Pediatric voice disorders at Hospital Dona Estefânica: Casuistic before and after distal chip videolaryngoscopy

Original Article

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Abstract

Objective: To describe the casuistic of the Voice Unit at Hospital Dona Estefânia and compare the diagnoses obtained with flexible fiberoptic videolaryngoscopy and distal chip flexible videolaryngoscopy.
Study design: Retrospective observational study.
Material and Methods: Review of clinical records from patients first evaluated from September 2018 to December 2021.
Results: Videolaryngoscopy was obtained in 78.1% of the 73 studied children. The following diagnoses were made: vocal fold nodules (42.5%), laryngopharyngeal reflux (12.3%), muscle tension dysphonia (9.6%), corditis (2.7%), vocal fold cyst (2.7%) and vocal fold polyp (1.4%). There was no statistically significant difference in the diagnoses made using distal chip videolaryngoscopy, but we noticed a decrease in the proportion of vocal fold nodules and normal laryngoscopies and an increase in the proportion of laryngopharyngeal reflux (p = 0.479).
Conclusion: Distal chip videolaryngoscopy did not change the diagnoses made in children with chronic dysphonia.
Keywords: dysphonia, voice disorders, laryngoscopes, stroboscopy, pediatrics

Introduction

Dysphonia is a frequent symptom in the pediatric population, affecting 6%–23% of children.[1,2] It is also a frequently overlooked symptom, given that its etiology is usually benign and that the correct diagnostic assessment and therapeutic approach may be challenging in this age group.[1-3] Although the etiology of pediatric dysphonia is mostly benign, with vocal cord (VC) nodules being the cause in more than half of the cases, it is rarely caused by potentially severe diseases such as recurrent laryngeal papillomatosis, VC paralysis, or neoplastic lesions, whose exclusion is mandatory.[2,4,5] Moreover, it has been demonstrated that chronic dysphonia

has a significant impact on the quality of life of children as it compromises communication as well as school and social life.[6] Thus, pediatric dysphonia requires a timely approach to achieve the correct etiological diagnosis, which needs to be based on the visualization of the larynx.[2,5] Currently, there are several techniques available for the visualization of the larynx. In the pediatric population evaluated in the voice clinic of the Dona Estefânia Hospital (HDE), this is usually achieved using flexible video laryngoscopy, which can be performed with a fiberoptic or distal-chip endoscope. Distal-chip endoscopes provide high-resolution images and have the potential to improve the detection and diagnosis of small VC lesions.[7,8] Scholman *et al.* demonstrated the superiority of this type of endoscope for the identification of a normal larynx and premalignant/malignant laryngeal lesions, as well as the detection of changes in the laryngopharyngeal mucosa through video images of the adult larynx.[7,8]

A literature review did not yield any study that compared the use of the different types of video laryngoscopes in the pediatric population. The objectives of the present study were to describe the cases of pediatric dysphonia from the voice clinic of the HDE and determine the differences between the diagnoses made using a flexible fiberoptic video laryngoscope (FOL) and flexible distal-chip video laryngoscope (DCL).

Materials and Methods

This retrospective study used the first consultation records of a consecutive cohort of patients who were evaluated at the voice clinic of the HDE between September 2018 and December 2021. This time interval included a period of 20 months before and after the availability of DCL. A sample of 85 cases was obtained. Twelve cases were excluded, including eight patients who did not exhibit dysphonia (seven had language impairments and one had velopharyngeal insufficiency) and four patients with self-limited acute dysphonia at the time of referral, which was resolved at the time of the consultation. Demographic data, clinical history relative to dysphonia, comorbidities, diagnoses, treatments, and laryngoscopy findings of the included patients were reviewed. The follow-up consultations were not considered for the recruitment of new cases but were used for the collection of data.

All consultations and laryngoscopy examinations were performed by the same senior otorhinolaryngologist.

Videolaringoscopy with FOL was performed using a 3.5-mm flexible fiberoptic naso-pharyngolaryngoscope coupled to a camera head (Pentax, Corp Japan, Tokyo, Japan) under continuous light. Videolaryngoscopy with DCL was performed with a 2.7-mm flexible nasopharyngolaryngoscope (XION GmbH, Berlin, Germany) under continuous light followed by stroboscopic light. All diagnoses used in the present study were established in the continuous light condition and were not altered by the subsequent exam under stroboscopic light (in patients in which it was performed).

