

# Five-Year Hearing Outcomes in Children with Cleft Lip/Palate

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**Objective:** To investigate the hearing outcomes in children with cleft lip and palate or isolated cleft palate, aged 5 years.

**Material and Method:** A cross-sectional descriptive study was performed for investigation of hearing outcomes in 35 children with cleft lip and palate, aged 5 years, Audiology Clinic, Srinagarind Hospital in 2011.

**Results:** Thirty-five ears in 22 children (50%; 95% confidence interval = 35.57 to 64.43) had conductive hearing loss. The degree of hearing loss was highest in mild degree in 28 ears. The most common tympanometric type was type B (39 ears, 55.71%).

**Conclusion:** The prevalence of hearing loss in children with cleft lip and palate at age 5 was high. Conductive hearing loss was the most common type. Therefore, audiological evaluation should be performed and followed until Eustachian tube function completely recovers.

**Keywords:** Hearing outcome, Cleft lip and palate

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Cleft palate with or without lip (CP±L) children have long-term hearing loss. Cleft palate causes middle ear effusion, which is associated with a functional obstruction of the Eustachian tube as a result of anatomic and physiologic variations of the tensor veli palatini muscle. This dysfunction leads to poor ventilation of the middle ear cavity, which in turn leads to negative pressure and results in a retracted tympanic membrane and mucous secretion from the tissue through osmosis into the middle ear cavity. Approximately 50% of children with cleft palate continue suffering from ear disease as adults<sup>(1)</sup>.

Otitis media with effusion (OME) universally presents in children with CP±L during the first six months of life<sup>(2-4)</sup>. The prevalence of OME in children with CP±L showed higher than in children without cleft palate. Many studies found a decrease in OME as children become older<sup>(5,6)</sup>. When children with CP±L demonstrate a higher prevalence of OME, the hearing threshold in this group may be more elevated from mild-to-moderate hearing loss. This hearing loss may persist to teenage years with 2 to 39%<sup>(5,7,8)</sup>. Handzic-cuk et al<sup>(9)</sup> studied in cross-sectional across different age groups

that compared hearing loss and cleft type. They concluded that the prevalence of hearing loss decreased with age with normal hearing achieved between 10 to 15 years in all cleft types.

Tawanchai Cleft Center was set up to be a specialized medical care center that provides care for cleft lip and/or palate patients. The multi-disciplinary care team provides holistic care under the standard treatment. Hearing problems found in these groups at the first hearing assessment was 79.49%<sup>(10)</sup> which was high prevalence same as the earlier reports<sup>(11-14)</sup>. The data of hearing status in long term follow-up has never been collected therefore the follow-up of hearing in children with CP±L in each age group is required for background information in the future care plan. The purpose of this study was to investigate the hearing outcomes in children with CP±L or isolated cleft palate at 5 years old.

## Material and Method

### Study design

This cross-sectional study was performed in children CP±L at 5 years old and treated at the Tawanchai Cleft Center.

### Participants

Thirty-seven children with CP±L, age 5 years old, who came for follow-up as per the Centre's

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guidelines were investigated at Audiology Clinic, Srinagarind Hospital in 2011. All participants' parents gave written informed consents. After exclusion (a child with CLP and facial cleft, a child with CLP and Treacher Collins Syndrome), 35 children with CP±L were recruited in present study. This project has been reviewed and approved by the Khon Kaen University Ethics Committees for Human Research in accordance with the Helsinki Declaration (HE521052),

### Study procedures

Demographic data including sex and cleft types was collected. The hearing evaluation included audiometry, and tympanometry examination were recorded in case record form. Audiometry used the conditioned-play technique. Ear-specific measurements were performed at least 500, 1,000, and 2,000 Hz by using headphone or insert earphones. A three-frequency pure tone average (PTA) was calculated for each ear. The degree of hearing loss was categorized according to standard definitions<sup>(15)</sup>; 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 disorders were classified as conductive, sensorineural, or mixed.

