



In this RWC column we will discuss:

- The Vitreo-Retinal Society of India (VRSI);
- Intraoperative Fluorescein Angiography;
- Plasma Rich in Growth Factor as Adjuvant to Vitrectomy in High Myopic Retinal Detachment Associated With Full-Thickness Macular Hole: A Reliable and Efficient Surgical Option; and
- RWC Retina Rocks Image Gallery case of the month.

Kourous Rezaei, MD, President
Ashish Sharma, MD, Committee Co-Chair
Lihteh Wu, MD, Committee Co-Chair

RWC GLOBAL SOCIETY PARTNER

THE VITREO-RETINAL SOCIETY OF INDIA

The Vitreo-Retinal Society of India (VRSI) is one of the largest retina societies in the world, with more than 1,500 trained retina specialists among its members across India. VRSI has an elected executive committee including Dr. N. S. Muralidhar as President, Dr. R. Kim as Vice President, Dr. Mahesh P. Shanmugam as Scientific Convenor, Dr. Manisha Agarwal as General Secretary, and Dr. Prashant Bawankule as Treasurer, along with other executive members.



VRSI focuses on two areas. First, the society contributes to public health and takes initiatives to avoid preventable blindness due to retinal pathologies

such as retinopathy of prematurity and diabetic retinopathy. The society is active in spreading awareness of these diseases through social media and skill transfer workshops.

The second focus of the society is keeping its members updated with the latest in the field of retina through continuing medical education programs. A quarterly newsletter focused on a particular topic of retina is circulated by the society to all its members. Retina updates are shared every month, giving the latest in retina. The VRSI Study Group has been formed to conduct collaborative research studies in the field of retina, with a recent publication in the journal *Eye*.

The VRSI annual scientific meeting will be held in Trivendrum, Kerala, India, December 1-3, 2023, where the national members will interact with world-renowned retina specialists, share their experience, and plan collaborative research in the field of retina. Prestigious oration lecture and awards form an important part of the annual conference, where national and international retina specialists are recognized for their excellent work and contributions in the field of retina.

Find out more about VRSI at www.vrsi.in.

RETINA WORLD CONGRESS VIDEO GALLERY CASE OF THE MONTH



Intraoperative Fluorescein Angiography

Submitted by: Alan J. Franklin, MD, PhD, Vitreoretinal Diseases and Surgery, Diagnostic and Medical Clinic, Mobile, Alabama, USA

The video presented in this column highlights 27-gauge surgery and intraoperative fluorescein angiography (FA) for complex diabetic vitrectomy surgery. The beveled 20,000 cuts-per-minute 27-gauge vitrectomy probe can delaminate preretinal tissue precisely, efficiently, and safely in the tight spaces that present in vitrectomy for advanced proliferative diabetic retinopathy. Once the preretinal membranes are removed, FA is performed intraoperatively. Here, FA identifies hot spots, some of which are not associated with bleeding. Laser is often directly applied to these hot spots to reduce the risk

of postoperative hemorrhage. During the macular peel, a residual vascular abnormality is observed that tethers preretinal tissue to the macula. Based on this configuration, tissue is first delaminated around this area. The vascular abnormality is delaminated last, thereby minimizing retinal traction. Finally, panretinal laser photocoagulation is applied more confluent to areas of relative nonperfusion in the retinal midperiphery. We believe that this combination of high-speed vitrectomy instrumentation and intraoperative FA may optimize our approach in the management of complex diabetic eye diseases.

doi: 10.3928/23258160-20230412-01



HOT TOPIC IN THE WORLD OF RETINA

Plasma Rich in Growth Factor as Adjuvant to Vitrectomy in High Myopic Retinal Detachment Associated With Full-Thickness Macular Hole: A Reliable and Efficient Surgical Option

Submitted by: Marta S. Figueroa, MD, PhD, Clinica Baviera, Ramón y Cajal University Hospital, University of Alcalá de Henares, Madrid, Spain; Andrea Govetto, MD, PhD, S.O.C. Oculistica, Ospedale del Circolo e Fondazione Macchi, Varese, Italy, and Clinica Baviera, Milan, Italy

