

Dysphonia in Children

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Summary: Introduction. Vocal symptoms are common among the pediatric population and are often caused by vocal abuse. Laryngoscopy is essential for their diagnosis because it helps differentiate several laryngeal lesions, leading to a decision for suitable treatments considering each case.

Objectives. This study aims to present the clinical characteristics, and the laryngoscopic diagnosis of a dysphonic child population.

Methods. The parents of 304 children, aged from 4 to 18 years and presenting prolonged hoarseness, answered a questionnaire about their children's voice, and all children were subjected to videolaryngostroboscopy.

Results. Male children aged from 7 to 12 years (64%) were predominant. Vocal abuse (n-162) and nasal obstruction symptoms (n-10) were the most frequent associated symptoms. The vocal symptoms had a chronic evolution (over 1 year) and were reported by most parents (n-200). The most commonly diagnosed lesions in the laryngoscopic exams were vocal nodules (n-175) and epidermal cysts (n-47). Furthermore, there was an association of some lesions, especially minor structural alterations.

Conclusion. In the present study, dysphonia occurred mainly in children aged from 7 to 12 years, predominantly males. Vocal abuse and nasal obstruction symptoms were frequently reported. Vocal nodules and cysts were the most commonly diagnosed laryngeal lesions in the laryngoscopic exams.

Key Words: Children–Voice–Dysphonia.

INTRODUCTION

Vocal symptoms are present in 6–23% of children aged from 4 to 12 years and occur because of inflammatory, infectious, congenital, traumatic, neurological, iatrogenic, and functional causes.^{1–3} Phonotrauma may occur because of psychosocial factors such as hyperactivity or impulsiveness, besides previous history of excessive crying, which are rather common among the child population.^{4,5} During leisure activities, children frequently increase their voice intensity, resulting in effort and cervical muscle tension. These vocal habits characterize hyperkinetic or musculoskeletal dysphonias and are the genesis of vocal nodule development.⁶

Laryngoscopy not only is essential to clarify the diagnosis of several laryngeal lesions but also leads to the correct treatment of each case. Vocal nodules are the major diagnosed lesion in dysphonic children and result from the abrupt and continuous collision of the vocal folds during phonation.^{6,7} The trauma extends to capillaries of the vocal fold mucosa, which causes variations in the dynamic of the fluid of lamina propria and edema, triggering the process of nodule formation. Histological analyses of vocal nodules have shown proliferation of epithelial layers, basement membrane thickening, and abundant fibronectin in the lamina propria.^{8,9}

Besides vocal nodules, other lesions can be diagnosed in dysphonic children such as vocal cysts, sulcus, mucosal bridges, paralysis, and papillomatosis. According to Pontes et al,¹⁰ minor structural alterations include a group of small imperfections in the laryngeal mucosa, which can be identified in the videolaryngostroboscopic exams. These lesions include cysts, mucosa bridge, microweb, and vocal sulcus. Vocal symptoms may manifest in the first years of life or later and can be triggered by vocal abuse.

The chronic evolution of dysphonia in children is responsible for the poor perception of parents and the delay in diagnosis and treatment. Moreover, the poor collaboration of children during laryngoscopic exams is another factor that affects the diagnosis. Thus, the aim of this study was to report the clinical aspects and the laryngoscopic diagnosis of a dysphonic child population.

CASES AND METHODS

This prospective clinical study analyzed vocal symptoms, associated symptoms, and laryngoscopic exams of children aged from 4 to 18 years, attended in the Outpatient Clinics of Voice Disorders at Botucatu Medical School between 2006 and 2011 and presenting predominant symptoms such as persistent or frequent hoarseness (more than two episodes per week). Their parents answered a questionnaire including data about age, gender, vocal symptoms, vocal abuse, and nasal and gastroesophageal symptoms. All children with gastroesophageal symptoms were referred to a specialist for investigation but we do not have information about the results of exams such as pH monitoring, impedance, esophagoscopy, or upper GI radiology.

Children presenting the following conditions were excluded: stridor or dyspnea, acute hoarseness during influenza, genetic syndromes of craniofacial malformation, and sensorineural hearing loss (according to the information given by their parents). The selected children were subjected to videolaryngostroboscopy (VLS), using the image conjugated system (video

Accepted for publication March 16, 2012.

