

ease. The most likely assumption seems to be that the patient died from a cocaine-induced arrhythmia. My question is whether the discussants agree, and whether the patient's schistosomiasis could have potentiated this fatal arrhythmia.

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TO THE EDITOR: The discussion of donor assessment by Kotton et al. suggests that exclusion criteria from the Centers for Disease Control and Prevention (CDC) (Table 3 of the article) are used to reduce the likelihood of transmission of the human immunodeficiency virus (HIV). In fact, the CDC's criteria do not have an exclusionary function but define a group of donors considered to have a high risk for transmission of HIV. The policy of the United Network for Organ Sharing does stipulate that transplantation centers must disclose this organ-specific information to potential recipients at the time the organ is offered, presumably during a discussion of informed consent.¹ The CDC's criteria were devised in 1994² in an effort to exclude donors with an unacceptably high risk of transmitting HIV. Fifteen years later, rising waiting-list mortality, improved prospective detection of infectious agents with nucleic acid testing, growing uncertainty regarding the effectiveness of the criteria, and the problem of promoting social bias against homosexual men have cast doubt on the importance of the criteria.³

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1. Acquired immune deficiency syndrome (AIDS), human pituitary derived growth hormone (HPDGH), and reporting of potential recipient diseases or medical conditions, including malig-

nancies, of donor origin. Richmond, VA: United Network for Organ Sharing, 2009. (Accessed July 23, 2009, at http://unos.org/PoliciesandBylaws2/policies/pdfs/policy_16.pdf)

2. Guidelines for preventing transmission of human immunodeficiency virus through transplantation of human tissue and organs. *MMWR Recomm Rep* 1994;43(RR-8):1-17.

3. Halpern SD, Shaked A, Hasz RD, Caplan AL. Informing candidates for solid-organ transplantation about donor risk factors. *N Engl J Med* 2008;358:2832-7.

THE DISCUSSANTS REPLY: Kamin et al. are correct that the CDC criteria have been used to define donors at higher risk for transmission of HIV. The criteria are generally considered to be outdated and less useful now than at the time they were developed, as the authors suggest.

Revision of these guidelines has been a work in progress for some time. Further guidance in this realm would help the clinicians involved with transplantation maximize the numbers of organs transplanted and minimize both the number of transplant-related infections and the mortality among patients on the transplantation waiting list.

Hauptman and Keller express concern about the use of this donor's heart. The cause of his ventricular fibrillation was presumed to be a cocaine overdose. Without further medical history, the surgeons involved in the case did not believe that placement of an implantable cardioverter-defibrillator for the recipient was indicated. Potentiation of this fatal arrhythmia by the donor's schistosomiasis also seems extremely unlikely. Given his epidemiologic history, myocarditis due to *Trypanosoma cruzi* could have been a risk factor for this arrhythmia, although his serologic screening for this disease was negative.

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Vision 1 Year after Gene Therapy for Leber's Congenital Amaurosis

TO THE EDITOR: Leber's congenital amaurosis, a common cause of blindness in infants and children,¹ recently became the first human genetic retinal disease to show improved vision in response to treatment. Patients with mutations in

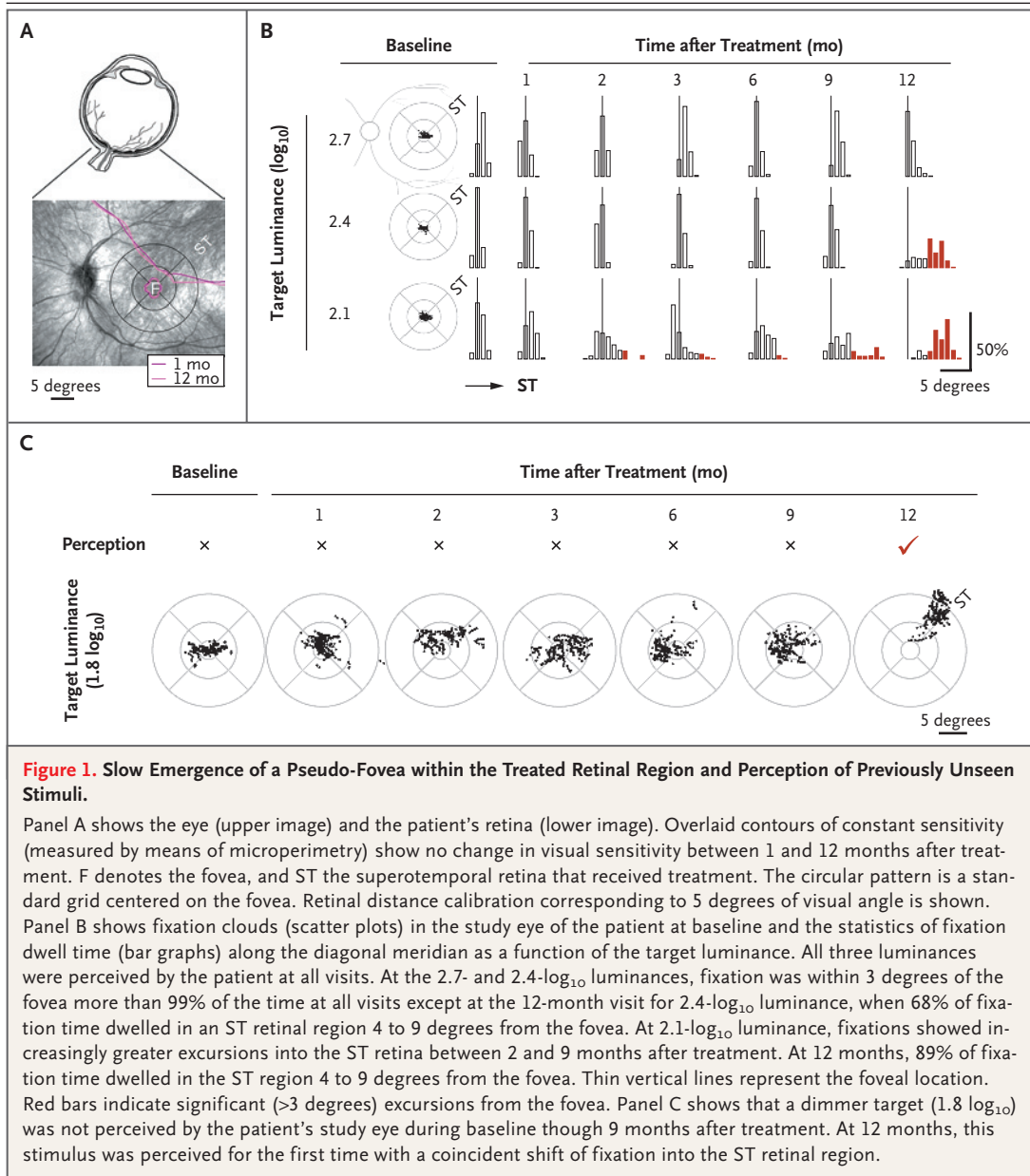
the gene encoding retinal pigment epithelium-specific 65-kD protein (*RPE65*) had gains in vision within weeks after subretinal injection of a vector containing the gene in one eye.²⁻⁵ At 1-year follow-up after gene therapy, the three young