Retinal detachment (RD) may be a dreadful complication of full-thickness macular hole (FTMH) in high myopic eyes.¹ Although the pathophysiology of this condition has yet to be fully elucidated, various factors are believed to play a role in its formation, including tangential traction due to abnormally rigid internal limiting membrane (ILM) and retinal vessels, anteroposterior traction due to steep staphyloma, and insufficient retinal adhesion due to defective retinal pigment epithelium (RPE) pump.¹

This condition may be approached with different surgical techniques, *ab interno* or *ab externo* including macular buckling, standard ILM peeling, ILM peeling with inverted flap technique, free ILM flap insertion, and the use of different extraocular tissues/compounds such as amniotic membrane plugs and anterior capsule plug with the goal to fill and close the macular hole (MH), facilitating the reattachment of the retina.²⁻⁶ Autologous retinal transplant has also been proposed as a useful resource in selected cases.⁷

Posterior staphylomas, extreme axial lengths, thin retina, insufficient ILM visualization due to poor contrast, and suboptimal dyeing are all factors that may negatively affect ILM peeling maneuvers in high myopic eyes. However, although difficult to perform, inverted flap and free flap techniques have significantly boosted idiopathic MH closure rate when compared to standard ILM peeling, according to multiple reports. In fact, primary closure rate increased from 33% to 56% after ILM peel only, to 80% to 100% with inverted flap.⁸⁻¹⁰

The inverted flap technique implies the preservation of sufficient ILM at the hole borders to create a scaffold in which glial migration and proliferation may occur, creating a combined mechanical plus biological effect.¹¹ However, although effective, inverted flap is a technique implying increased surgical manipulation compared to standard ILM peel.

In the case of detached retina, surgical maneuvers are even more challenging as the retina is much more mobile, and in such cases the use of perfluorocarbon liquid to stabilize the retina may be necessary.

A tempting alternative in the treatment of high myopic RD associated with FTMH is autologous plasma rich in growth factors (PRGF).¹² The use of this compound in medicine is steadily growing and its usefulness has been shown in different subspecialties including traumatology, oncology, dermatology, and maxillofacial surgery, as well as ophthalmology.¹²⁻¹⁶ Although autologous plasma as adjuvant to surgery is not a novelty in MH surgical repair, previous compounds had limited application among clinicians due to profound limitations such as time-consuming preparation, unpredictable intraocular biologic activity, and inconsistent platelet concentration.¹⁷⁻¹⁸

Recent advances and modernizations in autologous plasma preparation techniques have dramatically increased the predictability and reproducibility of PRGF injection and activation, speeding up the preparation process.^{12,13} As a result, the use of PRGF in challenging cases, such as high myopic eyes, is becoming increasingly popular among surgeons.¹⁹⁻²³ With modern preparation kits, the clotting and activation process can be controlled and predicted with the use of calcium chloride.^{12,13} After activation, platelet degranulation begins, and plasmatic fibrinogen progressively evolves into an organized fibrin network after 8 to 15 min from activation. Once clotted, PRGF firmly adheres to the RPE and the surface of the retina, filling the hole, and it has been shown to remain in position even after fluid-air exchange. This is a significant advantage compared to ILM free flap, in which the ILM patch is frequently displaced from the hole during fluid-air exchange procedures.

The anatomical resolution of FTMH may happen through two distinct mechanisms, mechanical and biological, and in both cases the PRGF may play a key



role. In FTMH associated RD, the anatomical closure of the hole is critical. Although the detachment may resolve after surgery even if the macular hole remains open, this may increase the risk of RD recurrence, as in high myopic eyes the RPE pump is weak and may not be enough to maintain the retina adherent.

The mechanical mechanism involves the release of tractional forces and the creation of a barrier between the vitreous chamber and the subretinal space. The release of traction is achieved by detaching the posterior hyaloid and by removing the ILM and epiretinal proliferations/membranes that are exerting tangential forces over the hole, keeping it open. In high myopic eyes, in which such mechanical traction may be particularly strong, ILM peel is a mandatory step toward FTMH resolution, even in smaller holes. In our experience, when we use PRGF we tend to peel the ILM without the creation of an inverted flap, extending the peeling as far as possible, at least up to the arcades, to release as much traction as possible.^{12,13}