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Journal of Voice, Vol. 26, No. 5, pp. 674.e17-674.e20
0892-1997/\$36.00

© 2012 The Voice Foundation
doi:10.1016/j.jvoice.2012.03.004

system type XE-30, Eco X-TFT/USB, Germany) attached to a rigid telescope (Asap, Germany), 70°, 8 mm, or to a nasofibrolaryngoscope (Olympus, Japan), stroboscopic light source (Atmos, Germany), and image registration in DVD. The project was approved by the Human Research Ethics Committee of Botucatu Medical School (number 2136/2006).

For statistical calculations relative to comparison between age rates and laryngoscopic diagnosis, Chi-square test was used.

RESULTS

Although 325 pediatric patients were included in the present study, 21 did not allow the exams, consequently the population decreased to 304 children, of whom 268 were subjected to exams with a rigid telescope and 36 with flexible nasofibroscope.

Age and gender

The predominant ages were 7–9 years (28.94%; 60 males and 28 females) and 10–12 years (40.46%; 88 males and 35 females) (Table 1). In the age groups above 12 years, there was predominance of girls.

Vocal and associated symptoms

Vocal abuse was reported by 162 children (54.67%), followed by nasal obstruction symptoms (n=110; 36.18%). A small number of children reported gastroesophageal symptoms (n=11; 3.6) (Figure 1).

Duration of symptoms

Duration of symptoms for over 1 year was reported by most of the children (n=200; Figure 2).

Videolaryngoscopy

Results of laryngoscopy are shown in Table 2. There was evident predominance of vocal nodules (Figure 3) over other laryngeal lesions. In addition, the frequency of epidermoid cysts was greater compared with other nonnodule diagnoses. The diagnosis of vocal epidermal cyst was based on the identification of the pearly lesion, where vascular dilation and restriction of the vibratory wave were identified. For 33 exams, the differential diagnosis between the cyst and vocal nodules could not be confirmed because the lesions were presented bilaterally in the endoscopy exams. The high number of other minor structural lesions such as sulci and mucosa bridge is also highlighted, and the frequent association of these lesions with nodules and vocal cysts. For the differential diagnoses of sulci and bridge, direct laryngoscopy was used in five children (two

bridges and three sulci). We identified one 5-year-old child with laryngeal dystonia associated with hyperthyroidism (Figure 4).

DISCUSSION

The results of the present study, which included 304 children with dysphonia and aged 4–18 years, indicated predominance of males (64%) over females (36%). Such data were also reported by other authors, even by those who studied smaller child populations. The distribution of gender of the 137 children with dysphonia analyzed by Connelly et al⁴ was very similar to that of the present study, where 61% were males and 39% were females. Angelillo et al⁵ studied a larger population of 312 dysphonic children and found that 57% were male and 43% were female.

During childhood, the behavior of boys is more impulsive and aggressive than that of girls and is allied to excessive hyperactivity, anxiety, and spirit of leadership. Such a profile reflects directly in the phonatory mechanisms, resulting in vocal abuse.^{11–13}

In adolescence, the larynx undergoes a series of structural alterations caused by masculine hormones enlarging its dimensions. Thus, the male pattern of the new glottic configuration is characterized by longer vocal folds and more acute angle of the thyroid cartilage, around 90°. In this period, the symptoms of dysphonia in male subjects tend to decrease and the vocal nodules start an involution process. However, this favorable course is not as evident in girls after adolescence. In girls, vocal folds elongate 3–4 mm during puberty, whereas in boys they increase by 1 cm.^{14,15} The evolution of symptoms and nodules after puberty was studied by De Bodt et al¹⁶ during the recall of 91 adolescents with previous diagnosis of vocal nodules in childhood. These authors observed that the symptoms of hoarseness persisted in only 21% of them, of whom 37% were females and only 8% were males. Laryngoscopy was done in 34 adolescents and the persistence of nodules was confirmed in 47% of the females and only in 7% of the males.