These procedures were performed under topical anesthesia by applying in each nasal cavity 1 ml of a 1:1 mixture of 0.25% oxymetazoline solution and 1% lidocaine.

The statistical analysis of the data was performed using the IBM SPSS® Statistics 25 software.

The nominal variables were expressed as percentages, while the continuous variables (age at the time of the first evaluation) were expressed as means ± standard deviation, after confirmation of normality.

The differences between the groups were explored using contingency tables and the chi-square test or Fisher's exact test in the case of nominal variables (when appropriate), and Student's t-test for independent samples in the case of normally distributed continuous variables. The comparison of the proportions of the dichotomous variables was performed using the binomial test. The level of significance was set at 0.05.

Results

Seventy-three new cases of chronic dysphonia from the voice clinic at the HDE were selected and included in the study. The mean age (± standard deviation) at the time of the first evaluation was 9.6 (± 3.7) years, varying between two and 20 years. The majority of the evaluated children (65.8%) were aged between six and 11 years, followed by children aged 12 years and more (20.5%) and, finally, children aged between two and five years (13.7%). The study's cohort included 53 boys (72.6%) and 20 girls (27.4%).

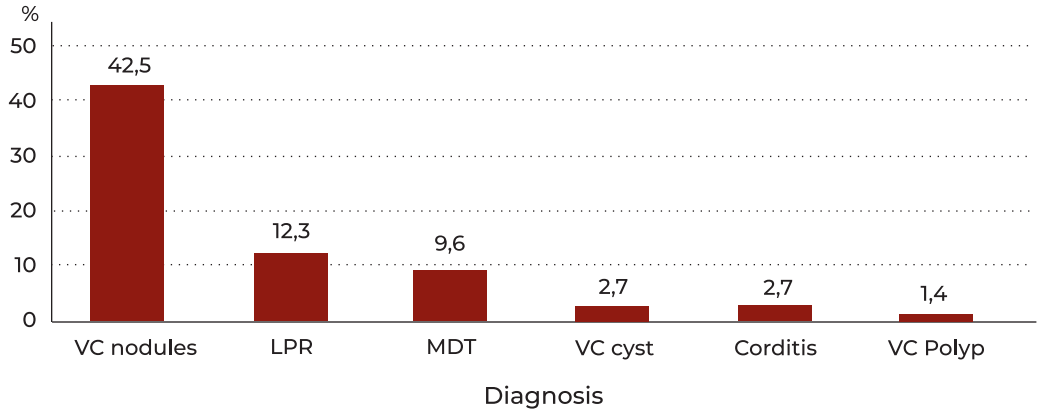
Videolaryngoscopy was performed in 78.1% of cases and the following diagnoses were established: VC nodules (42.5%), laryngopharyngeal reflux (LPR) (12.3%), muscle tension dysphonia (MTD) (9.6%), VC cysts (2.7%), corditis (2.7%), and VC polyps (1.4%) (Graph 1).

The diagnosis was made using FOL in 49.3% of cases and DCL in 28.8% of cases. There were no significant differences between the groups assessed using FOL and DCL regarding the demographic variables (p_{sex} = 0.352; p_{age} = 0.288), presence of a phonotraumatic behavioral profile (p = 0.435), and presence of nasal complaints (p = 0.182) or complaints indicative of LPR (p = 0.248) (Table 1).

The use of FOL was associated with a higher proportion of cases diagnosed as VC nodules (FOL 58.3%; DCL 47.6%) and of laryngoscopy exams classified as normal (FOL 11.1%; DCL 4.8%), and with a lower proportion of cases diagnosed as LPR (FOL 8.3%; DLC 28.6%); however, these differences were not statistically significant (p = 0.479) (Graph 2).

