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# A Case Study of Cochlear Implants and Complications

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## **A Case Study of Cochlear Implants and Complications**

### **Introduction**

A cochlear implant (CI) is an electronic medical device that replaces the function of the damaged inner ear. An electrode array is surgically placed into the cochlea, wiping out most of the structures of the inner ear. Candidates have severe-profound hearing loss and demonstrate little to no benefit from conventional hearing aids as indicated on various audiologic assessments. An individual can be implanted unilaterally or bilaterally.

The CI contains a sound processor worn behind the ear that captures sound and transforms it into digital code. This digital code is transmitted through the coil on the outside of the head to the internal portion of the implant. The implant converts this digitally-coded sound into electrical impulses, and sends them along the electrode array placed in the cochlea (inner ear). The implant's electrodes stimulate the hearing nerve, which then sends the impulses to the brain where they are interpreted as sound.

### **Purpose**

This case study aimed to examine the process a single cochlear implant candidate underwent before implantation; analyzing the participant's unique case history, educational history, and hearing instrument experience. These data were collected in questionnaire and interview form, and compiled in chronological order to portray the progression of the decision to seek implants as well as the implantation process itself. This information was gathered with the hope of better informing and preparing future implant candidates and audiologists working with these individuals. As the number of cochlear implants continues to rise, future studies could also be performed to establish a greater understanding of the impact the procedure can have on all aspects of the recipient's life.

### **Methods**

This study was conducted through e-mail correspondence at the participant's request. The participant was given two surveys to complete. Each survey was carefully constructed to obtain an in-depth understanding of their hearing history in order to establish a case history of the participant. Upon further review, it was determined that the focus of the literature search would be on the complications and side effects resulting from cochlear implants. This was influenced by the participant's stress on the pain they experienced throughout the recovery process.

### **Findings**

There are three categories of complications: postoperative complications (adverse reactions), surgical complications, and device-related complications. The specific adverse reaction that this case study focused on was pain. Pain was reported not only when the device was active, but also when external magnet and processor were not in use. Studies showed that 77% responded well to constructive therapy, 50% responded to prolonged antibiotic treatment, 17% responded to anti-inflammatories alone, 3% (1 patient) responded to deactivation of 2 electrodes, and 20% required reimplantation, after with pain resolved. Reimplantation is used for major complications.

The most commonly reported intraoperative complication were flap breakdown and incomplete electrode placement/electrode slip out. In a longitudinal study, Shapira, Yaar-Soffer, Hildesheimer, Migirov, and Henkin, .showed major complications in approximately 8.7% of patients (366 patients, 215 adults), and revision surgery required for 8.2% (30 patients). Other complications included 1.6% having device failure, caused by trauma or an unknown cause, 1.1% having electrode problems (shorts, kinking, placement issues), and 1 patient having facial nerve paralysis.

### **Conclusion**

In recent years, cochlear technology has continued to advance. These advances include different types of electrode arrays, such as straight, pre-coiled, and shorter lengths. These varying designs were created in hopes to eliminate trauma upon insertion of device, maintain residual hearing, and provide a closer fit to the modiolar of the cochlea. Although there are risks of serious complications, some calling for the surgical removal and reinsertion of the device, cochlear implants provide access to hearing that was not previously available.

In the final question for the participant of this study, I asked what was the most life changing part of the cochlear implantation process? His answer was “being able to hear birds chirping, the ‘sh’ sound, gas hissing,” all sounds he had never heard before, even with his hearing aids.

### **Acknowledgements**

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