The chronic and insidious manifestation of vocal symptoms in dysphonic children is the most frequently observed pattern, especially for vocal nodules. A large number of children present vocal symptoms since childhood, which are caused by congenital laryngeal lesions, including minor structural alterations such as cysts, bridge, and microweb. Vocal cysts, the second largest cause of dysphonia in childhood addressed in the present study, can be asymptomatic or manifest symptoms in early childhood, when the phonatory demand becomes more intense. Acute hoarseness is mainly reported in infections of upper

TABLE 1.
Correlation Between Age and Gender of Dysphonic Children

Age	4–6		7–9*		10–12*		13–15		16–18		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Female	14	4.6	28	9.21	35	11.51	17	5.59	16	5.26	110	36.19
Male	20	6.57	60	19.73	88	28.94	16	5.26	10	3.28	194	63.81

**P* = 0.005.

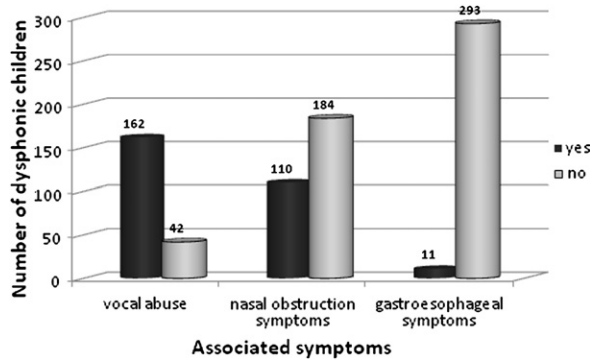


FIGURE 1. Associated symptoms.

airways or vocal abuse that can occur during child parties and group activities.

Videolaryngoscopy showed important predominance of vocal nodules (57.57%) and epidermal cysts (15.47%) over other lesions. The authors are unanimous to consider the high importance of vocal nodules in childhood dysphonias. The latter are phonotraumatic lesions and their origins maintain direct relationship with vocal misuse and inadequate vocal pattern. Mackiewicz-Nartowicz et al⁷ studied 150 dysphonic children aged from 2.5 to 14 years old and diagnosed vocal nodules in 85 children (56.66%), and expressive values of functional dysphonia (n-60; 40%). The minor values of functional dysphonia obtained in our study (n-10; 3.28%) can be attributed to the fact that our institution is a referral center for critically ill patients, and there are restrictions concerning spontaneous demand of patients with simpler diseases.

Other curious fact as to the results obtained by Mackiewicz-Nartowicz et al⁷ is the small number of vocal cysts (n-3) compared with that of the present study (n-47). Vocal cysts in children are generally epidermal and the diagnosis is based not only on the pearly lesions, but also on the presence of vascular dilation in their surface and on the decreased movement of the vibratory wave on the lesion during the VLS. Such an exam is essential for the diagnosis of these lesions.^{10,17,18} Even using this resource in the present study, the differential diagnosis between cyst and vocal nodule could not be confirmed for 33 cases because of the similarity between both lesions.

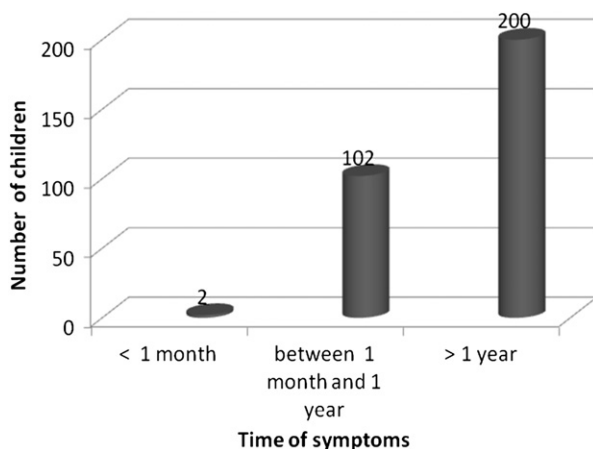


FIGURE 2. Time of symptoms.

TABLE 2.
Laryngoscopic Diagnosis in Dysphonic Children

Laryngoscopic Diagnosis	N	%
Lymphangiomas	1	0.33
Pharyngeal dystonia	1	0.33
Adherence postintubation	1	0.33
Granuloma intubation	2	0.66
Hemangioma	3	0.99
Laryngitis	4	1.31
Cyst + bridge/sulci	4	1.31
Papillomatosis	4	1.31
Paralysis	5	1.65
Microweb and nodules	6	1.97
Sulci/bridge	8	2.63
Functional dysphonia	10	3.28
Nodules/cyst	33	10.86
Epidermal cyst	47	15.47
Nodules	175	57.57
Total	304	100.00

