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Effect of adenoid hypertrophy on the voice and laryngeal mucosa in children

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ABSTRACT

Introduction: The adenoids, or pharyngeal tonsils, are lymphatic tissue localized at the mucous layer of the roof and posterior wall of nasopharynx.

Dysphonia defined as perceptual audible change of a patient's habitual voice as self judged or judged by his or her listeners.

The diagnosis of dysphonia relies on clinical judgment based on phoniatric symptoms, auditory perceptual assessment of voice (APA) and full laryngeal examination.

Patients and methods: Our study was conducted to evaluate the effect of adenoid hypertrophy on voice and laryngeal mucosa. The study sample composed of sixty children, forty of them had adenoid hypertrophy (patient's group) and twenty healthy children (control group). Patient's group composed of 17 boys (42.5%) and 23 girls (57.5%), while control group consists of 8 males (40%) and 12 females (60%). All patients and control group subjected to history taking, clinical examination, lateral soft tissue X-ray on the nasopharynx, APA based on the modified GRBAS scale and full laryngeal examination. The data are collected and analyzed statistically by using software SPSS.

Results: Our results showed that there is a significant association between adenoid hypertrophy and, degree of dysphonia, leaky voice, pitch of voice and laryngeal lesion.

Adenoid hypertrophy did not associate with loudness of voice, as well as character (irregular, breathy and strained). Laryngeal lesions were detected in thirteen children from patient group (32.5%): nodules ($n = 6$), thickening ($n = 5$), congestion ($n = 2$), while one child only out of 20 children of the control group had congestion (5.0%).

Conclusion: Our results showed the importance of the assessment of voice and laryngeal examination in patients with adenoid hypertrophy, also treating the minimal mucosal lesions that results from adenoid hypertrophy should be taken in consideration.

1. Introduction

The adenoid, or nasopharyngeal tonsil, is a lymphoepithelial organ located in a critical anatomical position in the roof of the nasopharynx, and it plays an important role in diseases of the upper respiratory tract [1].

The nasopharynx lies right above the throat; splashes of excessive "drip" from infected adenoids may land directly on the vocal folds. Although the larynx and vocal folds do not ordinarily become infected from adenoiditis, their mucosa does become irritated. The vocal folds are extremely sensitive to touch, and any fluid drops falling on them cause an irresistible urge to cough [2].

Adenoidal hypertrophy and adenotonsillar hypertrophy are common disorders in the pediatric population and can cause symptoms such as mouth breathing, nasal congestion, hyponasal speech, snoring, and obstructive sleep apnea (OSA), as well as chronic sinusitis and recurrent otitis media. More serious long-term consequences, typically secondary to OSA, include neurocognitive abnormalities (e.g. behavioral and learning difficulties, poor attention span, hyperactivity, below average intelligence quotient); cardiovascular morbidity (e.g. decreased right ventricular ejection fraction, left ventricular hypertrophy, elevated diastolic blood pressure); and growth failure [3].

Chronic dysphonia is quite common in young children and has an adverse impact on voice-related quality of life [4], prevalence rates vary from 3.9% to 23.4% [5] with the most affected age range of 8–14 years [6].

The etiological factors of acquired dysphonia in children are mainly due to vocal abuse and misuse' Chronic upper respiratory

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problems based on infections or allergies, gastroesophageal reflux and some studies suggest that the biologic composition of the vocal folds to withstand stress has some genetic and consequently individual determinants [7].

The aim of this work is to study the effect of adenoid hypertrophy on voice quality and laryngeal mucosa in children.

2. Patients and methods

The study was approved by The Research Ethics Committee of the Faculty of Medicine, Minia University, and written consent was filled by the parents of the studied children.

Our study is a prospective one that done on sixty child at the department of otorhinolaryngology, Minia university hospital, from November 2011 through May 2012. We divided the study sample into 2 groups, the study group that composed of forty patients that suffer from adenoid hypertrophy and the control group that consists of twenty healthy children – that presented to otorhinolaryngology clinic at Minia university hospital for any disease rather than upper respiratory tract infection or Adenoid hypertrophy (ex. ear wax).

The mean age of patients group is 6.2 years old with age ranged from 4 to 12 years old, and they composed of 17 boys and 23 girls. The age range of control group is similar to patient's group with mean age 7.2 years old, with 8 boys and 12 girls, (Table 1) shows demographic data of the studied sample. All the study sample underwent standard lateral soft tissue X-ray on the nasopharynx, the radiograph were obtained with children in supine position and their neck slightly extended. The study sample subjected to full history taking, questioner that filled by parents about past history of dysphonia since birth and history of abuse or misuse of voice, any previous medical disease or operative interference (tracheal intubation or laryngeal surgery in the past), and family history of hearing loss.

