

EFFECT OF EARLY-LIFE OTITIS MEDIA ON LANGUAGE SKILLS AND DEVELOPMENT

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ABSTRACT

Otitis media (OM) has been implicated as a major pathogenic condition with regard to developmental language impairment. However, an often contradicting and controversial research literature exists on the issue. This work was undertaken to study the potential impact of early-life OM with its subsequent conductive hearing loss on oral language development and its components in young children in a quantitative approach for better understanding of the nature of the problem. 105 children with their ages ranged from 22 months to 68 months (mean = 41 ± 1.4 months) were included in this study. All the children had bilateral chronic OM with the duration of chronicity ranged from 10 months to 36 months (mean = 21.4 ± 8.9 months). All the children were

evaluated through a diagnostic protocol utilizing subjective as well as quasi-objective measures of evaluations that included history taking, audiological testing and language assessment. Children with other risk factors that could adversely affect language development were excluded from the study. We found that the impact of duration of OM is more detrimental than the degree of hearing loss on the specific language components. The delay in semantic, pragmatic and prosodic ages were all found to be significantly correlated with the duration of OM. While, the degree of hearing loss was found to be significantly correlated only with the delay in prosodic age. However, on the other hand, the global measures i.e. the receptive, expressive and total language ages did not correlated significantly with both

the duration of OM and degree of hearing loss . We concluded that active language therapy is not necessarily for children with OM but the parents should be aware of the possible delay of the language skills of their children and monitor their face -to-face conversation during the bouts of OM for better outcome .

Key words : Otitis media – Language development – Conductive hearing loss

INTRODUCTION

Otitis media (OM) is a common pediatric illness in which infective or non-infective effusion accumulates in the middle ear ¹ . The duration of OM can vary widely from a few days to months, although, as reported by Daly (1997) ² , OM is resolved in 60 - 70 % of the children within 30 days of diagnosis irrespective of treatment with antibiotics. The hearing loss associated with episodes of OM has been reported to be variable , temporary and mild-to-moderate ³.

Approximately 80 % of all children up to 4 years of age experience OM ^{4 , 5}; a period of rapid developmental change, particularly in the domains of speech and language. The develop-

mental impact of persistent or recurrent OM early in life on speech and language skills has therefore been the focus of considerable research over the last 30 years. However , an often contradicting and controversial research literature exists on the issue. A number of studies ⁶⁻⁹ have examined the relationship between a history of early OM and language development in young children , but the exact extent of the relationship remains unclear and a point of debate . Some reasons for this lack of clarity and continuing debate are the lack of valid and reliable measures of hearing , speech, language and related abilities and paucity of objective and quantitative analysis ¹⁰.

Earlier research studies ¹¹⁻¹³ strongly suggested a significant negative impact of early OM on later speech and language abilities of children with subsequent recommendation of aggressive intervention regimens incorporating amplification , auditory training and speech and language intervention. Other studies ^{3,14,15} reported non-significant results or equivocal findings of the impact of OM on children's language development. Moreover, most of the

language tests and measures employed have been global measures focusing on general receptive and / or expressive language abilities ignoring the impact of OM on the various specific components of language (i.e. semantics , syntax , prosody , pragmatics and phonology) .

The aim of this work is to study the potential impact of early-life otitis media with its subsequent conductive hearing loss on oral language development and its components in young children in a quantitative approach for better understanding of the nature of the problem .

PATIENTS AND METHODS

105 children with their ages ranged from 22 months to 68 months (mean = 41 ± 1.4 months) attending the out-patient clinic of ORL department , Mansoura University Hospital were included in this study . All the children had bilateral chronic OM with the duration of chronicity ranged from 10 months to 36 months (mean = 21.4 ± 8.9 months) (table 1). All the children followed the protocol of assessment of delayed language children that is applied in Phoniatric Unit, Mansoura Faculty of Medicine and included :

I- Elementary diagnostic procedures :

{A}-Patient / Parent interview :

Children with a more or less same sociodemographic background were included in this study . Children who had other risk factors that could adversely affect global or language developmental outcome e.g. low birth weight , a history of neonatal asphyxia or other serious illness and a major congenital malformation or chronic illness were excluded from the study.

{B}- Vocal tract examination : Cases with palatal abnormality e.g. cleft palate , submucous cleft .. etc were excluded from the study .

