

Artificial Silicon Retina

ELE482 Biomedical Engineering Seminar III, February 25, 2002

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The Artificial Silicon Retina is a new product that will help those with loss of vision regain their sight. The ASR is a silicon chip 2 mm in diameter and 1/1000 inch in thickness containing approximately 3,500 microscopic solar cells called "microphotodiodes," each having its own stimulating electrode. These microphotodiodes are designed to convert the light energy from images into thousands of tiny electrical impulses to stimulate the remaining functional cells of the retina in patients with AMD and RP types of conditions. There are many reasons why people lose their vision. The ASR will be able to help those patients who have experienced Retinitis Pigmentosa and Macular Degeneration. Retinitis Pigmentosa is general term for a number of diseases that predominately affect the photoreceptor layer or "light sensing" cells of the retina. These diseases are usually hereditary and affect individuals earlier in life. Injury to the photoreceptor layer, in particular, reduces the retina's ability to sense an initial light signal. Despite this damage, however, the remainder of the retinal processing cells in other layers usually continue to function. Macular Degeneration refers to a degenerative condition that occurs most frequently in the elderly. It is a disease that progressively decreases the function of specific cellular layers of the retina's macula. The affected areas within the macula are the outer retina and inner retina photoreceptor layer. Patients with macular degeneration experience a loss of their central vision, which affects their ability to read and perform visually demanding tasks. Although macular degeneration is associated with aging, the exact cause is still unknown. The Artificial Silicone Retina will help these patients see by produceing visual signals similar to those

produced by the photoreceptor layer. These artificial "photoelectric" signals from the ASR induce biological visual signals in the remaining functional retinal cells that may be processed and sent via the optic nerve to the brain. The ASR is surgically implanted under the retina, in a location known as the subretinal space and is powered solely by incident light and does not require the use of external wires or batteries. The ASR has been tested in animals, and they have responded to light stimuli with retinal electrical signals and sometimes brain-wave signals. The induction of these biological signals by the ASR indicates that visual responses had occurred. In January 2000, the US government's food and drug administration authorized Optobionics to implant ASR in ten retinitis pigmentosa patients in a two-year safety and feasibility study. At this time, Optobionics is correlating and assessing clinical data from these patients. The implants continue to function electrically and remain stable in position, and the patients are in no discomfort. There have been no signs of ASR degradation or rejection, and no infection, inflammation or retinal detachment. Optobionics plans to submit a paper regarding the study in the first half of 2002. Once the trials have been completed further work can be done to improve the ASR. This is a promising new technology that will perhaps one day eliminate the problem of blindness.

References:

- <http://www.optobionics.com/index.htm>
- <http://www.usatoday.com/news/healthscience/health/2001-08-01-chip-usat.htm>•Zrenner Eberhart, will retinal implants restore vision?, SCIENCE, volume 295