Displacement of Submacular Hemorrhage With Subretinal Injection of Recombinant Tissue Plasminogen Activator and Gas Tamponade in the Setting of Myopic Degeneration

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When presented with a patient with submacular hemorrhage (SMH), the first questions should be: Do I intervene with surgery? What is the evidence showing that pneumatic displacement (PD) improves the visual outcome above and beyond what anti-vascular endothelial growth factor (VEGF) alone can do? Large-scale studies on this topic are difficult to conduct due to the rarity of this occurrence.

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Consideration of SMH size and location is essential to determining possible surgical intervention. SMH that are smaller than the one depicted in this video presented by Shields et al. are not likely to benefit from PD, as the prognosis is usually favorable with anti-VEGF therapy alone. A hemorrhage with a size between what is shown by the authors and extending out to the major arcade vessels is probably ideal for PD intervention. When the SMH extends past the major arcade vessels, PD may do more harm than good as a substantial amount of blood can be shifted peripherally and compromise remaining vision.

There are office-based approaches for PD using intravitreal injections of gas with or without tissue plasminogen activator (tPA); however, in my personal experience, I find the degree of displacement to be inconsistent. Nowadays, it is common practice to utilize a 23- or 25-gauge vitrectomy approach to create small, self-sealing sclerotomies. The 40-gauge cannula is ideal to inject tPA into the subretinal space. There has been a recent trend to deliver larger subretinal volumes, as many have found this to promote more effective displacement of the hemorrhage inferiorly. Good success can be achieved with air or short-acting gas, such as sulfur hexafluoride, and having the patient perform face-down positioning for only 1 day. Longer duration of positioning or longer-acting gases such as perfluoropropane are not necessary.

Finally, it is important to emphasize that concurrent treatment of the underlying choroidal neovascularization with anti-VEGF therapy is crucial. Before anti-VEGF agents, we would perform PD procedures with immediate success only to have a rebleed rate of 30% to 40% within 3 to 6 months postoperatively. Using monthly anti-VEGF intravitreal injections, some retinal surgeons have anecdotally found that large SMH can resolve completely after 4 months of therapy, bringing into question the need for surgical intervention entirely. This topic remains controversial, and further studies are needed.

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ABSTRACT: Myopic submacular hemorrhage (SMH) usually arises from either a break in Bruch's membrane (lacquer cracks) that damages the underlying choriocapillaris or the development of a choroidal neovascular membrane (CNVM) at the sites of prior lacquer cracks.[1,2] In pathologic myopia (PM), axial elongation leads to thinning of the choroid and retinal pigment epithelium, predisposing to rupture of Bruch's membrane.[3] If large hemorrhages involving the fovea are left untreated, subretinal hemorrhage and CNVM can cause devastating long-term vision loss due to irreversible retinal atrophy.[4] In this video,