adult patients in our trial^{4,5} remained without serious adverse events.

A noteworthy observation in one patient at 1 year after treatment prompted further studies. For the first time in her life, the patient reported that she could read the illuminated numerical clock display on the dashboard of the family vehicle while she was sitting in the front seat. The numerals subtended a visual angle equivalent to a visual acuity of 20/200, which is not different from her formally measured visual acuities at baseline or at 1 year after treatment. The sim-

plest explanation of this development would be increased visual sensitivity either at the fovea or in the treated region of the superotemporal retina. However, visual sensitivity (measured by means of microperimetry) was unchanged at this visit as compared with earlier post-treatment visits (Fig. 1A).

We sought to determine the basis of this development by quantifying fixation of the patient's gaze to dim targets over a range of luminances straddling her perception. At baseline, the patient had foveal fixation in both eyes over a range of



target luminances from 2.1 to 2.7 \log_{10} units higher than the normal foveal perceptual threshold (Fig. 1B), and the results were like those of other patients with Leber's congenital amaurosis caused by RPE65 mutations and similar visual-acuity levels.⁵

Fixation dwell time, quantified along the diagonal meridian with a range of target luminances perceived by the patient, suggested a slow emergence of visual gain over many months causing progressively greater fixational use of the treated superotemporal retina (Fig. 1B). This gain was particularly evident at lower luminances. By 12 months after treatment, the patient reported perception of the lowest luminance target (1.8 \log_{10}) for the first time. This target was not seen during any previous visit. New perception was accompanied by a distinct shift in fixation into the treated superotemporal retina (Fig. 1C, and video in the Supplementary Appendix, available with the full text of this letter at NEJM.org). Cone sensitivities in the control and study eyes of the patient were rendered as three-dimensional images on the view of the ocular fundus with a superimposed circular grid (Fig. 1 in the Supplementary Appendix). Foveal sensitivities in the two eyes were similar, but the superotemporal region of the treated eye, the "pseudo-fovea," was remarkably different from the cone blindness in the comparable region of the control eye.

The change in fixation by the patient was driven by the treatment-created extrafoveal cone vision with better sensitivity and greater expanse than the untreated foveal region (Fig. 1 in the Supplementary Appendix).^{4,5} The unexpected late emergence of visual gain in the patient to spatially coded and sustained stimuli and a coincident change in preference for fixation from the fovea to the treated retinal region suggest a slow development of a pseudo-fovea and an underlying experience-dependent plasticity of the adult visual system. These results raise the possibility that this gene-based therapy may further improve visual function in an unexpected and useful way in previously untreatable congenital blindness.

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Drs. Byrne and Hauswirth report having a financial interest in the use of adeno-associated virus (AAV) therapies and owning equity in Applied Genetics Technologies, a company that might, in the future, commercialize some aspects of this work; Dr. Kaushal, serving as a principal investigator of a clinical trial of AAV-RPE65 to treat Leber's congenital amaurosis sponsored by Applied Genetics Technologies; and Drs. Hauswirth and Jacobson, being coinventors on a patent (20070077228) held by the University of Pennsylvania, the University of Florida, and Cornell University on "a method for treating or retarding the development of blindness" (Dr. Jacobson has waived all claims to any financial benefit as a coinventor on the patent). No other potential conflict of interest relevant to this letter was reported.

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