culitis and intraretinal hemorrhages bilaterally. An old atrophic scar was noted in the left macula, with the right macula appearing normal. There were no vitreal snow balls, snow banking, punched-out choriotinal scars, nor any other complications.

Investigations included a full blood examination and film, calcium levels, syphilis serology, angiotensin-converting enzyme assay, chest radiography, and HLA-A29 typing. All results were normal except for the HLA-A29 typing, which was positive. Electrophysiology revealed delayed scotopic blue and photopic red b wave amplitudes. Fluorescein angiography revealed areas of vasculitis and typical late staining of the birdshot lesions.

Six months prior to the onset of symptoms, the patient, who works in an eye research institution, volunteered to have his fundi photographed for staff training purposes. Review of these photographs revealed his preexisting left macular scar and the presence of the typical depigmented birdshot choroidopathy lesions, retinal hemorrhages, and patchy retinal vasculitis (Figure 2).

Comment. Typically, the multiple depigmented lesions of birdshot choriorretinopathy are seen at the same time as the patient's initial examination for onset of symptoms.1,4,5 This case appears to be a typical manifestation of birdshot choriorretinopathy. It was purely coincidental that fundus photographs were taken 6 months prior to the onset of symptoms. It is quite possible that the fundal lesions of birdshot choriorretinopathy precede the onset of symptoms by some months but remain undetected in an asymptomatic subject who has no reason to be seen by an ophthalmologist.

The pathogenesis of birdshot chorioretinopathy remains unknown but there are several theories.1,5,6 Some place the disease focus in the choroid, which is supported by indocyanine green angiography findings.2 However, fluorescein angiography and electrodiagnostic findings implicate inner retinal dysfunction secondary to retinal vasculitis.1,3,7 Our patient is interesting in that he shows that both the retinal vasculitis and choroidal lesions can be present very early in the disease process.

Lyndell Lim, MBBS, FRANZCO
Alex Harper, MBBS, FRANZCO
Robyn Guymer, MBBS, PhD, FRANZCO

Correspondence: Dr Guymer, Macular Research Unit, Centre for Eye Research Australia, 32 Gisborne St, East Melbourne, Victoria 3002, Australia (rhg@unimelb.edu.au).

Financial Disclosure: None reported.


Figure 2. Fundal photographs taken 6 months prior to initial examination showing an old macular scar (asterisk) in the left eye (A) and choroidal birdshot lesions (black arrows) in both eyes (A and B). A superior area of vasculitis (white filled arrow) and venous sheathing (white outline arrow) in the right eye can be seen (B).

Tadalafil-Induced Subretinal and Choroidal Hemorrhage in a Patient With an Unsuspected Uveal (Choroidal and Ciliary Body) Melanoma

Tadalafil (Cialis; Lilly ICOS LLC, Bothell, Wash) is a Food and Drug Administration–approved phosphodiesterase type 5 (PDE5) enzyme inhibitor approved for the treatment of erectile dysfunction. Although preclinical testing of tadalafil and sildenafil citrate (Viagra; Pfizer Inc, New York, NY) included an extended eye examination, electoretinography, and postmortem histologic analysis and no adverse effects were seen, a variety of studies have subsequently highlighted ophthalmic problems with both agents. Transient changes in vision, transient and mild impairment in color discrimination, eye pain, eyelid swelling, electoretinographic abnormalities,1-3 abnormal histopathologic findings,7 pupil-sparing third nerve palsy,4 and central serous choroidopathy have been reported.8

We recently observed a male patient who suddenly developed a painful red eye and loss of vision after taking tadalafil and was found to have ruptured blood vessels in and on the surface of an ocular melanoma. The acute bleeding may be related to the vasodilatory effects of the drug on the ocular circulation in a patient taking aspirin.

Report of a Case. A 63-year-old man with erectile dysfunction was awakened by severe pain in his left eye a few hours after taking a single tadalafil tablet (20 mg). He went back to sleep, but in the morning he awakened with limited sight in his left eye. His initial examination that morning by an ophthalmologist demonstrated a markedly red eye, and he was treated with topical ketorolac tromethamine eyedrops (Acular; Allergan, Irvine, Calif) for what was initially diagnosed as noninfec-

tory included prostate cancer, for which he was surgically treated 3 years earlier.

One week after initial treatment the redness had subsided, but his vision had not improved, and he sought additional evaluation. His right eye was normal, but his left eye had vision of counting fingers; a shallow anterior chamber was identified, and early nuclear sclerosis was seen. A malignant melanoma of the choroid was identified. The melanoma extended anterior to the equator to the optic nerve and had clumps of orange pigment in it. The tumor was shaped like a fried egg, and the elevated central part had a collection of dark blood beneath the retina. Hemorrhages were also noted in the tumor itself.

B-scan ultrasound demonstrated a typical malignant melanoma of the choroid, with an elevated central portion corresponding to subretinal blood (Figure 1). The Bruch membrane was thick and vascularized, and subretinal pigment epithelial hemorrhage was identified in addition to hemorrhages in the tumor (Figure 2). There was marked vascular congestion in the tumor.

