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The feasibility of rigid stroboscopy in children☆

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Summary

Objective: Voice disorders in children are common but ways of their analysis are limited. We conducted a prospective feasibility study of rigid stroboscopy in children.
Methods: All children referred for voice analysis during the years 2002—2003 were evaluated including subjective perception of voice, voice recording, flexible or rigid laryngoscopy and stroboscopy. Children were prepared by an explanation and visual demonstration. Local anesthesia was introduced through inhalation of Lidocaine (2%) solution prior to examination. Stroboscopy was performed either by a 70° rigid laryngoscope or by a 3.0 mm fiberoptic-flexible endoscope.
Results: Forty-two children were analyzed. Rigid stroboscopy was feasible in 31 children of whom 7 were under 10 years of age. Short phonation time (7), gag reflex (6), impaired view due to high and posteriorly inclined epiglottis (4) were the main reasons of failure.
Conclusions: Standard telescopic stroboscopy can be safely and effectively implemented in the majority of children over 10 years of age.

1. Introduction

The estimated incidence of voice disorders among children ranges between only 1% [1], 6—9% [2] and up to 20% incidence in a group of 162 school children [3].

The common practice of evaluating hoarseness in children is traditionally perceptual, using subjective measures such as hoarseness, roughness and stridency. Clinicians, assuming vocal cord abuse the most likely cause of hoarseness in children, universally adopt a ''wait and see'' policy [4], and most pediatric otolaryngologists use speech therapy regardless of etiology or findings [1].

Diagnosis of vocal cord structural pathology is greatly improved by fiberoptic-flexible laryngoscopy and was found to be well tolerated even in young children in whom the ability to cooperate is limited [5].

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Stroboscopy is considered the best modality to study vocal cord function and its advantages were found to be valuable in detection of incipient pathologies (scar, sulcus), differentiate between pathologies (cyst versus nodule), and as a feedback to patient's family and therapist. The rigid stroboscopy, most commonly using a 70° laryngoscope, enables a clearer picture and is considered the standard mode of stroboscopic examination among adults. Yet, in a recent study, pediatric otolaryngologists reported that they used stroboscopy examinations in only 20% of children with voice disorders [1].

The feasibility of using a rigid laryngoscope for laryngoscopy and stroboscopy examinations in children aged 6—16 years was prospectively evaluated.

2. Materials and methods

The voice clinic in the Sheba Medical Center is a referral outpatient clinic that includes speech and language therapists and otolaryngologists. All children under 18 years of age were accompanied by parents or guardians. All children, age 6—16 years, referred for voice analysis during the years 2003—2004 were evaluated.

General and pediatric otolaryngologists and speech and language therapists referred approximately half of the study group while the other half was referred by team-members of the department.

The children underwent perceptual voice assessment, analysis of voice recording (using a headset microphone connected directly to a portable laptop computer, using the Goldwave©, version 4.23, computer software) and indirect laryngeal inspection (when possible). Flexible endoscopy was performed with a 3.0 mm fiberoptic endoscope and a 70° rigid laryngoscope was used for stroboscopy.

Children and parents were prepared by explanation of the procedure followed by a visual demonstration. A monitor, placed in front of the child, served for visual feedback. Young children were prepared with nasal and oral mask inhalation of Lidocaine solution (2 cc of 2% Lidocaine) to enable better tolerate additional oral topical spray with 10% Lidocaine solution, when necessary.

All examinations were recorded and reviewed to the children and parents. The members of the voice team established diagnosis following each examination.

3. Results

Forty-two children were analyzed (Table 1) and rigid stroboscopy could be performed in 31 children.

Table 1 Distribution by age (19 girls, 23 boys) of children undergoing stroboscopy

Age (years)	Number of children (N = 42)
6—7	4
8—9	6
10—11	13
12—13	7
14—15	12

The majority of failures, 7 out of 11, were among children younger than 10 years of age. Two children, aged 7 and 16 years, refused any examination.

The causes for stroboscopy failure included: short phonation time (7), gag reflex (6), highly oriented and posteriorly inclined epiglottis (4), pitch perturbation (4) and soft voice (3). Laryngeal pathologies, other than nodules were observed in the majority of children (Table 2). Five children with undefined lesions were recommended for direct laryngoscopy.

4. Discussion

The diagnostic armamentarium for examination of voice among adults is generally not implemented in children. Stroboscopy has proven very helpful in caring for voice patients, modifying diagnoses in 47%, and confirming uncertain diagnoses in many of the other patients studied [6].

The advantages of flexible over rigid endoscopy of the larynx are due to unaltered laryngeal behavior, variability of exposure angles, and the possibility to examine other pathologies of the upper airways function (i.e. velopharyngeal insufficiency). The main disadvantages include a lower magnification, a lower amount of light in the inspected field and the need to approximate the larynx for an optimal resolution [7]. Fiberoptic endoscopy for

Table 2 Clinical findings following stroboscopic examinations

Clinical finding	Number of children
Normal	5
Nodules	10
Cyst	8
Polyp	6
Sulcus	4
Edema	3
Mutation	2
Web	2
Monocorditis	1
Papillomatosis	1

children necessitates thin devices that limit the power of magnification and view field.

Papsin et al. [8] stipulated that examination of the larynx was well tolerated with a rigid 70° endoscope that added ability to perform stroboscopy. Also according to Reilly [1], the use of rigid laryngoscope was successful in 70% of 47 pediatric examinations, though the percentage of strobocsopy in that particular group was not defined. Hirschberg et al. [9] determined that a good stroboscopic registration is gained in children older than 6—7 years of age although they did not mention whether a fiberoptic or rigid scope was used.

The common failures of stroboscopy in children are related to a short phonation time (less than 5 s) and intolerance. We have noted that in some children with low voice intensity and pitch perturbations, stroboscopy may fail even when the phonation time exceeded 5 s. Pathological voice may frequently be expressed by either irregularity or short phonation. Precise synchronisation of the firing of the stroboscope from the laryngograph waveform, and the capture of images and waveforms into a computer, allowed inspection of short periods of phonation (less than 1 s) as a continuous replay of the images [10], however, our experience in the technique is limited. Also, in young children, the relatively higher position of the larynx or a posteriorly inclined epiglottis, prevent a proper laryngeal view or stimulate the gag reflex while inserting the rigid endoscope.

5. Conclusions

Standard rigid laryngoscopy and stroboscopy can be implemented in the majority of children over 10 years of age. Its additive information is most rewarding in the diagnosis of incipient pathologies and in recognizing and accepting therapeutic recommendations by parents and referring physicians.

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