The use of an intraocular tamponade such as gas or silicone oil is also important to create an interface between the hole and the vitreous chamber, which may avoid the hydration of the hole's border. This is supported by a recent clinical study highlighting how the etiology of intraretinal cystoid spaces in FTMH is probably linked to retinal hydration from the vitreous.²⁴ The mechanical effect of clotted PRGF, which is firmly adherent to the retinal surface, may further contribute to create a sealed interface between the retina and the vitreous, facilitating the closure of the hole and the resolution of the detachment. In high myopic eyes, the use of either air, gas, or silicone oil have been explored. We described good anatomical results with long-standing gases such as 12% perfluoropropane (C₃F₈) or silicone oil 1000 centistokes.^{12,13}

PRGF, together with other techniques such as the inverted ILM flap, autologous ILM graft, and amniotic membrane transplant, also relies on a different biological mechanism: to act as a scaffold for glial proliferation in the middle retina, promoting Muller cell activation and migration.^{12,13} This glial reaction may help to restore the normal foveal microanatomy. In this regard, PRGF may be especially helpful, as it can stimulate glial cell activation and migration through the release of mediators such as PDGF, basic fibroblast growth factor (b-FGF), and epidermal growth factor (EGF), among others, without carrying the risk of challenging and more invasive surgical procedures.^{12,13}

The biological mechanism is of seminal importance in the closure of FTMH in high myopic eyes, as

the removal of the sole mechanical forces may not be enough to seal the hole due to the peculiar anatomy of the posterior staphyloma. In many cases, the borders of the hole are flat over the RPE, with no intraretinal cystoid spaces, meaning that the hole is already dehydrated. This fact is a risk factor for surgical failure. In such cases, the borders of the hole may not come together even after ILM peel and gas tamponade, and only cellular proliferation and migration may help to restore the normal foveal anatomy. PRGF injection is by far the easiest technique, able to stimulate cellular proliferation without the risk of complicated surgical maneuvers.

Differently from FTMH over flat retina, in the case of associated RD, a critical step is the drainage of subretinal fluid during fluid-air exchange, as PRGF injection needs to be performed over flat retina. In such cases, both direct aspiration through the hole or the creation of a drainage retinotomy may be performed. To aspirate directly through the hole may allow to aspirate all subretinal fluid, as it is located in the most declivous position, favoring the flow of fluid from the periphery. Further, it avoids the creation of iatrogenic breaks, which have been shown to increase the risk of RD recurrence. On the other hand, the aspiration tip needs to be placed close to the FTMH, with the consequent risk of touching its borders and enlarging it, or touching the RPE, causing bleeding or damage to the RPE cells.

To avoid such complications, we use a soft-tip cannula specifically designed for high myopic eyes, with active aspiration. The soft tip is slowly placed over the center of the hole, just at the interface between the residual subretinal fluid and the air bubble. The aspiration is performed very slowly, with low vacuums, up to the complete removal of the subretinal fluid.

In conclusion, PRGF as adjuvant to vitrectomy is an emerging technique gaining popularity among vitreoretinal surgeon, and it can be extremely helpful in challenging cases such as FTMH associated RD in high myopic eyes. It offers a synergic mechanical-biological mechanism that helps in achieving FTMH closure and RD resolution. Modern PRGF preparation techniques can provide safe compounds with high concentration of growth factors. The behavior and coagulation of PRGF inside the eye can be controlled by the surgeon, increasing the predictability and reproducibility of this technique. Differently from other techniques, it is easier and less invasive, while providing similar outcomes.



Further studies are needed to explore the full capabilities of modern PRGF preparations in the treatment of high myopic RD associated with FTMH, although the current evidence is promising.

