

Research on Pronunciation Ability of Vietnamese Syllable Components before and after Using Cochlear Implants of Some Pre-School Children Groups (Case Study)

Van Tu Anh, MA.

Institute of Linguistics, Vietnam Academy of Social Sciences

Abstract: *This study is one in my research direction that being carried out in the past few years. This focuses on the communication ability of deaf children at some facilities treating deaf children in Hanoi. The study aims to determine the effect of cochlear implantation on hearing and speech of children with hearing impairment (deaf children) so that conclusions and recommendations can be made for the treatment and language learning of deaf children in Hanoi and the whole country. The study was conducted at Sunny AVT Center for Deaf Children in Hanoi in 2021 on the 25 deaf children in the center (Among them are 16 boys and 9 girls with Cochlear implants aged from 3-48 months). The study is carried out on 2 points of time: before and after hearing impaired children received Cochlear implants. Before Cochlear implant's Materials are records and notes of pronunciation ability of children with hearing aids and those materials after Cochlear implant's are videos of pronunciation ability. Research results show that cochlear implants is much superior than hearing aids. The great effect of the Cochlear implantation on the correct pronunciation of Vietnamese syllable components of the children is proved.*

Keywords: pronunciation ability; syllable components; pre-school children groups; Vietnamese

1. Aim of the Study

By comparing the ability of pronunciation of Vietnamese syllable components at 2 time points (before and after implantation of the Cochlear's) of the investigated children, this study aims to the impact of the implantation of Cochlear's and hearing therapy on the ability of pronunciation of Vietnamese syllable components in individual lessons of the deaf children.

2. Research Objectives

By comparing the ability of pronunciation of Vietnamese syllable components at 2 time points (before and after cochlear implantation) of the studied children, the study shows the impact of Cochlear's implantation. Cochlear's and the impact of hearing therapy on the pronunciation of Vietnamese syllable components in individual lessons of the deaf children.

3. Materials and Methods

This study was conducted at Sunny AVT Center for Deaf Children in Hanoi in 2021. The number of deaf children is 25, of which:

- There are 22 children with profound hearing loss and 3 children with severe hearing loss.
- Divided into 6 groups for survey, in each group there are subgroups, classified according to criteria of cochlear age of hearing impaired children.
- *Gender:* 16 boys and 9 girls.
- *Age:* Cochlear implant age: 3-48 months; Hearing Age: 0-48 months (before cochlear implantation) and 3-73 months (after cochlear implantation);

Speech Therapy Age: 0-48 months (before cochlear implantation) and 3-73 months (after cochlear implantation);

Age at survey: from 19-77 months (before cochlear implantation) and 29-103 months (after cochlear implantation).

- In this study, we have applied the following research methods: Field survey method, Auditory method, Analytical and synthesis method, Descriptive method.
- Study time: 2 time points (before and after hearing impaired children received Cochlear implants.)
- Types of materials:

The first type: The questionnaires assessing the language ability of the surveyed children are kept at the therapy facility. Each child has 2 ratings: 1) At the time before Cochlear transplant. 2) At the time point after Cochlear implantation.

The second type: Video files recording images and speech of the surveyed children (in individual classes in the therapy facility).

Third category: In-depth interviews with experts on children receiving cochlear implants, teachers directly teaching children, and caregivers.

4. Results

4.1 Tones

4.1.1. Tones in Vietnamese

In Vietnamese there are 6 tones in the order as follows: 1. *Ngang* (even) 2. *Huyền* (grave), 3. *Sắc* (acute) 4. *Hỏi* (hook above) 5. *Ngã* (tilde) and *Nặng* (dot under). \

4.1.2. Before transplant

5/6 groups could and 1/6 groups could not pronounce tones; groups of children with disabilities can pronounce at least 2 tones: 1, 2; up to 5 bars: 1, 2, 4, 5, 6.

4.1.3. After transplant

6/6 groups could pronounce tones, the number of tones pronounced varies from group to group; groups of children with disabilities could pronounce at least 4 tones: 1, 2, 5, 6; up to 6 tones: 1, 2, 3, 4, 5, 6.

4.1.4. Comparison of post-implantation and pre-implantation

Comparing pre-implantation and post-implantation, only 1 group of hearing impaired children could pronounce 1 more sound (group 1st: tone 3).

