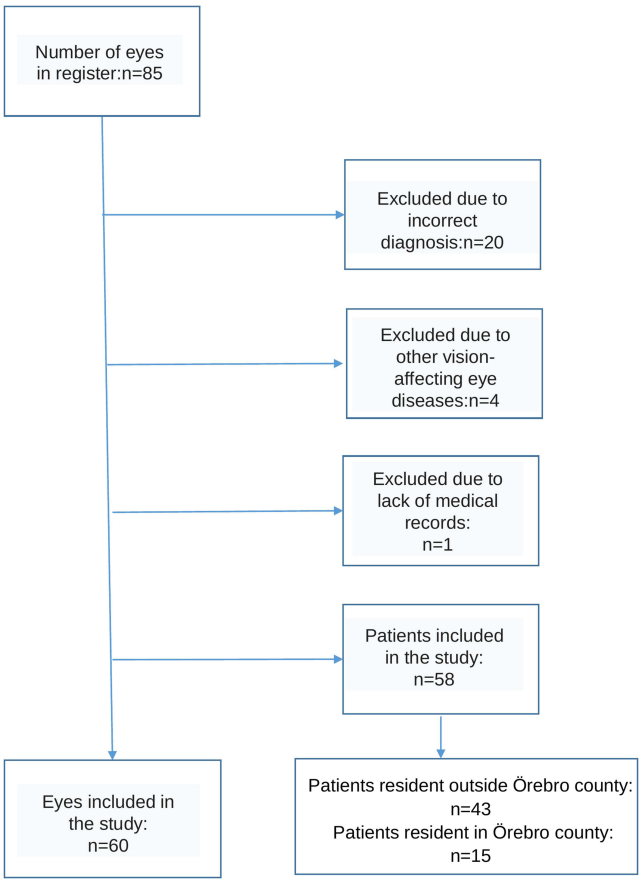

Figure 1 Study flowchart.

Table 1 Material (n = 60 Eyes)*

		ERM-F	%	LMH	
		n		n	
Operations (eyes)		30/60	50%	30/60	50%
Gender (patients)	Whole group (n=58)	28		30	
	Women	21/28	75%	12/30	40%
	Men	7/28	25%	18/30	60%
	Age range, whole group	52 – 84 years		51 – 84 years	
	Young	16/30	53%	14/30	47%
	Old	14/30	47%	16/30	53%
Eyes operated	Left	16/30	53%	8/30	27%
	Right	14/30	47%	22/30	73%
Median FU time (mo)	Whole group	27		26	
	Young	21		38	
	Old	30		16	
Preoperative VA	<0.5 decimal (worst)	12			
	>0.5 decimal (best)	11			
	<0.4 decimal			11	
	>0.4 decimal			9	
EP		0		21	
				8/14	57%
				6/14	43%
				13/16	81%
				3/16	19%
EZ defects		2		15	
	Young, EZ defect	1/16	6%	6/14	43%
	Young, no EZ defect	15/16	94%	8/14	57%
	Old, EZ defect	1/14	7%	9/16	56%
	Old, no EZ defect	13/14	93%	7/16	44%
ELM defects		2		10	
	Young, ELM defect	1/16	6%	3/14	21%
	Young, no ELM defect	15/16	94%	11/14	79%
	Old, ELM defect	1/14	7%	7/16	44%
	Old, no ELM defect	13/14	93%	9/16	56%

Note: *Unless otherwise indicated, data are given in number of eyes.
Abbreviations: ERM-F: epiretinal membrane foveoschisis; LMH: lamellar macular hole; ELM: external limiting membrane; EP: epiretinal proliferation; EZ: ellipsoid zone; FU: follow-up; old: >70 years; young: ≤70 years; VA: visual acuity. *Unless otherwise indicated, data are given in number of eyes.

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presence of ellipsoid zone (EZ) defects, among others. For the final analysis, the parameters selected were the presence or absence of epiretinal proliferation (EP) and defects in the external limiting membrane (ELM) and EZ.

