NEWS

The Confusing Mix of Hype and Hope

Despite promising leads and publicity galore, restoring vision through bionic eyes remains a distant dream

On 3 December 1999, media around the world reported that music icon Stevie Wonder had said he might be able to see someday, thanks to an artificial retina being developed at Johns Hopkins University in Baltimore, Maryland. Wonder made the remark at a funeral, where, according to press accounts, the mourners jumped up and cheered. Many researchers in this small, high-risk field had a decidedly different reaction. Two weeks later, their disbelief turned to dismay when ophthalmologist Mark Humayun of Hopkins's Wilmer Eye Institute appeared with Wonder on the television newsmagazine *20/20*.

"There is the possibility that Stevie Wonder could see?" host Barbara Walters asked.

"Certainly, there is the possibility," said Humayun, cautioning that he had yet to complete his exams of Wonder's eyes. "We believe that something could be available for patients in the next 2 to 3 years."

Wonderland. A TV interview raised hopes—false, some say—that Stevie Wonder might see, thanks to an artificial retina.

Humayun and his colleague, ophthalmologist Eugene de Juan Jr., now both at the Doheny Retina Institute at the University of Southern California (USC) in Los Angeles, have yet to implant their artificial retina in a single patient. "It was basically just hype," charges rival Alan Chow, a pediatric ophthalmologist in Chicago, Illinois. Chow's company, Optobionics, is developing a similar artificial retina now being tested in six patients—the only clinical trial of a permanently implanted device under way. Chow also emphasizes that Wonder, who became blind shortly after birth, would not be a good candidate for prosthetic eyes, as he likely has substantial damage to his retinas.

But Humayun and others have accused Chow, too, of overstating *his* results. "He hasn't shown any data, and it remains a mystery why," says Humayun, who attended a Vitreous Society meeting last November where Chow claimed that his six patients had shown "substantial visual function improvements." Before discussing details, Chow says he wants a scientific journal to publish his data.

Welcome to the contentious, competitive world of research on the bionic eye. Bionics—be it restoring vision by implanting a silicon chip or replacing a damaged heart with a plastic one—lends itself to hyperbole. Researchers work at the extreme edges of biological knowledge, attempting feats that were earlier the things of myths. Many also have commercial ties and hope to profit from their research.

Restoring vision, in particular, has a unique appeal, says ophthalmologist Eberhart Zrenner, who is working on an artificial retina with colleagues at the University Eye Hospital in Tübingen, Germany (see Viewpoint on p. 1022). And success would offer a unique triumph, he notes. You could say: "I'm the one who, like Jesus, made a blind man see again."

A dozen research groups are attempting to create artificial vision by either stimulating the visual cortex in the brain, the optic nerve, or, the most popular approach, the retina. The retina is a collection of rods, cones, ganglia, and bipolar cells sandwiched together. Retinal devices are silicon chips that surgeons can place on either side of that sandwich—the "subretinal" or the "epiretinal" space. The hope is that the retinal cells will transmit the signals to the optic nerve. Chow's device, which he invented with his brother Vincent, resembles a fly's eye and has solar cells that convert light into electrical signals. The USC group and others are placing arrays of electrodes on their chips, which receive electronic signals from a miniature camera mounted on glasses that the person wears. Others use cameras to send signals through wires implanted on the optic nerve or in the visual cortex.

To date, however, results have been mixed. Most human experiments have simply tested the effects of surgically delivering temporary electrical stimulations to the retina. Even so, Humayun is enthused that he has helped prove wrong several once-common beliefs, such as that there is no safe way to place an electronic device on a retina without damaging it.

But John Wyatt, an electrical engineer at the Massachusetts Institute of Technology, says his work on a retinal implant with Harvard neuroophthalmologist Joseph Rizzo has shown how difficult it is to create meaningful vision. In their experiments, what patients "saw" often did not correlate with the stimulation pattern, and none has recognized shapes or letters, as reported by Humayun and colleagues. "Let's aim for small successes for now," implores Wyatt. "To impart a coarse level of vision that would expand a blind person's autonomy is an ambitious but plausible goal."

Overstating the promise comes at a steep price, says Wyatt, noting that the blind and their families can suffer mightily. Harvard's Don Eddington, a biophysicist who develops cochlear implants, says hype also "reduces the credibility of this work in the minds of serious scientists." Eddington says this, in turn, "not only affects the individuals working in retinal prostheses but neural prostheses in general."

Humayun strongly denies that he hyped anything. And Gerald Chader, chief scientific director of the Foundation Fighting Blindness near Baltimore and a former official at the National Eye Institute (NEI), agrees: "I think [Humayun] tried to be very evenhanded."

Humayun points out that the story became news because of what Stevie Wonder, not Humayun, said. And although he agrees that Wonder is not an ideal candidate for this device, he doesn't think he provided false hope to the public or to Wonder, as no one knows enough to state definitively what will or won't work. The USC group hopes to launch clinical trials of its device later this year.

The Stevie Wonder publicity had an upside, too, Chader argues. It sparked a flow of philanthropic donations and, he suspects, may have influenced NEI's decision to fund a multimillion-dollar consortium effort that includes the USC researchers as well as Wyatt, Rizzo, and others.

When and if this research will pan out is anyone's guess. Says Zrenner, "That's like someone asking us when will we arrive at the moon when we've just begun to build a rocket."

—JON COHEN

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