4.2. Initial phoneme**4.2.1. Before transplant**

1/6 groups could not pronounce the initial phonemes (group 4), 5/6 groups could pronounce the initial phonemes; groups of children with disabilities could pronounce:

- At least 3 initial phonemes, including 2 types of consonants (lip, throat): 2 lip consonants: /b/, /m/; 1 pharyngeal consonant: /ʔ/;
- Maximum 13 initial sounds, including 5 types of consonants (lips, tip of tongue, throat, surface of tongue, base of tongue): 3 labial consonants: /b/, /m/, /v/; 5 tongue consonants: /t/, /d/, /z/, /s/, /n/; 2 throat consonants: /ʔ/, /h/; 1 lingual consonant: /c/; 2 tongue root consonants: /k/, /ŋ/.

4.2.2. After transplant

All 6/6 groups can pronounce the initial phonemes; groups of children with disabilities can pronounce:

- At least 14 initial phonemes, including 5 types of consonants (lips, tip of tongue, throat, surface of tongue, base of tongue): 3 lip phonemes: /b/, /m/, /v/; 6 lingual phonemes: /t/, /tʰ/, /d/, /z/, /s/, /n/; 2 throat phonemes: /ʔ/, /h/; 1 lingual phoneme: /c/; 2 tongue root phonemes: /k/, /ŋ/;
- Up to 20 initial phonemes, including 5 groups of consonants (lips, tip of tongue, throat, surface of tongue, base of tongue): 5 lip phonemes: /b/, /m/, /f/, /v/, /p/; 7 lingual phonemes: /t/, /d/, /z/, /s/, /tʰ/, /l/, /n/; 2 throat phonemes: /ʔ/, /h/; 2 lingual phonemes: /c/, /j/; 4 tongue root phonemes: /k/, /ŋ/, /ʒ/, /N/.

4.2.3. Comparison of post-implantation and pre-implantation

Comparing pre-implantation and post-implantation, the groups of children with disabilities have done more pronunciation (depending on the group):

From 7 initial phonemes (group 4, including 4 types of consonants: lips, tip of tongue, surface of tongue, base of tongue): 2 lip phonemes (/f/, /p/); 2 lingual phonemes: (/tʰ/, /l/); 1 lingual phoneme (/j/); 2 tongue root phonemes (/ŋ/, /N/).

To 16 initial phonemes (groups 3 and 5, including 5 types of consonants: lips, tip of tongue, throat, surface of tongue,

base of tongue): 3 lip phonemes (/b/, /m/, /v/); 6 tongue phonemes (/t/, /d/, /z/, /s/, /tʰ/, /n/); 2 throat phonemes (/ʔ/, /h/); 1 lingual phoneme (/c/); 4 tongue root phonemes (/k/, /ŋ/, /ʒ/, /N/).

4.3 Pretonic Phoneme**4.3.1. Before transplant**

Before implantation, all 6/6 groups of hearing impaired children could not pronounce the accompaniment /w/.

4.3.2. After transplant

After implantation, 5/6 groups could pronounce the accompaniment /w/ only 1/6 groups could not pronounce this phoneme.

4.3.3. Comparison of post-implantation and pre-implantation

Comparing pre-implantation and post-implantation, most of the hearing impaired children groups have ability of pronouncing the pretonic phoneme /w/.

4.4. Main phoneme**4.4.1. Before transplant**

There are 5/6 groups could pronounce the main phoneme and 1/6 groups could not pronounce them (group 5). Groups of children with disabilities could pronounce:

- At least 4 main phonemes, 4 long single vowels: /a/, /Φ/, /E/, /o/;
- To 12 main phonemes, including 3 types: 9 long single vowels: /i/, /e/, /E/, /œ/, /Φ/, /a/, /u/, /o/, /□/; 2 short single vowels: /ä/, /Φ() and 1 diphthong: /u¹o/.

4.4.2. After transplant

All 6/6 groups can pronounce the main phonemes. Groups of children with disabilities can pronounce:

- At least 7 main phonemes, including 3 types: 4 long single vowels: /i/, /a/, /E/, /□/; 2 short single vowels: (/Φ(, /ä/; 1 diphthongs: /œ¹Φ/;
- Up to 14 main phonemes, including 3 types: 9 long single vowels: /a/, /E/, /□/, /o/, /i/, /e/, /œ/, /u/, /Φ/; 2 short single vowels: (/Φ(, /ä/) and 3 diphthongs: /i¹e/, /œ¹Φ/, /u¹o/.