II- Clinical diagnostic aids:

{A}- Evaluation of the various aptitudes by formal testing: Cognitive age (mental age) using Stanford Binet intelligence scale (1986) (16) . Cases with mental retardation were excluded from the study .

{B}- Audiological evaluation: Carried out in the Audiology Unit ,Mansoura Faculty of Medicine and included:

1 - Otoscopy.

2 - Play audiometry : air and bone conduction thresholds (500-4000 Hz) using a Maico pure-tone and speech audiometer model MA 52 in a sound treated booth.

3 - Speech audiometry whenever possible.

4 - Tympanometry in cases with intact tympanic membrane, using an Interacoustics immittancemeter model AZ7.

5 - Auditory brainstem response to determine the hearing threshold level for difficult-to-test children. A Biologic recording system version 5.64 model 317 was used.

{C}-Language evaluation: using the Arabic Language test (17) and articulation test (18).

The language test items include the following:

I-Receptive part of the semantics : that examines the ability of the child to recognize / categorize different semantic groups , to make matching or pairing , to understand opposites and to recognize time concepts.

II-Expressive part of the semantics : that examines the ability of the child to name different semantic groups and to say opposites.

III. Receptive part of the syntax : which includes testing the ability of the child to understand sentences increasing in lengths , verb tenses , pronouns ..etc .

IV-The expressive part of the syntax : testing the ability of the child to produce or utter his name , verb tenses , prepositions ...etc .A sample of spontaneous speech was elicited and written as such and a comment on its length and degree of intelligibility was written.

V- Pragmatics: testing the ability of the child to understand and respond to sentences carrying pragmatic intentions, thus, illustrating functionalism, sense-making and fine-tuning. It also includes testing the ability of the child to initiate a dialogue, continue it, maintain topic and end it.

VI – Prosody : testing the ability of the child to imitate the intonation contour of an utterance taking into consideration the three prosodic features (tone unit , tonicity and tone contrast).

VII- testing phonology by the articulation test.

The semantic age , pragmatic age , prosodic age , receptive language age , expressive language age and total language age were then calculated for every child (17).

Mean and standard error of mean

(SEM) were used to describe data . Pearson product moment correlation was used to test for linear relationship between the duration of the otitis media and degree of hearing loss in one hand and the delay in language ages in the other hand for every child . Multiple linear regression analysis was used to test for contribution of the chronological age , duration of the otitis media and degree of hearing loss on the delay in language ages . P was considered significant if < 0.05 and highly significant if < 0.01 . Tests were run on an IBM compatible PC using SPSS for windows version 10 (SPSS Inc. , Chicago , IL) .

RESULTS

(1) Results of audiological evaluation :

Audiological evaluation of the studied children revealed that degree of conductive hearing loss ranged from 25 - 55 dB (mean \pm SEM = 37.9 \pm 1.14 dB) (table 1) .

(2) Results of language evaluation :

Calculation of the ages of different components of language of studied children and the delay of every language component from the children's mean chronological age are demonstrated in table (2) .

A statistically significant positive correlation was found between the duration of OM and the delay in semantic age of the studied children ($P < 0.05$) . A highly statistically significant positive correlation was also found between the duration of O.M. and the delay in both pragmatic and prosodic ages of the studied children ($P < 0.01$) . However, a statistically non-significant correlation was found between the duration of OM and the delay in receptive , expressive and total language ages ($p > 0.05$) (table 3).

The only statistically significant positive correlation was found between the degree of conductive hearing loss and the delay in prosodic age of the studied children ($P < 0.05$) . On the other hand , a statistically non-significant correlation was found between the degree of conductive hearing loss and the delay in semantic , pragmatic , receptive , expressive and total language ages ($p > 0.05$) (table 4) .

Multiple linear regression analysis revealed that the chronological age , duration of OM and degree of hearing loss all contribute significantly to prosodic age (table 5) . An equation

could be, then, formulated to predict the delay in prosodic age from the contributions of the chronological age, duration of otitis media and degree of conductive hearing loss :

$$\text{Delay in prosodic age} = \text{constant} (-22.786) - \{(\text{chronological age} \times 1.089) + (\text{duration of OM} \times 0.633) +$$

$$(\text{degree of HL} \times 0.313) \}$$

While, on the other hand, the regression analysis revealed a statistically non-significant contribution of the duration of O.M. and degree of conductive hearing loss on the delay of other linguistic abilities of children.

