Neuroprosthetics

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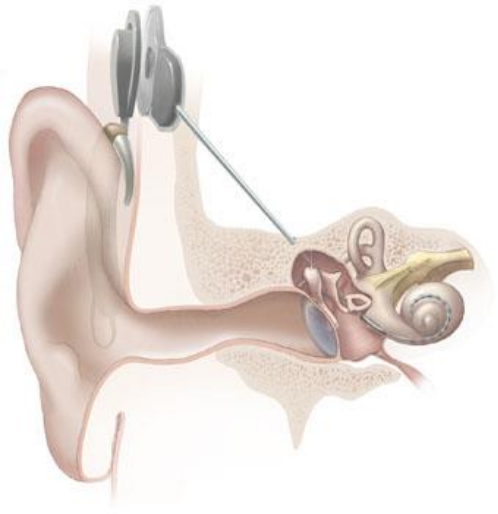
***Abstract*—Neuroprosthetics are used when an individual loses the ability to receive sensory input from a certain organ, such as the ear, eye, or a limb. It is possible mostly through these devices receiving information and sending it through electric pulses and stimulating parts of the brain.**

I. Introduction

When someone loses their ability to receive neural impulses from a certain organ or organ system, whether it is from a disease or sustained injury, there are developing technologies that allow for these problems to be solved. For example, if an individual is diagnosed with macular degeneration, and they begin to lose or fully lose their ability to see, they can benefit from the use of neuroprosthetics. These developing technologies are beginning to allow people who had previously had the unfortunate circumstance of potentially never being able to see, hear, or feel again, regain those abilities.

II. Methods

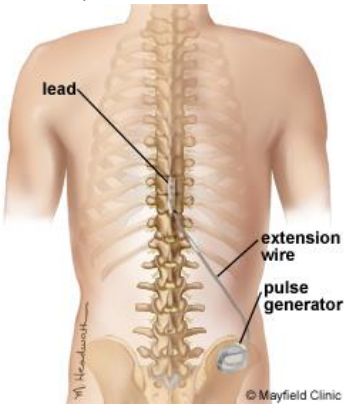
The application of neuroprosthetics usually involves surgery, as the implementation usually involves placing a nerve stimulator somewhere inside the body. As stated before, once these devices are planted inside the body, they act as substitutes for what the original organ was supposed to do. The device implanted into the region then acts by stimulating the nerve receptors in the region that are active, and allowing these nerves to send this information to the brain in a similar way to the naturally occurring one. Again, the cochlear implant, shown here:



being the most widely used and commonly occurring use of neuroprosthetics, is a great example of the method behind it. Two separate surgeries are performed in order for the results to be achieved. The first being the insertion of a small magnet above the ear so that the patient can attach the external piece, and then the actual stimulation device is planted in the cochlea, usually consisting of 22 electrodes to transmit information.

III. Results

The results of neuroprosthetics today are impressive, and the future of neuroprosthetics can be groundbreaking. Patients who have lost hearing, seeing, and feeling ability, are beginning to be able to regain these abilities through these technologies. Cochlear implants allow patients suffering from hearing diseases to regain hearing ability, visual prosthetics allow individuals suffering from diseases of the eye see better, and motor prosthetics allow people with prosthetic limbs gain control of these man-made devices. Also, neuroprosthetics can be used in methods other than sensory improvement; in spinal stimulation, this method is used to relieve pain:



This uses the same method of implanting nerve stimulators but has different results; pain relief.

IV. Discussion

To conclude, it is clear that neuroprosthetics are becoming crucial to many patients who suffer from nerve-losing diseases. Although today the surgeries can be very expensive and involve a certain element of risk, they are becoming more and more successful as they become more and more reasonable in cost. Neuroprosthetics holds a very promising future in the industry of bioengineering and in helping those patients who are effected by disease.

References

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