4.4.3. Comparing post-implantation and pre-implantation

Comparing pre-implantation and post-implantation, groups of hearing impaired children have pronounced more phonemes after transplant (depending on group):

- From 3 main phonemes (group 2nd, 3 diphthongs: /i¹e/, /œ¹Φ/, /u¹o/)
- To 14 main phonemes (group 5, 3 types: 9 long single vowels: /a/, /E/, /□/, /o/, /i/, /e/, /œ/, /u/, /Φ/; 2 short single vowels: (/Φ(, /ä/ and 3 diphthongs: /i¹e/, /œ¹Φ/, /u¹o/).

4.5. Final phonemes**4.5.1. Before transplant**

Before implantation, 3/6 groups could pronounce the final phonemes (groups: 3, 4, 5), 3/6 groups could not pronounce

those. Before implantation, groups of children with disabilities could pronounce:

- At least 1 last syllable, including 1 type (semi-vowel): 1 semi-vowel: /i≈/;
- Maximum 7 final phonemes, including 3 types: 2 semi-vowels: /u≈/, /i≈/; 2 nasal resonant consonants: /m/, /N/; 3 stop consonants: /p/, /t/, /k/.

4.5.2. After transplant

After implantation, 4/6 groups could pronounce the last phonemes and 2/6 groups could not pronounce those. After implantation, groups of children with disabilities can pronounce: At least 1 final phoneme, including 1 type (semi-vowel): 1 semi-vowel: /i≈/; Maximum 8 final phonemes, including 3 types: 2 semi-vowels: /u≈/, /i≈/; 3 nasal consonants: /m/, /n/, /N/; 3 stop consonants: /p/, /t/, /k/.

4.5.3. Comparing post-implantation with pre-implantation

Comparing pre-implantation and post-implantation, some groups of hearing impaired children pronounced more phonemes after transplant (varied in groups):

- *Group 6th*: 1 semi-vowel (/i≈/) and 6 final phonemes includes 3 types (semi-vowels, nasal resonant consonants, blocked consonants);
- *Group 1st*: 1 semi-vowel (/u≈/); 3 nasal resonant vowels (/m/, /n/, /N/); 2 stop consonants (/p/, /t/).

5. Comparing the pronunciation ability of Vietnamese syllable components before and after cochlear implantation of the surveyed groups of children

5.1. Comparison of the number of Vietnamese syllable components before and after cochlear implantation in the pronunciation of the surveyed groups of children

5.1.1. Before transplant

Before implantation, the total number of pronounceable syllable components in all groups is 4: *tone, initial phoneme, main phoneme* and *final phoneme*. Before implantation, the children had difficulty with all 5/5 components, Pre-implantation pronunciation accuracy was very poor, less than 50%.

5.1.2. After transplant

After implantation, the total number of pronounceable syllable components of 6 groups is 5 (out of 4 types of syllables): *tone, initial phoneme, pretonic phoneme, main phoneme, and final phoneme*.

5.1.3. Comparing post-implantation and pre-implantation

Comparing with pre-implantation the post-implantation of hearing impaired children has made great progress, that reflected in the bigger number of syllables and syllable types. Accordingly, the number of syllable components that pronounced correctly by hearing impaired children is also greater.

After implantation, they correctly pronounce all 5/5 syllable components. In which, 3/5 components (tone, first sound,

main sound) were pronounced more correctly than before implantation (70-90%). The timbre, voice quality, pitch, intensity and duration are also much more natural and easy to hear.

5.2. Comparing the number of children who could and could not pronounce Vietnamese syllable components before and after cochlear implantation

5.2.1. Pronounceable Phonemes

5.2.1.1. Before transplant

Before implantation, 5/6 groups could pronounce 3 syllable components (the tone, initial phoneme, main phoneme); No groups could pronounce the pretonic phoneme; 2/6 groups could pronounce the final phoneme.

5.2.1.2. After transplant

After implantation, 6/6 groups could pronounce 3 syllable components (tone, initial phoneme, main phoneme); 5/6 groups could pronounce the pretonic phoneme; 4/6 groups could pronounce the final phoneme.

