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Vitreous Hemorrhage After Intravitreal Tissue Plasminogen Activator (t-PA) and Pneumatic Displacement of Submacular Hemorrhage

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PURPOSE: To report the immediate complication of dense vitreous hemorrhage after intravitreal injection of tissue plasminogen activator and gas for treatment of two cases of sudden submacular hemorrhage associated with retinal arterial macroaneurysm.

METHODS: Case reports.

RESULTS: Two patients, a 67-year-old woman and a 92-year-old man, presented with sudden vision loss related to submacular hemorrhage from a retinal macroaneurysm. Tissue plasminogen activator at a dose of 50 μg to 75 μg and a sulfur hexafluoride (SF_6) gas bubble were injected intravitreally under local anesthesia. Dense vitreous hemorrhage was noted on the first postoperative day in both cases, which subsequently required pars plana vitrectomy removal.

CONCLUSION: Sudden severe vitreous hemorrhage may be an immediate complication after intravitreal injection of tissue plasminogen activator and gas for treatment of submacular hemorrhage associated with retinal arterial macroaneurysm.

SUBMACULAR HEMORRHAGE CAUSES SUDDEN VISION loss and can be associated with a variety of causes, the most common being age-related macular degeneration, retinal arterial macroaneurysm, and trauma. When the submacular hemorrhage is thick, the visual prognosis is poor.[1] Because of this, tissue plasminogen activator, a fibrin-specific protease, has been used as an adjunct in subretinal injections during vitrectomy to lyse the subretinal clot and facilitate surgical drainage.[2,3] Intravitreal injections of tissue plasminogen activator have also been given 1 day before vitrectomy and surgical removal of subretinal blood through a retinotomy.[4] To move the blood out of the central macula without the need for a pars plana vitrectomy and retinotomy, Heriot (American Academy of Ophthalmology Annual Vitreoretinal Update presentations, 1996–1997, unpublished data) reported the use of an intravitreal injection of tissue plasminogen activator and gas with postoperative face down positioning to lyse the blood clot and then displace the blood peripherally from the submacular space. Intravitreal injection of tissue plasminogen activator and gas was performed in two cases of sudden submacular hemorrhage associated with retinal arterial macroaneurysm. Dense vitreous hemorrhage was noted after intravitreal injection of tissue plasminogen activator and intraocular gas.

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• **CASE 1:** A 92-year-old man developed sudden vision loss in his left pseudophakic eye for 1 day before presentation. His visual acuity was RE: 20/20, LE: 20/400. A thick subfoveal hemorrhage and subinternal limiting membrane hemorrhage in the central macula were noted. Two days after symptom onset, an intravitreal 50-μg injection of tissue plasminogen activator and 0.55 ml of sulfur hexafluoride (SF_6) gas were given under retrobulbar anesthesia. On the first postoperative day, a dense vitreous hemorrhage with decreased vision to hand motion was noted. Intermittent face down positioning was continued for 5 days. Echography showed dense vitreous hemorrhage and inferotemporal displacement of the submacular hemorrhage. Six weeks postoperatively, pars plana vitrectomy was performed. Findings showed a microscopic hyphema, dense brown vitreous blood, thin residual submacular hemorrhage, an inferotemporal retinal macroaneurysm, and displaced subretinal blood in the inferior midperiphery. Three months later, visual acuity had improved to 20/80, with resolution of submacular hemorrhage.