Nasal symptoms and symptoms c ompatible with LPR were reported in 26.0% and 20.5%

Graph 1
Etiological diagnoses based on videolaryngoscopy



Abbreviations: VC, vocal cords; LPR, laryngopharyngeal reflux; MTD, muscle tension dysphonia

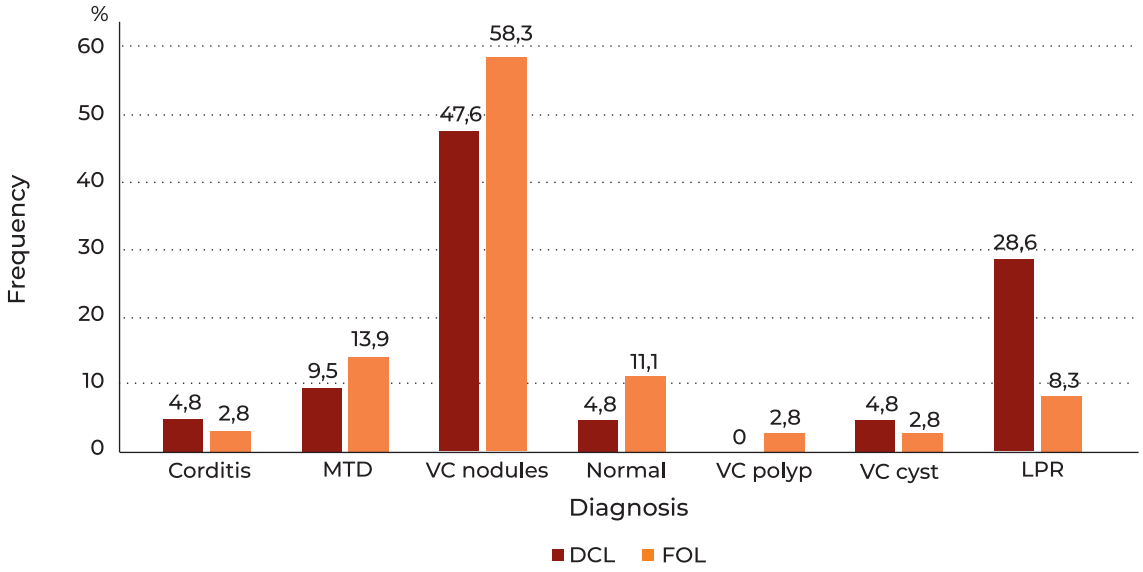
Table 1
Characterization of the groups undergoing FOL and DCL

	FOL	DCL	
Sex (%) Male Female	 75.0 25.0	 66.7 33.3	p = 0.352
Mean age at 1st evaluation (years)	9.57	10.57	p = 0.288
Phonotraumatic behavioral profile (%)	58.3	52.4	p = 0.435
Nasal symptoms (%)	20.0	35.0	p = 0.182
LPR symptoms (%)	17.1	28.6	p = 0.248

Abbreviations: FOL, flexible fiberoptic videolaryngoscope; DCL, flexible distal-chip videolaryngoscope; LPR, laryngopharyngeal reflux.

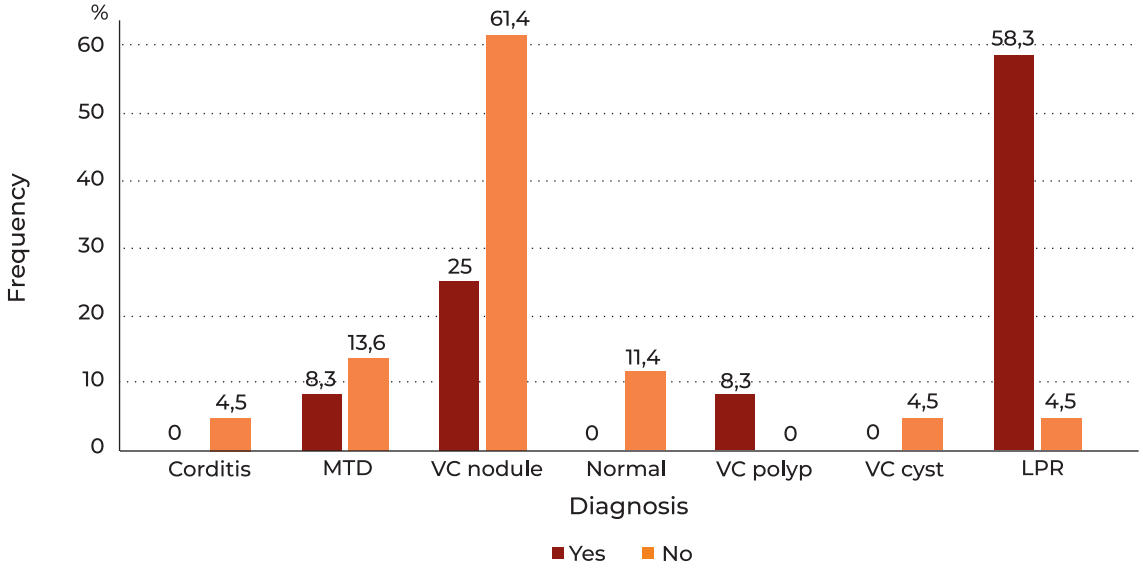
of cases, respectively. Habits suggesting phonotraumatic behavioral profile were observed in 57.5% of cases. There was no significant relationship of the established diagnoses with sex (p = 0.671), presence of nasal symptoms (p = 0.096), or presence of a phonotraumatic behavioral profile (p = 0.100). There was a significant relationship between the presence of complaints compatible with LPR and this diagnosis (p < 0.001) (Graph 3). The most frequently used treatment was speech therapy (93.2%), followed by proton pump inhibitors (21.9%).

