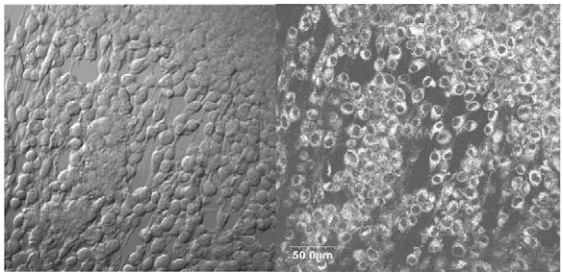

FIGURE 1. Vascular endothelial growth factor-expressing endothelial cells in culture are shown on brightfield microscopy at left. At right is a view of identical cells with confocal laser scanning microscope after labeling with anti–vascular endothelial growth factor-verteporfin immunoconjugate. Fluorescence excited with CY-5 filter set.

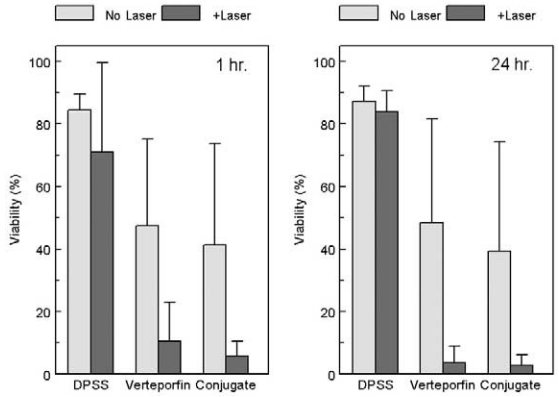

FIGURE 2. Mean percent cell viability by trypan blue exclusion over eight experimental runs in 24-well culture plates for vascular endothelial growth factor-expressing endothelial cells in Dulbecco phosphate buffered saline (DPSS), cells incubated with Visudyne at 40 µg/ml, and cells incubated with Visudyne conjugated to anti-vascular endothelial growth factor antibody. Error bars indicate 1 standard deviation. Laser-exposed groups were exposed to krypton-ion CW laser (647 nm) at a total light dosage of 56.5 J/cm.

unbound photosensitizer. The photosensitizer was excited by exposing selected wells to the krypton-ion CW laser (647 nm) at a total light dosage of 56.5 J/cm, which is the recommended ophthalmic light dosage. For each treatment condition, there were laser-exposed and nonexposed groups. After laser exposure, cells were incubated for either 1 or 24 hours, and cell viability was assessed using trypan blue exclusion.

The fluorescence excitation-emission spectrum of the conjugate was similar to that of verteporfin alone. Confocal fluorescence microscopy indicated that the conjugate bound strongly to cellular targets (Figure 1). In the absence of laser exposure, there was no significant change in cell viability at 1 hour between conjugate- and verteporfin-treated cells. In both 1 hour and 24 hour laser-exposed groups, cells treated with either conjugate or verteporfin alone exhibited large losses of viability ($P < .0001$) compared with Dulbecco PBS controls (Figure 2). Conjugate-treated cells had uniformly lower viabilities than cells exposed to verteporfin; however, the difference did not reach statistical significance. Power calculations suggest that if the observed trend were to continue, statistical significance would be reached with 72 replicates. Cells exposed to verteporfin without laser exposure also showed reduced viability, indicating possible toxicity or low-level activation of the agent by ambient light.

The photosensitizing properties of verteporfin survive conjugation. Conjugated verteporfin appears to bind to cellular targets more strongly than does the native photosensitizer. Although the behavior and pharmacokinetics of the conjugate in vivo will have to be investigated before clinical applications can be contemplated, this method appears to be a promising way to produce targeted photosensitizers.

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Visual Impairment and Unintentional Injury Mortality: The National Health Interview Survey 1986–1994

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PURPOSE: To examine the relationship between reported visual impairment and unintentional injury mortality.
DESIGN: Mortality linkage study of a population-based survey.
METHODS: Mortality linkage through 1997 of 116,796 adult participants, aged 18 years and older, from the 1986 to 1994 National Health Interview Survey was

TABLE 1. Unintentional Injury Mortality Subtypes by Visual Impairment Status: the National Health Interview Survey 1986–1994

Type of Unintentional Injury Death	Degree of Visual Impairment		
	No Visual Impairment (n = 111,715)	Some Visual Impairment (n = 4,754)	Severe Bilateral Visual Impairment (n = 327)
Transportation accidents (E800–849)	142	4	0
Poisoning and medical misadventures (E850–E879)	27	2	1
Falls (E880–E888)	46	2	2
Fire, natural/environmental factors (E890–E909)	14	2	0
Submersion, suffocation, and foreign bodies (E910–E915)	15	7	2
Other accidents, late injury effects (E916–E929)	26	1	1
Therapeutic use of drugs, medicinal and biological substances (E940–E949)	1	0	0
Total unintentional injury deaths	271	18	6

TABLE 2. Unintentional Injury Mortality Hazard Ratios (HR) and 95% Confidence Intervals (CI) for Participants With Vs Without Visual Impairment: the National Health Interview Survey 1986–1994

	Model Adjusted for					
	Sample Design		Sample Design, Age, Sex		Sample Design, Age, Sex, Eye Disease*	
	HR	95% CI	HR	95% CI	HR	95% CI
No visual impairment (n = 111,715)	1.0		1.0		1.0	
Some visual impairment (n = 4,754)	1.6	[0.9–3.0]	1.3	[0.7–2.4]	1.3	[0.7–2.3]
Severe bilateral visual impairment (n = 327)	10.2	[4.4–23.5]	7.3	[3.2–16.8]	7.4	[3.0–17.8]

*Cataract or glaucoma or retinopathy or two or more of these eye diseases.

analyzed with respect to reported visual impairment using Cox regression models.