• **CASE 2:** A 67-year-old woman developed sudden loss of vision in the left eye for 3 days before presentation. Her visual acuity was RE: 20/20, LE: 2/200. A thick subfoveal hemorrhage and subinternal limiting membrane hemorrhage in the central macula were noted. Four days after symptom onset, an intravitreal injection of 75 μg of tissue plasminogen activator and 0.5 ml of sulfur hexafluoride (SF_6) gas were given. On the first postoperative day, a dense vitreous hemorrhage with decrease in vision to hand motion was noted. Echography showed severe vitreous opacities, decreased submacular hemorrhage, and inferotemporal displaced subretinal hemorrhage. Intermittent face down positioning was continued for 5 days. Two months postoperatively, a pars plana vitrectomy was performed. Findings revealed dense brown vitreous hemorrhage, focal superonasal submacular hemorrhage, a superior macular macroaneurysm, and displaced inferotemporal subretinal hemorrhage. One month following vitrectomy,

increased edema and exudate were noted around the macroaneurysm. Focal laser treatment to the macroaneurysm was placed. Three months following vitrectomy, visual acuity was 20/200, without residual submacular hemorrhage or active leakage.

Sudden and severe vitreous hemorrhage may be an immediate complication of intravitreal injection of tissue plasminogen activator and gas for treatment of submacular hemorrhage associated with retinal macroaneurysm. Although the ability of intravitreal tissue plasminogen activator to penetrate through the internal limiting membrane and into the subretinal space is controversial, these cases suggest that tissue plasminogen activator can penetrate the internal limiting membrane to the level of the arterial macroaneurysm. Recent experimental work in the rabbit, which does not have a foveal region and thinner internal limiting membrane in the fovea as the human, shows that molecules as large as tissue plasminogen activator (70 kD) injected into the vitreous cavity do not penetrate the internal limiting membrane or into the subretinal space.[5] Although severe vitreous hemorrhage was not noted before tissue plasminogen activator injection in these cases with retinal macroaneurysm, subinternal limiting membrane hemorrhage was noted in both cases. Subinternal limiting membrane hemorrhage could allow increased intraretinal penetration of intravitreal tissue plasminogen activator through focal breaks and displacement of the internal limiting membrane and predispose these eyes to the potential complication of increased bleeding from the retinal macroaneurysm. Alternatively, vitreous bleeding could have occurred from the pars plana injection sites, but this immediate complication was not noted in other series of intravitreal injections of tissue plasminogen activator and gas (Heriot WJ, American Academy of Ophthalmology Annual Vitreoretinal Update presentations, 1996–1997, unpublished data).[4] This complication was also not noted during subretinal injections of up to 50 μg of tissue plasminogen activator during vitreous surgery for submacular hemorrhage associated with retinal arterial macroaneurysms.[3]

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Improvement in Macular Function After Retinal Translocation Surgery in a Patient With Age-Related Macular Degeneration

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PURPOSE: To assess focal electroretinographic findings before and after retinal translocation surgery in a patient with age-related macular degeneration.
METHOD: Case report. A 79-year-old man with a well-defined subfoveal choroidal neovascular membrane from age-related macular degeneration underwent preoperative and postoperative focal electroretinography.
RESULTS: After retinal translocation surgery, best-corrected Snellen visual acuity improved from 9/200 to 20/60. A significant increase in mean foveal amplitude, from 0.08 μV to 0.16 μV ($P = 0.008$) was recorded.
CONCLUSION: Age-related macular degenerative changes in visual acuity and foveal electroretinogram amplitude may be reversible after retinal translocation surgery. (Am J Ophthalmol 2000;129:547–549. © 2000 by Elsevier Science Inc. All rights reserved.)

AGE-RELATED MACULAR DEGENERATION IS THE LEADing cause of legal blindness in older people in the Western world. A recent development in the treatment of age-related macular degeneration is retinal translocation, whereby the fovea is surgically moved a short distance away from an underlying choroidal neovascular lesion.[1] Only a few cases have been reported, and long-term outcomes are unknown. A key issue in evaluating this new procedure is the measurement of macular function before and after surgery. We present a case of age-related macular degeneration with successful translocation surgery, in which focal electroretinography was used as an objective measurement of improvement in macular function.

A 79-year-old man presented with a central scotoma and decreased central vision in the left eye, 1 month after cataract surgery. Best-corrected Snellen visual acuity was LE: 9/200. A few drusen were seen in the macula on fundus

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