

Amniotic Membrane Graft for Posterior Scleral Perforation – a Novel Surgical Technique to Repair the Globe and Preserve Vision

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BACKGROUND

THE CLINICAL PROBLEM

- Posterior scleral perforation:** rare but devastating open-globe injury classically caused by high-velocity foreign bodies (FBs)
- Poor visual prognosis:**
 - Posterior perforating wounds carry a poor visual prognosis with ≥40% of patients left with a final visual acuity of NPL/PL^[1]
 - Outcomes vary depending on mechanism, location and other patient/injury related factors^[1,2]:
 - Retinal detachment in 70-90% of cases, proliferative vitreoretinopathy in 66% of cases
 - Phthisis, enucleation or need for keratoprosthesis in 56%
- Anatomically inaccessible:** wounds posterior to the equator are obscured by extraocular muscles (EOMs) and orbital fat making direct external repair infeasible

PRIMARY SURGICAL REPAIR WITHIN 24 HOURS^[3]

- Wound exploration:** involving conjunctival peritomy + identification of posterior extensions of wounds
- Ab-externo repair:** for anterior wounds, working from anterior to posterior
- Occult or posterior wounds:** challenging with limited repair options

FURTHER REPAIR METHODS^[1-4]

- If left to heal by secondary intention:**
 - Loss of globe integrity:** leading to hypotony and phthisis bulbi
 - Tissue incarceration:** high risk for proliferative vitreoretinopathy and retinal detachment
 - Sympathetic ophthalmia:** higher risk if globe is not closed
- Autologous Tenon plugs:** limited to smaller defects, fragile, prone to dislodgement, no antifibrotic effect
- Donor sclera/tenons +/- fibrin glue:** tissue availability restricted; donor sclera is rigid, leading to poor conformation to globe curvature

ADVANTAGES OF AMNIOTIC MEMBRANE GRAFT (AMG)

Anti-inflammatory and anti-fibrotic

suppresses TGF-β signaling; reduces PVR risk

Promotes healing

rich in EGF, KGF, HGF, bFGF growth factors

Non-immunogenic

low HLA-A, B, DR – minimal rejection risk

Antimicrobial

expresses β-defensins and elafin

CASES

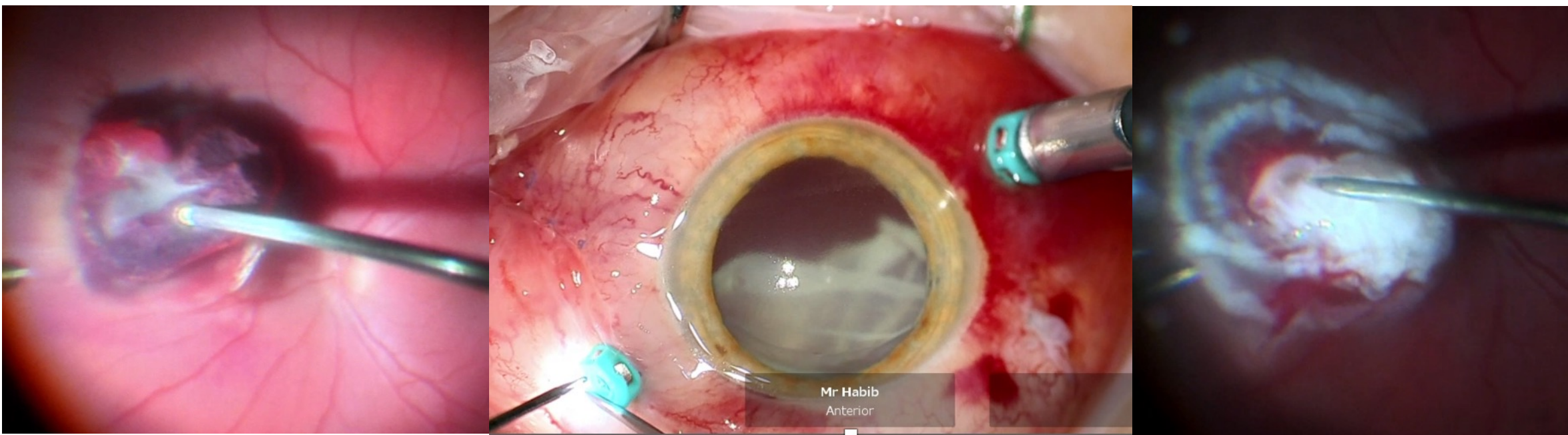
	CASE 1 (27-year-old male)	CASE 2 (40-year-old male)
Mechanism	Hammering chisel on metal	Hammering high-tensile steel with chisel
Initial VA	Perception of light	Counting fingers
Initial IOP	3 mmHg	4mmHg
Ocular Trauma Score (OTS) at presentation	23	33
OTS predicted VA at 6 months	74% chance of PL, 15% chance of LP/HM, 1% chance of better than 6/12 vision ^[5]	
CT findings	Anterior + posterior scleral perforation with intraorbital FB	Anterior + posterior scleral perforation with intraorbital FB
Surgery	Same day anterior repair Day 4: PPV and AMG	Same-day anterior repair Day 6: PPV and AMG
Follow-up duration	7 months	9 months
Final VA	Counting Fingers <i>Limited by dense cataract</i>	Hand movements <i>Limited by macular chorioretinal scar and cataract</i>
Intraorbital FB	Left in-situ	Left in-situ
Final IOP	18 mmHg	11 mmHg
Ongoing management	Phacoemulsification + IOL planned	Phacoemulsification + IOL planned (guarded prognosis)

