

OCULAR PROSTHESIS

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ABSTRACT:

The only thing worse than being blind is having sight but no **VISION**. In this paper we are proposing the ocular prosthesis technique for giving artificial vision for blind people. The main components used in cortical prosthesis method are Utah electrode array, intracortical microelectrodes and in retinal prosthesis method the main components used are retinal pigment epithelium and the neurosensory retina. Artificial vision technique can be used to reduce the blind rate.

INTRODUCTION:

As of 2017 there were 253 million people with some degree of vision loss, 217 million had low vision and 36 million were blind. Due to blindness the daily life of blind people gets affected. Thus in this paper we are proposing the technique of artificial vision that can be utilized by the blind people. Healing or changing the nervous system. It would be better to say, "WE SEE WITH OUR BRAIN THAN WITH OUR EYES". Ocular prosthesis can be achieved by the following methods:

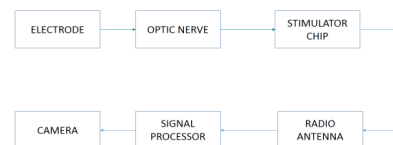
1. Cortical prosthesis.
2. Optic nerve prosthesis.
3. Retinal prosthesis.
4. Epiretinal prosthesis.

5. Subretinal prosthesis.

OBJECTIVES AND MOTIVATION:

- Provide artificial vision to the blind people.
- The motivation behind this paper is to reduce the inferiority faced by the blind people.

BLOCK DIAGRAM OF ARTIFICIAL VISION TECHNIQUE :



EXPLANATION FOR BLOCK DIAGRAM:

The electrode will absorb the electrical impulse, and these electrical impulses are sensed by the optic nerve via stimulator chip. The stimulator chip will convert the electrical signals into waves and send it to the radio antenna. The signal processor will convert the waves coming from the radio antenna into digital signals. These digital signals are sent to the camera for vision by the signal processor. Thus it is called as digital artificial vision. When a person is

born blind, inwardly his optic nerve would not function properly. At this stage we cannot use any retinal stimulation method.

OCULAR PROSTHESIS:

Due to accidents and treatment of orbital cancers blind eyes and other diseases lead to need for reconstruction of EYE. The design in ocular prosthesis are as follows,

- The duplicate eye is designed by taking the orbital tissue and eyelids.
- The bionic eye implant are of porous polyethylene, aluminium oxide or hydroxy appetite.
- After implant they allow the blood vessel to grow in them.
- There is a significant build up of salt and protein deposits on the eye in 1year time.
- Artificial drops are added to false eye to remove this deposits.

RETINAL PROSTHESIS:

Retinal prosthesis are implantable devices designed to support photo transduction within the eyes of individuals with significant retinal diseases. In the normal eye, photoreceptors are located within the outer layers of the retina that contains light sensitive pigments that results in photo transduction cascade to generate neuronal signals in the presence of light. These signals are passed to and processed by a network of neuron within the middle layer of retina before reaching the retinal ganglion cells within the inner layer.

TYPES OF RETINAL PROSTHESIS:

Retinal prosthesis can be done by using the following methods,

- ARGUS II retinal prosthesis system.
- Retina implant alpha – IMS.
- Epirep – III.
- Intelligent retinal implant system (IRIS) bionic vision restoration system.
- Boston retinal implant.
- Bionic vision – supraphoroidal retinal prosthesis implant.

BOSTON RETINAL IMPLANT:



The boston retinal implant is a sub-retinal retinal prosthesis developed by the boston retinal implant project. The current iteration improved in three significant ways:

1. An increase in power and data telemetry transfer capabilities due to a larger internal receiver coil.
2. A more resilient hermetic, titanium casing of internal circuitry.
3. A longer cable connecting the micro-electrode array to other internal components.

External components include a computer controller with an interface which allows user to adjust parameters of retinal electrical stimulation. Using power amplifiers the computer sends power and data signals to internal components.

wirelessly. The 16 microelectrodes on array of each 400 micrometers in diameter.

SURGICAL TECHNIQUE FOR BOSTON RETINAL IMPLANT:

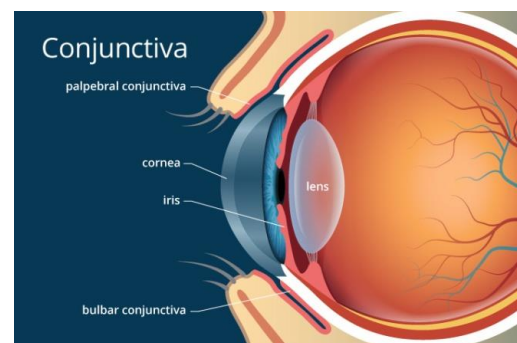
The following implantation techniques were used to implant devices in two minipigs. Conjunctiva is dissected and a 6 mm x 2 mm scleral flap is created in the supero-temporal quadrant. After partial vitrectomy, a needle is used to raise a retinal bleb, a separation of the choroid and retinal pigment epithelium from the retina, from the front. Receiver coils and the casing containing the internal processors are secured to the sclera anteriorly and in the superior nasal quadrant, respectively. Next, an incision is made in the choroid under the scleral flap to insert the micro-electrode array. The array is positioned so that it rests in the subretinal space created by the bleb. Once the array is positioned, the serpentine, polyimide foil connecting it to the other internal components is secured to the sclera with sutures and the scleral flap is sutured close. Finally, the conjunctiva is sutured back down over the implanted receiver coils.

CONJUNCTIVA:

- The conjunctiva is the clear, thin membrane that covers part of the front surface of the eye and the inner surface of the eyelids. It has two segments:
- **Bulbar conjunctiva:** This portion of the conjunctiva covers the anterior part of the sclera (the "white" of the eye). The bulbar conjunctiva stops at

the junction between the sclera and cornea; it does not cover the cornea.

- **Palpebral conjunctiva:** This portion covers the inner surface of both the upper and lower eyelids. (Another term for the palpebral conjunctiva is tarsal conjunctiva.)
- The bulbar and palpebral conjunctiva are continuous (see illustration). This feature makes it impossible for a contact lens (or anything else) to get lost behind your eye.



ADVANTAGES AND DISADVANTAGES:

❖ ADVANTAGES:

- The retinotopic stimulation from retinal implants is inherently more accurate, as the pattern of incident light on the microphotodiodes is a direct reflection of the desired image.
- Retinal implants directly stimulate the retinal ganglion cells, thereby bypassing all other retinal layers.
- Therefore, in principle, retinal implants could provide visual perception to individuals even if all

other retinal layers have been damaged.

❖ **DISADVANTAGES:**

- The quality of vision expected from a retinal implant is largely based on the maximum spatial resolution of the implant.
- Current prototypes of retinal implants are capable of providing low resolution, pixelated images

FUTURE SCOPE:

- Dobelle eye and the Artificial Silicon Retina, which provided the foundation for future work in restoring vision through visual prosthetics.
- As researchers develop advanced technology and a greater understanding of the visual system, prosthetic research will continue to advance, resulting in increased implant size and electrode density and improved device biocompatibility and surgical implantation protocols.
- Visual prosthetics remain, recent advances in technology and physiology may soon lead to the use of prosthetics as a viable treatment for photodegenerative diseases. .

CONCLUSION:

- By the method of retinal prosthesis blind rate can be reduced.
- Retinal prosthesis is a method of providing artificial vision to the blind people.

- This invention is not the only branch of science.
- It involves the participation different branches of science.
- This concludes every professional relating to a branch of science should have a interesting view towards other branches of science.

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