Table (1) : Descriptive data of the studied children (n = 105) :

	Chronological age (in months)	Duration of OM (in months)	Degree of HL (in dB)
Mean	41	21.4	37.9
SEM	1.4	0.9	1.14
Minimum	22	10	25
Maximum	68	36	55

SEM = Standard error of mean , OM = otitis media , HL = hearing loss .

Table (2) : Mean \pm SEM of the ages (in months) of different language components for all children (n = 105) and the delay from their mean chronological age:

Language component	Language Age	The delay
Semantics	25.3 \pm 1.4	15.7 \pm 1
Pragmatics	27.9 \pm 1.3	13.1 \pm 1.2
Prosody	20.9 \pm 0.5	20.1 \pm 1.2
Receptive language	31.1 \pm 1.4	9.9 \pm 0.7
Expressive language	30.9 \pm 1.5	10.1 \pm 1
Total language age	30 \pm 1.4	11 \pm 1

Table (3) : Correlation between duration of otitis media and the delay in language components of all children :

Language component delay	Duration of OM	P value
Semantic delay	0.214	0.03 *
Pragmatic delay	0.260	0.007**
Prosodic delay	0.366	0.001 **
Receptive language delay	0.012	0.9
Expressive language delay	0.044	0.65
Total language age delay	0.126	0.2

* Significant $p < 0.05$

** Highly significant $p < 0.01$

Table (4) : Correlation between duration of degree of hearing loss and the delay in language components of all children :

Language component delay	Degree of hearing loss	P value
Semantic delay	0.150	0.13
Pragmatic delay	0.149	0.13
Prosodic delay	0.237	0.01 *
Receptive language delay	0.057	0.56
Expressive language delay	0.003	0.98
Total language age delay	0.072	0.46

* Significant $p < 0.05$

Table (5) : Results of multiple linear regression of chronological age , duration of otitis media and degree of hearing loss against the delay of prosodic language age :

Variable	Partial R	Std. Error of partial R	t	P
Chronological Age	-1.089	0.028	38.367	< 0.001**
Duration of O.M	0.633	0.048	-13.263	< 0.001**
Degree of HL	0.313	0.032	9.917	< 0.001**
Constant	-22.786	1.486		

R : Regression coefficient ** Highly significant

DISCUSSION

Although there have been notable increases and improvements in the research on OM and language development, there has not yet been an attempt to an objective and quantitative examination of the research¹⁰. This study investigated the relationship between OM and the developmental domain of oral language in a controlled set-up where the OM as well as the specific language components were objectively assessed and diagnosed. We enrolled children with a more or less same sociodemographic background and with no recognized major biological or social risk factors for developmental delay.

Empirical studies that have assessed the degree of association between language development and the duration of OM during the first 3 years of life have yielded inconsistent findings. Some studies¹⁹⁻²² have found associations between at least some developmental measures—auditory perceptual abilities, speech perception and production and/or language and the duration of OM. However, other studies^{7,8,2} have found no association between developmental measures and antecedent OM. Some studies^{19,24} have attributed

negative associations between emerging language skills and otitis media to hearing status because of higher correlation coefficients of language skills with hearing loss than with duration of OM. However, other studies^{6,23} have not corroborated associations between the hearing loss associated with OM and later language outcomes.

The results of this study showed many similarities to, and some differences from the results of these previous studies. We found that the impact of duration of OM is more detrimental than the degree of hearing loss on the specific language components. The delay in semantic, pragmatic and prosodic ages were all found to be significantly correlated with the duration of OM. This could be explained to that the more the frequency and duration of episodes of OM, the shorter the disease-free intervals afforded to the children and the less time to catch up while still in the most active phase of language development. While, the degree of hearing loss was found to be significantly correlated only with the delay in prosodic age (the supra segmental aspect of language) in young children. This could be attributed that the

supra segmental aspect of any utterance is perceived in the low frequency area of hearing on which the conductive hearing loss affects mostly .