**Table 1.** Demographic characteristic of children with CLP

Subjects (n = 35)	Male		Female	
	Number	%	Number	%
Type of cleft	16	45.71	19	54.29
Right cleft lip and palate	3	8.57	3	8.57
Left cleft lip and palate	6	17.14	13	37.14
Bilateral cleft lip and palate	7	20	3	8.57
1 <sup>st</sup> palatoplasty (months)	12		11	

**Table 2.** Hearing status in children with cleft lip and palate

Cleft type (number of ears) n = 70	Normal ear (No.)	Conductive ear (No.)	Sensorineural ear (No.)
Right cleft lip & palate	4	7	1
Left cleft lip & palate	18	18	2
Bilateral cleft lip & palate	8	10	2
Total	30	35	5
Prevalence of hearing status	42.86%	50%	7.14%
95% CI	28.34 to 57.37	35.57 to 64.43	0 to 15.62

### Statistical analysis

The demographic data and prevalence of hearing loss were analyzed by descriptive analysis.

### Results

The 35 children with CP±L received their first reconstructive surgeries before they were 5 years old. The average age for palatoplasty is 12 months in male and 11 months in female. Twenty-six children (71.43%) had unilateral cleft lip and palate (CLP) and 10 (28.57%) had bilateral CLP (Table 1).

Table 2 shows the hearing status. Most children had conductive impairment ear (50%). Three children had sensorineural hearing loss: one child had bilateral high frequency sensorineural hearing loss but the hearing threshold at speech frequency was normal. The second child had bilateral sensorineural hearing loss and another one had high frequency sensorineural hearing loss on right ear and conductive hearing loss on left ear.

In terms of patients' ears, 37 in 70 ears (52.86%) had hearing loss; most of them had mild degree of hearing loss in 28 ears and moderately severe hearing loss in one ear. The moderately severe degree of hearing loss was found in only a child with bilateral asymmetrical sensorineural hearing loss. Degree of hearing loss is shown in Table 3.

**Table 3.** Degree of hearing loss

Cleft type (number of ears; n = 37)	Degree of hearing loss at speech frequency		
	Mild (No.)	Moderate (No.)	Moderately severe (No.)
Right cleft lip & palate	6	1	-
Left cleft lip & palate	14	5	1
Bilateral cleft lip & palate	8	2	-
Total	28	8	1

The highest tympanometry results in this study were type B tympanogram 39 (55.71%) ears. Three of 39 ears (7.69 %) had the pressure equalization tube in place due to Eustachian tube dysfunction (Table 4).

### Discussion

This study describes the hearing outcomes found in children with CLP at age 5 years at Srinagarind Hospital, which supported the earlier study<sup>(9,17)</sup>. The prevalence of hearing loss was similar to earlier studies<sup>(10-14)</sup>. Even though many of the previous studies showed the hearing outcomes improved with increased age<sup>(1,9,16,17)</sup>, the average age was above 7 years old. The results of Smith et al<sup>(16)</sup> study showed most of them had recovery of Eustachian tube function at an average of 6 years after palatoplasty. This supported Chu and McPherson's study<sup>(18)</sup> that collected the data from age >7 years. It might partly account for finding of low prevalence of hearing problems, due to the morphological growth in Eustachian tube that leads to improved hearing status at this age (>7 years).

The majority of the hearing outcomes in this study were conductive hearing loss that agrees with the previous studies<sup>(9,10)</sup>. Hearing problems in individual cleft type had no significant difference. This finding was consistent with the previous studies<sup>(18-20)</sup>. Two children with bilateral sensorineural hearing loss and a child with sensorineural hearing loss in one ear. Two of them had high frequency hearing loss and a child had hearing loss at all frequencies both ears. Bennett<sup>(1)</sup> reported 31% of 100 adult with cleft palate had either sensorineural or mixed hearing loss. Hearing loss in this group tended to be more severe at higher frequency.

