

Characteristics of the Hearing Loss in Unilateral Cleft Lip and Palate-Influence on Communication

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ABSTRACT

Etiology of otitis media with effusion (OME) is still unclear and often described as multi-factorial. It is very usual finding in cleft palate population. We tested relationship between the hearing level, audiometric frequencies, aging and ear side in unilateral cleft lip and palate 101 children (UCLP) and subgroups of left (UCLP)(L) and right cleft side (UCLP)(R). Group of left ears is prone to higher frequency and more severe hearing disturbances than groups of right ears, with less chance of normalizing hearing level with aging. Characteristics of hearing loss level and its improvement, in UCLP children depend of cleft type, ear side and age group.

Key words: *otitis media with effusion, hearing loss, cleft lip and palate*

Introduction

Conductive hearing loss accompanied by otitis media with effusion (OME) is usual finding in cleft palate population¹. Etiology of OME is still unclear and often described as multi-factorial. Previously author described correlation between severity of the cleft and the hearing loss². Our study presumed that because of the unfavorable pathoanatomic condition of the cleft side, Eustachian's tube anatomic region, ears on the cleft side might have more affected hearing than non-cleft side. We tested if presence of the cleft is additional structural etiological factor in universality of the otitis media with effusion (OME) in UCLP patients. Also, we tested relationship between the hearing level, audiometric frequencies, aging and ear side in unilateral cleft lip and palate children (UCLP) and subgroups of left (UCLP) (L) and right cleft side (UCLP) (R).

Method

Study group had 101 children. 68 males and 33 females of the same median age of 6 years, with previously surgically reconstructed isolated unilateral cleft lip and palate (UCLP) According to standard time protocol and operative procedures it was 27 children with cleft lip and

palate on right side (UCLP) (R) and 74 children with cleft lip and palate on the left side (UCLP) (L). All of the children had non-syndromic isolated cleft lip and palate, no additional neurologic deficit or additional malformations. Aging subgroups were analyzed separately for: 1–3 yr, 4–7, 8–12 years. Medians and averages for pure tone threshold of tonal audiometry for 250 Hz up to 4000 Hz were estimated for left and right ears respectively. Hearing loss was classified as normal (0–10 dB), mild (11–25 dB), moderate (21–40 dB) and severe >40 dB.² Tympanometry confirmed diagnosis of otitis media with effusion by presence of the type B curve. Descriptive statistics determined the main features of audiological data before ventilation tubes were placed.

Results

None of the ears had sensorineural hearing loss as sign of sequels of otitis media with effusion. There was no gender difference for the average hearing level (AHL) or median hearing loss (MHL) values across tested audiometric frequencies as shown in Table 1 and Table 2. Left ears in UCLP and UCLP (L) children have significantly higher level of AHL than older age subgroups in age

TABLE 1
HEARING LEVEL BY AGE GROUPS, ABSOLUTE VALUES IN DB

Cleft type	Hearing level (dB)																								
	Right ears												Left ears												
	AHL R		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		AHL L		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		
Age	N	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R		
UCLP	101	20	37	20	35	20	45	20	40	20	35	20	45	21	37	20	40	25	35	20	40	20	35	20	50
1–3	11	35	25	30	20	40	30	30	35	30	30	25	40	33	24	25	25	30	25	30	30	30	35	30	35
4–7	51	21	37	25	35	20	45	20	35	20	35	20	45	25	37	25	40	25	35	25	40	20	40	25	40
8–12	24	18	31	20	35	20	35	20	40	15	20	20	45	18	27	20	35	20	30	20	30	15	30	20	20
13+	15	16	32	20	25	15	40	15	30	10	30	10	35	16	34	15	30	15	30	10	30	10	40	15	50
UCLP (R)	27	18	29	20	30	20	35	15	30	20	35	20	40	18	27	20	35	20	25	15	30	15	30	20	40
1–3	1	21	0	25	0	20	0	25	0	15	0	20	0	18	0	25	0	20	0	15	0	15	0	15	0
4–7	14	23	26	20	30	20	30	20	30	23	35	23	40	21	23	23	30	23	20	20	30	20	30	20	40
8–12	8	17	28	15	20	20	35	15	30	15	20	15	35	18	11	15	20	18	10	18	20	15	10	20	15
13+	4	17	9	20	20	15	15	10	5	15	15	15	10	12	7	13	10	13	10	10	0	10	5	13	10
UCLP (L)	74	21	37	25	35	23	45	20	40	20	35	20	45	24	37	25	40	25	35	25	40	20	40	23	50
1–3	10	35	25	30	20	40	30	33	35	30	30	30	40	33	22	28	25	30	25	33	30	33	35	33	35
4–7	37	21	37	25	35	25	45	20	35	20	35	20	45	25	37	25	40	30	35	30	40	25	40	25	40
8–12	16	20	31	20	35	23	25	20	40	18	20	23	45	16	27	20	35	20	30	20	30	13	30	18	20
13+	11	16	32	20	25	15	40	15	30	10	30	10	35	17	34	15	30	15	30	15	30	15	40	15	50