However, on the other hand , the global measures i.e. the receptive , expressive and total language ages did not correlated significantly with both the duration of OM and degree of hearing loss . So , one clear clinical implication of the finding of this work that a history of OM with its subsequent conductive hearing loss in and of itself does not necessarily predict that young children will have language impairment . It is important to investigate and take into consideration the role of other notable extrinsic variables such as completion of medication routine , adult-child interaction , nutrition and so on . We could conclude that active language therapy is not necessarily for children with OM but the parents should be aware of the possible delay of the language skills of their children and monitor their face -to-face conversation during the bouts of OM for better outcome .

A future research may include studies that closely monitor sociolinguistic or parenting characteristics of the child during and between epi-

sodes of OM and might reveal specific factors that directly affect language skills .

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تأثير التهاب الأذن الوسطى فى المراحل المبكرة من العمر على المهارات اللغويه وتطورها

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قد يكون إلتهاب الأذن الوسطى عامل مرضى مؤثر على تطور اللغة فهناك تناقص بين الأبحاث المختلفة بهذا الصدد ويهدف هذا البحث إلى دراسة التأثير المحتمل لالتهاب الأذن الوسطى المزمن وضعف السمع التوصيلى الناتج عنه فى المراحل المبكرة من العمر على تطور اللغة ومكوناتها بصورة كمية لمزيد من فهم طبيعة هذه المشكلة.

أجرى هذا البحث على ١٠٥ طفل تتراوح أعمارهم ما بين ٢٢-٦٨ شهرا. وكان كل الأطفال يعانون من التهاب مزمن بالأذن الوسطى بالناحيتين ولفترة زمنية تتراوح بين ١٠ شهور و ٣٦ شهر. وتم تقييم كل الأطفال من خلال بروتوكول تشخيصى شاملاً التاريخ المرضى، التقييم السمعى وتقييم اللغة. وتم استبعاد الأطفال ذوى العوامل المرضية الأخرى التى قد تؤثر على اكتساب اللغة.

وأظهرت النتائج أن طول الفترة الزمنية لالتهاب الأذن الوسطى كان أكثر تأثيراً على اللغة من درجة النقص السمعى الناتجة. وأثبتت النتائج وجود علاقة طردية ذات دلالة إحصائية بين التأخر فى أعمار اكتساب المعانى والبلاغة والاطار اللحنى والمدى الزمنى لالتهاب الأذن الوسطى. بينما كانت درجة الضعف السمعى لها علاقة طردية فقط مع التأخر فى عمر إكتساب الاطار اللحنى للغة.

وعلى النقيض، فإن القياسات الكليه مثل العمر الإدراكى والعمر التعبيرى والعمر الكلى للغة ثبت أن ليس لها علاقة ذات دلالة إحصائية بالفترة الزمنية لالتهاب الأذن الوسطى وضعف السمع الناتج عنها.

وستخلص من هذا البحث أن العلاج اللغوى الإيجابى ليس ضروريا لهؤلاء الأطفال ولكن يجب تنبيه الوالدين لاحتمال تأخر إكتساب مهارات اللغة عند أطفالهم ويجب عليهم المشاركة الفعالة بالتحاور وجهاً لوجه مع أطفالهم خلال الفترات المرضية وذلك لتتاج لغوى أفضل.

PERCEIVED HYPERNASALITY IN THE PRESENCE OF ADEQUATE VELOPHARYNGEAL CLOSURE AS MEASURED BY AERODYNAMIC STUDIES

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ABSTRACT

It was found that there was a group of patients with repaired cleft palate who demonstrated a discrepancy between aerodynamic assessment of velopharyngeal (VP) adequacy and clinical judgement of nasal resonance. The aim of this work is to study such group of patients in order to understand and explain this discrepancy. This study comprised 37 subjects divided into two groups. The first group comprised 12 patients with the diagnosis of repaired overt or submucous cleft palate with an age range of 5 to 25 years (mean age = 13 years). This group showed an audible degree of hypernasality in their speech while they have adequate VP port area by aerodynamic measures. The second group (n = 25) comprised age and sex matched normal subjects who

demonstrated normal resonance of speech. All the subjects were assessed subjectively for the degree of open nasality on a 4-point scale and objectively by acoustic and aerodynamic studies.

Acoustic studies demonstrated a highly significant difference in the nasalance scores between both groups. Aerodynamic studies demonstrated a statistically non-significant difference concerning nasal flow and intra-oral and nasal pressure findings between both groups. While, on the other hand, the timing of both the nasal flow and the intra-oral pressure showed highly significant difference between both groups. Also, the nasal flow peak showed a highly significant shift to the right with delay in flow in relation to the intra-oral pressure.

