A longitudinal study on Speech Perception as Effect of Age at implantation in 50 Prelingually deaf children.

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Introduction

Early identification of a hearing loss followed by intervention, during the first six months of life significantly increases the level of language and speech (perception and production) compared to children with later identification and intervention. Children achieve higher levels of linguistic, academic and social skills when detection, diagnosis and intervention of a hearing loss begins at an early age (Yoshinaga-Itano et al, 2000 al).

Cochlear Implants (CIs) provide direct stimulation to the central auditory nervous system of hearing impaired children allowing cortical development to progress. But CI intervention needs to take place in early childhood to be maximally effective to allow children to acquire speech perception and production and oral language. When children receive CI after the end of the sensitive period it was observed consequences for cortical re-organization (Sharma and Campbell, 2011)

Published data indicate a wide range of performance among pediatric implantees. Waltzman et al (2000) categorized some variables affecting speech perception in children, and age at time of implantation was pointed as one of those variables.

Objective

To study the effect of age at the time of implantation on speech perception in five groups of age-matched children with no other disabilities.

Materials and methods

Children of the study were selected from the population of children with prelingual deafness who were implanted at the Cochlear Implant Center "Prof. Diamante", Buenos Aires, Argentina.

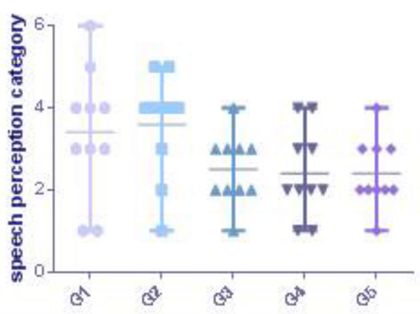
Children were divided into 5 groups based on age at CI:

Group1(N=10): prior to 2 years of age
Group2(N=10): between 2 years and 2 years 11 months
Group3(N=10): between 3 years and 5 years 11 months
Group4(N=10): between 6 years and 8 years 11months
Group5(N=10): between 9 years and 11 years 11 months

All 50 children had no other handicaps, normal cochleae with full insertion of the electrode array, without surgical complications.
All the subjects were enrolled in intervention programs following diagnosis. They are all receiving auditory, speech and language habilitation, and have parental and academic support (oral programs).

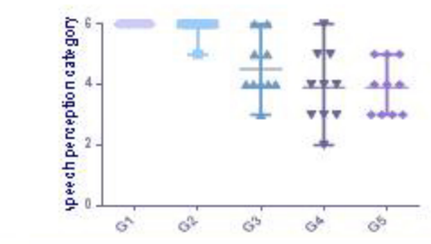
Results

6 m post- CI. No statistically significant differences among the groups.



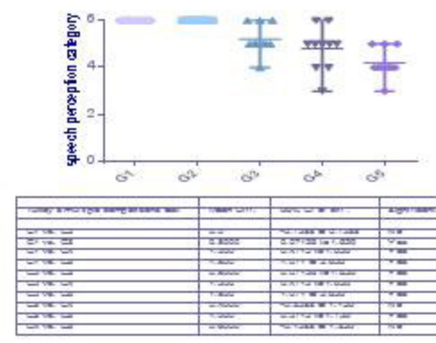
Tukey's multiple comparisons test	Mean Diff.	95% CI of diff.	Significant?	Summary
G1 vs. G2	-0.2000	-1.689 to 1.289	No	ns
G1 vs. G3	0.9000	-0.5885 to 2.389	No	ns
G1 vs. G4	1.000	-0.4885 to 2.489	No	ns
G1 vs. G5	1.000	-0.4885 to 2.489	No	ns
G2 vs. G3	1.100	-0.3885 to 2.589	No	ns
G2 vs. G4	1.200	-0.2885 to 2.689	No	ns
G2 vs. G5	1.200	-0.2885 to 2.689	No	ns
G3 vs. G4	0.1000	-1.389 to 1.589	No	ns
G3 vs. G5	0.1000	-1.389 to 1.589	No	ns
G4 vs. G5	0.0	-1.489 to 1.489	No	ns

