

# Macular Folds after Detachment Surgery: A Tale of Two Outcomes

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## Background

- 'Retinal folds' describe folds in the retina which can be associated with retinal displacement (1,2). Whilst peripheral folds are relatively common and usually clinically insignificant, folds at the macula are uncommon, but can cause significant visual symptoms. Their incidence has been reported to occur in 3% cases.
- Macular folds are thought to occur due to increased retinal mobility following detachment and small amounts of retained subretinal fluid in the presence of intraocular tamponading agents that push subretinal fluid towards the posterior pole. Retinal tissue is 'pinched' between the buoyant tamponade bubble and adjacent retina. Subsequent resolution of subretinal fluid then leaves base to base apposition of photoreceptor layers (3).
- Risk factors associated with the development of retinal folds include the use of intraocular gas tamponade, recent onset of retinal detachment, large circumferential buckles, superior bullous detachments, external drainage of SRF, incomplete internal drainage of SRF and retinal detachment running through the fovea with folds forming at the edge of the original detachment.
- Macular folds have been associated with numerous post-operative symptoms including metamorphopsia, aniseikonia, diplopia and central scotoma (4).

## Aim

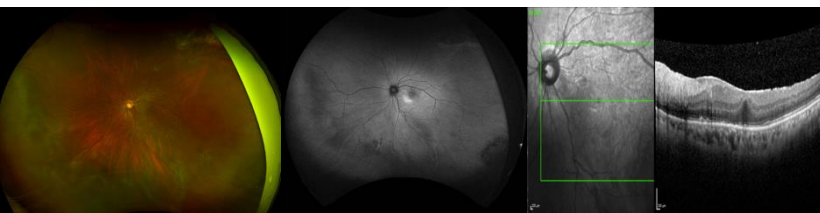
- To report two cases of symptomatic retinal fold formation following retinal detachment repair and their outcomes following corrective surgical procedures.

## Methods

- We retrospectively analysed two patients who developed macular folds following retinal detachment repair at Western Eye Hospital 2022-24. This involved review of the electronic patient record (Medisof) for clinical notes, operation notes and multimodal imaging investigations.
- Patient 1, a 53-year-old male myope, underwent left vitrectomy, cryotherapy, SF6 for a macula off rhegmatogenous detachment. Post-operatively he reported 'skewed' vision and torsional binocular diplopia associated an inferotemporal macular fold. 10 weeks later, he underwent induction of a localised retinal detachment to mobilise the macula and relieve the fold.
- Patient 2, a 44-year-old female myope, underwent right vitrectomy, cryotherapy, SF6 for a right macula off rhegmatogenous detachment. Post-operatively she described aniseikonia, distortion and binocular diplopia due to a macular fold. 3 weeks later, she underwent further vitrectomy whereby a localised retinal detachment was induced and the fold flattened with perfluorocarbon liquid.

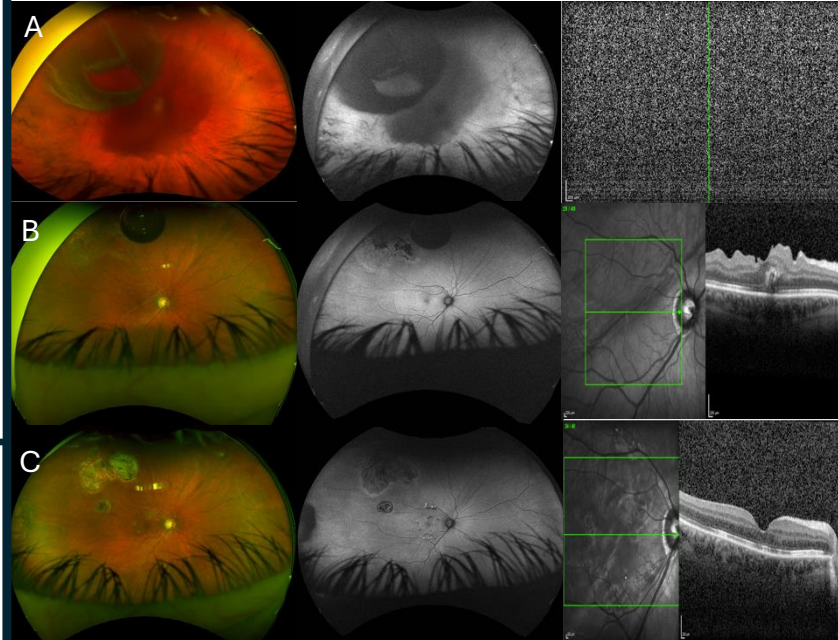
## Results

- **Patient 1:** Despite resolution of the retinal fold clinically and on OCT imaging, the patient remained symptomatic and inferior retinal displacement was noted on FAF. His vision remained counting fingers despite subsequent cataract and epiretinal membrane surgery.



