Abstract— Bionic eye technology is allowing even more people with degenerative diseases of the eye to regain sight, and as the field advances there will be an increase in the number of people who can be helped.

I. INTRODUCTION

Degenerative diseases of the eye can cause blindness without affecting the optic nerve. The current advancements in bionic eyes are in this field as they do not require brain surgery are able to give sight to most patients. Current retina implants are only able to give sight to patients who still have full use of their optic nerve.

II. METHODS

The Argus II, the only FDA approve bionic eye implant uses a camera inside a pair of sunglasses. This data is transmitted to the implant within the eye. The implant then relays data to the optic nerve, sending in small impulses. The wireless relay has an effective range of only a few centimeters, so when the glasses are removed the system stops relaying data, leaving the patient unable to see again.

III. RESULTS

Patients recieving the eye, began being approved for widespread implementation in Europe in 2010. The results of the technology have allowed people with no remaining vision to see again. The image that they see are not anything like what the normal person can see, with only 60 electrodes implanted into the optic nerve, the display that is seen is a dot matrix display of flashes of lights as described by the patients. These dots are able to represent the immediate environment for use in navigation, or even to give the patients the ability to read again. Letter recognition does not work with all patients, and even in those that it does work with it is fraught with inaccuracies due to the imprecise nature of the dot matrix display.

IV. DISCUSSION

With the cost of the device at nearly $100,000 USD, the Argus II device is extremely expensive, and as the device life can be at most 6 years, the cost of the device is prohibitively expensive for a majority of the population. With time the cost of the current model will come down, though as the prospective market is quite small, not much effort is being put into the area.

Along with the cost of the device and surgery, there are additional training sessions that are required for the device, further increasing the cost.

Advancements on the current design type are being attempted around the world. Future advancements look towards an increase in the number of dots in the matrix field, thus increasing the level of detail that the individual can achieve. Another area of advancement is using a wireless connection to an implant on the visual cortex. This allows for the treatment to be applied to patients with glaucoma, macular degeneration, and diabetic retinopathy. This technology currently being developed by the Monash Vision Group at the University of Monash expects that with their design they will be able to treat 85% of all cases of degenerative blindness.

Both of these technologies currently have their limits as they both require that the patient has a fully developed visual cortex. Neither device brings back the vision that the patient once had, they simply replace it with a very basic display, though as the resolutions increase on these devices there will be less of a difference.

REFERENCES