Graph 2
Proportion of diagnoses obtained using a flexible fiberoptic videolaryngoscope and flexible distal-chip videolaryngoscope (p = 0.479)



Abbreviations: DCL, flexible distal-chip videolaryngoscope; FOL, flexible fiberoptic videolaryngoscope; MTD, muscle tension dysphonia; VC, vocal cords; LPR, laryngopharyngeal reflux.

Graph 3
Presence of symptoms indicative of laryngopharyngeal reflux according to the diagnosis (p < 0.001)



Abbreviations: MTD, muscle tension dysphonia; VC, vocal cords; LPR, laryngopharyngeal reflux.

Discussion

Seventy-three children with an objective diagnosis of chronic dysphonia on clinical observation were evaluated between September 2018 and December 2021 in the first consultation at the voice clinic of the HDE. The mean age of these children was 9.6 years; 65.8% of them were aged between six and 12 years and 72.6% were boys. These demographic characteristics were as expected and similar to those reported in other studies on dysphonic children, which describe mean ages between nine and 11 years[1,4] with 64% of the children aged between seven and 12 years[5], and 62% to 70.1% of the children being boys.[1,4,5]

All diagnoses were benign, with the main one being VC nodules (42.5%). VC nodules have been reported in the literature as the main cause of pediatric dysphonia and accounted for 40% to 57.6% of cases in previous studies.[1,4,5] The second most frequent diagnosis was LPR (12.3%). This condition is reportedly frequent among children with dysphonia and is the etiological diagnosis in 24% to 36% of cases.[4,9] A recent systematic review showed a strong relationship between gastroesophageal or laryngopharyngeal reflux and the development of dysphonia in the pediatric population.[10]

In the present study, a phonotraumatic behavioral profile was detected in 57.5% of cases, which is similar to that reported by other authors (54.7%).[5] Patients and carers should be systematically asked about the presence of phonotraumatic behaviors, which include screaming or loud talking, excessive talking, intense whispering, making abrupt glottic attacks and sound effects (e.g., imitating characters), and throat-clearing, because they are present in most cases and are a key area of therapeutic intervention.[11]

The presence of inflammatory disease which may be involved in the development of dysphonia should also be systematically investigated.[4] In the present sample, nasal symptoms were exhibited by 26% of patients and LPR was detected in 20.5% of cases, and a significant association between the symptoms and a diagnosis of LPR was established.

Martins *et al*. described a higher percentage of nasal symptoms (36.2%) and a lower percentage of LPR symptoms (3.6%).[5] Given the subjectivity inherent to the description of symptoms, some variation in the observed percentages is to be expected, depending not only on how the patients and their carers perceive these complaints but also on how the physicians investigate their presence.