Main outcomes were the best postoperative "Best-Corrected Visual Acuity" (BCVA), complication rate and the impact of preoperative factors on visual improvement. BCVA was not necessarily from the last visit. We have not identified any new eye diseases during follow-up that affect vision in connection with the most recent visit, and our intention was to reflect the patient's highest visual potential.

Visual acuity was converted to LogMAR, to assess changes in vision. Percentage improvement in vision was calculated by comparing pre- and postoperative median and mean values in decimal notation.

Surgical Technique

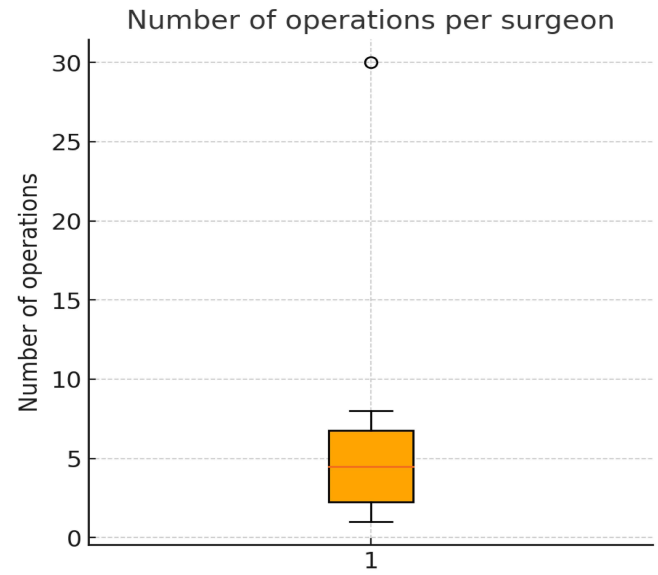
Nine retinal specialists performed the surgeries, each choosing the technique, treatment, and postoperative care independently, as illustrated in Table 2.

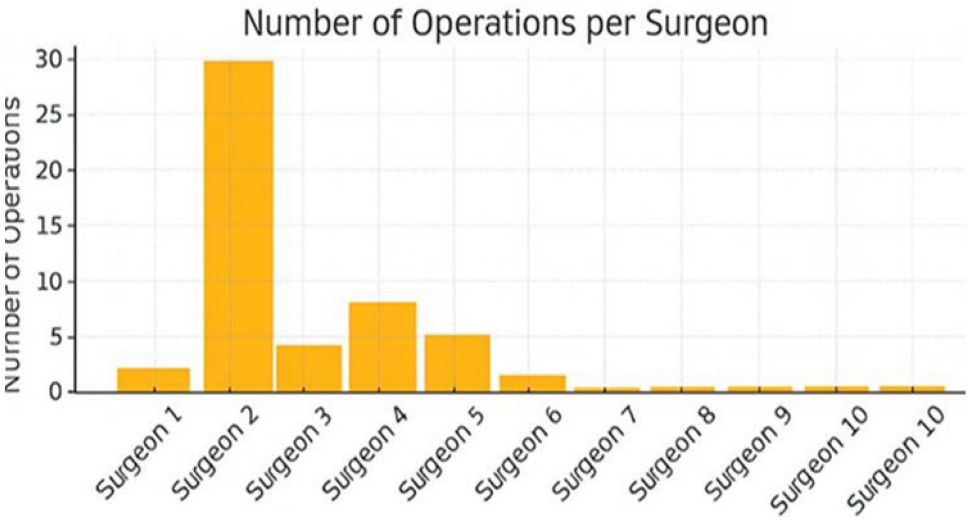
The distribution of surgeries among the surgeons was highly uneven, with one surgeon performing 30 surgeries, four surgeons sharing 5 surgeries, and the remaining 25 surgeries distributed among the other four surgeons Figure 2. Due to the uneven distribution of surgical volume, where most surgeons performed only a few procedures, we did not analyze individual outcomes, as such comparisons would lack statistical reliability and could be misleading.