These aerodynamic timing results may, therefore, explain why these patients have perceived open nasality. The current study also, indicates that the acoustic measurements using nasometer may be more sensitive in detection of open nasality than aerodynamic measurements using PERCI. Moreover, the results of the latter should be carefully interpreted when a discrepancy occurs between perceptual judgments and VP port areas.

Key words :

Hypernasality- Velopharyngeal valve - aerodynamic studies

INTRODUCTION

Velopharyngeal incompetence (VPI) is a condition that causes hypernasal distortion and nasal emission during speech. This is due to inter-structural inability for alternate sealing-off and opening of the nasopharynx in rapid coordinated physiological movements that are properly timed with other articulators of the speaking mechanism¹. Finding objective means of assessment of the velopharyngeal function remains the concern of most clinicians. The main purpose of finding objective means is to answer more precisely the questions raised by the multidisciplinary

team and to help direct the patient to the most effective line of treatment².

For many years, clinicians have relied heavily on acoustic and aerodynamic measures for assessment of velopharyngeal incompetence. These procedures have proved to be both effective, non-invasive and feasible. Acoustic analysis is mainly obtained by calculating nasalance scores which are determined by a percentage ratio of nasal to oral plus nasal acoustic energy. On the other hand, aerodynamic studies utilize values obtained from nasal airflow and pressure, as well as oral pressure to measure the velopharyngeal port area (VPA). Warren have suggested that patients with varying degrees of hypernasality can be categorized on the basis of pressure-flow test results³. He proved that VPA less than 0.05 cm² is considered indicative of adequate closure. An intermediate category of borderline closure produces measures between 0.05 and 0.19 cm². VPA equal to and greater than 0.20 cm² is considered inadequate.

In most cases of VPI, hypernasality is readily detected by the instrumental measures. However, it was found that there was a group of pa-

tients with repaired cleft palate who demonstrated a discrepancy between aerodynamic assessment of velopharyngeal adequacy and clinical judgement of nasal resonance. The speech of those patients were judged as hypernasal although VPA was less than 5 mm^2 by aerodynamic measures. In 1993, Warren et al.⁴ tried to explain this phenomenon on the basis of a timing disorder of VP closure.

The aim of this work is to study such group of patients with repaired cleft palate who demonstrated an audible degree of hypernasality in their speech while they have adequate VPA by aerodynamic measures in order to understand and explain this discrepancy between the subjective perceptual ratings and the objective aerodynamic measures.

MATERIAL AND METHODS

This study comprised 37 subjects divided into two groups. The first group comprised 12 patients who attended the Phoniatrics Unit, Ain Shams University Hospitals with the diagnosis of repaired overt or submucous cleft palate. They were 6 males and 6 females with an age range of 5 to 25 years (mean age = 13 years). This group showed an audible

degree of hypernasality in their speech while they have adequate VPA by aerodynamic measures. The second group ($n = 25$) comprised age and sex matched normal subjects who demonstrated normal resonance of speech. None of the subjects of either group demonstrated hearing loss, mental subnormality or neuromuscular disorders.

All the subjects were assessed subjectively and objectively as follows :

(A) Subjective assessment:

Auditory perceptual assessment of the degree of open nasality of all subjects was judged by 3 clinicians on a 4-point scale:

0 = normal (no audible open nasality).

1 - mild degree of open nasality .

2 = moderate degree of open nasality .

3 = severe degree of open nasality

(B) Objective measures:

(1) *Acoustic measures* : The VPA of all subjects were assessed using Kay Elemetrics Nasometer (model 6200-2, version 1.5) for measurement of nasalance scores for an oral sentence (/ali rah jel'ab korah/) on the basis of calculating the ratio of nasal to

oral plus nasal acoustic energy in terms of percentage according to the following equation⁵ : nasalance % = nasal energy / (nasal + oral energy) %

