A New Frontier in Artificial Vision for Macular Degeneration

by Paul Stabile

There is an innovative bionic vision system moving to clinical trial in the Department of Ophthalmology at the University of Pittsburgh with the hope of helping the visually impaired improve visual function. The Bionic Visual System, developed by Daniel Palanker, PhD of Stanford University and José-Alain Sahel, MD, consists of a wireless miniature photovoltaic subretinal implant (chip), special eyeglasses, and a CPU processor. This has been in development for several years by Pixium Vision, a company incubated by the research at the Institut de la Vision in Paris. Three patients in Paris received the implant in the French feasibility study started December 2017. The visual device has recently received approval from the US Food and Drug Administration (FDA) to begin the clinical feasibility study here in Pittsburgh for patients with end-stage atrophic Dry Age-related Macular Degeneration (AMD). Our center will be the only US participant in this early feasibility trial.

Joseph N. Martel, MD, Assistant Professor of Ophthalmology at the University of Pittsburgh School of Medicine, will be the first to implement the new artificial visual system in the United States, as part of the 36-month feasibility study at UPMC. The study is designed to evaluate the safety and performance of this new visual device in eliciting central visual perception among patients who have lost their central vision due to atrophic advanced dry-AMD. Five patients will be recruited to this study. A unique collaboration with the University of Pittsburgh and the French Institutions: University Pierre et Marie Curie of the Sorbonne Universités, the Institut National de la Santé et de la Recherche Médicale (Inserm), and the Centre National de la Recherche Scientifique (CNRS) has made this possible. Dr. José-Alain Sahel, Chairman of the Department of Ophthalmology, who was recruited to the University of Pittsburgh from Paris, is forging this relationship and was instrumental in initiating the science behind the bionic vision system.

José-Alain Sahel, MD, Chairman, Department of Ophthalmology at the University of Pittsburgh and Founder/Director of the Institut de la Vision in Paris, holding the retinal implant.

Joseph Martel, MD

How does it work? A 2mm chip will be implanted beneath the retina, which will mimic activity of the non-functioning part of the retina and provide the electrical impulse to the optic nerve and ultimately the brain so they can be processed. After the chip is inserted it works in coordination with special eyeglasses. These glasses extract the normal light in our environment and are sent to a processor/computer that the patient wears. That computer then processes this light in the environment and translates that information back to the glasses and to an infrared laser. The infrared laser then shines the infrared light into the eye and to the subretinally implanted chip. The chip recognizes this infrared laser, which generates an electrical impulse in a certain pattern that the patient will learn how to interpret. After device implantation patients undergo training and readaptation training.

This new procedure is the hope of the future for more than just this one group of patients. If this is found successful on patients with dry-AMD, then it is possible that it will lead in the future to further trials for patients with retinitis pigmentosa or other degenerating age-related eye diseases. S+S