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## Case Series

# Pitfalls and Complications of Epiretinal Membrane Peeling in Eyes with Comorbid Subretinal Drusenoid Deposits: A Report of Five Cases

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## ABSTRACT

**Background:** Idiopathic epiretinal membranes (ERM) are common with potential for severe visual loss. Surgical outcomes are excellent but predominantly reported from healthy eye studies rather than those with co-morbidities. We report a series of patients with subretinal drusenoid deposits (SRDD) and comorbid ERM with post-operative complications or poor outcomes, describing potential pitfalls to avoid.

**Case Presentation:** This is a case series illustrating the poor functional and morphological outcomes following ERM surgery in five eyes with SRDD. These eyes appear at risk of geographic atrophy (GA), choroidal neovascular membrane (CNVM) formation (pre-and post-operatively) and outer retinal atrophy (ORA), all of which can limit outcomes.

**Conclusion:** ERM surgery in eyes with SRDD presents specific challenges. Assessment of outer retinal changes can be challenging pre-operatively, particularly with significant oedema. Identification of patients with SRDD in ERM eyes often relies on examination of the contralateral eye. Appropriate listing is paramount, with care taken to rule out pre-existing GA or CNVM through use of fundus fluorescein angiography. Patients should be given a guarded prognosis during the consenting process if the outer retina is poorly visualized.

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## Background

Epiretinal membranes (ERM) are a common pathology [1] with an established surgical management that has developed significantly in technique and instrumentation since the first cases, with 70-80% gaining 2 Snellen lines or more in best corrected visual acuity (BCVA) [2]. Most studies include idiopathic ERM, with outcomes among eyes with co-morbidities poorly described. As ERM incidence occurs mainly in the elderly, co-morbid age-related maculopathy (ARM) is a common finding [1]. Limited studies have assessed outcomes of ERM surgery in eyes with ARM, with conflicting results [3, 4]. Limited literature exists on outcomes in eyes with subretinal drusenoid deposits (SRDD). A recent case-control study demonstrates surgery in eyes with SRDDs is

associated with less favorable visual outcomes. Fewer patients demonstrate gain in BCVA, whereas a significant number show a deleterious decline [5].

The epidemiology of SRDD differs to that of ARM, being more frequent in woman, and imposing greater risk of age-related macular degeneration (AMD) [6]. They are associated with reduced retinal sensitivity, visual dissatisfaction, are prevalent in eyes with age related choroidal atrophy, and associated with choroidal ischaemia and thinning [7-10]. We report cases where eyes with SRDD have undergone ERM surgery with poor postoperative results. We discuss in detail complications and pitfalls and explore potential ways to reduce risk.

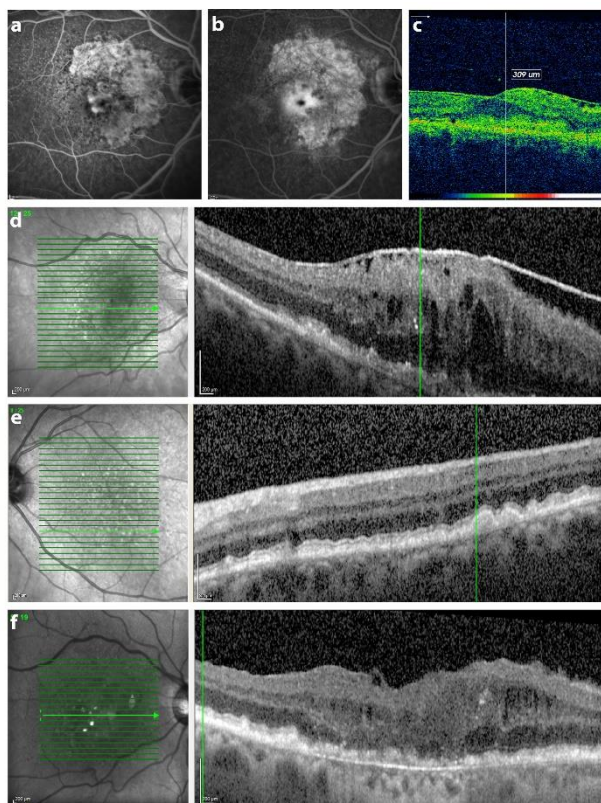
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## Case Presentation

Ethics committee approval was not required for this study as patients were seen and treated as part of their routine clinical care and results were analysed in a retrospective fashion. Our code of conduct adhered to ethical principles outlined in the declaration of Helsinki. Full informed written consent was granted by all patients. Five patients with comorbid ERM and SRDD underwent vitrectomy and ERM peeling. It was noted that functional and morphological outcomes appeared poor.