(2) *Aerodynamic measures* : The VPA of all subjects were also assessed using PERCI Sars (Palatal Efficiency Rating Computed Instantaneously). Subjects were asked to produce a series of the bilabial plosive /b/ in the word /amber/. The nasal-plosive blend /mb/ was used to stress the palatal mechanism as described by Warren³. Measurements obtained from PERCI were intra-oral pressure in cm H₂O, nasal pressure in cm H₂O, nasal air flow in L/sec, and velopharyngeal valve area in mm². The latter measurement is mathematically and automatically calculated from the following equation⁶:

$$A = V / k (\Delta P / d)^{1/2}$$

where A = area of orifice, V = nasal airflow, k = 0.65,

ΔP = oral-nasal pressure, and d = density of air

The duration of both the nasal airflow and intra-oral pressure were determined during the production of the nasal-plosive blend. The relation

between the peak of the nasal airflow curve and the intra-oral pressure curve was also determined. The peak of the nasal flow curve normally corresponds to the beginning of the rise of the oral pressure curve. Any shift in this relation is determined in msec and described as peak shift.

Statistical analysis was done using T-test for comparing the results of both groups. P was considered significant if < 0.05 and highly significant if < 0.01.

RESULTS

I- Results of auditory Perceptual assessment :

All 12 patients demonstrated a degree of open nasality as judged by the 3 clinicians. This degree ranged from 1 to 2. Four of them showed a degree of 1, two showed a degree of 1-2, while six patients demonstrated a degree of 2 open nasality.

II - Results of objective measures :

A) Nasalance scores :

There was a highly significant difference ($p < 0.01$) between mean values of both groups where patients scored higher results than normal subjects (table 1).

B) PERCI readings :

i) *Flow and pressure findings* : All items entering the equation were compared between both groups to determine any differences in their results. It was found that all parameters showed statistically non-significant difference ($P > 0.05$) although VP port areas showed a tendency for higher mean results in the patients group than the normal group (table 2).

ii) *Timing results* : The timing of both the nasal flow and the intra-oral pressure showed highly significant difference ($p < 0.01$) between both groups with group 1 producing more durations than group 2. The nasal flow peak also showed a highly significant shift to the right with delay in flow in relation to the intra-oral pressure ($p < 0.01$) (table 3).

Table (1): Results of nasalance scores of group 1 (patients, $n = 12$) and group 2 (normal subjects , $n = 25$) as compared by T-test:

Measures	Group 1	Group 2	T-value	P-value and significance
Nasalance (%)	41.3 \pm 21	15.1 \pm 5	12.5	$P < 0.01$ HS

HS = highly significant

Table (2): Results of flow and pressure findings of group 1 (patients, $n = 12$) and group 2 (normal subjects , $n = 25$) as compared by T-test:

Measures	Group 1	Group 2	T-value	P-value and significance
Nasal Flow (L/s)	20.7 \pm 15	16.1 \pm 13	1.07	$P > 0.05$ NS
Intra-oral pr. (cm H ₂ O)	3.9 \pm 2	6.4 \pm 4	1.9	$P > 0.05$ NS
Nasal pr. (cm H ₂ O)	0.86 \pm 0.7	0.45 \pm 0.3	1.3	$P > 0.05$ NS
Oral-nasal pr.	3.0 \pm 2.4	6.0 \pm 3.6	2.1	$P > 0.05$ NS
VPA (mm ²)	1.9 \pm 0.5	1.1 \pm 0.7	1.9	$P > 0.05$ NS

VPA = velopharyngeal orifice area

NS = non-significant

Table (3): Timing results of nasal airflow and intra-oral pressure (in msec) of group 1 (patients, n = 12) and group 2 (normal subjects, n = 25) as compared by T-test:

Measures	Group 1	Group 2	T-value	P-value and significance
Nasal flow	0.35±0.05	0.18±0.06	7.14	P < 0.01 HS
Oral pressure	1.30±0.3	0.16±0.05	14.65	P < 0.01 HS
Peak shift	0.40±0.1	0.08±0.02	11.8	P < 0.01 HS

HS = highly significant

DISCUSSION

The patients' group presented in this study actually caused a dilemma while interpreting its results. Aerodynamic measurements of VP port areas by Perci of the patients' group were way below the borderline measures, (5 mm²). While, on the other hand, their nasometric findings assured that they had perceived open nasality in their speech and, in some of them, these values reached moderate degrees. The results shown in this study point to the fact that there is still another variable that may determine and interfere with cleft palate patients' speech. This factor may be the timing by which closure of the VP valve is effected.