The inclusion criteria is adenoid hypertrophy without any other causes of upper or lower respiratory obstruction, after medical and radiological evaluation of the study sample. The exclusion criteria were other causes of chronic nasal obstruction rather than adenoid hypertrophy, cleft palate either frank or submucous and children with sensorineural hearing loss, that evaluated by otorhinolaryngological examination and audiological evaluation.

The study sample subjected to full detailed laryngeal examination using rigid laryngeal telescope and APA was done using modified GRBAS scale. GRBAS was developed by Hirano that modified by Kotby on 1986 to evaluate the severity of dysphonia and the type of voice quality [8]. The examiner did not know children of the study sample belongs to which group.

GRBAS scale is one of the scaling methods that have been introduced by the Japan Society of Logopedics and phoniatrics. In GRBAS scale, (G) stands for grade of dysphonia, (R) stands for roughness, (B) stands for breathiness, (A) stands for asthenia and (S) for strained voice [9].

Table 1
Demographic data of the studied sample.

	Patients group ($n=40$)	Control group ($n=20$)
Mean age	6.2 years	7.2 years
Males	1 7 (42.5%)	8 (40%)
Females	23 (57.5%)	12 (60%)
Adenoid	Hypertrophied	Non-Hypertrophied
Abuse of voice	Non	Non
Medical disease	Non	Non
Audilogical evaluation	NAD	NAD

NAD = no abnormality detected.

Kotby introduced a modified GRBAS scale which includes grade [G], strain [S], leakage [L], breathiness [B] and irregular [I]. The modified GRBAS scale parameters appear to be quite reliable for evaluating the severity of dysphonia and type of voice quality.

The evaluation of APA included in our study was:

- Grade of dysphonia; it either (normal, slight, moderate, or severe)
- Character; it can be (strained, leaky, breathy and irregular)
- Pitch; overall increase, decrease or diplophonia
- Loudness; (excessively loud, soft or fluctuating)

Both groups are matching each other except, adenoid hypertrophy which is the only difference between both groups, as shown in Table 1.

The data are collected from both groups and analyzed statistically by using software SPSS version 17. Chi Square test was used for testing the significance of differences between many proportions (qualitative data) (e.g. APA between control and patient group) and the probability (p value) of <0.05 was used as a cut off point for all significant test.

3. Results

Our results showed that six patients (15.0%) had slight dysphonia and eight (20.0%) patients had moderate dysphonia, while 26 patients not suffer from dysphonia. The control group shows one child (5.0%) had slight dysphonia. Table 2 Shows the association between adenoid hypertrophy and grade of dysphonia, with (P value = 0.034). Our data reveal that adenoid hypertrophy can lead to dysphonia as 35.0% of our patients suffer from it.

Our results pointed out that seven patients (17.5%) suffered from slight degree of character strained voice, four patients (10.0%) suffered from moderate degree and one child of the control group (5.0%) had slight degree. There is no association between adenoid hypertrophy and character strained voice (P value = 0.110), as shown in (Table 2).

Our results revealed that twelve patients suffered from leaky voice (seven patients of slight degree and five patients of moderate degree). While all control group didn't suffer from leaky voice. Our results showed significant association between adenoid hypertrophy and leaky voice, as shown in Table 2 with (P value = 0.024).

Neither patient nor control groups suffered from character breathy voice, this mean that adenoid hypertrophy did not lead to character breathy voice.

Our data revealed that two patient had slight character irregular voice while no one from control group suffer from character irregular voice; so, there is no association between adenoid hypertrophy and character irregular voice (P value = 0.309), as shown in Table 2.

Our results pointed out that fourteen (35.0%) out of 40 patients had decreased voice pitch, while one child out of 20 children of the control group had decreased voice pitch. These data means that, there is statistical association between adenoid hypertrophy and pitch of voice, as (P value = 0.011), this finding shown in Table 2.

We found that, there is no statistical difference in loudness between patient's group and control group, this mean that adenoid hypertrophy does not affect loudness of voice in children.

Laryngeal lesions were detected in thirteen children from patient group (32.5%): nodules ($n=6$), thickening ($n=5$), and congestion ($n=2$), while only one child out of 20 children of the control group had congestion (5.0%). These data means that there is statistical association between adenoid hypertrophy and laryngeal lesions, as (P value = 0.018), Table 3.