

ORIGINAL PAPER

Role of videoendoscopy in phoniatics: data from three years of daily practice

Il ruolo della videoendoscopia in foniatria: dati di tre anni di pratica clinica

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Key words

Voice • Swallowing • Diagnosis • Endoscopy

Parole chiave

Voce • Deglutizione • Diagnosi • Endoscopia

Summary

Phoniatics is the medical specialty involved in the management of communication and swallowing disorders. Videoendoscopy plays an important role in the assessment of various disorders in the clinical practice of phoniatics: the voice as well as the speech and swallowing mechanisms can be analysed through this procedure. Aim of the study is to describe videoendoscopic application in daily phoniatic practice: data on 1627 participants, consecutively examined, are reported. A total of 2004 videoendoscopy examinations were performed between March 1999 and December 2002. Study population comprising 1627 patients (716 male, 911 female); age ranged from 0.6 to 97 years. The following parameters were considered: a) function to be assessed through videoendoscopy (voice, speech, swallowing, other); b) phoniatic nosological chapter in participants with a recognized disease; c) age of participant; d) occupation of participant; d) medical discipline related to disease identified. Three populations were analysed: study population (1627 subjects), subjects requiring phoniatic consultation for voice and swallowing assessment. The participants examined endoscopically required a phoniatic consultation in order to have a voice or a swallowing assessment, respectively, in 67% and 20% of the cases. In 411 out of 1095 (37.5%) voice evaluations, no disorder was identified, while in most of the swallowing assessments (93.1%), a clear dysphagic disorder was detected. A bimodal distribution appeared in the 1627 participants and in the voice population with a first peak at age 20-40 years and a second peak at age 50-70. In the swallowing population, the number of participants examined appeared to increase with age. In the swallowing population, pensioners and clerks represent almost 80% of the population; in the total population, as well as in the voice populations, pensioners as well as teachers, singers and students are well represented. In most cases (52.5%), no clear disease was present. The two areas of disease most represented were otorhinolaryngology and neurology.

Riassunto

La Foniatria è la specialità medica dedicata alla gestione dei disturbi della comunicazione e della deglutizione. La videoendoscopia (VES) ha un ruolo importante nella valutazione di diversi disturbi della pratica clinica foniatica: i meccanismi della voce, così come quelli della parola e della deglutizione, possono essere analizzati attraverso questa procedura. Scopo dello studio è descrivere l'applicazione della VES nella pratica foniatica quotidiana: vengono riportati i nostri dati su 1.627 soggetti consecutivamente esaminati. 2.004 VES sono state effettuate fra marzo 1999 e dicembre 2002. 1.627 soggetti, 716 maschi e 911 femmine, sono stati esaminati; l'età dei soggetti variava fra gli 0,6 e i 97 anni. I seguenti parametri sono stati considerati: a) funzione da valutare attraverso la VES (voce, parola, deglutizione, respirazione); b) capitolo del catalogo nosologico foniatico nei casi con una malattia riconosciuta; c) età dei pazienti; d) lavoro dei pazienti; d) disciplina medica legata alla malattia identificata. Sono state analizzate tre popolazioni: la popolazione di 1.627 soggetti, le popolazioni che richiedevano un consulto foniatico per una valutazione della voce e della deglutizione. I soggetti esaminati endoscopicamente hanno richiesto un consulto foniatico per avere una valutazione della voce e della deglutizione rispettivamente nel 67% e nel 20% dei casi. In 411 dei 1.095 (37,5%) delle valutazioni vocali, non è stato identificato alcun disturbo, mentre nella maggior parte delle valutazioni deglutorie (93,1%) era visibile un chiaro disturbo disfagico. Nei 1.627 soggetti e nella popolazione esaminata per valutazione vocale è apparsa una distribuzione bimodale con un primo picco all'età di 20-40 anni e un secondo picco all'età di 50-70 anni. Nella popolazione di soggetti esaminati per una valutazione deglutoria il numero di soggetti esaminati sembra crescere con l'età. Pensionati e impiegati rappresentavano quasi l'80% della popolazione esaminata per valutazione deglutoria; nelle restanti due popolazioni non solo pensionati, ma anche insegnanti, cantanti e studenti sono ben rappresentati. Nella maggior parte dei casi (52,5%) non era presente un chiaro quadro patologico. Le due aree di malattia maggiormente rappresentate erano l'otorinolaringoiatria e la neurologia.

