

Relationship of Language Development and Hearing Status in Children with Cleft Lip and Palate

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Objective: To investigate the relationship of language development and hearing status in children with cleft lip and/or palate.

Material and Method: Data were collected from hospital records of 225 children with cleft lip and palate and cleft palate who underwent language and hearing assessment between June 2007 and September 2010 at Srinagarind Hospital, Khon Kaen University. Descriptive data of the language and hearing evaluation were presented.

Results: There was no significant correlation of language development and hearing status in children with cleft lip and/or palate. The predominant type of hearing loss that is found in normal and delay language development groups was bilateral conductive hearing loss. The sex and cleft types bore no correlation with language delays.

Conclusion: The results of current research indicate language development of children with cleft lip and/or palate does not depend on degree of hearing loss.

Keywords: Language development, Hearing status

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Cleft lip and/or palate are a common congenital anomaly in the Thai population. The incidence of cleft lip and/or palate was reported to be 1.10 and 2.49 per 1,000 live births⁽¹⁾. Hearing impairment has been reported as a common co-morbidity with cleft palate and the presence of peripheral hearing loss in this group has been well documented. Middle ear disease is a universal finding in children with cleft palate. The incidence of such conditions as otitis media with effusion (OME) and acute otitis media (AOM) in this groups has been reported to be at least 90%, even after repair of the cleft⁽²⁻⁴⁾. This condition leads to conductive hearing loss and continues to exist for several years if left untreated-usually from birth until eight or nine years of age.

The typical consequences of hearing loss include significant delays in language development and academic achievement. These delays are apparent for both children with mild to moderate hearing loss^(5,6) as well as for those whose losses fall in the severe and profound ranges⁽⁷⁾. The literature clearly indicates that

a mild hearing loss is a serious handicap to an infant learning language and to a child in the classroom. The loss may be serious enough to affect verbal performance on an IQ test or other language-associated measures of aptitude⁽⁶⁾. In contrast, other studies⁽⁸⁻¹⁰⁾ report that if hearing loss, which is caused by otitis media, seems to be compensated for or disappears during the preschool age or later, there was no effect on language development.

Generally, it is expected that children will start making sounds between 2 and 3 months of age and babble between 6 and 10 months of age. Children typically start using real words between 12 and 14 months of age, and able to construct sentences three to five words by the age of 3 years⁽¹¹⁻¹³⁾. If the children of 24 months of age who produce fewer than 50 words can be considered as performing at a level below the normal expressive language range and may be at risk for chronic communication handicaps^(14,15).

The purpose of the current study was to investigate the relationship of language development and hearing status in children with cleft lip and/or palate at Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.

Material and Method

The authors studied retrospectively the

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clinical charts of consecutive children with cleft lip and/or palate who had undergone language and hearing evaluation between June 2007 and September 2010 at Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Thailand. The project had been reviewed and approved by the Khon Kaen University Ethics Committees for Human Research (HE 541 129).

Participants

Children with cleft lip and/or palate who presented at Srinagarind Hospital under the “Smart Smile and Good Speech” project as a celebration of the 50th birthday of Her Royal Princess Sirinthorn.

Inclusion criteria

Children with cleft lip and palate or isolated cleft palate under 15 years old.

Exclusion criteria

Children with syndromic cleft lip and palate of which there was no data of language assessment and hearing evaluation.

In total, the data of 384 patients with cleft lip and/or palate were collected but after the exclusion criteria were applied, 225 patients with cleft lip and/or palate remained in the study.

Study procedure

The authors reviewed in detail the charts of each patient. Patient charts were checked for data on patient identification (age, sex, type of cleft lip and palate) and the results of the first visit language and hearing assessment. The data were extracted and transferred to case report forms. Double entries and accuracy verification were performed. The speech and language assessment was done by certified speech and language pathologists and the hearing evaluation was conducted by a certified audiologist at Srinagarind Hospital. Data were considered as follow:

Language test

A child’s language skill is scored based on 2 tests:

- 1) Thai early language mile stone: TELM⁽¹⁶⁾ assessed language skills for young children aged 0-3 years.
- 2) Speech and language screening: SLS was reviewed from previous tests⁽¹⁷⁻²¹⁾. Language skill was scored as pass (0) when child passed all items of language skills and as fail (1) when a child does not pass any item of language skills.

Hearing assessments

Hearing assessments were conducted using standard behavioral audiometry, pure tone audiometry and low-frequency probe tone tympanometry. The audiometric assessment was done in a sound proof booth. The frequencies for pure tone thresholds were 0.5, 1, 2 and 4 KHz. Using the pure tone average for 0.5, 1 and 2 KHz, the degree of loss was determined using the following categories⁽²²⁾: normal hearing (≤ 25 dBHL), mild hearing loss (26 to 40 dBHL), moderate hearing loss (41 to 55 dBHL), moderately severe hearing loss (56 to 70 dBHL), severe hearing loss (71 to 90 dBHL) and profound hearing loss (>90 dBHL). Hearing loss was identified as conductive, sensorineural or mixed. ABR (auditory-brain stem response testing) was also performed when behavioral measures were not sufficiently reliable to provide ear-specific estimates of the type, degree and configuration of hearing loss. Low frequency probe tone tympanometry was performed on all of the subjects to detect middle ear pathology.