RESULTS: The average follow-up was 7.0 years, and 295 unintentional injury deaths were identified. After controlling for survey design, age, sex, and the presence and number of eye diseases, participants with severe, bilateral visual impairment were at increased risk of death relative to participants without visual impairment (hazard ratio: 7.4; 95% confidence interval: 3.0–17.8).

CONCLUSIONS: Our data provide evidence that severe, bilateral visual impairment is associated with an increased risk of unintentional mortality among adults in the United States. (Am J Ophthalmol 2003;136: 1152–1154. © 2003 by Elsevier Inc. All rights reserved.)

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NUMEROUS INVESTIGATORS HAVE SHOWN THAT VISUAL impairment is associated with an increased risk of falls[1] and motor vehicle crashes.[2] Associations between visual impairment and mortality from unintentional injuries have not been extensively studied, however, because of the low incidence of deaths.

We examined the relationship between visual impairment and unintentional injury mortality from 116,796 adult participants, aged 18 years and older, of the National Health Interview Survey (NHIS), years 1986 to 1994. The NHIS is an annual population-based survey of the US civilian noninstitutionalized population. Survival status from mortality linkage is available through 1997.[3] Cause of death was recoded and reported using the International Classification of Diseases, ninth revision (ICD-9). Unintentional injury deaths included ICD-9 codes E800-E949. Participants were asked about "blindness in one or both eyes" and "any other trouble seeing with one or both eyes

even when wearing glasses" as well as questions about glaucoma, cataracts, and "a detached retina or any other condition of the retina." Visual impairment status was categorized as follows: (1) no visual impairment; (2) some visual impairment; and (3) severe bilateral visual impairment.[4]

All Cox regression analyses were completed using the Software for the Statistical Analysis of Correlated Data package, and included adjustments for the survey design, age, sex, and the presense of glaucoma, cataracts, and retinopathy. Mortality linkage identified 295 unintentional injury deaths; the average follow-up was 7.0 years. The percentages of unintentional deaths were 0.24%, 0.38%, and 1.84% in participants with no visual impairment, some visual impairment, and severe bilateral visual impairment, respectively. The distribution of the unintentional injury deaths by visual impairment status is provided in Table 1. Analyses indicated no significant interactions between covariates (for example, age, sex, and selected eye diseases) and visual impairment status in the prediction of unintentional injury mortality. As shown in Table 2, risk of unintentional injury mortality was slightly and nonsignificantly elevated in participants with some visual impairment relative to participants with no visual impairment. Participants with severe bilateral visual impairment were at significant increased risk of unintentional injury mortality relative to participants reporting no visual impairment (hazard ratio: 10.2; 95% confidence interval: 4.4–23.5); further adjustment for covariates lowered but did not eliminate the significance of this association (hazard ratio: 7.4; 95% confidence interval: 3.0–17.8).

The identification of a significant relationship between severe bilateral visual impairment and increased risk of unintentional injury mortality was possible because this population-based study used a very large sample (n = 116,796). However, the absolute number of unintentional injury deaths among visually impaired participants was small. In addition, there is likely a small level of mortality misclassification in the present study (that is, less than 3%);[3] furthermore, reported visual impairment does not always correspond with clinical measures of visual impairment.[4] Nevertheless, our findings support the growing evidence that visually impaired adults are at increased risk of unintentional injuries. This increased risk is rarely discussed in low vision textbooks and manuals written either for clinicians or for patients with severe visual impairment.[5] Findings from the present investigation suggest that these risks should be addressed as part of low vision services.

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Long-term Follow-up for Bullous Keratopathy After Sato-type Anterior–Posterior Corneal Refractive Surgery

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PURPOSE: To evaluate cases of bullous keratopathy resulting from anterior–posterior radial corneal keratotomy (Sato-type operation) performed from 1951 to 1959.

DESIGN: Observational case series.

METHODS: Records for a total of 220 eyes of 139 patients with follow-up examinations were examined. The age at operation vs time to occurrence of bullous keratopathy after the original operation was evaluated in four age groups. Endothelial cell density was measured in 11 long-term postoperative eyes.

RESULTS: The mean time to development of bullous keratopathy after surgery was 26.9 ± 8.8 years (mean ± SD; n = 173 eyes). The length of this period was not affected by the age of the patient at the time of the original surgery. Average endothelial cell density in 11 eyes of 11 patients 28.5 ± 3.7 years after surgery was 639 ± 135 cells/mm^2.

CONCLUSIONS: Although some corneas remained clear more than 26 years after anterior–posterior radial keratotomy, the risk of late corneal decompensation continues to exist for these patients.

ONE OF THE EARLY ADVOCATES OF REFRACTIVE SURgery was Dr. Tsutomu Sato,[1] who in 1939 devised a procedure to change the corneal curvature by making a horizontal incision in the corneal endothelium in patients with keratoconus. He used posterior keratotomy for the correction of astigmatism in 1941, and anterior–posterior corneal incisions to correct myopia in 1943. Sato reported that this procedure would safely correct up to 4 diopters of

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