Table 2 Surgical Technique

Category	Option	n/N
Tamponade	C2F6	29/60
	SF6	11/60
	Air	10/60
	Silicone oil, 1000 cs	1/60
	No tamponade	9/60
Intravitreal dye	MembraneBlue-Dual	32/60
	MembraneBlue-Dual+Triamcinolone	20/60
	Triamcinolone	2/60
	No dye	2/60
	Unknown dye	4/60
Gauge	23G	9/60
	25G	38/60
	27G	12/60
	Unknown size	1/60
Anesthesia	Local	57/60
	General	3/60
Form of care	Outpatient	57/60
	Inpatient	3/60

Abbreviations: C2F6, hexafluoroethane; SF6, sulphur hexafluoride; cs, centistoke; Triamcinolone, Triamcinolone acetonide; n, patients; N =, group size.





Summary Statistics

Minimum: 1.00	Interquartile Range (IQR): 5.50
1st Quartile (Q1): 1.00	Mean: 6.00
Median (Q2): 2.50	Strandard Deviation: 8.89
3rd Quartile (Q3): 6.50	
Maximum: 30	

Figure 2 Boxplot diagram and Bar Chart: Number of operations per Surgeon.

Pars plana vitrectomy (PPV) was done using the Alcon Accurus system with wide-angle viewing.

If epiretinal membranes (ERM) and epiretinal proliferation were present, these were carefully peeled off and then the internal limiting membrane (ILM), often with the aid of intravitreal dyes. The size of the peeled area was not recorded, and embedding of EP was not performed.

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Tamponade was used in 85% of cases (51/60) to reduce the risk of FTMH.

In the ERM-F group, 8 eyes were phakic and 22 eyes were pseudophakic preoperatively at vitrectomy/peeling. In the LMH group, the distribution was the same; 8 and 22 eyes, respectively. All eyes were pseudophakic at follow-up.

Statistics

Analyses included chi-square, Sign test (ST), Mann–Whitney *U*-test (M-W), and Shapiro–Wilk test using online tools (Social Science Statistics, Statistics Kingdom, Calculator Soup). P-values were adjusted for multiple comparisons via the Benjamini-Hochberg method (FDR = 0.05) and reported as p-adjusted ("p-adj."). Both median and mean were used to assess vision improvement. A formal power analysis was not performed, as the sample size reflected the maximum number of patients available at our clinic.

Supplementary Table S1. reports descriptive statistics (median difference, range, SD, IQR, p, and p-adj); Supplementary Table S2 shows confidence intervals (CIs).

CIs for mean and median differences were calculated using the Single-Sample CI Calculator (S-SCIC) and the Single-Parameter Bootstrap CI Calculator (S-PBCIC).

Ethical Aspects

This retrospective study was conducted using pseudoanonymised patient data. Direct identifiers were removed and replaced with study-specific codes, and a separate code key was securely stored and accessible only to authorised personnel. The Institutional Review Board/Ethics Committee of Örebro University Hospital approved the study design and waived the requirement for informed consent based on the retrospective design and use of pseudonymized data (Swedish Ethical Review Authority, Umeå; Dnr: 2019–06452 and Dnr: 2023–05075-02). The study was conducted in accordance with the Declaration of Helsinki.

Results

Age and Gender Distribution

Age and gender distribution are shown in Table 1. Women were predominant overall (33/58), especially in the ERM-F group (21/28), while the LMH group had more males (18/30). Gender distribution differed significantly between groups (p-adj = 0.0268), consistent with previous studies.[7,8]

In the ERM-F and LMH groups, age ranged from 52 to 84 and 51 to 84 years, respectively, with median ages of 70 and 72.5 years. This difference was not statistically significant (U = 365; adjusted p = 0.3588; Mann–Whitney *U*-test; see Supplementary Table S3).

Vision Development and Improvement

Visual acuity outcomes were evaluated using LogMAR values, as presented in Table 3, Supplementary Tables S1 and S3, and illustrated in Figure 3. To minimize potential bias, percentage improvements were calculated using both median and mean values, expressed in decimal notation.

Both the ERM-F and LMH groups demonstrated statistically significant development in visual acuity after surgery, based on LogMAR values. In the ERM-F group (n = 30), the development was highly significant (p-adj = 0.0010), and the LMH group (n = 30) also showed very significant development (p-adj = 0.0012).