REFERENCES

1. Ikuno Y. Overview of the complications of high myopia. *Retina*. 2017;37(12):2347-2351. <https://doi.org/10.1097/IAE.0000000000001489> PMID:28590964
2. Michalewska Z, Michalewski J, Dulczewska-Cichecka K, Nawrocki J. Inverted internal limiting membrane flap technique for surgical repair of myopic macular holes. *Retina*. 2014;34(4):664-669. <https://doi.org/10.1097/IAE.000000000000042> PMID:24263468
3. Dai Y, Dong F, Zhang X, Yang Z. Internal limiting membrane transplantation for unclosed and large macular holes. *Graefes Arch Clin Exp Ophthalmol*. 2016;254(11):2095-2099. <https://doi.org/10.1007/s00417-016-3461-4> PMID:27520464
4. Alkabes M, Mateo C. Macular buckle technique in myopic traction maculopathy: a 16-year review of the literature and a comparison with vitreous surgery. *Graefes Arch Clin Exp Ophthalmol*. 2018;256(5):863-877. <https://doi.org/10.1007/s00417-018-3947-3> PMID:29589106
5. Caporossi T, De Angelis L, Pacini B, et al. A human amniotic membrane plug to manage high myopic macular hole associated with retinal detachment. *Acta Ophthalmol*. 2020;98(2):e252-e256. <https://doi.org/10.1111/aos.14174> PMID:31318489
6. Caporossi T, Pacini B, De Angelis L, et al. Human amniotic membrane to close recurrent, high myopic macular holes in pathologic myopia with axial length of >30 mm. *Retina*. 2020;40(10):1946-1954 <https://doi.org/10.1097/IAE.0000000000002699> PMID:31868775
7. Grewal DS, Mahmoud TH. Autologous neurosensory retinal free flap for closure of refractory myopic macular holes. *JAMA Ophthalmol*. 2016;134(2):229-230. <https://doi.org/10.1001/jamaophthalmol.2015.5237> PMID:26720054
8. Lois N, Burr J, Norrie J, et al; Full-thickness Macular Hole and Internal Limiting Membrane Peeling Study (FILMS) Group. Internal limiting membrane peeling versus no peeling for idiopathic full-thickness macular hole: a pragmatic randomized controlled trial. *Invest Ophthalmol Vis Sci*. 2011;52(3):1586-1592. <https://doi.org/10.1167/iovs.10-6287> PMID:21051731
9. Parravano M, Giansanti F, Eandi CM, Yap YC, Rizzo S, Virgili G. Vitrectomy for idiopathic macular hole. *Cochrane Database Syst Rev*. 2015;2015(5):CD009080. <https://doi.org/10.1002/14651858.CD009080.pub2> PMID:25965055
10. Spiteri Cornish K, Lois N, Scott NW, et al. Vitrectomy with internal limiting membrane peeling versus no peeling for idiopathic full-thickness macular hole. *Ophthalmology*. 2014;121(3):649-655. <https://doi.org/10.1016/j.ophtha.2013.10.020> PMID:24314837
11. Shiode Y, Morizane Y, Matoba R, et al. The role of inverted internal limiting membrane flap in macular hole closure. *Invest Ophthalmol Vis Sci*. 2017;58(11):4847-4855. <https://doi.org/10.1167/iovs.17-21756> PMID:28973331
12. Figueroa MS, Mora Cantalops A, Virgili G, Govetto A. Long-term results of autologous plasma as adjuvant to pars plana vitrectomy in the treatment of high myopic full-thickness macular holes. *Eur J Ophthalmol*. 2021;31(5):2612-2620. <https://doi.org/10.1177/1120672120960340>

