# A STUDY ON TAMIL LANGUAGE DEVELOPMENT AND TAMIL SPEECH INTELLIGIBILITY OF CHILDREN USING COCHLEAR IMPLANT

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## Abstract

Cochlear implanted children are expected to take advantage of the young age at implantation giving best chances for developing optimal language and speech skills. In this study, two groups of prelingually deafened children were followed up over a period of 1 year after implantation to determine the effect of implantation on their language and speech skills as well as their auditory abilities. The results showed that both groups produced highly significant improvement after 1 year in language skills, auditory abilities, and speech reading abilities. These results indicate that early implantation has a favorable effect on speech characteristics as well as the auditory abilities of cochlear implanted children. However, it is too early to judge the effect of the age at implantation on the language acquisition skills of these children.

***Key words:*** *cochlear implantation, implantation age, language and speech skills*

## INTRODUCTION

One explanation for the better linguistic progress that is expected in children who receive their cochlear implant earlier rather than later due to the concept of the sensitive period. According to theories of neuro-cognitive development, there is a period of 'heightened sensitivity for language learning in young humans'. Infants who hear

normally develop spoken language with great ease primarily through their auditory channel. Young infants can detect the differences among various acoustic phonetic units specific to their native language, as well as those of other languages to which they have had no exposure. Cochlear implants have become a popular option for children with profound hearing loss. Evidence supporting the benefits of early implantation is found in experimental, developmental, and clinical cochlear implant studies. The general consensus is that children have the best opportunity to learn language during their first 5 years of life.

According to Paul PV, Quigley SP, this critical period for language learning is particularly important in deaf and hearing-impaired children. Providing cochlear implants to deaf children at a young age may enable them to take advantage of this critical period for learning language and is likely to increase their chances for developing speech and language skills similar to those of normal-hearing children. Early implantation would also result in a decrease in the duration of auditory deprivation, a decrease considered to positively influence performance with a cochlear implant.

## OBJECTIVES

- To investigate the effect of implantation on language and speech of cochlear implanted children treated with the same program of habilitation, in order to decide the optimal timing of implanting children.
- To evaluate language and speech were fixed post-implantation periods.

## SUBJECTS AND METHODS

This research was conducted between the months of February 2018 and March 2019. Consent to participate in this research was obtained from the subjects' parents before commencement of the study. This study was performed on 20 children, who received cochlear implantation at an age range of (2 years, 4 months) to (6 years, 3 months). For the purpose of the study, they were divided into group I (GI) and group II (GII), with a cut-off age of 3 years, 8 months. GI (number=10) included children younger than 3y 8m while GII (number=10) included children who are older. Both groups received the same habilitation program of language and speech therapy based on combined group and individual therapy sessions. Language and speech scores were analyzed at a fixed post-implantation interval of 12 months. Language was analyzed

before implantation and at 1 year, interval post-implantation. Speech scores were analyzed also and compared at the 1year assessment. On the time interval (1 year) the language age deficit was calculated as the difference between the chronological age at time of evaluation and the corresponding language age score obtained at that time using the Standardized Tamil Language Test. This test measures receptive and expressive language skills giving a total language age in years.

In this analysis, age at the time of test administration may be a confounding variable because children who underwent implantation at a younger age were also younger when the 12-month post-implantation interval testing was performed. Thus, one may hypothesize that children who receive implants at an older age may perform better on these tests because they are developmentally more advanced at the time of evaluation. Thus a language improvement quotient was determined by calculating the difference between the languages ages in a period of time divided by the period of time. Speech analysis was performed using the assessment protocol which includes analysis of supra-segmental phonology (rate, stress and tonality), segmental phonology (consonants and vowels), nasal resonance and general intelligibility of speech, giving scores that ranged from 0 (normal) to 3 (denoting severe abnormality). Assessment of auditory perception skills was performed evaluating a hierarchy of listening skills ranging from detection, to discrimination, identification, recognition and comprehension. Assessment of speech reading abilities was done and expressed as percent change over time.