When visual improvement was assessed using decimal acuity values, the ERM-F group demonstrated an increase in median visual acuity from 0.50 to 0.95 (+90%) and in mean acuity from 0.50 to 0.80 (+60%). In the LMH group, the median improved from 0.40 to 0.55 (+38%), while the mean increased from 0.40 to 0.60 (+50%).

Postoperative vision declined in 3 eyes in the ERM-F group and in 1 eye in the LMH group, while 93% of all eyes showed stable or improved visual acuity. The results observed in the ERM-F group are consistent with previous studies.[6,7]

Table 3 Visual Improvements After Surgery Stratified by Group, Age, OCT Biomarkers, and Preoperative Vision

Subgroup	n	Preop BCVA	Postop BCVA	Median Change	Mean Change	p-adj.	Interpretation
ERM-F (all)	30	0.5	0.95	+90%	+60%	0.0010	Significant
LMH (all)	30	0.4	0.55	+38%	+50%	0.0012	Significant
ERM-F ≤70 y (young)	16	0.45	1.0	+122%	+89%	0.004	Highly significant
ERM-F >70 y (old)	14	0.55	0.6	+9%	+32%	0.084	Not significant
LMH ≤70 y (young)	14	0.5	0.75	+50%	+48%	0.005	Highly significant
LMH >70 y (old)	16	0.31	0.5	+61%	+49%	0.026	Significant
LMH with EP	21	0.4	0.5	+25%	+42%	0.012	Significant
LMH without EP	9	0.5	0.7	+40%	+69%	0.012	Significant
LMH with EZ defect	15	0.4	0.5	+25%	+32%	0.084	Not significant
LMH without EZ defect	15	0.4	0.7	+75%	+64%	0.003	Significant
ERM-F, worst (<0.5)	12	0.4	0.8	+100%	+127%	0.005	Significant
ERM-F, best (>0.5)	11	0.7	0.9	+29%	+16%	0.452	Not significant
LMH, worst (<0.4)	11	0.25	0.3	+20%	+80%	0.179	Not significant
LMH, best (>0.4)	9	0.5	0.8	+60%	+33%	0.026	Significant

Abbreviations: LMH, lamellar macular hole; ERM-F, epiretinal membrane foveoschisis; EP, epiretinal proliferation; EZ, ellipsoid zone; BCVA, best-corrected visual acuity; young, age ≤70 years; old, age >70 years; p-adj, adjusted p-value; worst LMH, BCVA <0.4; best LMH, BCVA >0.4; worst ERM-F, BCVA <0.5; best ERM-F, BCVA >0.5; n, number of patients.

Comparing Differences in Visual Development Between Surgery of Phakic Eyes versus Pseudophakic Eyes

During the study, the approach to lens surgery changed. Initially, most patients were phakic with preoperative BCVA measured before cataract surgery; postoperative BCVA was always assessed after cataract surgery. Later, cataract surgery was done first, allowing preoperative measurements in pseudophakic eyes and a more isolated evaluation of macular surgery. As phakic eyes were few (n = 8), no z- or p-value is reported; significance was based on the W-value.

In patients with epiretinal membrane (ERM-F), the phakic group (n = 8) showed a median BCVA improvement from 0.5 to 0.95 (90%), statistically significant at $p < 0.05$. In the pseudophakic group (n = 22), median BCVA improved from 0.5 to 0.90 (80%), with high statistical significance ($p = 0.0006$).

For lamellar macular hole (LMH), the phakic group (n = 8) improved from 0.45 to 0.675 (50%), significant at $p < 0.05$, while the pseudophakic group (n = 22) improved from 0.4 to 0.5 (25%), also statistically significant ($p = 0.00328$). As shown in Supplementary Table S3, these results demonstrate that even pseudophakic patients experience significant visual improvement following macular surgery, arguing that vision gains cannot primarily be explained by cataract surgery, particularly in LMH cases. However, the study did not account for potential posterior capsule opacification or its treatment.