METHODS

We report the results of **ab-interno amniotic membrane graft** for posterior scleral perforation in two cases of severe penetrating trauma. Both cases were operated by Mr M Habib, consultant vitreoretinal surgeon.

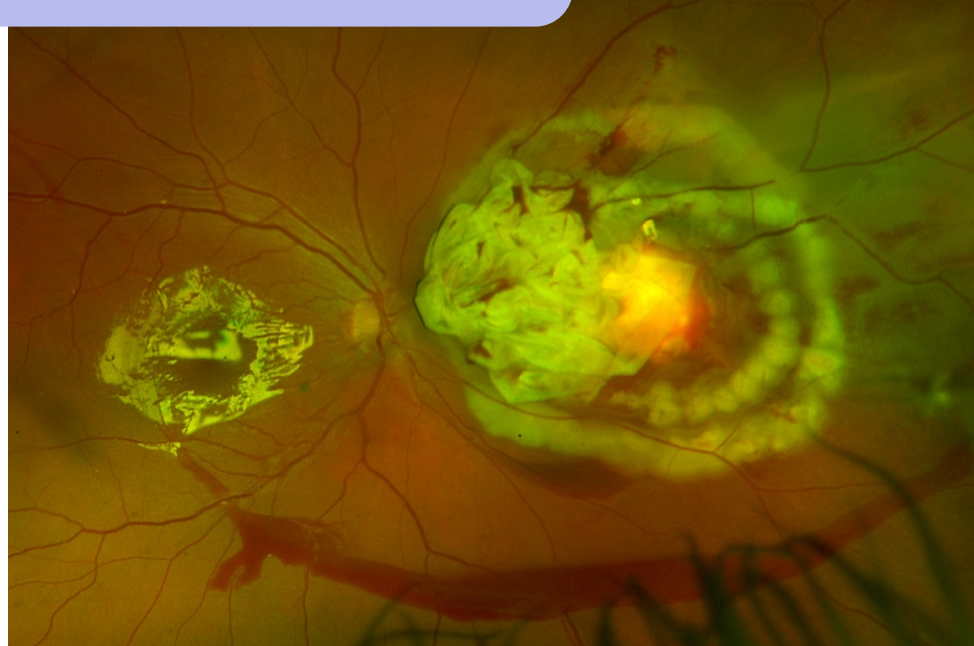
SURGICAL TECHNIQUE

- Anterior scleral perforation closed primarily
- 25g pars plana vitrectomy with careful vitrectomy around perforation site
- Endolaser around perforation site
- AMG introduced via trochar:** bimanual under direct observation
- Amniotic membrane graft to plug posterior wound**
- Silicone oil tamponade for prolonged scleral support