Introduction

The field of communication disorders is primarily involved in the knowledge of the normal functioning of some human abilities and specifically of: voice, speech, language, non verbal and verbal communication, fluency of the above-mentioned functions, swallowing, academic learning, and interpersonal relationships. The nosological catalogue could be divided into the following chapters: voice disorders, organic speech disorders, fluency disorders, aphasias, dysarthrias, retardations and dementiae, swallowing disorders, verbal disorders in the deaf and related disabilities and problems, learning disorders, socio-cultural and emotional troubles^{1,2}. Phoniatics is the medical specialty focusing on the management of communication and swallowing disorders, including the physical, developmental, functional and behavioural aspects of verbal communication and swallowing³.

Videoendoscopy (VES) plays an important role in the assessment of various communication and swallowing disorders: the voice as well as speech and swallowing mechanisms can be analysed using this procedure⁴⁻⁶. VES allows the anatomical and functional examination of the larynx and vocal tract; the examination can be video-recorded, either analogically or digitally, allowing documentation for longitudinal comparison and for medical-legal and research purposes. A multidimensional set of minimal basic measurements suitable for voice assessment has recently been proposed. It includes five different approaches: perception, VES, acoustics, aerodynamics, and a subjective rating by the participant⁷. The role of VES in voice assessment, either rigid or flexible, can be further enlarged by the application of a stroboscopic light⁸⁻¹¹. If VES is essential in the examination of the voice mechanism, it has gained a similar role in the analysis of speech, especially in the evaluation of velo-pharyngeal functions and dysfunctions following anatomic or neurological impairment, since it can be found in organic speech disorders and dysarthrias, respectively¹²⁻¹⁴. Over the last fifteen years, VES has gained an important role also in the assessment of swallowing; comparison with the videofluoroscopic technique; reports of routine application by various authors and inter-observer agreement studies, have led to fiberoptic endoscopic evaluation of swallowing (FEES) becoming a valid and reliable tool in everyday practice¹⁵⁻¹⁹.

To our knowledge, no reports have appeared so far in the literature on the role of VES in daily phoniatic practice. Aim of the study is to determine the use of VES in daily phoniatic practice: data refer to 1627 participants, consecutively examined over a three-year period.

Material and methods

PARTICIPANTS

A total of 2004 VES have been performed in the Phoniatic Department of Turin between March 1999 and December 2002. A total of 1627 patients (716 male, 911 female; age range 0.6-97 years (mean 45.7, SD \pm 19.6).) were examined; 279 participants underwent more than one examination; the number of examinations per participant ranged from 1 to 6.

INSTRUMENTATION AND EXAMINATION

The Atmos Mediastroboscope was used and the images, digitally obtained, were stored. Endoscopic examinations were carried out using either a Pentax FNL-10RP2 fiberscope or Wolf 4450.47 90° rigid telescope. The Mediastroboscope allowed both image and sound digital recordings as well as a software system for storage and rapid retrieval (MediaStrobo v.1.1.5.14 by Atmos Medizintechnik GmbH). The software system also included the means for acoustic analysis (WinSAL-V v.1.2a by Media Enterprise): long-term as well as short-term analyses are possible. Spectrography of the sustained vowels [a,i] at FFT-1024 points ranging between 0 and 8 kHz was routinely performed, when a voice or speech examination was carried out; the sample frequency was 20000 Hz. Details of the procedure were explained to each participant, prior to any examination. In the cases with hyper-reflexive gag reflex, 10% lidocaine hydrochloride, was sprayed, for topical anaesthesia, on the pharyngeal mucosa. When FEES was performed, the procedure described by Bastian⁶ was used and only the most significant images of penetration, aspiration or retention were stored. In patients with a tracheostomy tube, simultaneous modified Evans blue dye procedure and video nasal endoscopic evaluation of the swallow were performed, as suggested by Donzelli et al.²⁰.