Vision Development by Age Group

To evaluate the influence of age on postoperative visual outcomes, patients were divided into two groups: ≤70 and >70 years. In the ERM-F subgroup, younger patients (n = 16) demonstrated a highly significant improvement in BCVA, with median values increasing from 0.45 to 1.0 (+122%) and mean values from 0.47 to 0.89 (+89%) (p-adj = 0.004). In contrast, older patients (n = 14) showed a smaller, non-significant improvement from a median of 0.55 to 0.60 (+9%) and mean of 0.53 to 0.70 (+32%) (p-adj = 0.084).

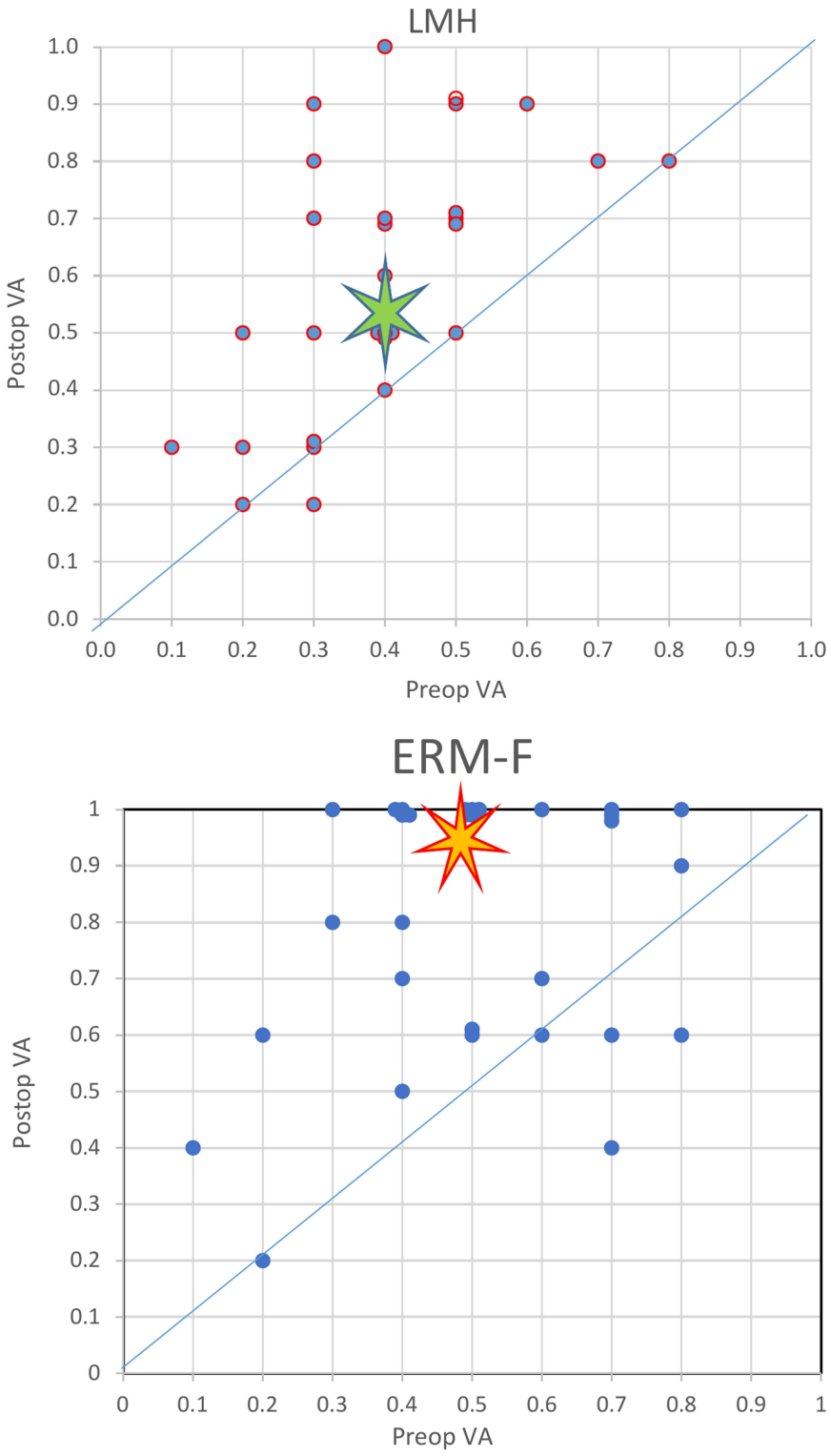

Figure 3 Green star represents: Median results for the lamellar macular hole (LMH) group (0.4/0.55). Orange star represents: Median results for the Epiretinal membrane foveoschisis (ERM-F) group (0.5 / 0.95).

There were no significant differences between younger and older ERM-F patients regarding follow-up duration, time to best-corrected visual acuity (BCVA), or presence of ellipsoid zone (EZ) defects, suggesting that these factors do not explain the disparity in visual outcomes.

In the LMH group, both age categories experienced significant visual improvement. Younger patients (n = 14) improved from a median BCVA of 0.50 to 0.75 (+50%) and mean from 0.47 to 0.70 (+48%) (p-adj = 0.005). Older patients (n = 16) also showed a statistically significant gain, with median values increasing from 0.31 to 0.50 (+61%) and mean from 0.33 to 0.49 (+49%) (p-adj = 0.026).

As shown in Table 3, these findings indicate that favorable surgical outcomes can be achieved even in older LMH patients, despite 81% (13/16) exhibiting epiretinal proliferation (EP) and/or EZ defects. No major differences in follow-up time, presence of EP, EZ status, or time to BCVA were observed between age groups.

Vision Development by Gender

Gender distribution differed markedly between diagnostic groups, with a female predominance in the ERM-F cohort and a male predominance in LMH, as shown in Table 1.

In ERM-F eyes, women (n = 22) demonstrated a statistically significant improvement in BCVA, with median values increasing from 0.50 to 0.80 (+60%) and mean values from 0.47 to 0.76 (+62%) (p-adj = 0.004). Men (n = 8) also showed a numerical improvement (median: 0.63 to 1.0, +59%; mean: 0.58 to 0.90, +55%), though this did not reach statistical significance (p-adj = 0.121).

