

인공와우 이식 후 반대 귀의 보청기 착용이 어음 변별력에 미치는 영향

한림대학교 일반대학원 학과간협동과정 언어청각학과,¹ 한림대학교 자연과학대학 언어청각학부²

홍 빛 나¹ · 김 진 숙^{1,2}

ABSTRACT

Binaural Benefits for Children who Use Hearing Aids and Cochlear Implants

Bin -Na Hong¹ and Jin -Sook Kim^{1,2}

¹Speech Pathology & Audiology, Inter -Disciplinary Program, Graduate School, Hallym University, Chuncheon, Korea,

²Department of Speech Pathology & Audiology, College of Natural Sciences, Hallym University, Chuncheon, Korea

Objective : The purpose of this study was to document word discrimination abilities in children who use a cochlear implant in one ear and a hearing aid in the other ear. **Method** : Twenty-one children participated in this study. All children used a cochlear implant and a hearing aid which was fitted using the NAL-NL1 prescription. Performance in word discrimination was assessed under four noise conditions (N/O, N/F, N/CI, N/HA) and three aided conditions (CI, HA, CI/HA). **Results** : Binaural performance by CI/HA was better than monaural performance by CI or HA in four noise conditions. This is indicated by the significantly higher CI/HA word discrimination scores compared with CI scores and HA scores. A significant correlations were found between CI scores and CI/HA scores in word discrimination. **Conclusion** : We have shown that the use of a hearing aid and a cochlear implant in opposite ears results in binaural advantages in word discrimination. Therefore, it is recommended that bimodal stimulation be the standard practice for clinical management of children and adults who wear unilateral cochlear implants.

KEY WORDS : Binaural hearing · Cochlear implant · Hearing aid · Word discrimination.

INTRODUCTION

(Cochlear implant) Tyler 가
1957 Djourno 가
& Eyries (binaural hearing) 가

1)

가

: 2005 11 9

: 2005 11 30

교신저자 : 홍빛나, 135 - 080

705 - 26

가 가

: (02) 562 - 6119 · : (033) 256 - 3420

E - mail : habina2@hanmail.net

가

Shallop
 3) 7

Dooley 4)
 Armstrong 5) 4

Ching 6) 21

Hamzavi 7) 7

Ching 8) 16

Dettman 9) 16

가 가 가 가 가

가 가 가

가 가

MATERIALS AND METHODS

연구대상

21

1.3

21 10
 11 4.5 11.5
 7.9 가 10
 2 , 21 9
 MED - EL , 8 Clarion
 4 Nucleus
 12 0.5, 1, 2 kHz (Puretone Thre-
 shold Average, PTA) 102.9 dBHL ,
 30.9 dBHL 47.8 dBHL
 가 17 dB
 1 kHz HA 가 CI
 10 dB 2 kHz 가
 30 dB (Fig. 1).

검사도구

ECKEL
 single room single wall Bruel & Kjar
 Model 2260 25~30 dBA SPL
 GSI 61
 Siemens Triano SP
 fitting Siemens fitting

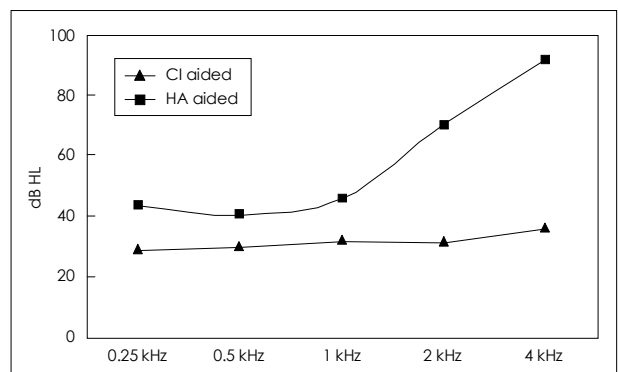


Fig. 1. Means of CI and HA aided threshold at 0.25, 0.5, 1, 2 and 4 kHz.

NAL - NL1 (National Acoustic Laboratories Non-Linear Version 1) fitting

1 4 10
(HU - WDP) ' .¹⁰⁾

연구절차가

가 가

가

(insertphone) 0.25, 0.5, 1, 2, 4 kHz

가

NAL - NL1

가

45° 1 m
(warble tone) 가

가 65 . 10

dBa 가 가 100%

(N/O), 55 dBA (sp- 분석방법
speech noise) (N/F), SPSS 11.0 WINDOW
(N/C), one - way ANOVA repeated design
(N/HA) Pearson
가 (CI), t - test
(HA), (CI/
HA) 가 12
(Fig. 2).