PMID:32985261

13. Figueroa MS, Govetto A, Arriba-Palomero P. Short-term results of platelet-rich plasma as adjuvant to 23-G vitrectomy in the treatment of high myopic macular holes. *Eur J Ophthalmol*. 2016;26(5):491-496. <https://doi.org/10.5301/ejo.5000729> PMID:26742873
14. Kirchner F, Pinar A, Milani I, Prado R, Padilla S, Anitua E. Vertebral intraosseous plasma rich in growth factor (PRGF-Endoret) infiltrations as a novel strategy for the treatment of degenerative lesions of endplate in lumbar pathology: description of technique and case presentation. *J Orthop Surg Res*. 2020;15(1):72. <https://doi.org/10.1186/s13018-020-01605-w> PMID:32093768
15. Anitua E, Pino A. The management of postsurgical wound complications with plasma rich in growth factors: a preliminary series. *Adv Skin Wound Care*. 2020;33(4):202-208. <https://doi.org/10.1097/01.ASW.0000604168.62330.c7> PMID:31789622
16. Fan Y, Perez K, Dym H. Clinical uses of platelet-rich fibrin in oral and maxillofacial surgery. *Dent Clin North Am*. 2020;64(2):291-303. <https://doi.org/10.1016/j.cden.2019.12.012> PMID:32111269
17. Blumenkranz MS, Ohana E, Shaikh S, et al. Adjuvant methods in macular hole surgery: intraoperative plasma-thrombin mixture and postoperative fluid-gas exchange. *Ophthalmic Surg Lasers*. 2001;32(3):198-207. <https://doi.org/10.3928/1542-8877-20010501-05> PMID:11371086
18. Paques M, Chastang C, Mathis A, et al; Platelets in Macular Hole Surgery Group. Effect of autologous platelet concentrate in surgery for idiopathic macular hole: results of a multicenter, double-masked, randomized trial. *Ophthalmology*. 1999;106(5):932-938. [https://doi.org/10.1016/S0161-6420\(99\)00512-6](https://doi.org/10.1016/S0161-6420(99)00512-6) PMID:10328392
19. Purtskhvanidze K, Frühsorger B, Bartsch S, Hedderich J, Roeder J, Treumer F. Persistent full-thickness idiopathic macular hole: anatomical and functional outcome of vitrectomy with autologous platelet concentrate or autologous whole blood. *Ophthalmologica*. 2018;239(1):19-26. <https://doi.org/10.1159/000481268> PMID:29050013
20. Hagenau F, Nobl M, Vogt D, et al. Highly concentrated autologous platelet-rich plasma restores foveal anatomy in lamellar macular hole surgery. *Klin Monbl Augenheilkd*. 2021;238(8):885-892. In English. <https://doi.org/10.1055/a-1409-9268>.
21. Anitua E, de la Fuente M, Del Olmo-Aguado S, Suarez-Barrio C, Merayo-Llodes J, Muruzabal F. Plasma rich in growth factors reduces blue light-induced oxidative damage on retinal pigment epithelial cells and restores their homeostasis by modulating vascular endothelial growth factor and pigment epithelium-derived factor expression. *Clin Exp Ophthalmol*. 2020;48(6):830-838. <https://doi.org/10.1111/ceo.13767> PMID:32342597
22. Arias JD, Hoyos AT, Alcántara B, Sanchez-Avila RM, Arango FJ, Galvis V. Plasma rich in growth factors for persistent macular hole: a pilot study. *Retin Cases Brief Rep*. 2022;16(2):155-160. <https://doi.org/10.1097/ICB.0000000000000957> PMID:31895724
23. Todorich B, Sharma S, Vajzovic L. Successful repair of recurrent optic disk pit maculopathy with autologous platelet rich plasma: report of a surgical technique. *Retin Cases Brief Rep*. 2017;11(1):15-17. <https://doi.org/10.1097/ICB.0000000000000276> PMID:26829447
24. Govetto A, Sarraf D, Hubschman JP, et al. Distinctive mechanisms and patterns of exudative versus tractional intraretinal cystoid spaces as seen with multimodal imaging. *Am J Ophthalmol*. 2020;212:43-56. <https://doi.org/10.1016/j.ajo.2019.12.010> PMID:31862446



RETINA ROCKS IMAGE GALLERY CASE OF THE MONTH

Giant Tear of the Retinal Pigment Epithelium

Submitted by: Anjana Mirajkar, MD; Manish Nagpal, MD; Navneet Mehrotra, MD; Akansha Sharma, MD; Retina Foundation, Ahmedabad, Gujarat, India

A 62-year-old man presented with 1 month of vision loss in his left eye. Vision was 20/30 in the right eye and 20/60 in the left eye.

Multicolor imaging of his left eye shows a giant retinal pigment epithelial (RPE) tear extending from the inferior macula into the superotemporal mid-periphery, along with a much smaller tear just inferior to the macula (**Figure 1A**). The beds of the RPE tears are depigmented. Increased subretinal pigmentation is noted on either edge of the giant tear. Subretinal fluid variably elevates the macula with inner retinal folds radiating from the optic nerve temporally. This subretinal fluid extends into the superior and temporal mid-peripheries (**Figure 2**).

B-scan optical coherence tomography (OCT) shows marked subretinal fluid (**Figure 1B**). Bare Bruch's membrane is noted temporally, and the RPE tear is lifted nasally and floating within the serous detachment.