### Case I: Potential for Misdiagnosis of CNVM

A 78-year-old woman was referred to the vitreoretinal surgery clinic with reduced vision and distortion. Spectral domain optical coherence tomography (SDOCT) demonstrated ERM with macular pucker and retinal thickening. Subsequent 25-gauge (G) pars plana vitrectomy (PPV) with ERM peeling was performed. Postoperatively BCVA worsened from 6/30 to 6/38, with increasing distortion. Fundus fluorescein angiography (FFA), demonstrated classic choroidal neovascular membrane (CNVM), as shown in (Figures 1a & 1b). Re-analysis of the preoperative SDOCT revealed a sausage shaped area of subretinal hyper-reflectance in keeping with CNVM that was undetected preoperatively (Figure 1c).

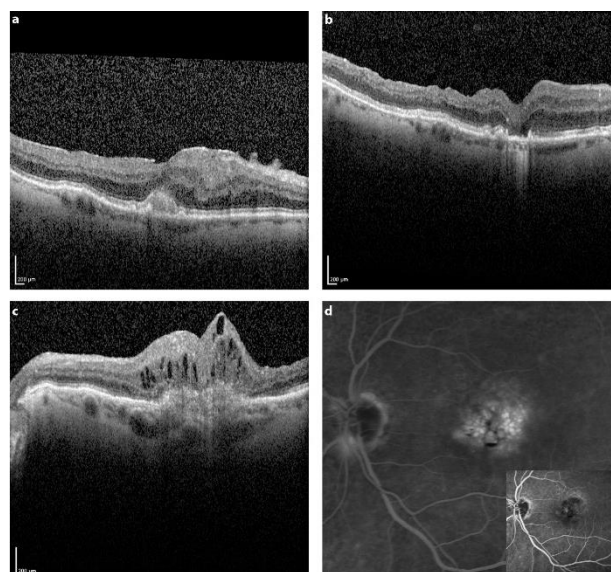


**Figure 1: a) & b)** FFA taken post ERM peeling showing a window defect secondary to foveal sparing U-shaped GA with a subfoveal classic CNVM demonstrated by a lacy pattern of early and progressive leakage. **c)** Preoperative SDOCT of the same eye demonstrating a visible ERM on the inner retinal surface with a comorbid subretinal sausage shaped area of hyper-reflectivity, representing a type 2 CNVM that was not detected clinically preoperatively. **d)** SDOCT image of an eye with ERM and associated retinal thickening. There is poor visualization of

outer retinal structures with significant artefacts and reduced image quality. SRDD are fine structures and in such oedematous retina are difficult to identify unless superior and inferior raster scans (where oedema is often less significant) are reviewed. **e)** SDOCT of the contralateral eye to that in **d)** demonstrating a saw-tooth undulation of the ISel secondary to numerous SRDD, which are almost universally bilateral findings. **f)** Postoperative SDOCT of **e)** demonstrating the visualization or development of foveal involving GA with significant reduction in retinal thickening.

### Case II: Geographic Atrophy Development

A 76-year-old female with preoperative BCVA of 6/60 presented with ERM and gross retinal thickening (mean central thickness of 587µm). Oedema prevented accurate assessment of the outer retina (Figure 1d). Contralateral eye analysis revealed large numbers of SRDD (Figure 1e), giving a saw-tooth pattern of undulation to the inner segment ellipsoid (ISel). The patient underwent PPV, combined cataract surgery and intraocular lens implant with ERM peel. Despite complete ERM removal with reduced mean central retinal thickness (392µm), BCVA remained 6/60. Center involving geographic atrophy (GA) developed (Figure 1f).



