International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

Hearing Aid use before Cochlear Implantation-Is it Mandatory?

Dr. Rohan Patel[1], Dr. Ankur Barot[2], Dr. Nisarg Mehta[3], Dr. Rajesh Vishwakarma[4]

[1]3rd year Resident Doctor, Dept. of ENT & Head-Neck Surgery, B. J. Medical College & Civil Hospital, Ahmedabad, India

[2, 3]2nd year Resident Doctor, Dept. of ENT & Head-Neck Surgery, B. J. Medical College & Civil Hospital, Ahmedabad, India

[4]Prof & Head, Dept. of ENT & Head-Neck Surgery, B. J. Medical College & Civil Hospital, Ahmedabad, India

Background: *Patients having severe to profound sensory neural hearing loss can be potentially benefitted by Cochlear Implant. Using Hearing Aid pre-operatively in such patients sensitizes vestibulo-cochlear nerve & Auditory & Language areas in the brain.* ***Objective:*** *Objective of the study was to evaluate role of using Hearing Aid pre-operatively in patients who are going to be operated for Cochlear Implant.* ***Method:*** *The study was conducted in Department of ENT, Civil Hospital, Ahmedabad from June 2014 to June 2015. We studied & evaluated Hearing & Speech Abilities following cochlear implant in 30 patients of age group 1-7 years who used Hearing Aid pre-operatively for duration of at least 6 months. Control group was 30 children of 1-7 year of age who did not use hearing aid pre-operatively. All the subjects underwent Auditory Verbal Training by certified Speech & Language Pathologist and the benefits were evaluated on Categories of Auditory Performance Scale & Speech Intelligibility Rating Scale.* ***Result:*** *Patients in case group showed significantly betterscore on Category of Auditory Performance Scale & Speech Intelligibility Scale within same time frame which was taken as 3 months, 6 months, 9 months & 12 months duration. However parental motivation& home training were also important.* ***Conclusion:*** *Using hearing aid pre-operatively in patients with cochlear implant confirms better Hearing & Speech Abilities compared to patients who did not use Hearing aid pre-operatively. So use of Hearing Aid should be offered pre-operatively to the patients who are going to be operated for Cochlear Implant.*

Keywords: Cochlear Implant, Congenital Deafness, TORCH infection, Hearing Aid, CAP & SIR scale

1. Introduction

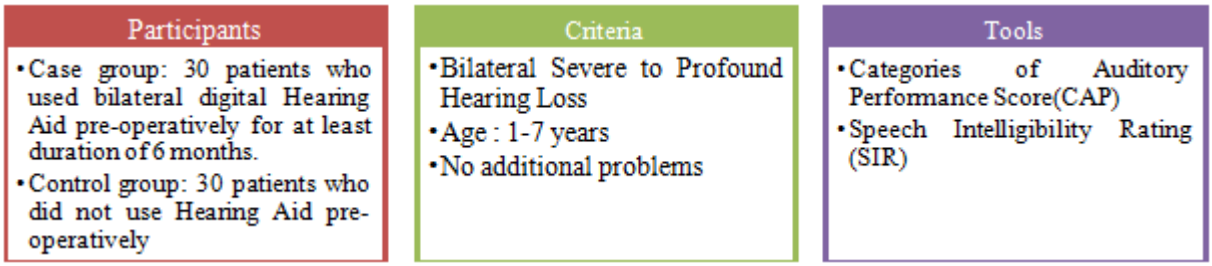
Sensory neural hearing loss can be mild, moderate, severe, profound or total.It may be congenital or acquired and congenital variety is followed by genetic mutation or environmental factors such as TORCH infection. Patients having severe to profound sensory neural hearing loss can be potentially benefitted by the Cochlear Implant A **hearing aid** or **deaf aid** is an electroacoustic device which is designed to amplify sound for the wearer, usually with the aim of making speech more intelligible, and to correct impaired hearing as measured by audiometry. Many patients with severe to profound sensory neural hearing loss are using Hearing Aid pre-operativelywhich may sensitize Vestibulo-cochlear nerve & Auditory-Language areas in the brain. It will be interesting to see whether it improvesauditory & verbal response following the cochlear implantation.

2. Objectives

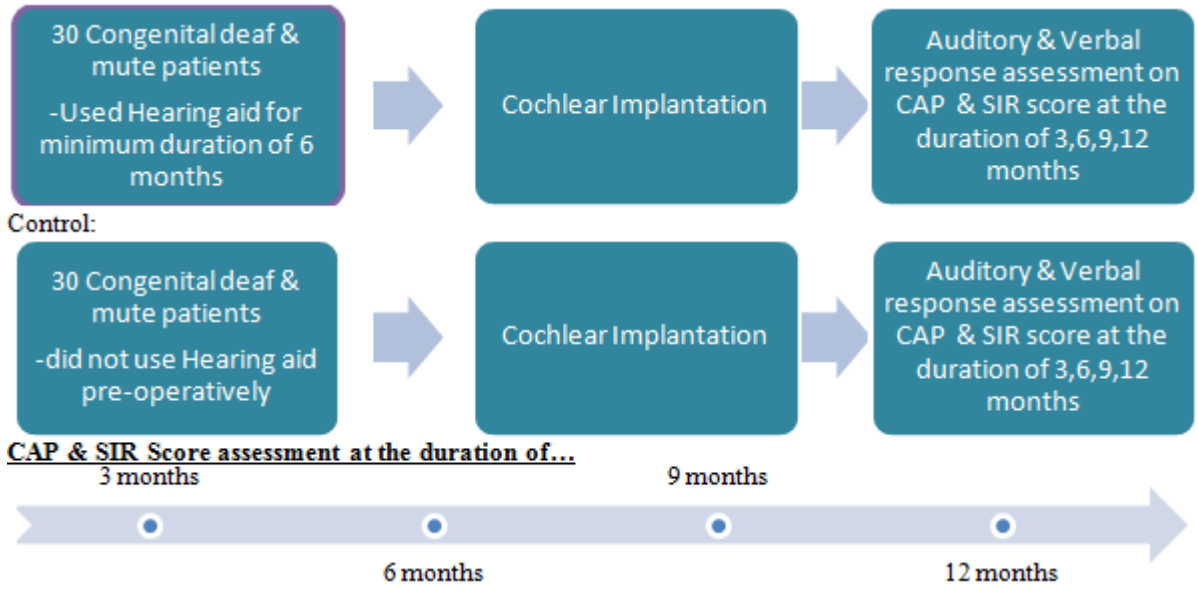
Objective of the study was to assess & evaluate the Auditory as well as Verbal response following cochlear implantation in congenitally deaf & mute patients who used hearing aid pre-operatively in both the ears for at least duration of 6 months & compare it with the control group who did not use hearing aid pre-operatively before implantation. By comparing between two groups we can justify the use of pre-operative hearing aid trial who later on under gone cochlear implantation.