Fluorescein angiography (**Figure 3**) shows marked hyperfluorescent window defects from the

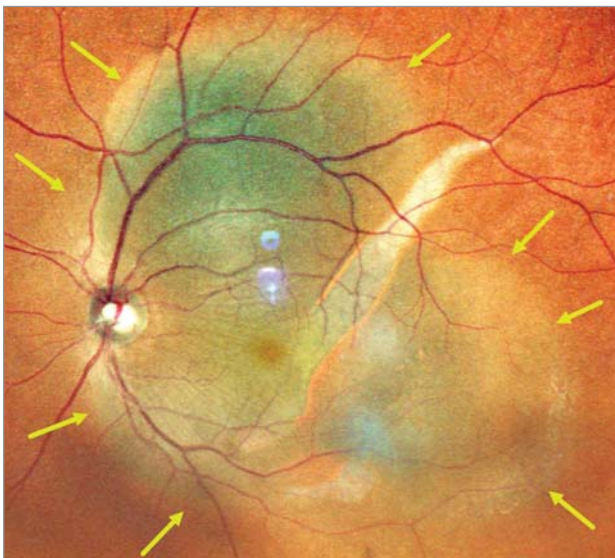


Figure 2. Subretinal fluid extends into the superior and temporal mid-peripheries (yellow arrows).

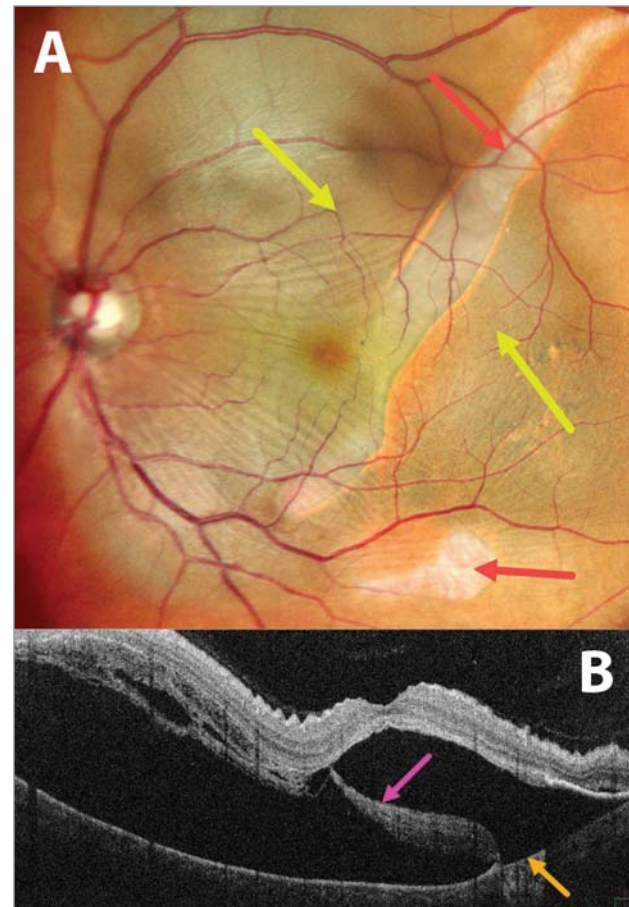


Figure 1. (A) Multicolor imaging shows a giant retinal pigment epithelial (RPE) tear extending from the inferior macula into the superotemporal midperiphery along with a much smaller tear just inferior to the macula. The beds of the RPE tears are depigmented (red arrows). Increased subretinal pigmentation is noted on either edge of the giant tear (yellow arrows). Subretinal fluid variably elevates the macula with inner retinal folds radiating from the optic nerve temporally. (B) B-scan optical coherence tomography shows marked subretinal fluid. Bare Bruch's membrane is noted temporally (orange arrow), and the RPE tear is lifted nasally and floating within the serous detachment (pink arrow).

absent RPE with blockage on either side of the giant tear from the redundant retracted RPE.

An asymptomatic retinal pigment epithelial detachment is noted in his right macula (**Figure 4**). The choroid does not appear thickened on OCT B-scan. He was placed on a 5-day tapering course of oral steroids, but was subsequently lost to follow-up.