**Figure 2: a)** Preoperative SDOCT image demonstrating SRDD and ERM with a comorbid adult vitelliform type lesion at the fovea. **b)** Postoperative SDOCT showing resolution of the subfoveal lesion and the development of ORA and associated reduced BCVA. There has been atrophy and disappearance of the ISel and the external limiting membrane with focal thinning of the outer nuclear layer. **c)** Postoperative SDOCT showing a pigment epithelial detachment with overlying intraretinal fluid and retinal thickening. **d)** FFA suggesting of a retinal angiomatous proliferation/type 3 CNVM. The early frames demonstrate a parafoveal right angled blood vessel (inset) which progressively leaks.

### Case III: Outer Retinal Atrophy (ORA)

An 82-year-old pseudophakic male presented with right eye ERM and reduced BCVA (6/18) (Figure 2a), with associated adult vitelliform type lesion on SDOCT. Subsequent PPV and ERM peel resulted in worsening of BCVA to 6/36, with development of ORA following the regression of the central adult vitelliform type lesion (Figure 2b).

#### Case IV: Postoperative CNVM Development and Misdiagnosis as Cystoid Macular Oedema (CMO)

A 94-year-old female with BCVA of 6/60 underwent PPV, combined cataract surgery and ERM peeling. Initially BCVA improved to 6/36 but the patient developed a pigment epithelial detachment on SDOCT (Figure 2c) with intraretinal fluid. Initially, this case was managed as postoperative CMO but subsequent FFA revealed occult CNVM (Figure 2d).

#### Case V: Postoperative CNVM and Delayed Re-Presentation

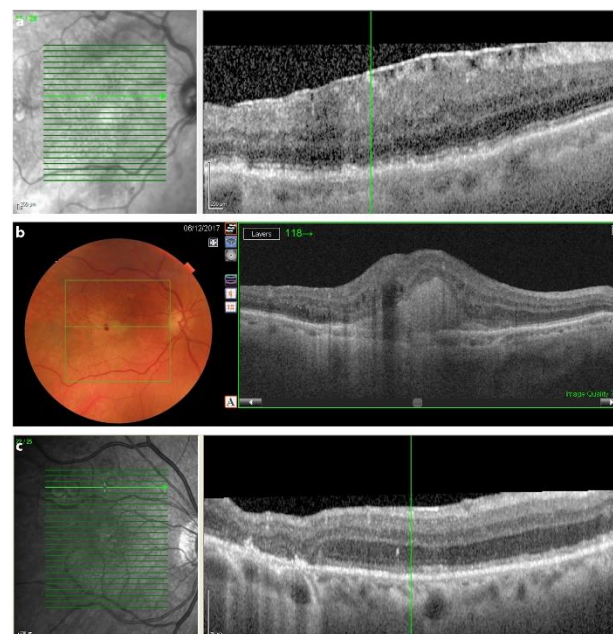
An 81-year-old female underwent PPV and ERM peel (Figure 3a). BCVA improved initially from 6/24 to 6/12 with normal postoperative SDOCT. The patient was discharged but soon developed reduced central vision and distortion. Initially she dismissed these symptoms as normal following her recent surgery. Upon re-presentation, a disciform scar had formed from CNVM (Figure 3b).

#### Conclusion

Eyes with SRDD are high risk of developing AMD [6]. When assessing newly symptomatic elderly patients with ERM, recognition of SRDD warrants careful examination for possible CNVM, given both pathologies present with similar symptoms, with vigilance not to miss early classic CNVM on SDOCT imaging. A low threshold for FFA is required if suspicion of CNVM exists, particularly in eyes with gross retinal thickening and poor outer retinal visualization. This can result in diagnostic errors as prominent ERM is clearly visible and may falsely be attributed as the only cause of visual decline and distortion.

Eyes with ERM and significant retinal thickening can cause difficulty in analysis of the outer retina. Integrity of ISel on SDOCT has been reported to correlate with preoperative and postoperative BCVA, with SRDD causing undulation and disruption to the ISel [11]. Adequate SRDD identification may rely on analysis of contralateral eyes in the presence of ERM with oedema, secondary to outer retinal artefacts and degradation of image quality. Surgeons must be aware that ERM patients with poor visualization of the outer retina, with SRDD in the contralateral eye, may have a guarded prognosis if non-visible disruption to the outer retina exists. In case II it cannot be established if GA was present, but not visible preoperatively, or developed following surgery. The case highlights the risk of comorbid AMD in eyes with SRDD, and acts as a reminder that with retinal thickening GA may not be clinically obvious.