CASE 1

1 WEEK POST-OP



1 YEAR POST-OP

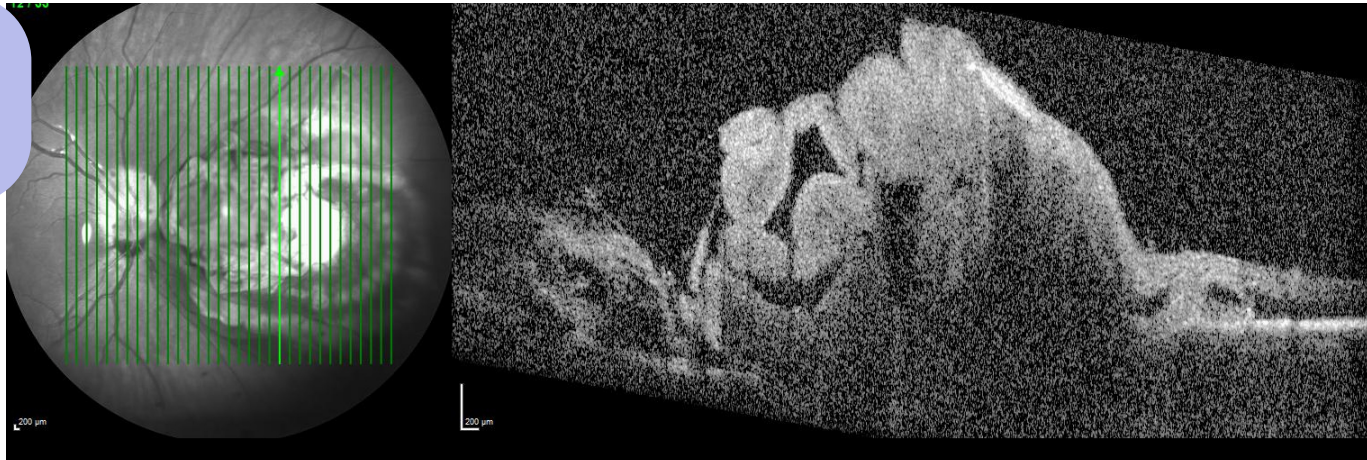


Healing of perforation and scar formation

POST-OPERATIVE OCT OVER AM GRAFT

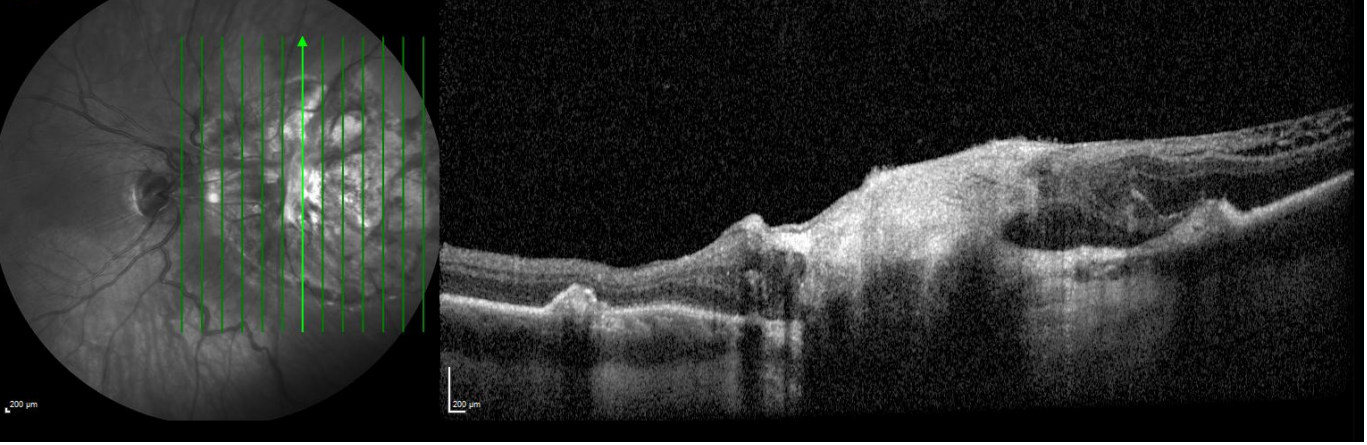
1 week

AMG in situ, perforation repaired



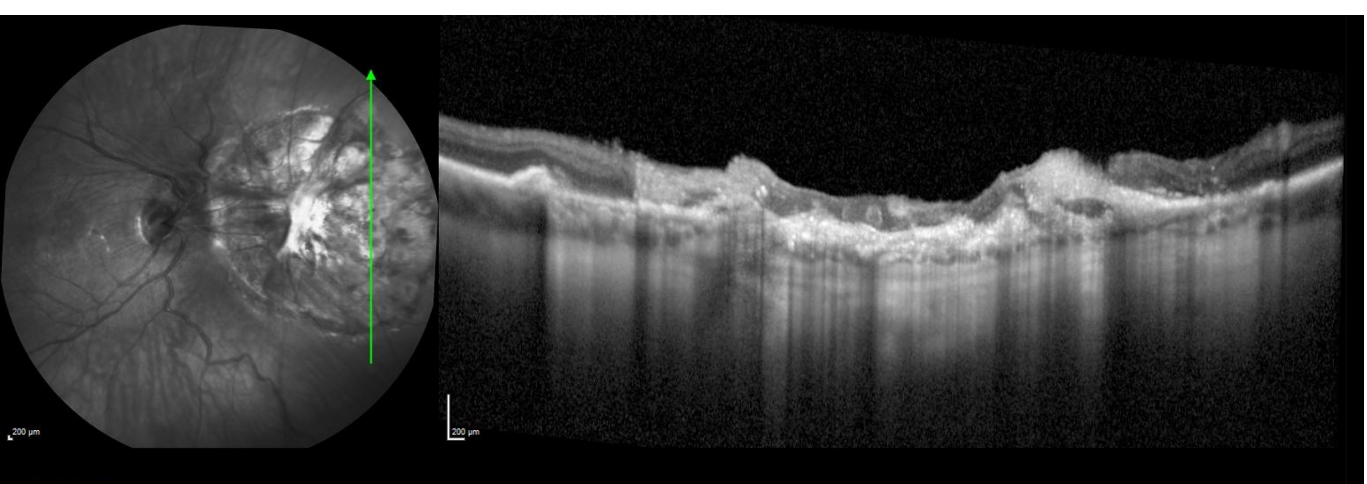
