

## ORIGINAL ARTICLE

### Middle Ear Pathologies in Different Types of Cleft Palate

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**Background:** The aim of this study was to investigate the prevalence of a history of aural pathologies in patients with cleft palate referred to Cleft Lip/Palate team of Isfahan University of Medical Sciences between 2005 and 2011, and to identify possible associations between patients' cleft type and their middle ear health status.

**Methods:** A file review of 833 patients with different kinds of orofacial clefts, who had been referred to the mentioned cleft palate team in 2005 to 2011, was performed. Then patients who suffered from Non-cleft velopharyngeal insufficiencies and patients that didn't have any information about the middle ear health status and were not assessed by the otolaryngologist too, were excluded. Finally, the prevalence of a history of aural pathologies (including otitis media with effusion, recurrent acute otitis media and/or hearing impairments) and its association with type of cleft was studied in 675 patients.

**Results:** 52.1% of our patients with different types of orofacial cleft had experienced a history of aural pathologies. Middle ear status was related to type of cleft and its prevalence was much higher in patients with different kinds of cleft palate compared with cleft lip/ alveoli ( $p < 0.001$ ).

**Conclusion:** It is possible that we underestimated the prevalence of middle ear pathologies in our patients. Because we had to confine our study to take a history about middle ear health status. Therefore, it seems that we need a careful modification to our team audiologic screening protocols in order to early identification of treatable aural pathologies and prevention of their consequences and to optimize the speech, language and cognitive development of children with clefts.

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## Introduction

Cleft of lip/ palate (CL/P) is a congenital anomaly of the lip, palate, or both that is due to failure of parts of the lip and/ or the roof of the mouth do not fuse normally during fetal development<sup>[1-3]</sup>. It may appear in different degrees of severity and configuration<sup>[3]</sup>. Orofacial clefting is one of the most common congenital malformations, with an incidence of 1 in every 500-700 live births<sup>[4-5]</sup>. But it varies with race and the nature of the cleft itself. The incidence of isolated cleft palate (CP) is racially homogenous at approximately 0.5 per 1000 live births. With regard to

respect of CL±P, however, the incidence is more heterogeneous and varies between 0.3 to 2.1 per 1000 in different races<sup>[4]</sup>.

Children with cleft lip and palate experience many difficulties such as feeding problems, dental abnormalities, hearing impairments, and speech and language disorders<sup>[6]</sup>.

Hearing disorders are common comorbidity with cleft palate that are caused by functional impairment of the opening mechanism of the Eustachian tube<sup>[3]</sup>. Tensor veli palatini and levator veli palatini, the muscle responsible for Eustachian tube function, have an

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abnormal point of insertion in children with cleft lip and palate<sup>[2-3]</sup>. It results in dysfunction of Eustachian tube and occurrence of otitis media, consequently. Otitis media with effusion (OME) is a condition which presents with fluid in the middle ear space without other symptoms<sup>[2, 7]</sup>. Acute Otitis Media (AOM) includes fluid in the middle ear space accompanied by symptoms of an ear infection (e.g., pain, fever)<sup>[7]</sup>. These middle ear pathologies can lead to a conductive hearing loss (CHL) in 50% to 93% of patients<sup>[8-9]</sup>.

Hearing status, especially in young children, can influence communication development. Hearing loss, even if transient or mild, can lead to delay in language acquisition. Therefore, because of the high chance of occurrence of middle ear pathologies and hearing impairments, children with cleft palate are at increased risk for communication disorders<sup>[10-11]</sup>.

Schonweiler and et al(1999)<sup>[12]</sup> reported that abnormal findings in phonology, morphology, syntax, vocabulary, auditory perception, and speech comprehension are significantly more frequent in cleft palate children with concomitant hearing loss than children with cleft palate without auditory impairments. Schonweiler, Radu and Ptok (1998)<sup>[13]</sup> showed that even a mild fluctuating hearing loss can have a major influence on speech and language development.