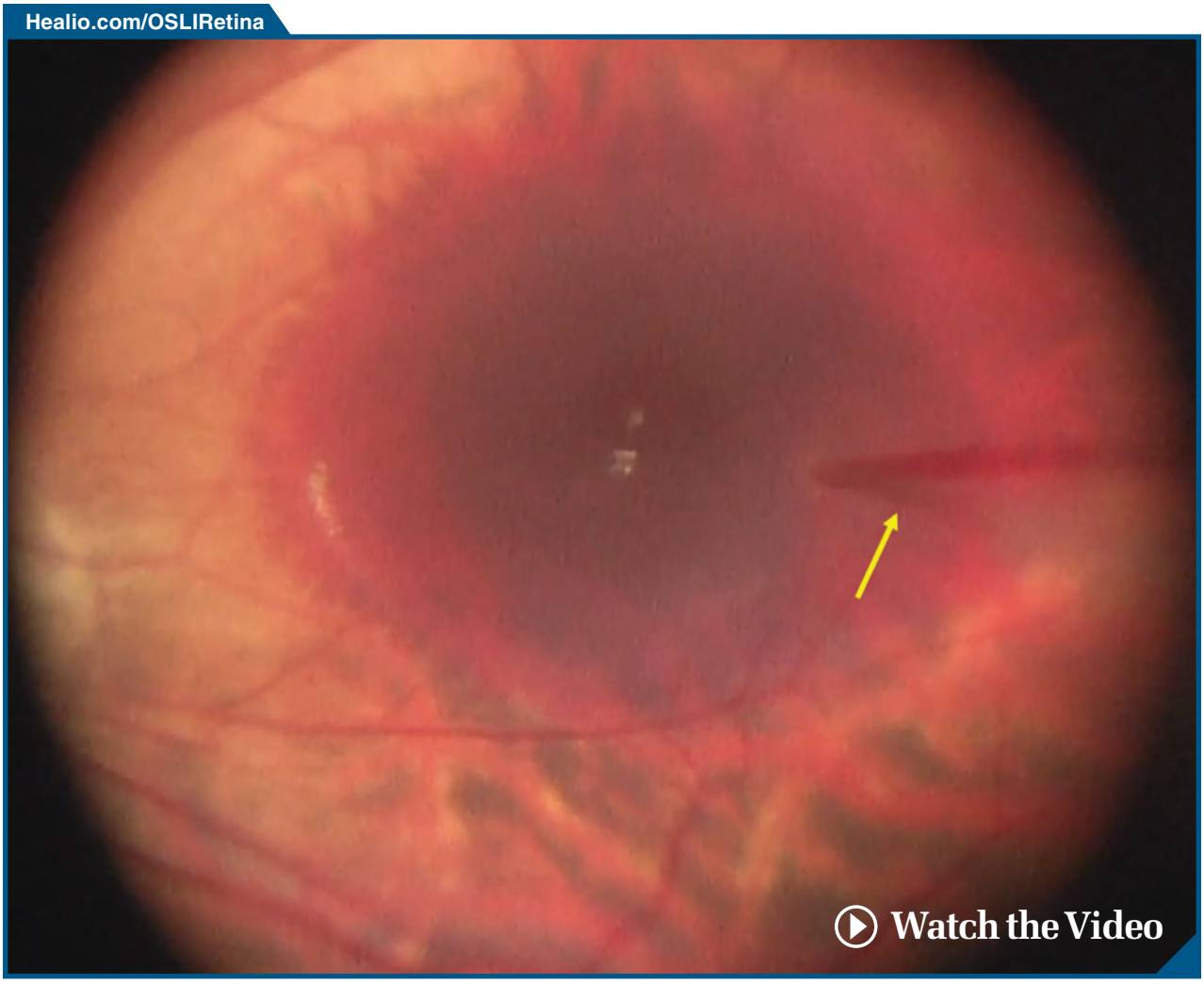

Figure 1. Intraoperative image of delivery of tissue plasminogen activator into the submacular space using a small-bore cannula (yellow arrow).

the authors describe their technique of using a subretinal injection of recombinant tissue plasminogen activator with a concurrent gas tamponade to displace SMH.

Pathologic myopia (PM) is defined as high myopia (refractive error of ≥ –6.00 diopters or an axial length of ≥ 26.5 mm) along with any posterior specific pathology from axial elongation.[1] Choroidal neovascular membrane (CNVM) within the macula occur in approximately 10% of patients suffering from PM and is a leading cause of irreversible vision loss in addition to diffuse macular atrophy.[4] Fortuitously, intravitreal injections of anti-vascular endothelial growth factor (anti-VEGF) pharmacologic agents have been utilized with great success in the treatment of myopic CNVM.[5] In this article, we describe our experience using subretinal delivery of tissue plasminogen activator (tPA) with gas displacement for recurrent submacular hemorrhage (SMH).

CASE PRESENTATION

A 17-year-old male was initially referred for sudden onset of a central scotoma in the left eye. His past ocular history was unremarkable other than severe myopia in both eyes (manifest refraction: –23.25 + 2.75 × 113 in the right eye and –23.50 +3.75 × 068 in the left eye). Best-corrected visual acuity (BCVA) was 20/40 and 20/150 in the right and left eyes, respectively. The anterior segment exam was unremarkable, whereas fundus examination of the left eye was notable for subretinal pigmentary changes in the temporal fovea. Optical coherence tomography (OCT) demonstrated a staphylomatous contour

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and an outer retinal hyperreflective lesion with subtle subretinal fluid consistent with a CNVM. The patient received monthly intravitreal bevacizumab (Avastin; Genentech, South San Francisco, CA) for 3 months with only mild improvement in visual acuity due to loss of outer retinal integrity. One year later, he presented with sudden onset of vision loss in the right eye with a BCVA of 20/30 and 20/100 in the right and left eyes, respectively. Dilated fundus examination demonstrated a nasal and inferior subretinal hemorrhage in the parafoveal region. OCT revealed a mixed hyper- and hyporeflective subretinal lesion in the nasal/inferior parafovea consistent with hemorrhage and a CNVM. He was treated with monthly intravitreal aflibercept (Eylea; Regeneron, Tarrytown, NY) for 3 months in the right eye. Unfortunately, the patient returned less than 4 weeks after his third intravitreal aflibercept injection with hand motion vision in the right eye and a recurrent SMH under his fovea (Figure 1). Given the significant decrease in right eye vision (previously his better-seeing eye) despite monthly aflibercept, the patient elected to undergo vitrectomy with tPA and gas tamponade displacement.

SURGICAL TECHNIQUE

A standard core vitrectomy was performed followed by an induction of a posterior vitreous detachment. Once the hyaloid was elevated from the retinal surface, a 41-gauge cannula (MedOne Surgical, Sarasota, FL) was used to carefully inject 0.1 mL of tPA (12.5 µg / 0.1 mL) into the subretinal space producing a subtle fluid bleb. Following a complete air-fluid exchange, 18% sulfur hexafluoride was infused into the posterior segment to displace the subfoveal hemorrhage.

Postoperatively the patient continued to undergo monthly injections of aflibercept with complete resolution of the subretinal hemorrhage and improvement in BCVA to 20/125 in the right eye. With extension of intravitreal aflibercept to an 8-week interval, the patient developed recurrent (nonfoveal) hemorrhage from the CNVM, which resolved with a 6-week injection schedule.

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