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A NOTE ON BLUE HEARING SYSTEM (BHS) TO DEVELOP SPEECH IN DEAF AND MUTE PEOPLE

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Abstract

In this paper, the innovative idea of Blue Hearing System has been presented which is an artificial hearing system. This BHS uses the instrument cochlear implant, a bionic ear, whose working is based on the electromagnetic phenomenon of Induction and another important part of this BHS is the learning to create and expand the vocabulary of the person possessing the cochlear implant instrument. The output of the BHS is the measurement of the responses towards various sounds given by the fellow and by meaningful speech development in him or her.

Keywords: Blue Hearing System, Cochlear Implant Instrument, Simulated Model

Introduction

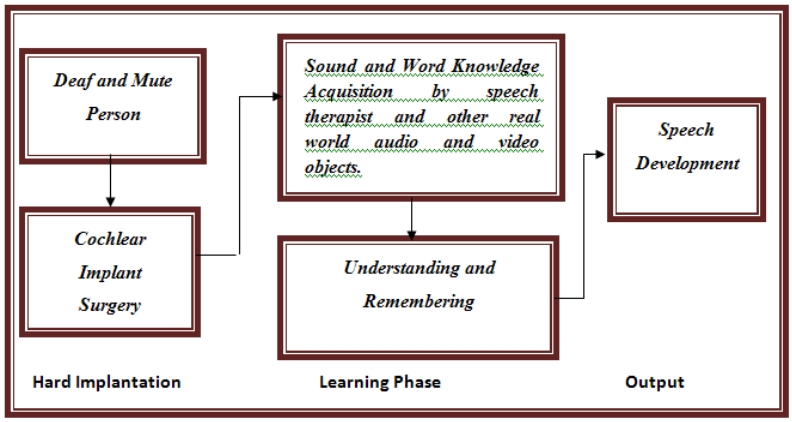
A Blue Hearing System is the system which uses the electromagnetic device cochlear implant (CI) to provide a sense of sound to a person who is profoundly deaf or severely hard of hearing[1]. Children and adults who are deaf or severely hard-of-hearing can be fitted for this system. They learn to associate the signal provided by an implant with sounds they remember. This often provides recipients with the ability to understand speech solely by listening through the implant, without requiring any visual cues such as those provided by lip reading or sign language[1-5].There are a number of factors that determine the degree of success to expect from the operation and the device itself[2]. Cochlear implant centers determine implant candidacy on an individual basis and take into account a person's hearing history, cause of hearing loss, amount of residual hearing, speech recognition ability, health status, and family commitment to aural habilitation/rehabilitation. Potential candidates undergo an extensive evaluation at the clinic to determine if they are good candidates for cochlear implantation. An ear, nose and throat surgeon implants the hearing receiver/stimulator in the inner ear. After two to four weeks, patients return to the clinic to have the device activated. Several programming sessions are required to obtain optimal performance[1-3].

Motivation

My five years old son is deaf and mute by birth that is why only nonverbal communication was possible between us, even I could not be able to listen the word "*Maa*" from him, But now after using Blue Hearing System he has pronounced me as "*Maa*" which is the greatest achievement of my life, this is the only reason which diverted me to work in depth for Blue Hearing System.

Simulated Model of BHS

Figure 1: Blue Hearing System



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This model consists of three parts as shown in figure1- Hard implantation, Learning Phase, Output

Hard implantation

This part includes the person himself and the crucial cochlear implant Surgery by an ENT specialist. Hearing impairment or Deafness refers to conditions in which individuals are fully or partially unable to detect or perceive at least some frequencies of sound which can typically be heard by members of their species.

What is a Cochlear implant?

The implant is surgically placed under the skin behind the ear. The basic parts of the device include:

Outer part:

The external part of a cochlear implant consists-

- a microphone which picks up sound from the environment
- Speech processors are the component of the cochlear implant that transforms the sounds picked up by the microphone into electronic signals capable of being transmitted to the internal receiver. The coding strategies programmed by the user's audiologist are stored in the processor, where it codes the sound accordingly. The signal produced by the speech processor is sent through the coil to the internal receiver, where it is picked up by radio signal and sent along the electrode array in the cochlea.
- a transmitter, which is a coil held in position by a magnet placed behind the external ear, and transmits the processed sound signals to the internal device by electromagnetic induction.

Figure 2: Vipansh with cochlear implant

Inner part:

The internal part of a cochlear implant consists-

- a receiver and stimulator secured in bone beneath the skin, which converts the signals into electric impulses and sends them through an internal cable to electrodes,
- an array of up to 22 electrodes wound through the cochlea, which send the impulses to the nerves in the scala tympani and then directly to the brain through the auditory nerve system.