Regression of SRDD can cause loss of the ISel, ORA and visual decline [12]. SRDD have been associated with outer retinal ischaemia and their presence may represent loss of retinal pigment epithelium, photoreceptor and choriocapillaris structure and function [10, 12]. These changes may limit the potential for BCVA improvement following ERM peeling and, as in case III, could result in worsening of BCVA. Whether risk of ORA is increased by ERM peeling needs to be fully elucidated by future studies. We have observed in clinical practice widespread ORA development in areas of initiation of ERM peeling in eyes with SRDD (Figure 3c) with the use of retractable 25G diamond dusted membrane scrapers (Bausch and Lomb, Rochester, New York).



**Figure 3:** **a)** Preoperative SDOCT showing ERM and SRDD with adequate visualization of the outer retina with no OCT features suggestive of a CNVM. **b)** SDOCT taken upon delayed re-presentation to the hospital eye service showing a subretinal area of increased reflectance associated with haemorrhage. The patient had a disciform scar clinically. **c)** SDOCT taken 11-months post ERM peeling. In the area around the superotemporal vascular arcade, where the ERM peel was initiated, there are extensive areas of ORA with loss of the ISel and corresponding thinning of the outer nuclear layer and the retinal pigment epithelium, with enhanced transmission of signal within the choroid/sclera.

Choroidal neovascularization development after vitrectomy and ERM peeling is an established rare complication [13]. Eyes with SRDD are high risk of AMD but whether ERM surgery increases risk through direct microtrauma or postoperative inflammation cannot be elucidated [8]. In patients with increasing postoperative intra/subretinal fluid, surgeons should have low thresholds for FFA, minimizing risk of misdiagnosing CNVM as CMO, allowing prompt treatment. It is paramount, that if patients are discharged, they should be warned that they are at risk of CNVM and issued with an Amsler grid, with appropriate instructions for home screening. Otherwise, in eyes with reduced vision, and those following recent surgery, symptoms may be dismissed by patients, resulting in delayed presentation and treatment.

In summary, we report an easily identifiable patient group with SRDD that pose several specific challenges for ERM surgery. Firstly, surgeons should be cautious regarding the high prevalence of GA and CNVM; being extra vigilant to rule out co-morbid CNVM upon presentation, particularly among eyes with oedema and poor visualization of outer retina. Surgeons should consider preoperative FFA if any doubt exists. Patients with SRDD in either eye and poor visualization of the outer retina, with inability to confirm a structurally intact ISel, should be counselled that they may have a guarded prognosis. They should be warned specifically about the risk of AMD and advised to return with symptoms of increasing metamorphopsia or other concerning symptoms.



## Conflicts of Interest

None.

## Ethics Approval and Consent to Participate

Ethics committee approval was not required for this study as patients were seen and treated as part of their routine clinical care and results were analyzed in a retrospective fashion. Our code of conduct adhered to ethical principles outlined in the declaration of Helsinki. Full informed written consent was granted by all patients.

## Consent

Informed consent for publication of the patient clinical details and clinical images was obtained from the patient.

## Availability of Data and Materials

The authors declare that all the data in this article are available within the article.

## Competing Interests

None.

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None.

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## Author Contributions

Craig Wilde conceived and wrote the manuscript. Andrew R Ross created the images. Mary Awad, Heen-Choon Chen, and Winfried M Amoaku edited the manuscript. Heen-Choon Chen supervised the manuscript. All authors read and approved the final manuscript.

## Abbreviations

**ARM:** Age-Related Maculopathy  
**AMD:** Age Related Macular Degeneration  
**BCVA:** Best Corrected Visual Acuity  
**CNVM:** Choroidal Neovascular Membrane  
**CMO:** Cystoid Macular Oedema  
**ERM:** Epiretinal Membranes  
**FFA:** Fundus Fluorescein Angiography  
**G:** Gauge  
**GA:** Geographic Atrophy  
**ISel:** Inner Segment Ellipsoid  
**ORA:** Outer Retinal Atrophy  
**PPV:** Pars Plana Vitrectomy

**SDOCT:** Spectral Domain Optical Coherence Tomography

**SRDD:** Subretinal Drusenoid Deposits

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