Most degree of hearing loss in this study was mild. In contrast, the study of Handzic-Cuk et al<sup>(9)</sup> found that all of cleft types mostly suffered from moderate and severe hearing loss, which was similar to Gould and Muntz's finding<sup>(19)</sup>. Ramana YV et al<sup>(21)</sup> studied in

**Table 4.** Tympanometric finding

Cleft Type (number of ears; n = 70)	Type of tympanogram		
	A (No.)	B (No.)	C (No.)
Right cleft lip & palate	5	7	-
Left cleft lip & palate	12	20	6
Bilateral cleft lip & palate	6	12	2
Total	23	39	8

the older children (>7 years) with unrepaired cleft palate. They found 73.3% of the ears had mild conductive hearing loss. They concluded that probably improved hearing in this age group is due to the development of the angle of Eustachian tube. Their results could not conclude about the benefit between the conservative treatment alone and early aggressive surgical treatment.

Most tympanometric types in this study was type B, Type B tympanogram has been shown to predict the middle ear pathology especially otitis media with effusions. Smith et al<sup>(16)</sup> found that the Eustachian tube function of most children with CLP significantly improved after 6 to 7.5 years of age. This agrees with Handzic Cuk et al's study<sup>(22)</sup>, which studied cleft palate children at median age 6 years. They still found a high type B tympanogram in all cleft types until age 7 because of the immaturity of neuromuscular control and the upper respiratory tract infections. In addition, Kobayashi H et al<sup>(23)</sup> concluded that the Eustachian tube function in children with CLP began gradually improving until approximately age 7. Therefore, children with cleft palate should be followed until 7 years old or beyond this age.

### Conclusion

Prevalence of hearing loss in children with

CP+L was at high rate. An audiological assessment was still a critical necessity. Even if the results of a hearing test on young children indicated no hearing problem, careful prolonged assessment is required. Although this study cannot be representative of the entire cleft palate children, because the sample is only 35 children with CP+L, it is a basis for the continuing care of children with CP+L.

#### **What is already known on this topic?**

Children with CP+L have a high risk for hearing loss, particularly conductive hearing loss.

#### **What this study adds?**

Children with CP+L had also risk for sensorineural hearing loss. Moderate degree of hearing loss that affects both speech and language development and academic achievement was high rate and need early intervention.

#### **Acknowledgments**

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#### **Potential conflicts of interest**

None.

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### ผลลัพธ์ของการได้ยินในเด็กปากแหว่งเพดานโหว่หรือเด็กเพดานโหว่ที่อายุ 5 ปี

พนิดา ธนาวิรัตน์านิจ, เบญจมาศ พระธานี

**วัตถุประสงค์:** เพื่อศึกษาผลการได้ยินในเด็กปากแหว่งเพดานโหว่หรือเด็กเพดานโหว่ที่อายุ 5 ปี

**วัสดุและวิธีการ:** เป็นการศึกษาเชิงพรรณนา ณ จุดเวลาใดเวลาหนึ่ง แบบตัดขวาง ในเด็กปากแหว่งเพดานโหว่ อายุ 5 ปี จำนวน 35 คน ที่มาติดตามการรักษาตามแนวทางของการดูแลเด็กปากแหว่งเพดานโหว่และได้รับการตรวจการได้ยิน ณ คลินิกโสตสัมผัสวิทยา โรงพยาบาลศรีนครินทร์ปี พ.ศ. 2554

**ผลการศึกษา:** พบว่าในเด็กจำนวน 22 คน (50%; 95% confidence interval = 35.57 to 64.43) มีการสูญเสียการได้ยินแบบการนำเสียงเสีย 35 หู โดยพบการสูญเสียการได้ยินระดับเล็กน้อยจำนวน 28 หู ผลการตรวจสมรรถภาพหูชั้นกลางพบมากที่สุดคือ ชนิด B พบจำนวน 39 หู คิดเป็นร้อยละ 55.71

**สรุป:** อุบัติการณ์ของการสูญเสียการได้ยินในผู้ป่วยปากแหว่งเพดานโหว่อายุ 5 ปี ยังอยู่ในระดับสูง โดยพบชนิดของการสูญเสียการได้ยินแบบการนำเสียงเสียมากที่สุด ดังนั้นเด็กควรได้รับการตรวจและติดตามการได้ยินจนการทำงานของหูสุดเคยเขียนทำงานได้อย่างสมบูรณ์

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