

SURGICAL MANAGEMENT OF RETINAL DETACHMENT IN UVEAL MELANOMA



Addressing this complication requires careful planning and follow-up.

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Retinal detachment (RD) in the setting of uveal melanoma (UM) can occur as a direct consequence of the tumor itself, as a complication of its treatment, or as an unrelated event. RDs associated with UM can occur in a variety of forms, including exudative (ERD), tractional (TRD), or rhegmatogenous (RRD).¹

The timing of the onset of RD significantly influences the diagnosis, urgency, and surgical approach (Table). It is essential to maintain a careful balance between tumor control, mitigation of spread, and preservation of visual function when selecting the surgical procedure. A multidisciplinary approach involving ocular oncologists and vitreoretinal surgeons is critical to achieve optimal patient outcomes. This article provides a broad overview of the various types of RDs in patients with UM, with a focus on surgical management.

DETACHMENT TYPES IN UM

ERD

ERD is the most common presentation in UM with the volume of fluid generally correlating with tumor size; thus, a large ERD is rare in small, untreated melanomas.^{2,3} Medium or large tumors, especially metastatic lesions, can cause rapid progression of exudation and can be misdiagnosed as RRD without recognizing the underlying choroidal lesion. In these cases, a high index of suspicion for ERD is warranted, and ultrasound plays an important role (Figure 1).

After treatment, ERD can occur due to toxic tumor syndrome, which is characterized by intratumoral necrosis, ischemia, and vascular incompetence. This syndrome manifests with macular edema, hard exudates, ERD, iris neovascularization, and neovascular glaucoma.⁴

TRD and Combined TRD/RRD

TRD and combined TRD with RRD are typically late complications of radiation therapy for UM and fall under the broader complication of radiation retinopathy. Radiation retinopathy usually occurs 6 months to 3 years after treatment and is characterized by endothelial cell loss and

TABLE. TYPES OF UVEAL MELANOMA-ASSOCIATED RETINAL DETACHMENTS

Type of RD	Timing of Onset	Clinical Features
Exudative retinal detachment (ERD)	Present at diagnosis or after treatment	- Subretinal fluid resolves gradually after treatment - Massive ERD after treatment may suggest complications such as toxic shock syndrome
Rhegmatogenous retinal detachment (RRD)	Before (as complication of biopsy) or after treatment	- Linked to retinal breaks - Requires differentiation from ERD (the presence of hydration folds on OCT and/or proliferative vitreoretinopathy suggests RRD)
Tractional retinal detachment (TRD) and Combined TRD/RRD	Post-radiotherapy	- Fibrotic traction secondary to ischemia and neovascularization - Poor visual outcomes - Complex cases with both TRD and RRD components

capillary occlusion, which progresses to retinal ischemia and neovascularization.⁵ In later stages, these can result in TRDs.⁶

Beykin et al reported a 1.48% incidence of TRD/RRD in 473 patients treated with ruthenium-106 brachytherapy. All patients underwent pars plana vitrectomy (PPV) with silicone oil tamponade; despite anatomic success, visual outcomes were limited.⁷ No tumor growth or dissemination was observed during the follow-up period (average of 18.4 months) after PPV.

RRD

The occurrence of RRD in patients with UM is rare (Figure 2). At Moorfields Eye Hospital, a large tertiary center in London that treats approximately 300 new cases

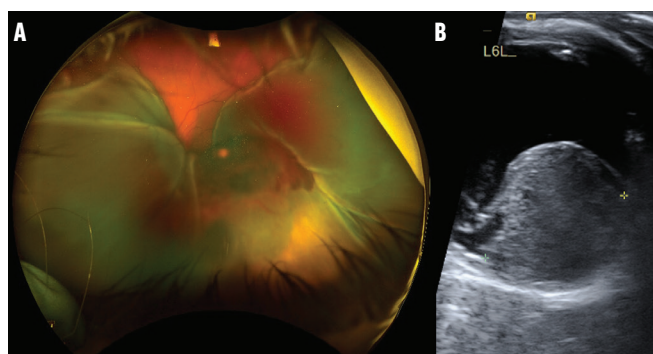


Figure 1. Color fundus photography demonstrates a subtotal ERD (A). B-scan ultrasonography reveals a choroidal melanoma underlying the ERD (B).

of UM and 1,800 new cases of RRD annually, the incidence is approximately one case per year.⁸

RRD may be identified in three contexts:

- concurrent with UM, where symptoms of RRD lead to incidental discovery of the tumor,
- as a rare complication of transvitreal retinochoroidal biopsies, particularly in the case of flat lesions, and
- post-treatment due to a normal posterior vitreous detachment or treatment complications (eg, globe perforation during plaque placement).