3. Methods

The study was conducted in Department of ENT & Head-Neck Surgery, B. J. Medical College, Civil Hospital, Ahmedabadfrom June 2014 to June 2015. The present study was approved by the Ethics Committee on Human Subjects of the institute, and informed consent was obtained from parents of all patients.



4. Cases:



Categories of auditory performance (CAP) score(1)

0) no awareness of environmental sound
1) awareness of environmental sounds
2) responds to speech sounds
3) recognizes environmental sounds
4) discriminates at least two speech sounds
5) understands common phrases without lipreading
6) understands conversation without lipreading with a familiar talker
7) can use the telephone with a familiar talker

Speech intelligibility ratings(SIR)(2)

1) Prerecognizable words in spoken language (the child's primary mode of everyday communication may be manual)
2) Connected speech is unintelligible; intelligible speech is developing in single words when context and lip reading cues are available
3) Connected speech is intelligible to a listener who concentrates and lip-reads within a known context
4) Connected speech is intelligible to a listener who has little experience of a deaf person's speech; the listener does not need to concentrate unduly
5) Connected speech is intelligible to all listener's; the child is understood easily in everyday contexts

5. Result

Average CAP & SIR Scoring at the above mentioned time frame is shown below in the table

CAP Score (avg)	3 months	6 months	9 months	12 months
Case	1	2	2	3
Control	1	1	2	2

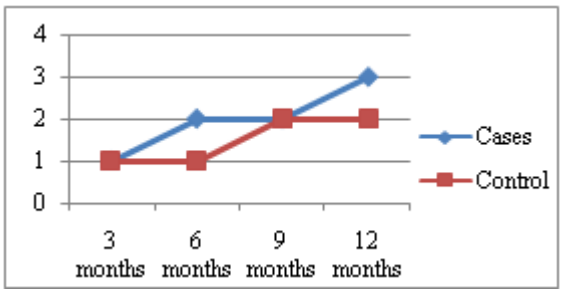


Figure 1: Average CAP score for cases and control over period of time

SIR Score (avg)	3 months	6 months	9 months	12 months
Case	2	3	4	5
Control	1	2	2	4

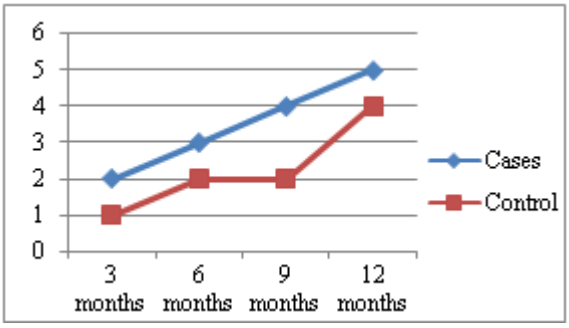


Figure 2: Average SIR Score for cases and control over period of time

Patients in case group showed better score on Category of Auditory Performance (CAP) Scale &Speech Intelligibility Rating (SIR) scale within same time frame which was taken as 3 months, 6 months , 9 months & 12 months duration.

6. Discussion

- Patients who were using hearing aid pre-operatively performed better though statistically not significant than those who did not use hearing aid on CAP & SIR Scores.

However the sample size here is small. In terms of development of the speech over a long period of time this small difference can affect learning.

- In the study of the effects of age at cochlear implantation and hearing aid trial on auditory performance of Chinese infants it was found that Infants undergoing hearing aid trial and habilitation demonstrated a significant positive effect on the development of auditory skills in comparison with infants without trial and habilitation. (3)
- Using hearing aid pre-operatively in patients before cochlear implant sensitizes the vestibulo-cochlear nerve and Auditory & Language areas in the brain which in turn confirms better Hearing & Speech Abilities compared to patients who did not use Hearing aid pre-operatively. (4)
- Regular use of hearing aid helps in rapid adapting of the patient to regular use of the Cochlear Implant. (5)
- So use of Hearing Aid should be offered pre-operatively to the patients who are going to be operated for Cochlear Implant. However parenteral motivation & home training is equally important. (6)

7. Conclusion

Hearing aids should be offered pre-operatively to the patients undergoing cochlear implantation for better auditory-verbal outcome. Not only it improves CAP score and SIR but it also sensitize a patient to wear future cochlear implant external processor. Still we require study with large subject group with longer follow up to conclude more firmly. Development of speech is also dependent on motivation of parents and their ability to give speech therapy to child at home. In future we may consider educational status of parents in such type of studies.

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