AHL.R=average hearing level – right ears; AHL.L=average hearing level – left ears; UCLP=unilateral cleft lip and palate; UCLP (R)=unilateral cleft lip and palate (right side); UCLP (L)=unilateral cleft lip and palate (left side); N=number of ears; M=median value; R=range between min. and max

group of 1–3 yr (Figure 1). MHL was higher at lower frequencies particularly for 500 Hz than at middle register of 1000 Hz, 2000 Hz and 4000 Hz.. Right ears in UCLP (L) group showed significant improvement of AHL until

7 yr, while left ears of UCLP (L) have delay in improvement of hearing loss until 12 yr (Figure 2). The frequency of 250 Hz in this study ears showed less improvement of MHL with aging than other audiometric frequencies.

TABLE 2
ABSOLUTE DIFFERENCE IN AHL AND MHL (DB) BETWEEN NEIGHBORING AGE GROUPS

Cleft type	Age groups compared	Right ear						Left ear						
		AHL.R	AHL.L	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
UCLP														
	1–3 vs. 4–7	-14*	-8	-5	-20*	-10*	-10*	-5*	0	-5	-5	-10	-5	
	4–7 vs. 8–12	-3	-7**	-5	0	0	-5	0	-5*	-5**	-5*	-5**	-5*	
	8–12 vs. 13+	-2	-2	0	-5	-5	-5	-10*	-5	-5	-10	-5	-5	
UCLP (R)														
	1–3 vs. 4–7	-	-	-	-	-	-	-	-	-	-	-	-	
	4–7 vs. 8–12	-6	-3	-5	0	-5	-8	-8	-8*	-5	-2	-5	0	
	8–12 vs. 13+	-	-	-	-	-	-	-	-	-	-	-	-	
UCLP (L)														
	1–3 vs. 4–7	-14*	-8	-5	-15**	-13*	-10**	-10*	-3	0	-3	-8	-8	
	4–7 vs. 8–12	-1	-9*	-5	-3	0	-3	3	-5	-10*	-10*	-12	-7*	
	8–12 vs. 13+	-4	1	0	-8	-5	-8	-13	-5	-5	-5	2	-3	

* statistically significant at p<0.05; ** p<0.01

AHL.R=average hearing level – right ears; AHL.L=average hearing level – left ears; UCLP=unilateral cleft lip and palate; UCLP (R)=unilateral cleft lip and palate (right side); UCLP (L)=unilateral cleft lip and palate (left side).

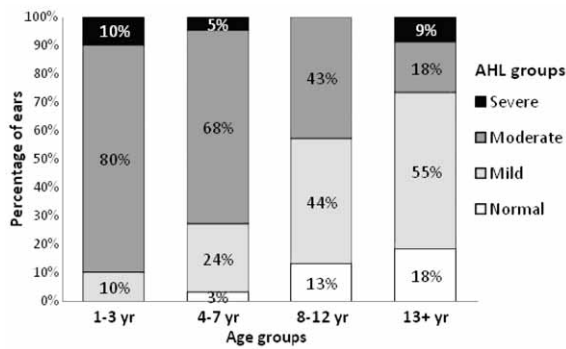


Fig. 1. UCLP (L) – LEFT ear-proportions of ears with mild, moderate and severe AHL and normal hearing by age groups.

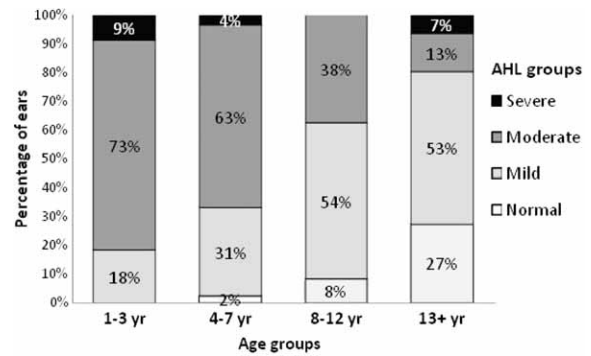


Fig. 3. UCLP – LEFT ear-proportions of ears with mild, moderate and severe AHL and normal hearing according to age groups.