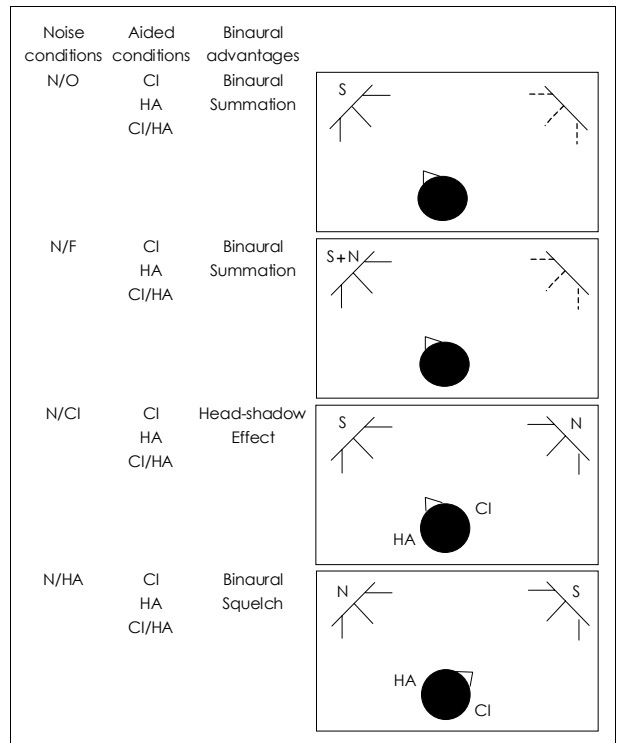


Fig. 2. Four noise conditions (N/O, N/F, N/CI, N/HA) and three aided conditions (CI, HA, CI/HA).

WDP 10 1 HU - 60

가

60

가

1 m

90° 1 m

65 dBA

2 가

가

각 소음 환경에서 증폭기 착용 상태에 따른 어음 변별력

가

(Fig. 3).

HA

CI

. CI CI/HA

HA

가 N/O 가

. CI CI/HA

RESULTS

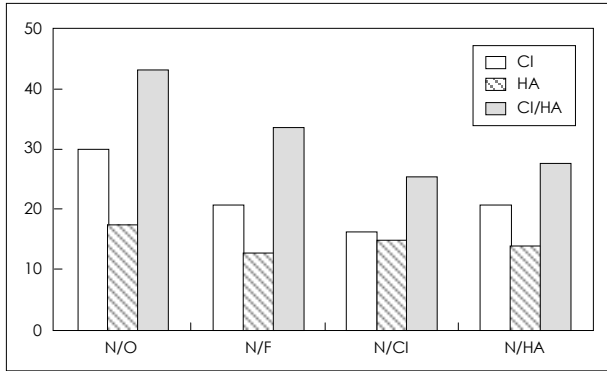


Fig. 3. Means of words discrimination scores of three aided conditions (CI, HA, CI/HA) and four noise conditions (N/O, N/F, N/CI, N/HA).

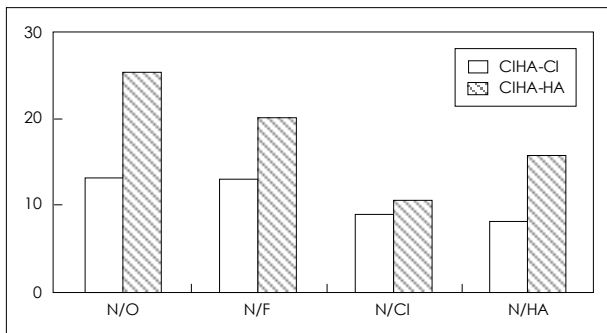


Fig. 4. Means of words discrimination score differences of three aided conditions (CI, HA, CI/HA) and four noise conditions (N/O, N/F, N/CI, N/HA).