Paliobei, Psifidis and Anagnostopoulos<sup>[10]</sup> studied the auditory status of 42 patients with cleft palate between 5 and 15 years of age. Their results indicated that 69%

of patients had mild or moderate hearing loss that 72 percent of them were of the unilateral cleft lip and palate (UCLP) type. Also, serous otitis media was observed in 50% of patients at their first visit.

In another study of 18 children with cleft palate<sup>[14]</sup> it was also shown that impedance tympanogram and tonal audiogram results were only normal in 22% and 27.8% of patients, respectively.

Goudy and et al<sup>[11]</sup> found conductive hearing loss in 25% of 8-25 year old patients with cleft palate. But more than 90% of their patients had reported a history of middle ear disease. They introduced middle ear surgery, cholesteatoma and 4 or more myringotomy tube insertions as risk factors associated with CHL.

Flynn and et al<sup>[2]</sup> compared the prevalence of otitis media with effusion, and hearing sensitivity in children with and without clefts from 1 to 5 years of age. Their findings indicated a significantly higher prevalence of OME in children with cleft palate (74.7% versus 19.4%). OME led to hearing loss in 83.1% of ears, with this loss more prevalent in the cleft group (89.7% cleft and 70.0% non-cleft).

The aim of this study was to investigate the prevalence of a history of aural pathologies in patients with cleft palate referred to CLP team of Isfahan University of medical sciences between 2005 and 2011, and to identify possible associations between patients' cleft type and their middle ear health status.

**Table 1.** Distribution of age groups and cleft types

Frequency(percent)		Frequency(percent)	
Age groups(year)		Types of cleft	
0-3	360 (43.2%)	UCLP1	241 (28.9%)
3-6	165 (19.8%)	BCLP2	153 (18.4%)
6-12	126 (15.1%)	CP3	151 (18.1%)
12-18	55 (6.6%)	Soft palate only	153 (18.4%)
>18	109 (13.1%)	CL/A4	68 (8.2%)
Missing data	18 (2.2%)	Submucous cleft palate	47 (5.6%)
		Non-cleft VPI5	20 (2.4%)
Total	833 (100%)	Total	833 (100%)

1. Unilateral cleft lip/ palate, 2. Bilateral cleft lip/ palate,
3. Isolated cleft palate, 4. Cleft lip/ alveoli,
5. Non-cleft velopharyngeal insufficiencies.

**Table 2.** Middle ear status in relation to cleft type

		Ear		Total
		Group I	Group II	
Type of cleft	a. UCLP1	106(52.7%)	95(47.3%)	201
	b. BCLP2	70(54.3%)	59(45.7%)	129
	c. CP3	77(59.7%)	52(40.3%)	129
	d. Soft palate only	76(57.1%)	57(42.9%)	133
	e. CL/A4	4(8%)	46(92%)	50
	f. Submucous cleft palate	19(57.6%)	14(42.4%)	33
Total		352(52.1%)	323(47.9%)	675

1. Unilateral cleft lip/ palate,
2. Bilateral cleft lip/ palate,
3. Isolated cleft palate,
4. Cleft lip/ alveoli

## Methods

A file review of 833 patients with different kinds of orofacial clefts, who had been referred to the cleft palate team of Isfahan University of medical sciences in 2005 to 2011, was performed. This kind of information derivation from patients' files was approved by the Ethics Committee of Isfahan university of medical sciences. Information about age, sex, cleft type, age at different surgeries had been recorded in their charts. Also, parents or adult patients had been asked about a history of OME, recurrent AOM and/ or hearing impairments. Moreover in some cases, an otologic evaluation had been performed by an otolaryngologist.

We used descriptive statistics in order to show distribution of age (in 0-3, 3-6, 6-12, 12-18, >18 years of age), sex(male and female), and cleft type(including unilateral cleft lip and palate (UCLP), bilateral cleft lip and palate (BCLP), overt cleft of the soft and hard palate (CP), Soft palate only, cleft lip/alveoli (CL/A), submucous cleft palate and Non-cleft velopharyngeal insufficiencies) in our patients (n=833).