Several minor structural alterations in the children's larynx were also diagnosed in our study such as sulci and bridges, and in some cases the differential diagnosis among them could not be concluded using only endoscopy, demanding surgical manipulation, which occurred for five of these cases. The association of more than one lesion in one same child must also be highlighted. Mortensen et al¹⁸ reviewed the medical records of 80 dysphonic children aged from 3 to 17 years and identified 132 laryngeal diagnosis, indicating the presence of more than one lesion in each child. Predominance of vocal nodules (n-11), laryngitis (n-41), polyps (n-15), and functional dysphonia (n-11) was highlighted by these authors.

Vocal abuse was reported by a large number of dysphonic children (54.67%). Equivalent results were found by other authors such as Connelly et al⁴ (45.2%) and Angelillo et al⁵ (90.3%). Vocal abuse is the essence for the development of phonotraumatic lesions, especially vocal nodules.

It is important to notice that some children with vocal nodules do not report daily vocal abuse. In these cases, other causes should be investigated such as respiratory symptoms,

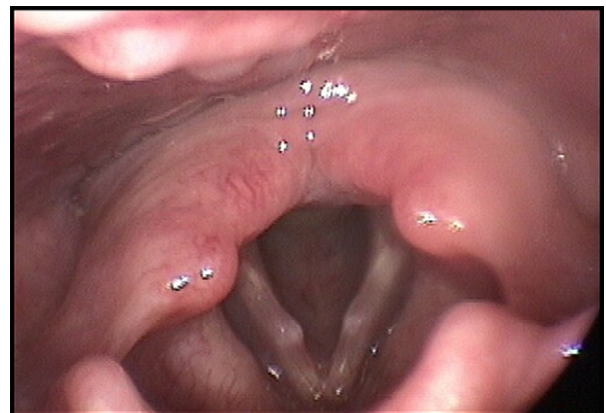


FIGURE 3. Vocal nodules in both vocal folds.

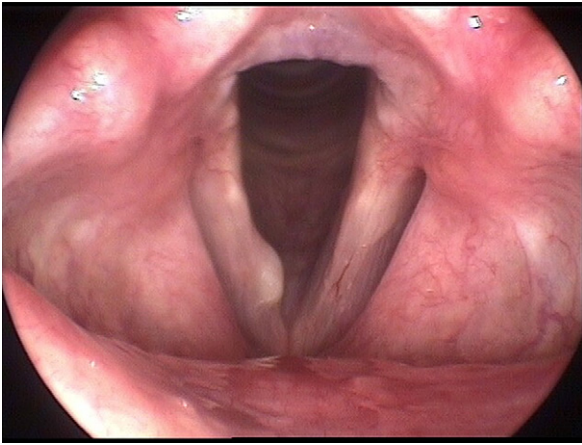


FIGURE 4. Vocal cyst in right vocal fold.

gastroesophageal reflux, and auditory symptoms. Respiratory symptoms (nasal obstruction and increased secretions) were reported by 36.18% of the children in this study. The constant inhalation of poorly conditioned air, resulting from mouth breathing and contamination of laryngeal structures by the secretions originated in the nasal cavity and the rhinopharyngitis, are responsible for the chronic inflammatory process of the laryngeal mucosa. This condition demands an increase in subglottic pressure and effort in phonation. Some authors registered important alterations in the auditory-perceptual vocal parameters and in the acoustic measures of patients with tonsils hypertrophy, in addition to an improvement in the acoustic parameters such as the resonance after surgery of tonsils, confirming the influence of respiratory disturbs on the phonation.^{19,20}

Although not frequently reported by the parents of the pediatric subjects of this study (3.6%), gastroesophageal symptoms should be included in the care protocols for child and adult patients with dysphonias because the reflux laryngitis can be associated with several laryngeal lesions such as inflammation, pachydermia, mucosal thickness, nodules, and vocal polyps.^{21,22} In these cases, the success of dysphonia treatment is directly related to the gastroesophageal reflux control.

CONCLUSION

In the present study, the clinical aspects and the results of videolaryngoscopic exams of 304 dysphonic children indicated predominance of males aged from 7 to 12 years. Vocal abuse seems to play an important role in child dysphonias, which had nodules and vocal cysts as main diagnosis.

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