Background and Purpose

Background

285 million people worldwide experience visual deficits (acuity worst than 20/40 or visual field less than 200) (NEI, 2012; WHO, 2013)

In 2002, clinical trials of the Argus I were commenced at Doheny Retina Institute. It was implanted into 6 subjects with Retinitis pigmentosa (Ong & de Cruz, 2012)

Purpose of Technology

It mimics the function of the retina to restore sight for those with severe vision loss
It uses a retinal implant that converts images into electrical impulses that activate the remaining retinal cells which then can carry the signal back to brain (Ong & del Cruz, 2012)

Type of Technology

Brain Machine Interface
Neural Prosthesis

Diagnosis Impacted

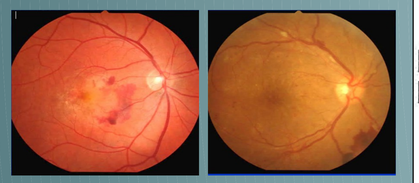
Age related macular degeneration
Severe trauma involving the eyes
Retinal dystrophies
Retinitis pigmentosa (RP)- loss of photoreceptors and retinal pigment epithelial cells
Diabetic retinopathy (Anthony, 2012; Dagnelie, 2012; Ong & de Cruz, 2012)

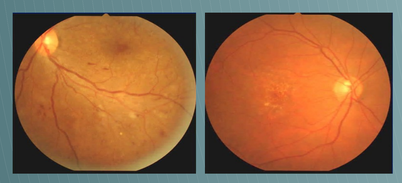
Client Factors

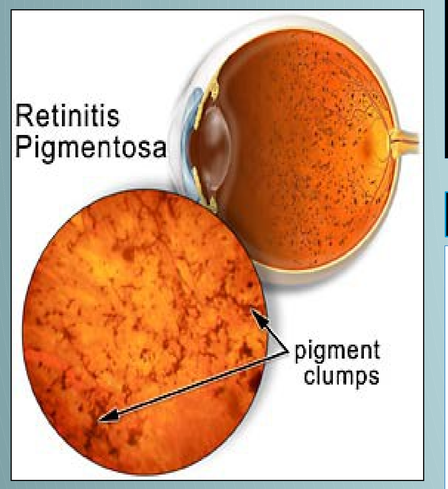
Body structures- the retina
Body function- seeing and related function, including visual acuity, visual stability, visual proprioception
Field functions- includes detection/registration, modulation, and integrations from the body and surrounding areas

Brain Structures

Retina :The retina is sensory tissue that lines the inner eye. It captures light which is transmitted to the brain to produce an image





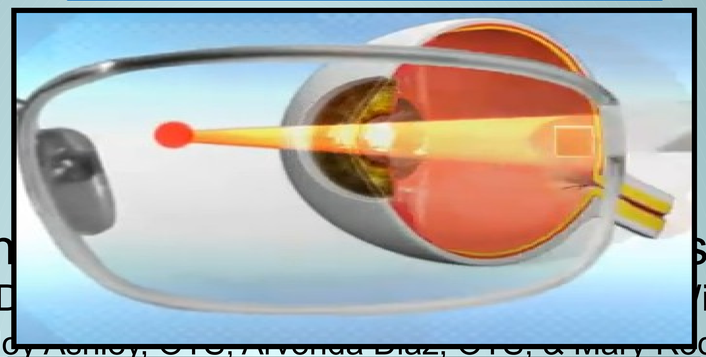


Blanchard, S., Butarzoni, J. , Wilson, K. B. (2012). *Overview of Low Vision Rehabilitation for the Occupational Therapist* [PowerPoint slides]. Retrieved from https://blueline.instructure.com/courses/315760/wiki/lecture-vision-and-assistive-technology?module_item_id=2583515

FDA approved, vendor resource availability, cost/funding

In 2007, Argus II was FDA approved retinal prosthesis system using the epiretinal transplant for clinical studies in humans (Ong & de Cruz, 2012). Currently unavailable for mainstream use.
Cost $60,000 for the Bio-Retina by Nano Retina to $115,000 for the Argus II by Second Sight (Anthony, 2012). This cost is not covered by insurance.
Available in Europe and Australia, not United States (Anthony, 2012)
Active research is being done also in Belgium, Canada, China, Germany, Japan, Korea, and Spain (Dagnelie, 2012)

Schematic of Bio-Retina



http://www.extremetech.com/extreme/132918-the-laser-powered-bionic-eye-that-gives-576-pixel-grayscale-vision-to-the-blind