**Comment.** Three selective PDE inhibitors (sildenafil, vardenafil hydrochloride, and tadalafil) have been approved by the Food and Drug Administration for the treatment of erectile dysfunction. They are all selective for PDE5 inhibition, but vardenafil has the highest potency and the greatest selectivity. Sildenafil and vardenafil have a shorter duration of action (approximately 4 hours), whereas tadalafil may last up to 36 hours. These agents do not directly cause penile erections, but they do affect the response to sexual stimulation. They enhance the effect of nitric oxide in the corpus cavernosum by inhibiting PDE5, which is responsible for degradation of cyclic guanosine monophosphate in the corpus cavernosum, causing smooth muscle relaxation and inflow of blood into the corpus cavernosum. These agents are considered safe, and millions of doses have been prescribed. The most common adverse effects are related to vasodilation, including headache (11%-15%), dyspepsia (4%-10%), flushing (2%-3%), and nasal congestion (1%-3%). Although highly selective, tadalafil may also inhibit PDE11, PDE3, and PDE6; PDE6 is found only in the retina and functions in visual transduction.

Tadalafil has been shown to cause systemic vasodilatation with a slight reduction in systolic and diastolic blood pressure. Studies of ocular perfusion have suggested that these agents cause vasodilation. Histopathologic studies of long-term use of sildenafil in rats demonstrated dilation and congestion of choroidal capillaries. There was a suggestion of similar findings in humans using a single dose (200 mg) of sildenafil. Using lower doses (50 mg) of sildenafil in healthy adults demonstrated a change in pulsatile ocular blood flow. In a double-masked, randomized crossover trial using 100 mg of sildenafil on 2 separate days, results were less clear. Many other studies have demonstrated a measurable vasodilatory effect of sildenafil on retinal arterioles and venules.

We believe that the painful red eye, subretinal and intratumoral hemorrhage, and intratumoral vascular congestion seen in this patient may have been related to the vasodilatory effect of tadalafil in a patient who was also taking aspirin. The vasodilation may have caused the red eye and transient swelling of the choroid, contributing to the rupture of a neovascular membrane that
was present beneath the retinal pigment epithelium–Bruch membrane complex. The presence of aspirin may also have contributed to the acute bleeding from this membrane.

David H. Abramson, MD
Indira S. Rollins, RN
Amy Lin, MD
Peter Odell, MD
Robert Folberg, MD

Correspondence: Dr Abramson, 70 E 66th St, New York, NY 10021 (abramsod@mskcc.org).

Financial Disclosure: None reported.

mology meetings and journals. When Dr Coleman published the first edition of *Ultrasonography of the Eye and Orbit* in 1977, it became the major reference for the field. Almost 30 years later, this second edition highlights the advances and current status of this field as seen through the eyes of one of its pioneers. The authors have extensive experience in the design and use of ophthalmic ultrasound instrumentation. They clearly explain the fundamental physics of ultrasound in layperson’s as well as in more precise mathematical terms. They highlight the advantages and limitations of different scanning modalities, such as sector, linear, and arc scans, and discuss the factors that determine the quality of B-scan images. Dr Coleman, despite his passion for his own methods, also provides an objective analysis of his and Dr Ossoinig’s methods.

The chapters on ocular and orbital diagnosis detail the conditions in which ultrasound has diagnostic utility. The figures are of high quality, and the accompanying legends and text are clear and concise. While *Ultrasonography of the Eye and Orbit, 2nd Edition*, written by Sandra Frazier Byrne, RDMS, and Ronald L. Green, MD, contains examples of more disease conditions, Dr Coleman’s text includes more images taken with new or novel imaging systems. Recently, the availability of higher frequencies and digital signal processing has improved ultrasound resolution substantially. The authors have played a significant role in these advances, and the sheer beauty of some of these images is in itself reason enough to own this book.

Advances in computer processing have opened new avenues for ultrasound diagnostic techniques. This book describes 3-dimensional ultrasound imaging and discusses its utility for monitoring choroidal melanoma following eye-sparing therapies. The authors describe their decades of work using computer-assisted analysis of raw radio-frequency data to assess the malignant potential of choroidal melanoma. A uniquely detailed chapter about arc scanning with high-frequency evaluation of the anterior segment provides a good basis to understand the benefits of the Artemis 2 (Ultralink LLC, St Petersburg, Fla), a 50-MHz, 3-dimensional arc B-scan unit, for use in refractive surgery.

One significant drawback to previous books on ophthalmic ultrasound has been their inability to demonstrate the kinetic findings of an ophthalmic examination within the printed medium. This book is accompanied by a DVD that demonstrates the basic kinetic findings of conditions, such as retinal detachments and vitreous hemorrhage, using narrated video clips. The authors include videos of typical patient examinations from start to finish using their techniques and instrumentation. The video of an examination using the Artemis 2 is especially well done. I would like to see even more narrated video clips to demonstrate how the findings of a dynamic ultrasound examination can help in diagnosis. The DVD format would also be ideal for showcasing 3-dimensional ultrasound image acquisition and interpretation.

This compact book manages to squeeze twice the information into half the number of pages as the first edition. I would recommend this text for ophthalmologists and technicians who have an interest in understanding ophthalmic ultrasound, or to anyone who desires proficiency in ultrasound examination techniques.

**H. Culver Boldt, MD**

**Correspondence:** Dr Boldt, Department of Ophthalmology & Visual Sciences, University of Iowa, 200 Hawkins Dr, Iowa City, IA 52242 (culver-boldt@uiowa.edu).

**Financial Disclosure:** None reported.

---

**Correction**

**Error in Dose.** In the Case Report by Abramson et al titled “Tadalafil-Induced Subretinal and Choroidal Hemorrhage in a Patient With an Unsuspected Uveal (Choroidal and Ciliary Body) Melanoma,” published in the July issue of the ARCHIVES (2006;124:1058-1060), there was an error in dose. The dose of the single tadalafil tablet was 20 mg, not 200 mg. We regret the error. This correction was made previously to online versions of this article.