12 m post- CI. G1 and G2 vs G3, G4 and G5, statistically significant differences



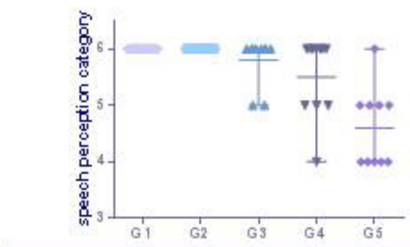
Tukey's multiple comparisons test	Mean Diff.	95% CI of diff.	Significant?	Summary
G1 vs. G2	0.0	-0.6156 to 0.6156	No	ns
G1 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G1 vs. G4	1.600	0.3844 to 2.816	Yes	**
G1 vs. G5	1.400	0.1844 to 2.616	Yes	*
G2 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G2 vs. G4	1.600	0.3844 to 2.816	Yes	**
G2 vs. G5	1.400	0.1844 to 2.616	Yes	*
G3 vs. G4	0.8000	-0.4156 to 2.016	No	ns
G3 vs. G5	0.6000	-0.6156 to 1.816	No	ns
G4 vs. G5	-0.2000	-1.416 to 1.016	No	ns

18 m post-CI G1 and G2 vs G3, G4 ,G5 statistically significant differences. G3 vs G5 statistically significant differences



Tukey's multiple comparisons test	Mean Diff.	95% CI of diff.	Significant?	Summary
G1 vs. G2	0.0	-0.6156 to 0.6156	No	ns
G1 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G1 vs. G4	1.600	0.3844 to 2.816	Yes	**
G1 vs. G5	1.400	0.1844 to 2.616	Yes	*
G2 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G2 vs. G4	1.600	0.3844 to 2.816	Yes	**
G2 vs. G5	1.400	0.1844 to 2.616	Yes	*
G3 vs. G4	0.8000	-0.4156 to 2.016	No	ns
G3 vs. G5	0.6000	-0.6156 to 1.816	No	ns
G4 vs. G5	-0.2000	-1.416 to 1.016	No	ns

24 m post-CI: G1, G2, G3 and G4 vs G5, statistically significant differences



Tukey's multiple comparisons test	Mean Diff.	95% CI of diff.	Significant?	Summary
G1 vs. G2	0.0	-0.6156 to 0.6156	No	ns
G1 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G1 vs. G4	0.8000	-0.7156 to 2.316	No	ns
G1 vs. G5	1.400	0.1844 to 2.616	Yes	*
G2 vs. G3	0.8000	-0.4156 to 2.016	No	ns
G2 vs. G4	0.8000	-0.7156 to 2.316	No	ns
G2 vs. G5	1.400	0.1844 to 2.616	Yes	*
G3 vs. G4	0.0000	-1.216 to 1.216	No	ns
G3 vs. G5	1.200	0.3682 to 2.032	Yes	***
G4 vs. G5	0.8000	0.3682 to 1.232	Yes	***

Conclusion

Our results are in agreement with other studies that show that age at implantation correlates with improved speech perception after CI. (Waltzman, 2000, Govaerts et al, 2002, Zwolan et al, 2004 , Tajudeen et al, 2010, Hernan et al. 2012).

In this study of 50 children implanted between 12 months and 11 years 11 months, earlier implantation before 3 years, resulted in a better rate of speech perception adquisition abilities, with more rapid progress in auditory performance. These children had no other handicaps, they are all receiving auditory, speech and language habilitation, and have parental and academic support (oral programs)

We also observed improvement in speech perception, in all the other groups, even the group of children implanted later. It means that there is not a lack of benefit in relation with speech perception following cochlear implantation at a later age. Children implanted later also showed pre to post CI improvement. But, we consider that no single factor is sufficient to reliably predict speech perception and language outcomes in all patients.

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