Performing laryngoscopy to determine the diagnosis in children with dysphonia is deemed essential and feasible in most cases.[12] The larynx was visualized in 78.1% of children in the present sample, using a flexible laryngoscope in all cases (49.3% FOL and 28.8% DCL). A study that compared the diagnostic accuracy of rigid and flexible laryngoscopy, using direct laryngoscopy as the gold standard, showed the superiority of the former (64% vs 30%), but only rigid laryngoscopy exams used stroboscopic light and all flexible laryngoscopy exams were performed with fiberoptic devices coupled to a camera head and not with a distal chip.[13] Although rigid laryngoscopy is described in the literature to yield high-quality images, with greater magnification and better lighting, and is feasible in 85% of children aged seven years and more[14], it can be difficult to execute because it depends on an individual child's ability to collaborate and tolerate the exam. Additionally, this population has a more marked pharyngeal reflex and shorter phonation time.[15] In our experience, DCL provides high-quality images and is well accepted by patients and carers, thus allowing satisfactory management of children with dysphonia; therefore, the use of rigid laryngoscopy during consultation is not a common practice in our center.

In the present study, after the exclusion of demographic, behavioral, and clinical differences between the children assessed using either DCL or FOL, there was a trend towards a reduced proportion of diagnosed VC nodules and of laryngoscopy exams being classified as normal, as well as an increase in the proportion of LPR with the use of DCL, although the described differences were not

statistically significant. These variations may be attributed to the superior image resolution and quality with DCL[7,8]; no irregularities were found that could correspond to artifacts in the previously obtained images, which were diagnosed as VC nodules considering the epidemiology of the study population.[12] On the other hand, we think that the increase in the number of LPR diagnoses is related to the fact that DCL provides images of superior resolution and brightness[1,12] that allow detection of small epithelial changes and small variations, such as subtle differences in the color and roughness of the laryngopharyngeal mucosa, which can be missed in images obtained through optical methods with insufficient resolution.[7,8]

The diagnoses made using DCL were subsequently confirmed by observation under stroboscopic light. Ramos *et al*. compared the diagnoses made before and after the use of laryngeal stroboscopy and reported a reduction from 54% to 33% in the proportion of diagnosed VC nodules, as well as an increase in the number of diagnosed CV cysts (from 13% to 32%), which show the ability of this technique to distinguish between bilateral and unilateral lesions with reactive changes of the contralateral VC.[1,4,5,14] Although a trend of reduction in the number of diagnosed VC nodules was observed, there was no increase in the number of unilateral lesions; this variation may be explained by a more precise evaluation of the VC structure as a result of the superior images obtained with DCL.[7,8]

The main limitation of the present study is its retrospective nature, which was potentially detrimental to the collection, analysis, and comparison of data and the uniformity of the evaluations. However, we think that this was mitigated by the fact that all consultations and laryngoscopy exams were performed by the same senior otorhinolaryngologist, who followed a predefined protocol that ensured more standardized consultations, observations, and guidance. Some children with dysphonia may have more specific etiologies, such as recurrent laryngeal papillomatosis and VC paralysis[1,5], but these cases were absent from the present study sample, although they are often seen in our center. This is due to the follow-up of these children in the larynx consultation of the HDE, similar to what Centeno and Penna (2019) have described.[16] The videolaryngoscopes that were used not only differed in the technology but also in the diameter and light options. The smaller diameter of the DCL may have contributed to the fact that the exam was well tolerated, thereby allowing more detailed and prolonged observations, which may have led to an eventual bias in the comparison of the diagnoses that were made. However, the systematic use of topical anesthesia may have reduced the impact of this disparity. The difference in the lighting options did not interfere with the conclusions because all diagnoses were made based on the data obtained under continuous light and were not altered by the subsequent observation under stroboscopic light, even in the cases in which this option was available. The existence of multiple etiological diagnoses means that some of them are represented by a small number of children, which has an impact on the statistical power. This may explain why some data described in the study did not reach statistical significance. Thus, further studies with larger samples and more observers are necessary to confirm the reported findings and draw more robust conclusions.

Conclusion

The patients evaluated in the voice clinic of the HDE were aged between six and 12 years and were mostly boys, with the main cause of dysphonia being VC nodules. There were no statistically significant differences between the two analyzed methods of evaluation, although there appears to exist, in this population, an association between the use of DCL and a reduction in the number of diagnoses of VC nodules and normal laryngoscopy exams, as well as an increase in the number of LPR diagnoses.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

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Availability of scientific data

There are no datasets available, publicly related to this work.

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