N/CI 가 CI가 HA
 CI가 HA
 가
 가 (p<.05). Scheffe
 N/O, N/F N/CI
 HA CI CI/HA CI CI/HA
 가 , HA CI/HA CI CI/HA
 가 . HA CI
 , HA CI
 CI/HA
 . N/HA HA CI/HA
 가 . HA CI/HA
 , CI CI/HA
 가 가
 가
 가 (p<.05).

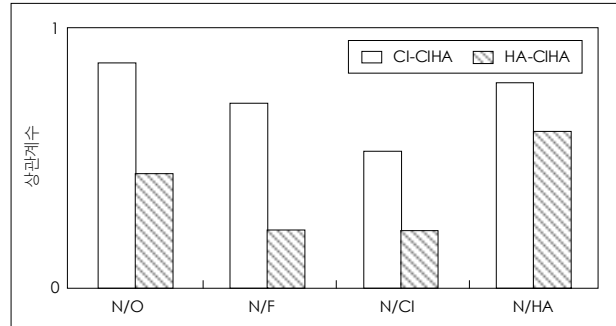


Fig. 5. Pearson correlations between CI and HA scores and CI/HA scores in word discrimination.

증폭기 착용 상태에 따른 어음 변별력의 이득 차

(Fig. 4). ' CI/HA -
 CI ' CI/HA CI
 HA 가 , ' CI/HA -
 HA ' HA CI/HA
 CI . N/O CI
 HA 13% , N/F
 8%, N/CI 0.5% N/HA
 7% . N/CI
 가
 가 (p<.05).

증폭기 착용 상태에 따른 어음 변별력의 상관관계

CI HA
 CI/HA (Fig. 5).
 CI CI/HA N/O
 가 0.87 N/CI 0.52
 가 . HA CI/HA
 N/HA 0.6 가
 CI/HA CI CI/HA HA
 , CI CI/HA 가
 HA
 HA - CI/HA N/F N/CI
 가 (p<.05).

인공와우 이식 연령에 따른 어음 변별력 비교

21	6	6
	5.24	10.27

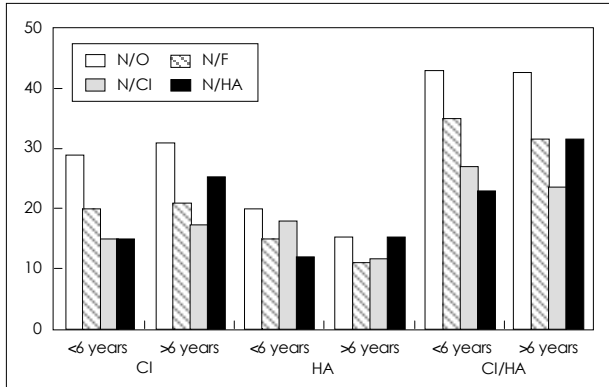


Fig. 6 Age effect of three aided conditions (CI, HA, CI/HA) and four noise conditions (N/O, N/F, N/CI, N/HA).

t - test

1.2 6 1.4 6

CI N/O N/F N/CI N/HA

6 10% 6

6 5~ 5 N/HA 가

7% , N/HA 6 1~4% N/O CI/HA 6 8% 6

(Fig. 6).

DISCUSSION

CI HA CI/HA

가 가

가

CI HA CI/HA

가

CI/HA CI

12~13%가

Ching ⁸⁾ 16

SNR 10 dB

CI CI/HA HA

가 CI CI/

HA N/CI CI

CI/HA N/F 가 N/HA

N/CI CI

CI/HA CI HA

CI HA

Gantz ¹¹⁾ 10 가

N/CI 10 N/HA

10 5 5 CI 12

6 5 N/HA 가

CI/HA 가 CI

가 가

CI HA NAL -

NA1 HA HA

가 HA 가 CI

가 HA 가

Muller ¹²⁾ 가

가

가 가 3.8 가

¹³⁾

Blamey ¹⁴⁾ fitting 가 6 6~12 1.5
 가 Ching ⁶⁾ 가 ¹⁶⁾ 6 1.4 6 가
 가 가 1.2 6 1.4 가 Zwolan
 가 ¹⁷⁾ 2 11 가
 CI/HA CI HA가 2
 가 HA CI/HA CI 3
 CI CI/HA CI/HA CI/HA
 HA CI Mondain ¹⁵⁾ 가 21 가
 CI 가 1.3
 6 CI 1
 , HA CI/HA 6 가 가
 N/HA CI 6
 가 HA 6
 가 N/HA 6 가가
 N/HA 6 가 가
 6 가 가
 가 가
 가 가
 가 가
 가 가