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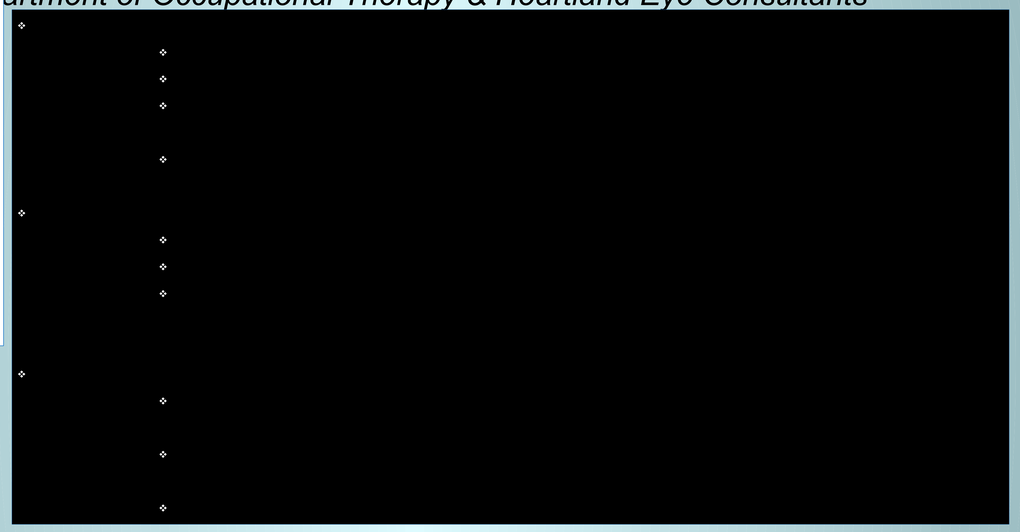
Authors: Jo Ashley, OTS; Aiyonda Diaz, OTS; & Mary Rodriguez, OTS
artment of Occupational Therapy & Heartland Eye Consultants



- **Pros**
  - With interprofessional collaboration of optometrist and occupational therapy client may achieve functional vision with magnification
  - Multidisciplinary technology can improve overall function for individuals who are blind (Merabet, 2011)
- **Cons**
  - Not everyone with visual impairments could benefit as it is only designed for those with profound vision loss
  - The technology does not provide perfect vision
  - May misinterpret items in the world due to perceptual mismatch
  - The damage site determines if a patient can receive the technology
  - Users have distorted visual processing associated with the device (Merabet, 2011)
- **Ethical Issues**
  - Attempting to restore what was once considered damaged
  - Most individuals who would benefit from this technology live in developing countries and therefore only a small amount of patients would be able to receive the technology (Merabet, 2011)
- **Safety Precautions**
  - The retinal implant is invasive and has a high risk for infection (Cohen, 2007)
  - Corrosion resistant from normal saline and fluids in the implant area (Cohen, 2007)
  - Charged/density limits: amount of current that can be delivered safely to targeted neuronal tissue (Cohen, 2007)
  - Vision rehabilitation is recommended following implantation (Dagnelie, 2012; Guo, 2010)

Type or Level of Research Evidence

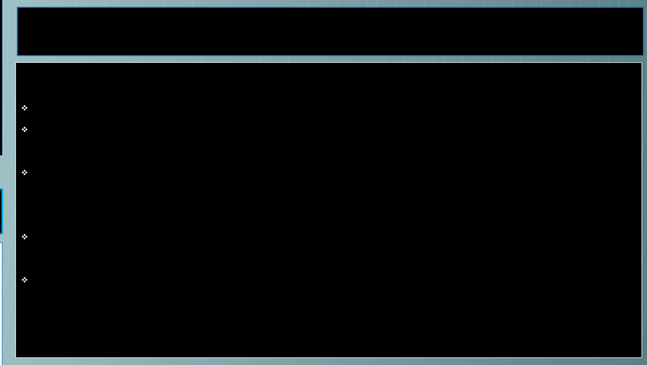
Article I: "The Bionic Eye: The Review" is a literature review examining research developed on the various type of visual prosthesis. This review has an evidence level of V which states that the information is provided from a respected authority and based on clinical evidence and descriptive studies.

Article II: "Retinal implants: Emergence of a Multidisciplinary Field" is a literature review, at evidence Level V. This article focuses on engineering and rehabilitation challenges of using retinal implants. Research is clinically based.

Article I Summary

Retinal implants: Emergence of a multidisciplinary field

This article is a literature review discussing multidisciplinary teams in several countries, including the US, who are studying various approaches to stimulate bipolar and/or ganglion cells in patients with degenerative eye disease leading to complete blindness.
Assessment for transplantation should include visual performance and function without the transplant and expectations with the transplant.
Continuing research into changes of the degenerative retina will increase understanding of secondary cell signal and neural signaling in the visual system.
Research in the next decade will be dedicated towards decreasing the distance between the implant and bipolar and/or ganglion cells, as well as smaller electrodes with higher resolution (Dagnelie, 2012).



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