A tear of the RPE is common in RPE detachments associated with neovascular age-related macular degeneration, but can also occur in numerous other etiologies including central serous chorioretinopathy and polypoidal choroidal vasculopathy. The

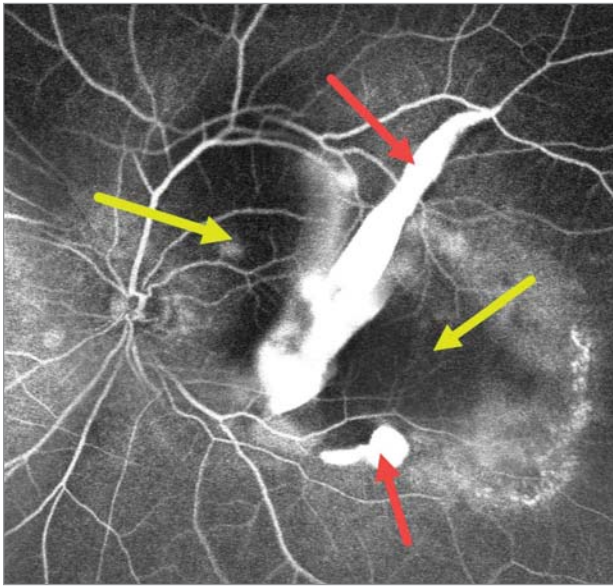


Figure 3. Fluorescein angiography shows marked hyperfluorescent window defects from the absent retinal pigment epithelial (RPE) (red arrows) with blockage on either side of the giant tear from the redundant retracted RPE (yellow arrows).

tear leaves a depigmented region where the RPE was and is now absent, along with a pigmented relatively straight subretinal lesion from the scrolled RPE edge.

Our patient's presentation is unique in that RPE tears are usually much smaller and tend to rip in just one direction. The edges of our patient's RPE retracted both nasally and temporally. RPE tears are usually singular, and ours had an additional, much smaller secondary tear more inferiorly. Although our patient's findings seem to be in the pachycho-roid spectrum, the lack of a thickened choroid on OCT scanning makes the etiology less certain.

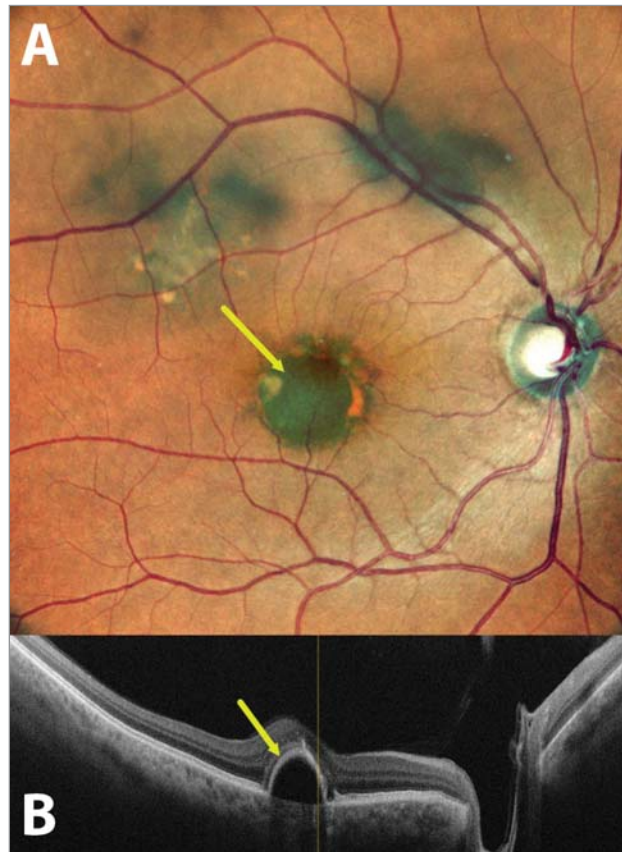


Figure 4. An asymptomatic retinal pigment epithelial detachment is noted in the right macula. (A) Multicolor imaging. (B) Optical coherence tomography.

This case is from the Retina World Congress Retina Rocks (<https://retinaworldcongress.org/retina-rocks/>), the world's largest online, open-source retina image gallery and reference library.