Patients who suffered from non-cleft VPI were excluded (n=20). Because the pathologies causing the problem were undiagnosed in some cases or resulted from neurological impairments. Also in an early analyze, it was observed that 138 of our patients (or their parents) didn't have any information about the middle ear health status and they were not assessed by the otolaryngologist too. So, they were excluded and

finally, we investigated the prevalence of a history of aural pathologies (including OME, recurrent AOM and/ or hearing impairments) in 675 patients. In order to determine possible associations between patients' cleft type and their middle ear health status, patients with different kinds of cleft that we had information about their middle ear status (n=675) were classified into two groups: Group I with a history of aural pathologies and group II without any history of aural pathologies. Then Chi-Square tests were used to compare middle ear health status in different types of cleft. Data analyses were performed using SPSS 17.0 software for Windows.

## Results

Our study population included 447 males (53.7%) and 386 females (46.3%). The range of patients' age, at their last evaluation session was 2 day to 54 years old. Table one demonstrates the distribution of age groups and cleft types in all patients (n=833).

352 (52.1%) of our patients with different types of orofacial cleft that we had information about their middle ear status (n=675), had experienced a history of aural pathologies including OME, recurrent AOM and/ or hearing impairments (group I) and 323 (47.9%) didn't have such history(group II).

The results of the Chi-Square tests showed that middle ear pathologies are significantly less prevalent in patients with cleft lip/alveol only compared with all other kinds of cleft palate ( $p<0.001$ ). But there are not significant differences between patients with other

types of palate involvement regarding middle ear status ( $p>0.05$ ). These findings were showed in table two. The prevalence of a history of middle ear problems is about 50-60% in patients with different types of cleft palate with or without cleft lip compared with just 8% in patient with cleft lip/alveol only.

## Discussion

Findings show that about half of our patients are 0-3 years old. So in order to decrease of cleft palate complications, we have to present appropriate early interventions about middle ear health status and speech and language development in these children.

On the other hand, the number of patients in the group of >18 years of age was relatively high. As Isfahan cleft care team was initiated since 2005, these patients hadn't received multidisciplinary services in their early childhood. So they are looking for management of consequences of their late interventions now.

With regard to middle ear status, recent studies have demonstrated that the prevalence of middle ear pathologies (including chronic and acute middle ear effusion) in cleft palate is high and are observed in about 75-90% of patients<sup>[2,14]</sup> and even in more than 90 % of them<sup>[11, 15]</sup>. These findings are in contrast to what we observed. On the other hand, Chu and McPherson<sup>[3]</sup> studied the otoscopic status of 180 Chinese children and young adults seen at a cleft lip and palate clinic and reported only 23.7% of ears had abnormal tympanometric results. The authors considered racial factors as a possible reason of observed differences between their results and higher rates of otological problems observed in Western studies. But it seems differences between our results and other studies that demonstrated much higher rates of middle ear disease<sup>[2,11,14]</sup>, is due to different methodologies. One of the limitations of our study was that we didn't have the results of exact otologic examinations in most of our cases and we had to confine our study to take a history about middle ear health status. Therefore, it is possible that we underestimated the prevalence of middle ear pathologies in our patients.

During this study, it was established that middle ear status is related to type of cleft and its prevalence is much higher in patient with different kinds of cleft palate compared with cleft lip/ alveol. This finding is in line with those of Paradise, Bluestone, and Felder<sup>[16]</sup>, one of the earliest studies that performed in patients

with cleft palate. Also, patients with submucous clefts may also be subject to a high prevalence of aural pathologies as same as other types of cleft palate.

In conclusion, it seems that we need a careful modification to our team audiologic screening protocols in order to early identification of treatable aural pathologies and prevention of their consequences and to optimize the speech, language and cognitive development of children with clefts.

## Conflict of Interest

The authors declare they have no conflict of interest which may arise from this manuscript.

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