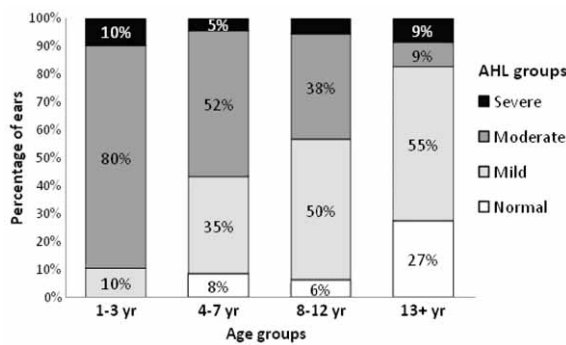


Fig. 2. UCLP (L) – RIGHT ear-proportions of ears with mild, moderate and severe AHL and normal hearing according to age groups.

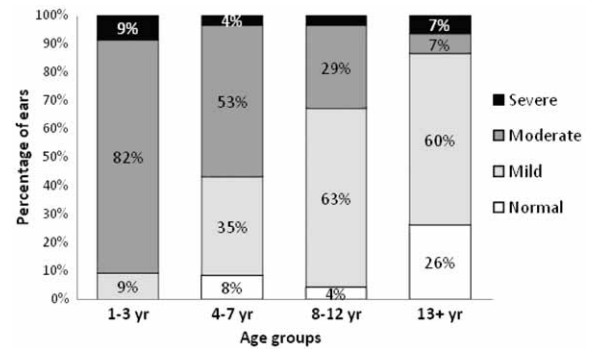


Fig. 4. UCLP – RIGHT ear-proportions of ears with mild, moderate and severe AHL and normal hearing according to age groups.

Left ears of UCLP (L) showed more improved MHL at middle register (10 dB at 500 Hz and 1000 Hz, 7,5 dB at 4000 Hz) than right ears (Figure 3). Right ears have higher rate of improvement of MHL for low register (15 dB for 500 Hz and 1000 Hz) than left ears. Improvement of AHL is twice higher for right *vs.* left ears (Figure 4). The children in age group of 1–3 yr show more hearing loss than older children. Hearing loss improves and normalizes with aging, slower for left than right ears and with different dynamics for different audiometric frequencies. In group of UCLP (R) ears small number of tested ears showed the same hearing improvement as ears of UCLP (L) children.

Discussion

Previous studies described changes of the length and angulations of cranial base, more backward and upward position of the maxilla and smaller sphenopalatine angle as additional etiological factor to OME in UCLP patients³⁻⁵. Differences of the skull base in cleft *vs.* non-cleft side patients were found. Our results suggested that cleft lip and palate could not be considered as only local defect. UCLP is malformation of the 1st branchial arch so we expected accompanied structural and functional changes of the rest of the 1st branchial arch too. According to our results, left ears in UCLP (L) are more prone to hearing

impairment than right ears because of structural changes of the whole 1st branchial arch of the left side. Morphological expression of orofacial region and Eustachian is affected and thereby responsible for functional disturbances. According to our finding, different and independent mechanisms of pathogenesis of hearing loss exist in cleft *vs.* non-cleft side ears. In the presence of the cleft mechanisms, particularly in UCLP (L), hearing loss for left ears is connected with increase presence of middle ear effusion which affected hearing of the middle frequency register. Non cleft right ears have less amount of middle ear effusion and have more prominent edema of mucosa which affected hearing of the lower frequency register. Presence of the cleft is additional etiological factor which contributes to the higher frequency and universality of the OME in cleft palate individuals.

Conclusion

Group of left ears is prone to higher frequency and more severe hearing disturbances than groups of right ears, with less chance of normalizing hearing level with aging.

Characteristics of hearing loss level and its improvement, in UCLP children depend of cleft type, ear side and age group.

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KARAKTERISTIKE GUBITKA SLUHA KOD JEDNOSTRANOG RASCJEPa USNE I NEPCA – UTJECAN NA GOVOR

SAŽETAK

Etiologija upale srednjeg uha s izljevom (OME) je još uvijek nejasna, a često se opisuje kao multifaktorska. Inače, OME je česta u populaciji s rascjepom nepca. Mi smo testirali odnos između razine sluha, audiometrijske frekvencije, starenja i strane uha u 101 djeteta s jednostranim rascjepom usne i nepca (UCLP). Skupina djece s oštećenim lijevim uho je imala veću učestalost i teže smetnje sluha od skupine s oštećenjem desnog uha, ali i manje šanse za normalizaciju razine sluha sa starenjem. Karakteristike razine gubitka sluha kao i njegovo poboljšanje, u UCLP djece ovisi o vrsti rascjepa, strani uha i dobne skupine.