Learning phase

Learning, which includes the post implantation therapy, is the most important part of BHS which helps young children to acquire speech, language, and social skills[1]. The variety and complexity of learning systems makes it difficult to formulate a universally accepted definition of learning. After 3–4 weeks of healing during which the wound must be kept dry, the implant is turned on or "activated". Results are typically not immediate, and post-implantation therapy is required as well as time for the brain to adapt to hearing new sounds. In the case of congenitally deaf children, audio logical training, speech therapy typically continue for years, though infants can become age appropriate - able to speak and understand at the same level as a hearing child of the same age in a matter of months; however it is far more common for the process to take years. The participation of the child's family in working on spoken language development is considered to be even more important than therapy, because the family can aid development by participating actively - and continually - in the child's therapy, making hearing and listening interesting, talking about objects and actions, and encouraging the child to make sounds and form words.Auditory Therapy, also called auditory rehabilitation, utilizes structured activities that should be carried over into real life to optimize the use of the new signal[2,3]. It may involve exercises to discriminate between specific sounds (also called phonemes) or to identify single words. Many professionals suggest that individuals generally will need to master discrimination and identification of specific sounds and words in order to be successful at the next level of listening - that involving comprehension of statements and questions and effective participation in conversations[1-5]. We are not training the ears. We are training the brain to interpret what the ears hear.

The case study of some children with CI

Figure 3: Age at Implantation Vs. Age at Normally Developed speech

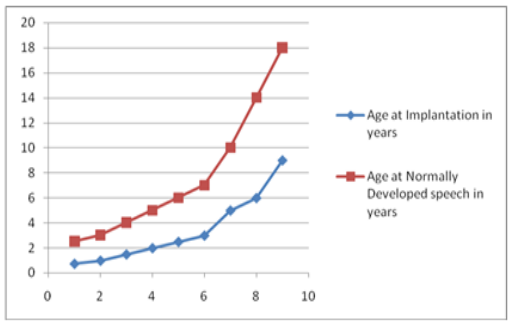

Table1: Age at Implantation Vs. Age at Normally Developed speech

Name	Age at Implantation in years	Age at Normally Developed speech in years
Bhavya	0.75	2.5
Tanvi	1	3
Aakash	1.5	4
Twarit	2	5
Palak	2.5	6
Gungun	3	7
Vikas	5	10
Priya	6	14
Prabhu	9	18

Table1 and Figure3 show that the BHS Implantation at earlier stage requires less time to learn normal speaking.

The factors affecting hearing outcomes:

Hearing is uniquely different for everyone - like a fingerprint. Many factors can affect how well your child will hear and talk with a cochlear implant. These include[2-3]:

- How long your child has had hearing loss
- The condition of their inner ear
- Other medical conditions
- The level of habilitation after receiving the cochlear implant
- Practice hearing with their cochlear implant

Output

The output of a BHS is the developed speech and understanding in the respective fellow.

Optimum age for BHS

A growing body of evidence points to the importance of early auditory input for developing language skills. Currently, the Food and Drug administration guidelines approve cochlear implantation at one year of age, although many children are implanted as young as 6 months of age. The research shows that deaf children's word-learning skill was strongly affected by their early auditory experience, whether that experience was through normal means or with a cochlear implant. Children who received the implant by the age of 13 months performed similarly to their normal-hearing counterparts while children who received a cochlear implant later performed, on average, more poorly than their normal-hearing peers. Taken together, the findings suggest that early access to auditory input, even if the access to sound is quite impoverished, plays an important role in acquiring the ability to rapidly learn associations between spoken words and their meanings, The risk of surgery in the older patient must

be weighed against the improvement in quality of life [1]. As the devices improve, particularly the sound processor hardware and software, the benefit is often judged to be worth the surgical risk, particularly for the newly deaf elderly patient. Research shows that congenitally deaf children who receive cochlear implants at a young age (less than 2 years) have better success with them than congenitally deaf children who first receive the implants at a later age, though the critical period for utilizing auditory information does not close completely until adolescence. Additionally, a 2010 study into bilateral implantation showed that children who receive their first cochlear implant before the age of 1½ responded well to the second one, even if the second one was implanted as late as 9 years old. In contrast, children who got their implants at age 2½ years or later did not respond as well to the later second implant, regardless of when they received it. One doctor has said. They can get an implant and learn to speak during a time window. From the ages of two to four, that ability diminishes a little bit. And by age nine, there is zero chance that they will learn to speak properly. So it is really important that they get recognized and evaluated early.

Conclusion

The conclusion of the present work study is that BHS is a boon for a deaf and mute fellow. By passing through the proper Learning phase a deaf and mute fellow can also live a life of a common man. There are many important benefits of the Blue Hearing System as the people possessing BHS: speaks at normal hearing level, has greater confidence in social situations, hears clearly in noisy environments, enjoys a world of new sounds, feels safer in the world and talks on the phone, enjoys music.

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