Outcomes

The main outcomes of the present study were the correlation of language development and hearing status in children with cleft lip and/or palate.

Statistical analysis

Descriptive statistics were used to describe the amount of language development and hearing problems in the children. A Chi-squared test was used to determine the association of language development with sex and cleft type ($p \leq 0.05$). The Spearman correlation was used to establish language development trends related to hearing loss.

Results

All 225 included children with cleft lip and/or palate were investigated through language testing and hearing evaluation. The mean age was 3.3 years, with a minimum age of 4 months and a maximum of 14.8 years, median 2.3 years and mode 1.2 years. The demographic characteristics of the children are presented in Table 1. The predominant type of hearing loss in both normal and delayed language development groups was bilateral conductive hearing loss. 84% in children with cleft lip and/or palate had unilateral and bilateral hearing loss (Table 2). The delayed language development in the present study was found in 21.78 % (49 in 225).

Mild degree of hearing loss (40.82%) was the highest prevalence found in the delayed language development group, while the moderate degree of

Table 1. Demographic characteristics of patients with cleft lip and palate

	n	%
Subjects (n = 225)		
Sex		
Male	114	50.67
Female	111	49.33
Age (Years)		
0 to 3	147	65.33
3 to 6	53	23.56
6 to 9	10	4.44
9 to 12	11	4.89
12 to 15	4	1.78
Type of cleft lip/palate		
Group I: isolated cleft lip	3	1.33
Group II: isolated cleft palate	47	20.89
Group III: unilateral cleft lip and palate	113	50.22
Group IV: bilateral cleft lip and palate	62	27.55

hearing loss (36.36%) was the highest found in normal language development (Table 3). The association between language development and the degree of hearing loss were examined descriptively with correlations. The Spearman correlation coefficient produced a positive but not significant correlation between language development and all of degree of hearing loss ($r_s = 0.107$; $n = 225$; $p > 0.05$).

In the current study, differences in language development between male and female children with cleft lip and/or palate were not significant ($p > 0.05$) (Table 4). Including, among the four cleft type categories none were significantly associated with delayed language ($p > 0.05$).

Discussion

Many previous researchers have reported delayed speech and language development in children with cleft palate. Various incidence percentages for language delays can be found to vary from 67% to 92%⁽²³⁻²⁷⁾. The current study reported the same as in previous research, but the incidence for language delays is low. The probable main reason of language problems in children with cleft lip and/or palate is directly involved hearing problems⁽²⁸⁾, which is caused by middle ear pathology and Eustachian tube dysfunction.

However, the finding in the current study found no correlation between the language delays and hearing disorder, which is contrasting with the several studies^(2,23-27,29). Schonweiler et al⁽²⁷⁾ studies in 417 children with cleft palates. They found that language

Table 2. Language development and type of hearing loss

Language development (n = 225)	Hearing status							
	Normal hearing	Unilateral CHL	Bilateral CHL	Bilateral SNHL	Bilateral mixed HL	CHL and SNHL	CHL and mixed HL	
	n	n	n	n	n	n	n	%
Normal (n = 176)	33	11	128	2	1	0	1	0.57
Delayed (n = 49)	3	4	35	1	5	1	0	2.04
Total	36	15	163	3	6	1	1	0.44
	%	%	%	%	%	%	%	%
	18.75	6.25	72.73	1.14	0.57	0	0	0.57
	6.12	8.16	71.43	2.04	10.20	1	0	2.04
	16	6.67	72.44	1.33	2.66	1	1	0.44

CHL = conductive hearing loss; SNHL = sensorineural hearing loss; HL = hearing loss

Table 3. Language development and degree of hearing loss

Language development (n = 225)	Degree of hearing loss											
	Normal		Mild		Moderate		Moderately severe		Severe		Profound	
	n	%	n	%	n	%	n	%	n	%	n	%
Normal (n = 176)	44	25	55	31.25	64	36.36	12	6.82	1	0.57	0	0
Delayed (n = 49)	7	14.29	20	40.82	14	28.57	5	10.20	2	4.08	1	2.04