5.2.2. Unpronounceable Phonemes

5.2.2.1. Before transplant

Before implantation, 1/6 groups could not pronounce the tones (group 4th), 1/6 groups could not pronounce the initial phonemes (group 4th), 1/6 groups could not pronounce the main phoneme (group 5th); 4/6 groups could not pronounce the final phoneme (4 groups: 3, 4, 5, 6); 6/6 groups could not pronounce the pretonic phoneme.

5.2.2.2. After transplant

After implantation, 1/6 groups could not pronounce the pretonic phoneme (group 3rd), 2/6 groups could not pronounce the final phoneme (groups: 4, 5).

5.3. The order of syllable components pronounced by the groups of children surveyed before and after cochlear implantation (according to difficulty)

5.3.1. Before transplant

Before implantation of the Cochlear's devices, 3 basic syllable components (*the tones, initial phonemes, main phonemes*) were not a big problem to pronoun for the groups of children surveyed. The reason is that all the groups of children are given hearing aids (in one or both outer ears).

5.3.2. After transplant

After implantation, for groups of children with disabilities, correct pronunciation of *the pretonic* and *final phonemes* is still difficult. Besides, the correct pronunciation of *the tones, the initial and the main phonemes* is no longer difficult. So, after transplanting; the 4 important syllable components (*the tone, the initial phoneme, the main phoneme*) and *the main phoneme* are no longer difficult for the surveyed groups of children.

Thus, without looking at the mouth shape of the children, before implantation, the pretonic phoneme is the most difficult element for them to pronounce, then in turn, the final the tone, the initial and the main phonemes.

This shows two things: 1) Cochlear implants is much superior than hearing aids, 2) The great effect of the implantation of cochlears on the correct pronunciation of Vietnamese syllable components of the groups of children with disabilities is proved.

6. Conclusion

1) Relationship between age and ability of pronunciation of Vietnamese syllable components before and after cochlear implantation of surveyed children groups

1.1. Correlation between age and ability to pronounce Vietnamese syllable components before and after cochlear implantation of surveyed groups of children

Normally, after Cochlear implanting, the number of syllable components that the children with disabilities can pronounce will be proportional to the age (age of the Cochlear implant, age of children life at the time of survey, age of listening and age of Auditory Verbal Therapy, age of children life at the time of cochlear implantation): The older the children with these ages are, the more syllable components they can pronounce.

Before implantation, the number of syllable components that children with disabilities can pronounce will be proportional to the ages (age of Life at the time of the survey, age of Listening and age of Auditory Verbal Therapy: the older the child with these ages is, the greater number of syllables and syllable components that he/she can pronounce.

1.2. The age order has the strongest impact on the ability to pronounce Vietnamese syllable components before and after cochlear implantation of the surveyed groups of children

In the above-mentioned ages, whether before implantation or post-implantation, the age of Listening and the age of Auditory Verbal Therapy (AVT age) have the strongest impact on the number of syllable components of the children with disabilities, the older these two years are, the more pronounced most children with disabilities can be. syllable composition; The age of life when implanting a smart phone is not a strong factor, it is not that every age when the implant is smaller (earlier), more syllable components can be pronounced.

However, there are also exceptions, after implanting a Cochlear, not every child with a life age at the time of the survey, the age of the Cochlear, the age of hearing, the age of the brain, and the age of life at the time of implantation can pronounce many components. more syllables, and vice versa. Children with disabilities who have a lifespan at the time of the survey, the age of cochlear implants (CIs), the age of Listening, the age of the mental abilities are older, implanted earlier, heard earlier, can pronounce more syllable components than children with those ages less, implant later, listen later.

2) The role of early intervention in the development of the pronunciation ability of Vietnamese syllables of the surveyed groups of children

Early intervention includes steps: 1) Early detection of hearing loss right after birth; 2) Early use of hearing aids (wearing hearing aids and cochlear implants) in the golden age to learn hearing and speaking (6 months to 24 months of life, the sooner the better); 3) Receive hearing and speech therapy by Auditory Verbal Therapy method at specialized and integrated therapy facilities right after wearing hearing aids and cochlear implanted.

Early intervention plays a leading role in the development of the pronunciation ability of Vietnamese syllables of the surveyed groups of children.

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