CONCLUSION

21
가 . 가
가 . 가
가 . 가 HA CI
CI HA . HA CI
CI HA
가
CI CI/HA
가 CI가
6

REFERENCES

1. Dowell RC, Martin LFA, Clark GM. Results of a preliminary clinical trial on a multiple channel cochlear prosthesis. *Annals Otology, Rhinology, Laryngology*. 1985;94:244-250.
2. Tyler R, Gantz B, Rubinstein J. Three-month results with bilateral cochlear implants. *Ear Hear*. 2003;12:80-89.
3. Shallop JK, Arndt PL, Turnacliiff KA. Expanded indications for cochlea implantation: perceptual results in seven adults with residual hearing. *Journal of Spoken Language Pathology Audiology*. 1992;16:141-148.
4. Dooley GJ, Blamey PJ, Seligman PM, Alcantara JZ, Clark GM, Shallop JK, et al. Combined electrical and acoustical stimulation using a bimodal prosthesis. *Archives of Otolaryngology Head and Neck Surgery*. 1993;119:55-60.
5. Armstrong M, Pegg P, James C, Blamey P. Speech perception in noise with implant and hearing aid. *American Journal of Otology*. 1997;18:140-141.
6. Ching TYC, Incerti P, Hill M. Binaural benefits for adults who use hearing aids and cochlear implants in opposite ears. *Ear & Hearing*. 2004;25:9-21.
7. Hamzavi J, Marcel-Pok S, Gstoettner W, Baumgartner WD. Speech perception with a cochlear implant used in conjunction with a hearing aid in the opposite ear. *International Journal of Audiology*. 2004;43:61-65.
8. Ching TYC, Psarros C, Hill M, Dillon H, Incerti P. Should children who use cochlear implants wear hearing aids in the opposite ear?. *Ear & Hearing*. 2001;22:365-380.
9. Dettman SJ, D'Costa WA, Dowell RC, Winton EJ, Hill KL, Williams SS. Cochlear Implants for Children with significant residual hearing. *Archives of Otolaryngology Head and Neck Surgery*. 2004;130:612-618.
10. Bang JH. A study on the development of a word discrimination test by picture. Graduate school of social welfare, Hallym university;2002.
11. Gantz BJ, Tyler RS, Rubinstein JT, Wolaver A, Lowder M, Abbas P, et al. Binaural cochlear implants placed during the same operation. *Otology & Neurotology*. 2002;23:169-180.
12. Muller J, Schon F, Helms J. Speech understanding in quiet and noise in bilateral users of the MED-EL COMBI 40/40+ cochlear implant system. *Ear Hear*. 2002;23:198-206.
13. Eisenberg LS, Kirk KI, Martinez AS, Ying EA, Miyamoto RT. Communication abilities of children with aided residual hearing. *Archives of Otolaryngology Head and Neck Surgery*. 2004;130 (May) :563-569.
14. Blamey PJ, Dooley GJ, Parisi ES. Monaural and binaural loudness measures in cochlear implant users with contralateral residual hearing. *Ear & Hearing*. 2000;21:6-17.
15. Mondain M, Sillon M, Vieu A, Levi A, Artieres FR, Peguine O, et al. Cochlear implantation in prelingually deafened children with residual hearing. *International Journal of Pediatric Otorhinolaryngology*. 2002;63:91-97.
16. Svirsky MA, Meyer TA. Comparison of speech perception in pediatric clarion cochlear implant and hearing aid users. *Annals Otology, Rhinology, Laryngology Supplement*. 1989;108:104-109.
17. Zwolan TA, Ashbaugh CM, Alarfaj A, Kileny PR, Arts HA, El-kashlan HK, Telian SA. Pediatric cochlear implant patient performance as a function of age at implantation. *Otology & Neurotology*. 2004;25:112-120.

□ 부록 : 배경정보 설문지와 HU-WDP □

Audiological History

(,)

1.

2.

3.

?

4.

?

5.

?

6.

?

가

HU-WDP

: _____	: / /	: M / F
: / /	: _____	
: _____	headphone/insertphone/speaker	

I ()			II ()			III ()			IV ()		
HL											
%			%			%			%		