Table 4. Effect of sex and cleft types on language development

Subject (n = 225)	Language development					
	Normal			Delayed		
	No.	%		No.	%	
Sex						
Male	114		87	76.32	27	23.68
Female	111		89	80.18	22	19.82
Type of cleft						
Group I	3		2	66.67	1	33.33
Group II	47		37	78.72	10	21.28
Group III	113		91	80.53	22	19.47
Group IV	62		46	74.19	16	25.81

skills do not correlate to the type of cleft palate, but rather to the frequency and degree of hearing loss. Jocelyn et al⁽²⁹⁾ stated that children with cleft lip and palate had significantly lower scores on test of comprehension and expressive language abilities than matched a group of non-cleft children at 12 and 24 months of age. The reasons for the discrepancy with other studies could be the limitation of the data summarized in the current study which is two-fold: first, the present study is retrospective by nature, using data from the available recordings collected by the clinicians. Especially, the variation of language assessment recording which had been conducted by four speech and language pathologists who routinely worked in the speech clinic at Srinagarind Hospital. The second limitation associated with the current study is that it included only first visit assessment results and lacked the long-term effects information. The affect of hearing loss to language development in cleft children depends on the severity, age and times of occurrence and duration of middle ear effusions. Recurrent otitis media induced a temporary decrease in hearing sensitivity, which appeared to resolve itself as the children matured

and which was not associated with delay in language acquisition. Some investigators^(8-10,30) agree with the current study. They suggested that no significant relationship exists between the hearing loss, which is the occurrence of otitis media at young children, and language skills. Wright et al⁽¹⁰⁾ studied whether recurrent otitis media in infants and young children is followed by delayed language development was addressed by following longitudinally through the first 2 years of life. They concluded that they could not identify delays in language acquisition in otitis-prone children.

The correlation of language delays with sex in children with cleft lip and/or palate was found by Young et al's study⁽³¹⁾. They studied in Chinese Singaporean pre-schools with non-syndromic cleft lip and/or palate. They found that significantly more males than females were identified with language difficulties; this finding agrees with the later study⁽³²⁾, however, the finding disagrees with the current study.

Nakajima et al⁽³²⁾ studied the comparison of the speech development of children with three types of cleft palate. The study found that children with

bilateral cleft lip and palate began using two-word sentences 3 to 4 months later than children with isolated cleft palate and unilateral cleft lip and palate. They concluded that speech development of children with isolated cleft palate and unilateral cleft lip and palate was similar to normal children. However, children with bilateral cleft lip and palate had lower verbal scores on WPPSI (Wechsler Pre-school and Primary Scale of Intelligence). Additionally, in their study Ruitter et al⁽³³⁾ reported the communicative abilities in 117 children with non-syndromic cleft palate. The present study showed children with bilateral cleft lip and palate appeared to have the most problems and the least in isolated cleft lip. However, contrasting results have also been noted in the current study; there was no significant evidence of delayed language development among type of clefts, which is the same as the Schonweiler et al's study⁽²⁷⁾.

Conclusion

Although, the several studies concluded that the correlation of language development and hearing status in children with cleft lip and/or palate are not linked, it is important to be concerned and monitor the delayed language and hearing problem in cleft children. Both language delays and hearing deficits lead to other problems such as learning, communications, psychosocial and educational problems.

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Potential conflicts of interest

None.

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ความสัมพันธ์ของพัฒนาการทางภาษาและลักษณะทางการได้ยินในเด็กปากแหว่งเพดานโหว่

พนิดา ธนาวิรัตน์านิจ, เบญจมาศ พระธานี

วัตถุประสงค์: เพื่อศึกษาความสัมพันธ์ของพัฒนาการทางภาษาและลักษณะทางการได้ยินในเด็กปากแหว่งเพดานโหว่

วัสดุและวิธีการ: นำข้อมูลจากแบบบันทึกการตรวจเด็กปากแหว่งเพดานโหว่ของโรงพยาบาลจำนวน 225 ราย ที่ได้รับการประเมินพัฒนาการทางภาษาและการได้ยินในช่วง เดือนมิถุนายน พ.ศ. 2550 ถึง เดือนกันยายน พ.ศ. 2553 ณ โรงพยาบาลศรีนครินทร์ ข้อมูลของการประเมินพัฒนาการทางภาษาและการได้ยินจะถูกแสดงในเชิงพรรณนา

ผลการศึกษา: พัฒนาการทางภาษาไม่มีความสัมพันธ์กับลักษณะทางการได้ยินในเด็กปากแหว่งเพดานโหว่ชนิดของการสูญเสียการได้ยินที่พบมากทั้งในกลุ่มที่มีพัฒนาการทางภาษาปกติและกลุ่มที่มีพัฒนาการทางภาษาล่าช้า คือการสูญเสียการได้ยินแบบการนำเสียงเสียทั้ง 2 ข้าง และพบว่าเพศและชนิดของปากแหว่งเพดานโหว่ไม่มีความสัมพันธ์กับภาษาล่าช้า

สรุป: การศึกษานี้พบว่าพัฒนาการทางภาษาของเด็กปากแหว่งเพดานโหว่ไม่ขึ้นกับระดับของการสูญเสียการได้ยิน