**Patient 1: Multimodal UWF, FAF & OCT imaging**  
No imaging was available for the patient pre-operatively.  
Post-operative imaging above demonstrates persistent inferior macular displacement but no macular fold following intervention.

- **Patient 2:** The procedure for patient 2 was successful in correcting both the retinal fold and in improving the patient's symptoms with the patient reporting only intermittent ghosting post-operatively. Vision was recorded as 6/7.5 with pinhole.



**Patient 2: Multimodal UWF, FAF & OCT imaging**  
Row A: Macular off detachment associated with a superotemporal U shaped retinal tear  
Row B: Retinal displacement with an oblique linear superonasal macular fold. Also seen are a superotemporal cryotherapy scar and remaining gas bubble  
Row C: Resolution of the macular fold with re-establishment of normal foveal contour. Also seen is a retinotomy scar temporal to the macula

## Discussion

Our cases describe the development of symptomatic macular fold formation after retinal detachment surgery. Although corrective procedures for both cases achieved anatomical resolution of the macular fold, visual outcomes differed significantly. These cases highlight that retina unfolding procedures carry a variable visual prognosis and patients should be consented accordingly.

## Prevention:

- The major risk factors for macular fold development are well defined (5). Emphasis should be placed on primary prevention of macular folds during retinal detachment surgery.
- Patient 1 developed a symptomatic macular fold associated with inferior macular displacement. Risk factors identified for this patient included macular off status, a large extent of detachment, the use of intraocular gas tamponade and incomplete (partial) internal drainage of subretinal fluid.
- Patient 2 developed a symptomatic macular fold. Risk factors identified for this patient included macular off status, recent onset of detachment, superior bullous detachment and the use of intraocular gas tamponade.

- In cases with non-modifiable risk factors (e.g. retinal detachment across the macula, bullous detachment), emphasis should be placed on the surgical technique and correct post-operative posturing (5).

## Surgical technique:

- For **buckles**, this would include 1) avoidance of large, circumferential buckles, or 2) avoidance of external drainage of subretinal fluid.
- For **Pars plana vitrectomy**, this would include 1) complete internal drainage of subretinal fluid and 2) avoidance of submacular displacement of fluid during fluid air exchange.
- **Pneumatic Retinopexy:** PR carries a reduced risk of retinal fold formation compared to PPV as should be considered in suitable cases(6)
- **Posturing**
  - There is no consensus regarding the best method to prevent macular folds.
  - Suggestions include 1) immediate prone position + support the break, 2) immediate supine + support the break or 3) support the break alone.

## Treatment

- A variety of management options are reported, from observation to surgical intervention.
- Observational outcomes vary, from spontaneous resolution to severe structural damage and late PVR-related re-detachment.
- Different surgical corrective techniques have been described but no single technique is standardised.
  - Examples include: subretinal BSS, subretinal filtered air (7), use of perfluorocarbon liquid, ERM peeling, manual unfolding with silicone tipped cannula under heavy liquid and laser photocoagulation to the edge of the fold.
- Patient 1 underwent induction of localised retinal detachment and posturing lying supine with neck hyperextension for 2 days daytime and prone right cheek to pillow at night. This was successful in resolving the fold anatomically but inferior retinal displacement persisted and there was no visual improvement. Factors which may have contributed to his poor visual outcome are the persistent retinal displacement, increased time to surgical correction (10 weeks) and presence of associated ocular comorbidity (epi-retinal membrane).
- Patient 2 underwent corrective surgery with induction of localised retinal detachments using balanced salt solution, flattening with perfluorocarbon liquid, laser, SRF drainage through the retinotomies and careful fluid-air exchange followed by gas-air exchange and immediate posturing face down daytime and left side at night for 5 days. This was successful in terms of anatomical and visual improvement. Factors which may have contributed to the successful outcomes include shorter interval to corrective surgery (3 weeks vs 10 weeks) and the absence of additional ocular comorbidities.

## Conclusion:

- Macular folds are an uncommon but clinically important complication following retinal detachment repair surgery.
- Identification of risk factors for macular folds, precautionary intraoperative manipulation and appropriate post-operative posturing can prevent their development in most cases. Emphasis should be placed on primary prevention.
- Surgical treatment to unfold the retina can achieve anatomical resolution but visual outcomes vary. Different surgical techniques have been described but further research is required to help to determine optimal techniques.

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