Anatomic success in RRD associated with UM is strongly influenced by the presence of proliferative vitreoretinopathy (PVR). Haimovici et al reported a small series without PVR and a primary success rate of 90% using scleral buckle and pneumatic retinopexy.⁸ In contrast, our series showed 37% of patients with PVR at presentation and a 59% initial success rate, mainly repaired by PPV. With multiple surgeries, we were ultimately able to achieve retinal reattachment in 84% of cases.⁹

SURGICAL TECHNIQUE: FACTORS TO CONSIDER **Treatment Status**

In cases of untreated UM, the safety of full PPV remains uncertain. Although transvitreal retinochoroidal biopsies are generally considered safe,¹⁰ there is limited evidence to support full PPV in this context. Consequently, scleral buckling or pneumatic retinopexy is often preferred to minimize the risk of seeding. When PPV is essential (eg, in cases of PVR), it is advisable to perform the surgery at the time of plaque removal, if the detachment does not interfere with plaque placement.¹

In the case of treated tumors, radiation therapy, conjunctival scarring, extraocular muscle fibrosis, and rare cases of scleral necrosis post-brachytherapy may complicate scleral buckle placement.¹¹ In such cases, PPV is the most appropriate technique, especially when managing concomitant RRD and vitreous hemorrhage, PVR-related RRD, TRD, or a combined TRD/RRD. In cases of treated UM, PPV has not been associated with an increased risk of metastasis.¹²

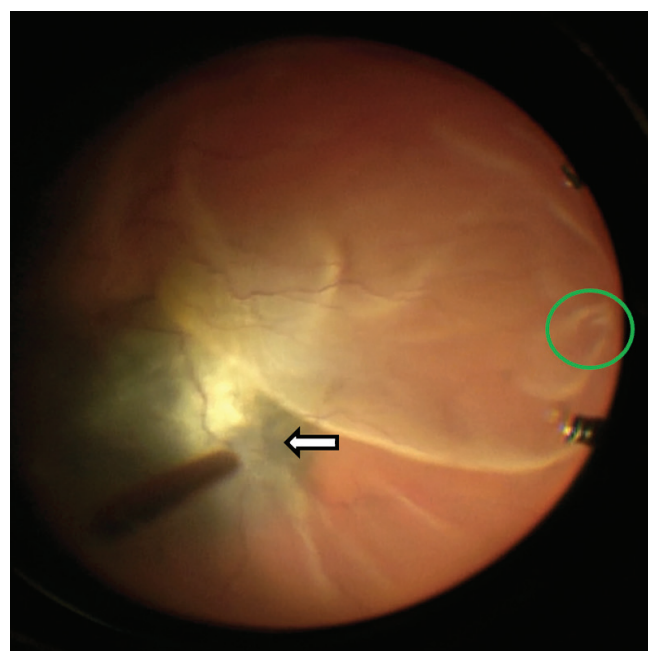


Figure 2. Intraoperative imaging during PPV for an RRD in a patient with a previously treated peripapillary choroidal melanoma shows a superotemporal horseshoe retinal tear (green circle). The white arrow indicates the treated melanoma.

Tumor Location

Small posterior pole melanomas are often suitable to all surgical techniques; medium to large tumors in the periphery may interfere with adequate tamponade, as the tumor affects how the gas or oil bubble conforms to the retina.¹

Retinal Tear Location

Tears located near the tumor are particularly difficult to treat. Scleral buckling and pneumatic retinopexy are often unsuitable, as the gas bubble may not conform adequately to the retina around the tumor; therefore, it may not tamponade the break, and the scleral buckle may fail to create effective indentation. In such cases, PPV remains the most suitable option.¹

Anesthesia

While vitreoretinal surgery is commonly performed under local anesthesia, the timing of RD repair in relation to tumor treatment affects the choice of anesthetic. Radiation-induced scarring often complicates the use of a sub-Tenon block, as anesthetic uptake may be reduced; therefore, general anesthesia is recommended to ensure pain control, patient comfort, and surgical safety.