The high preoperative BCVA and a ceiling effect (ie, limited room for improvement near the maximum value of 1.0) in men may partly explain the lack of statistical significance despite comparable relative improvement. Overall, women, who were more frequently affected by ERM-F, demonstrated clearly favorable surgical outcomes.

In the LMH group, both sexes experienced comparable visual improvement. Women (n = 12) improved from a median BCVA of 0.40 to 0.55 (+38%) and mean of 0.40 to 0.58 (+45%) (p-adj = 0.032). Men (n = 18) improved from a median of 0.40 to 0.57 (+43%) and mean of 0.40 to 0.60 (+50%) (p-adj = 0.005). As shown in Supplementary Table S3, no significant gender-related differences in surgical outcomes were observed.

Differences in Follow-Up (FU) Times and Time to Achieve Best Postoperative BCVA

To investigate whether follow-up (FU) duration influenced visual outcomes, we analyzed both total follow-up time (defined as time from surgery to last visit) and time to best postoperative BCVA.

For the full cohorts, ERM-F and LMH patients had comparable follow-up durations, with median values of 27 and 26 months, respectively. This difference was not statistically significant (p-adj = 1.019). Similarly, the median time to reach best BCVA was 6 months for ERM-F and 8 months for LMH, with no significant difference between the groups (p-adj = 0.982).

Subgroup analysis by age revealed no significant difference in follow-up time between younger (≤70 years) and older (>70 years) ERM-F patients (median 21 vs 30 months; p-adj = 0.98). Likewise, the time to reach best BCVA did not differ significantly (median 9 vs 6 months; p-adj = 0.478). In the LMH group, younger patients had a numerically longer follow-up (median 38 vs 16 months), though this was not statistically significant (p-adj = 0.059), as shown in Supplementary Table S3. Time to best BCVA was similarly comparable between younger and older patients (8 vs 5 months; p-adj = 0.602). Notably, eyes in all groups generally reached best BCVA within the first postoperative year, contrary to the expectation that visual improvement might be delayed. However, as with other macular conditions, the possibility of additional long-term gains with extended follow-up cannot be excluded. Importantly, neither shorter follow-up nor delayed visual recovery appears to explain the poorer outcomes observed in older ERM-F patients.