7 months

Healing and scar formation



11 months

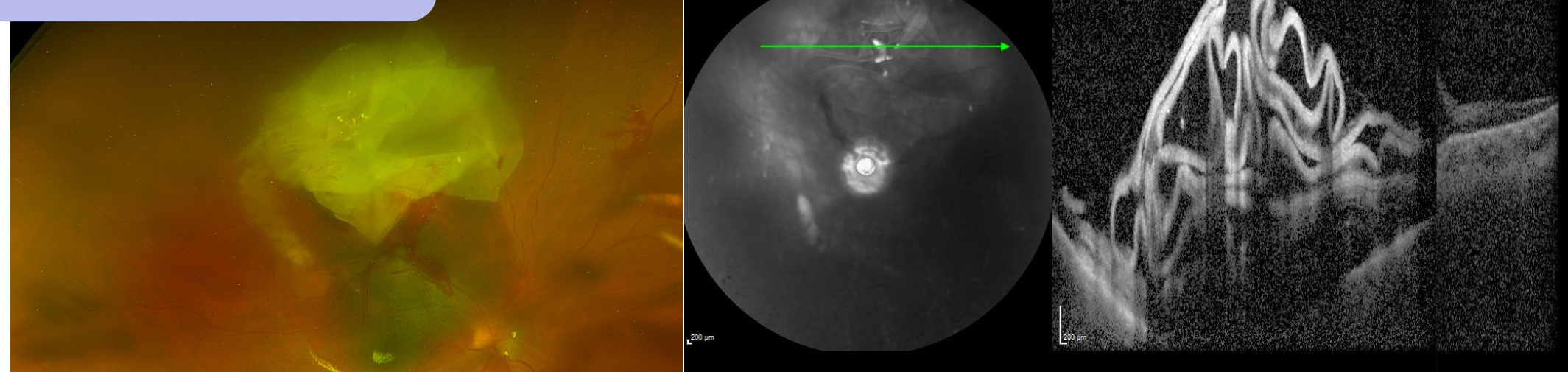
Scar formed, globe intact, reduced inflammation



CASE 2

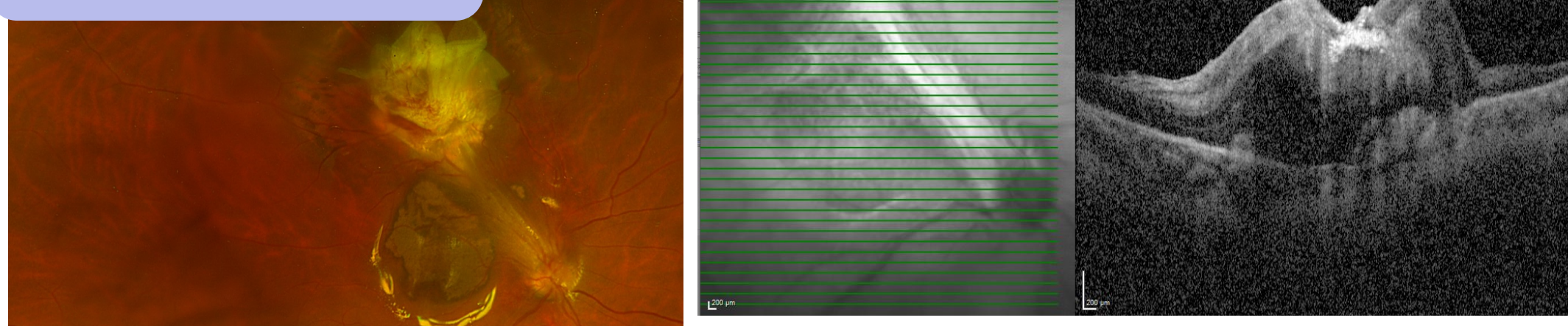
Scleral perforation healed but development of submacular haemorrhage and subsequent scar