PEARLS

Scleral Buckle

- Precise tumor localization is essential. While this can be challenging with a detached retina, intraoperative ultrasound is helpful.

- Avoid placement of the suture directly over the tumor.
- Avoid external drainage to prevent potential extraocular extension.
- Ultrasound visualization and monitoring of the tumor may be difficult during follow-up, depending on the location of the scleral buckle.

PPV

- Consider performing a local peritomy with cryotherapy at the time of trocar removal and suturing sclerotomies.
- Use valved trocars.
- Determine accurate localization of the tumor to avoid trocar insertion into the tumor, especially in cases of ciliary body melanoma.
- Keep the cutter away from the tumor; accidentally cutting into the melanoma can cause cell dispersion.

PREPARE THE PATIENT

Visual outcomes in UM-associated RD cases are typically poor due to factors such as radiation retinopathy/neuropathy, redetachment, PVR, and the need for reoperation. Counsel patients to set realistic expectations, emphasizing that while anatomic reattachment is possible, functional outcomes may be poor.⁹ Understanding the type and timing of RD, tumor characteristics, and treatment history are critical for selecting the appropriate surgical technique. ■

1. Anguita R, Chou HD, Raval VR, et al. Managing vitreoretinal complications in uveal melanoma: Surgical treatment and practical considerations [published online ahead of print August 28, 2024]. *Semin Ophthalmol*.
2. Shields CL, Demirci H, Materin MA, Marr BP, Mashayekhi A, Shields JA. Clinical factors in the identification of small choroidal melanoma. *Can J Ophthalmol*. 2004;39(4):351-357.
3. Guner MK, Ferencsik K, Olsen TW, Dalvin LA. Optical coherence tomography findings in choroidal melanoma-associated subretinal fluid. *Retina*. 2022;42(11):2159-2168.
4. Groenewald C, Konstantinidis L, Damato B. Effects of radiotherapy on uveal melanomas and adjacent tissues. *Eye (Lond)*. 2013;27(2):163-171.
5. Brown GC, Shields JA, Sanborn G, Augsburger JJ, Savino PJ, Schatz NJ. Radiation retinopathy. *Ophthalmology*. 1982;89(12):1494-1501.
6. Archer DB, Amoaku WM, Gardiner TA. Radiation retinopathy: clinical, histopathological, ultrastructural and experimental correlations. *Eye (Lond)*. 1991;5(Pt 2):239-251.
7. Beykin G, Pe'er I, Hemo Y, Frenkel S, Chowers I. Pars plana vitrectomy to repair retinal detachment following brachytherapy for uveal melanoma. *Br J Ophthalmol*. 2013;97(12):1534-1537.
8. Haimovici R, Mukai S, Schachat AP, et al. Rhegmatogenous retinal detachment in eyes with uveal melanoma. *Retina*. 1996;16(6):488-496.
9. Anguita R, Makuloluwa A, Bhalla M, Katta M, Sagoo MS, Charteris DG. Rhegmatogenous retinal detachment in choroidal melanoma: clinical features and surgical outcomes. *Eye (Lond)*. 2024;38(3):494-498.
10. Bagger M, Smidt-Nielsen I, Andersen MK, et al. Long-term metastatic risk after biopsy of posterior uveal melanoma. *Ophthalmology*. 2018;125(12):1969-1976.
11. Jabbarli L, Guberina M, Biewald E, et al. Scleral necrosis after brachytherapy for uveal melanoma: analysis of risk factors. *Clin Exp Ophthalmol*. 2021;49(4):357-367.
12. Bansal AS, Bianciotto CG, Maguire JJ, Regillo CD, Shields JA, Shields CL. Safety of pars plana vitrectomy in eyes with plaque-irradiated posterior uveal melanoma. *Arch Ophthalmol*. 2012;130(10):1285-1290.

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