OCT Findings with Potential Impact on Vision Development

Structural changes detected by OCT, including epiretinal proliferation (EP), defects in the external limiting membrane (ELM), and ellipsoid zone (EZ) disruption, were predominantly observed in the LMH group.

Of the 24 eyes exhibiting such changes, 22 (73%) were LMH eyes and only 2 (7%) belonged to the ERM-F group. EZ defects were present in 50% of LMH eyes (15/30), compared to 7% of ERM-F eyes (2/30). ELM defects were observed in 12 eyes (10 LMH, 2 ERM-F), while EP was exclusively found in LMH eyes (21/30). Although EP appeared more frequent in older LMH patients, this age-related difference was not statistically significant.

LMH eyes with EP (n = 21) showed a statistically significant improvement in BCVA from a median of 0.40 to 0.50 (+25%) and mean from 0.38 to 0.54 (+42%) (p-adj = 0.012). Eyes without EP (n = 9) also improved significantly, with

a median increase from 0.50 to 0.70 (+40%) and mean from 0.42 to 0.71 (+69%) (p-adj = 0.012). Although both groups benefited from surgery, eyes without EP achieved greater visual gains. As detailed in Table 3, analysis of EZ integrity showed that eyes with EZ defects (n = 15) exhibited a non-significant BCVA improvement, from a median of 0.40 to 0.50 (+25%) and a mean of 0.37 to 0.49 (+32%) (p-adj = 0.084). In contrast, eyes without EZ defects (n = 15) demonstrated a statistically significant improvement, with median BCVA increasing from 0.40 to 0.70 (+75%) and mean from 0.42 to 0.69 (+64%) (p-adj = 0.003). Overall, although LMH eyes showed visual improvement regardless of EP or EZ status, smaller gains in visual acuity were associated with the presence of structural changes, especially EZ disruption.

Is Visual Development Dependent on Preoperative Vision?

Surgical decision-making is often more challenging in patients with either very poor or relatively good preoperative visual acuity. To explore this, outcomes were analyzed in subgroups with the lowest ("worst") and highest ("best") baseline BCVA, defined as <0.5 or >0.5 for ERM-F, and <0.4 or >0.4 for LMH, with intermediate values excluded to ensure balanced group sizes.

As shown in Table 3, eyes in the ERM-F group with poor preoperative vision (n = 12) demonstrated a statistically significant improvement, with median BCVA increasing from 0.40 to 0.80 (+100%) and mean from 0.33 to 0.75 (+127%) (p-adj = 0.005). In contrast, those with better preoperative vision (n = 11) showed smaller, non-significant gains—from a median of 0.70 to 0.90 (+29%) and mean of 0.69 to 0.80 (+16%) (p-adj = 0.452). We introduce the term ceiling effect to describe the constrained potential for visual improvement in eyes with preoperative BCVA near 1.0.

In contrast, the LMH group showed a reversed trend. Eyes with better preoperative vision (n = 9) experienced a statistically significant improvement, with median BCVA rising from 0.50 to 0.80 (+60%) and mean from 0.57 to 0.76 (+33%) (p-adj = 0.026). Eyes with poor initial vision (n = 11) showed numerical but non-significant gains—from a median of 0.25 to 0.30 (+20%) and mean of 0.25 to 0.45 (+80%) (p-adj = 0.179).

As seen in other subgroup comparisons, the discrepancy between median and mean values in both LMH subgroups may reflect underlying variability. To explore possible explanations, we compared age, follow-up duration, time to best BCVA, and the presence of EP and EZ defects between "worst" and "best" eyes. However, no significant differences in these factors were observed (Supplementary Table S1,Rank: 21,25,26,27,28,33,34,36).