1 WEEK POST-OP



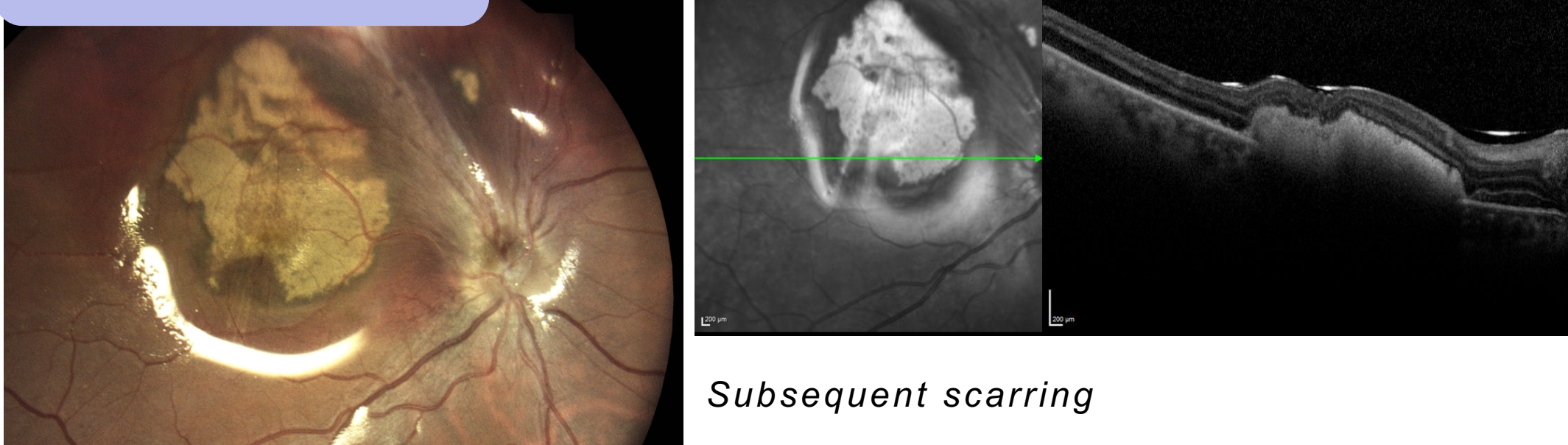
AMG in-situ, perforation repaired

2 MONTHS POST-OP



Acute submacular haemorrhage

4 MONTHS POST-OP



Subsequent scarring

DISCUSSION

EVIDENCE BASE – ophthalmic use of AMG established

- Zhang Q et al.^[6]**: AMG used to close a posterior scleral perforation and choroidal hole (case report)
- Suwandi J et al.^[7]**: “internal plug” technique using two large sheets of amniotic membrane can effectively repair extensive posterior scleral perforations without donor tissue
- Ma D et al.^[8]**: Amniotic membrane grafting is a viable surgical option for managing severe scleral melting and corneoscleral ulcers, achieving complete re-epithelialisation.
- Hanada K et al.^[9]**: Multi-layered transplantation acts as a biological scaffold to fill stromal defects, effectively restoring deep corneal and scleral ulcers.

OUR CASES

- Globe integrity preserved at >7 months
- IOP normalised in both cases: AMG provides a watertight seal sufficient to maintain globe pressure during scleral remodeling
- VA outcomes confounded: submacular haemorrhage and dense cataract were sequelae of original trauma, not graft failure
- No phthisis, no inflammation stable globe at 7–9 months supports AM's antifibrotic and immunomodulatory profile

CONCLUSION

Amniotic membrane grafts can be safely deployed to plug posterior scleral perforations and effectively promote healing

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