The patients' group showed two main differences in the aerodynamic timing results. The first was a prolonged timing of the nasal flow and the intra-oral pressure curves. The second was a main shift of the peak of the flow curve to the right in relation to the oral pressure curve. These changes may be explained by one of the following : The delay in closure may be a trial on the part of patients to overcome nasal emission of air by prolonging the closure time. Or it may be due to lack of proper coordination of the neuromuscular system of the VP valve in patients with repaired cleft palate.

Normally, the peak of the nasal

flow must occur during the oral pressure-rise phase. There should be no nasal flow at the oral pressure peak. In the patients' group the shift of the flow curve to the right is indicative of nasal flow associated with the pressure peak. This explains why these patients have perceived open nasality.

The prolonged open time for the VP orifice is confirmed by Dalston et al.⁷ and Warren et al.⁴ who described similar findings in a group of patients who demonstrated hypernasality with normal VP port areas. Dalston et al.⁷ explained the timing delay by adjustments that were presumed to be necessary in order to compensate for differences in VP movement capabilities. However, Warren et al.⁴ also found that patients had significantly lower nasal airflow rates than normal non-cleft subjects. Nevertheless, they suggested that the time where the nasal chamber is open to the vocal tract was more important to determine the degree of open nasality than the actual amount of airflow escaping through the nose.

The current study indicates that the acoustic measurements using

nasometer may be more sensitive in detection of open nasality than aerodynamic measurements using PERCI. Moreover, the results of the latter should be carefully interpreted when a discrepancy occurs between perceptual judgments and VP port areas. It is recommended that the velopharyngeal closure patterns for other conditions associated with VPI such as hearing impairment, mental retardation and neuromuscular disorders be studied in order to evaluate their closure patterns. The present study also indicates that in rehabilitation of such patients it may not be enough to have the patient try to minimize hypernasality by reducing expiratory effort. The duration of closure should also be shortened perhaps through visual feedback using PERCI for better outcome.

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الخنف المفتوح المسموع فى وجود قياسات طبيعية للصمام اللهاى البلعومى باستخدام دراسة ديناميكية الهواء

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من وحدتى أمراض التخاطب بأقسام الأذن والأنف والحنجرة كلية الطب

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وجد أنه فى مجموعة من مرضى شق سقف الحلق والذي أجريت لهم جراحة لاصلاح الشق، أنهم يعانون بعد العملية من نسبة من الخنف المفتوح المسموع وكذلك من إختلاف فى نتائج الفحص الديناميكي لالية الهواء، أثناء الكلام وهذا فى وجود قياسات طبيعية لمساحة الصمام اللهاى البلعومى لهذه المجموعة. تهدف هذه الدراسة الى معرفة سبب هذه الفروق فى النتائج. وتشمل عينة البحث ٣٧ شخص مقسمة إلى مجموعتين، المجموعة الأولى وتضم ١٢ مريض من مرضى شق سقف الحلق المخاطى بعد اجراء العملية تتراوح أعمارهم بين ٥ - ١٢ سنة (المتوسط ١٣ سنة). يبين فحص هذه المجموعة وجود خنف مفتوح مسموع مع وجود قياسات طبيعية لمساحة الصمام اللهاى البلعومى باستخدام وسيلة فحص ديناميكية الهواء (البيرسى). أما المجموعة الثانية وعددها ٢٥ فهى المجموعة الضابطة والكلام فيها طبيعى وكذلك قياسات الصمام اللهاى البلعومى. وقد تم رصد نتائج كل من المجموعتين بتقييم درجات الخنف المفتوح المسموع وأيضاً باستخدام القياسات الصوتية وقياسات ديناميكية الهواء للصمام اللهاى البلعومى، وتبين وجود نتائج إيجابية فى المجموعة الأولى فى تأخر العامل الزمنى بين سرعة مرور الهواء الأنفى وضغط الهواء الفمى وكذلك فى إنحراف منحنى سرعة مرور الهواء من الأنف الى اليمين. وهذا قد يفسر مانسمعه من خنف مفتوح فى وجود قياسات طبيعية لمساحة الصمام اللهاى البلعومى. وضحت هذه الدراسة أيضاً أهمية النازوميتير كوسيلة فعالة فى قياسات الخنف المفتوح وأنه أكثر فاعلية عن إستخدام جهاز البيرسى.