## DATA ANALYSIS AND INTERPRETATION

**Research Hypothesis:** There is influence between age of CI children and their language performance

**Table No – 2: One-way ANOVA difference between age of CI children and their language performance**

| Language performance | n | Mean | S.D | Statistical inference |
|---|---|---|---|---|
| **Parents Occupation** | | | | |
| Private | 18 | 4.31 | 0.418 | t=2.134<br>0.002<0.05<br>Significant |
| Government | 2 | 4.12 | 0.579 | |
| **Age** | | | | |
| 4yrs | 7 | 4.31 | 0.418 | f=1.783<br>0.006<0.05 |
| 5yrs | 7 | 4.12 | 0.579 | |

| | | | | |
|---|---|---|---|---|
| 6yrs | 6 | 4.35 | 0.671 | Significant |

One-way ANOVA '*f*' test table indicates that mean and S.D values of Private (n=18) 4.31±0.418, Government (n=02) 4.12±0.579. Therefore, there is influence between CI children parents' occupational status and their children language performance. The calculated value is greater than table value (0.002<0.05). The mean and S.D values of 4yrs age (n=7) 4.31±0.418, 5yrs (n=07) 4.12±0.579 and remaining 6yrs 4.35±0.671. Therefore, there is influence between CI children age and their language performance. The calculated value is greater than table value (0.006<0.05).The research hypothesis is accepted.

## CONCLUSION AND RECOMMENDATIONS

This is in agreement with who stated in 2018 that children benefit from cochlear implantation regardless of their age. So when comparing children in each group with themselves the results were different from when comparing them with children in the other group and the comparison was always in favor of the younger group. The early implanted group demonstrated significantly better auditory abilities, better speech production skills, and better speech intelligibility 1 year after implantation than the older implanted group. The early implanted group also ended with significantly less speech reading abilities than the older group 1 year after implantation. These results indicate the favorable effect of young age at implantation over the previous parameters. Language skills, however, did not show a significant difference in the magnitude of improvement, between the 2 groups at the evaluation 1 year after implantation. Judging the age at implantation as a prognostic factor for language improvement may require a period of follow up, longer than 1 year, allowing language either to reach its ceiling or to plateau. The results of this study are supportive of the recent trend towards early cochlear implantation 'the earlier the implantation the better the outcomes'.

## References

Brackett D, Sara CV. Communication outcomes related to early implantation. Am J Otol. 1998;19(4):453-460.

Bradham T, Jones J. Cochlear implant candidacy in the United States: prevalence in children 12 months to 6 years of age. Int J Pediatr Otorhinolaryngol 72(7):1023-1028, 2008.

Bradham T, Snell G, Haynes D. Current practices in pediatric cochlear implant. ASHA (19) 32- 42, 2009.

Holt RF, Svirsky MA . An exploratory look at pediatric cochlear implantation: Is earliest always best? Ear and Hearing, ( 29) : 492-511, 2008.

Inscoe J. Communication outcomes after paediatric cochlear implantation. Int J Pediatr Otorhinolaryngol. 1999;47:195-200.

Kileny PR, Zwolan TA, Ashbaugh C. The Influence of Age at Implantation on Performance with a Cochlear Implant in Children. Otol Neurotol. 2001;22(1):42-46.

Lee DS, Lee JS, Oh, et al. Cross-modal plasticity and cochlear implants. Nature. 2001;409(6817):149-150.

Nikolopoulos TP, Archbold SM, O'Donoghue GM. The development of auditory perception in children following cochlear implantation. International Journal of Pediatric Otorhinolaryngology. 1999;49(Supple 1):189-191.

Paul PV, Quigley SP. Language and deafness. San Diego, CA: Singular Publishing Group, Inc. 1994; 97-144.

Ryals BM, Rubel EW & Lippe W. Issues in neural plasticity as related to cochlear implants in children. Am J Otol. 1991;12 (supply): 22-27.