Complications

No serious complications, such as endophthalmitis or retinal detachment, were observed. In the LMH group, a full-thickness macular hole (FTMH) developed in 2 out of 30 eyes (6.7%). One of these patients underwent reoperation with gas tamponade and recovered without complications. The other patient did not recover after reoperation, and further treatment was not pursued due to a poor visual prognosis. Nowadays, it has become increasingly common to conclude the operation with a medium-term gastamponade (C2F6) with the intention of preventing or healing a penetrating macular hole. In the patients who developed FTMH, tamponade was missing in one case and in the other case the patient received a short-acting gas (SF6) (Table 2). In a study by Er-reguyeg et al.[9] FTMH occurred in 5 patients out of 39 LMH patients (12%), all with short-acting tamponade (SF6 or air). Changing the peeling technique to a more gentle approach has also been tried with positive results.[10,11]

No cases of FTMH were observed in eyes operated for ERM-F.

Discussion

Had the sample been larger and the assumptions of regression analysis met, it may have been possible to more clearly distinguish the effect on vision improvement from the various factors. However, the stratification (subgrouping) strategy adopted in this study provides a more direct estimate of the usefulness of the procedure to various groups of patients.

Our analysis showed positive vision improvement in all groups/subgroups.This also applied to older LMH patients with low preoperative vision, serious OCT changes and a short FU time.[12]

In some groups, substantial differences emerged depending on whether the calculation is based on mean or median values. The differences in results between the mean and median can be partly explained by the relatively small sample

size, as well as the skewness of the data. The true value of the change in the population is likely to lie somewhere between the two estimates, but with uncertainty depending on the structure and size of the data.

Findings that should be noted are that eyes with EZ defect and with EP achieve worse improvement and that "old ERM-F" performs worse than younger ones. A study on full-thickness macular holes (FTMH) showed delayed microstructural recovery in older patients after successful anatomical closure. This might be a relevant parameter to consider in older patients with ERM-F.[13]

Although there are differences in vision improvement between subgroups, all groups show positive change, albeit to varying degrees.

The most surprising result was that old LMH patients had significant vision development and a vision improvement of 61.3%. This was despite the fact that this group had the lowest median preoperative vision and structural OCT changes in 81% of cases.[14]

It was also surprising to find that the median "time to BCVA" in all subgroups occurred within the first postoperative year. In complicated macular surgery, achieving BCVA often takes longer.[8,15] In the LMH group, further visual improvement over time may still occur.

If we accept that ERM-F and LMH are completely separate diseases, it does not make sense to try to find common factors that explain differences in vision before and after surgery.

If the median and mean improvement values are weighted together in the LMH group, there is no major difference in improvement regardless of age, gender or preoperative vision. However, a noticeable difference in improvement for the worse is obtained if the patient has EP and to an even greater extent if the patient has defects in the EZ. We interpret these OCT changes as a negative factor for vision improvement. At the same time, it is important to emphasize that patients experienced improvement regardless of these changes.

Since we believe that the aforementioned OCT changes worsen over time, it is important not to delay a decision on possible surgical intervention. We found that FTMH occurred only in LMH patients. The higher presence of EP, and thus the need for peeling, combined with defect EZ, likely represents a risk-prone situation for the development of FTMH.

Regarding the prevention of FTMH, it may be appropriate to use at least medium-term gas tamponade and/or more gentle peeling of EP.[9–11]

Despite the retrospective design and small sample size often seen in studies of rare diseases, such research can still stimulate interest and contribute to larger patient inclusion in future studies.

Conclusion

Although the subgrouping revealed differences in the degree of improvement, all groups and subgroups demonstrated positive visual outcomes. However, not all of these changes reached statistical significance. The study indicated that certain factors negatively affected recovery, although advanced age, poor baseline vision, and pronounced OCT changes did not preclude a favorable postoperative outcome. While visual outcomes can be satisfactory despite retinal changes, early surgery may be beneficial, as EZ disruption and EP appear to be associated with limited recovery and and a potentially increased risk of FTMH.

Disclosure

The authors declare no competing interests in this work.

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