In this study, the following parameters were considered: a) function to be assessed through VES (voice, speech, swallowing, respiration); b) phoniatic nosological chapter according to Schindler's classification¹, in those participants with a recognized disease or disorder; c) age of the participant; d) occupation of the participant; e) medical discipline related to the disease identified (e.g. otorhinolaryngology, in the case of vocal fold polyp). Each parameter was analysed and reported as an independent variable. Since the participants required phoniatic consultation leading to an endoscopic examination, mainly in order to have a voice or a swallowing assessment, three groups were considered: the total number of the 1627 participants examined, the participants examined for voice assessment and the participants examined for assessment of swallowing.

Results

The functions for which the participants required a phoniatic consultation leading to an endoscopic examination are shown in Table I; for the cases in which a disease or disorder was recognized, the corresponding phoniatic nosologic chapter is also reported. In most cases, the participants submitted to endoscopy required a phoniatic consultation in order to undergo voice (67%) or swallowing (20%) assessment. In 854 out of the 1627 subjects examined (52.5%), no clear disease or disorder was identified. In approximately 10% of cases, the function studied did not involve either the voice, speech, or swallowing; but, in those cases, could be accounted for by globus sensation, irritable larynx syndrome²¹, Eustachian tube function and respiratory function. While in 411 out of 1095

(37.5%) voice evaluations, no disorder was identified, in most of the swallowing assessments (93.1%), a clear dysphagic disorder was detected.

Age of the participants examined is shown in Table II. While a bimodal distribution appears in the 1627 participants and in the voice population, with a first peak at age 20-40 years and a second peak at 50-70 years, the number of participants examined, in the swallowing population, appeared to increase together with age.

The occupations of those examined are outlined in Table III. Pensioners and clerks represent almost 80% of the group, in the swallowing population; pensioners, as well as teachers, singers and students, are well represented in the total and in the voice groups. The functions assessed and the medical discipline of the diseases identified for each function are

Table I. Functions assessed, phoniatic nosologic chapter for participants with recognized disease or disorder of the 1627 participants examined.

Functions assessed	N. participants	Phoniatic nosologic chapter	N. participants
Voice	1095 (67%)	Dysphonia	411 (25%)
Swallowing	322 (20%)	Dysphagia	300 (18%)
Speech	66 (4%)	Organic speech disorder	46 (2.8%)
		Dysarthria	16 (1%)
Other	144 (9%)		
Globus	79		
Irritable larynx syndrome	40		
Eustachian tube function	15		
Respiratory function	10		

Table II. Age of participants examined. Ranges of 10 years are examined; number of participants for age range is reported. Three populations were considered: 1627 participants examined, 1095 participants examined in order to undergo voice assessment, 322 participants examined in order to undergo swallowing assessment.

Age range (years)	N. participants for age range (N = 1627 pts examined)	N. participants for age range (N = 1095 voice evaluations)	N. participants for age range (N = 322 swallowing evaluations)
0-10	43 (2.6%)	30 (2.7%)	8 (2.5%)
11-20	123 (7.6%)	96 (8.7%)	15 (4.7%)
21-30	284 (17.4%)	215 (19.6%)	18 (5.7%)
31-40	263 (16.2%)	204 (18.7%)	31 (9.3%)
41-50	224 (13.7%)	144 (13.3%)	31 (9.3%)
51-60	252 (15.6%)	168 (15.4%)	50 (15.6%)
61-70	261 (16.1%)	138 (12.6%)	75 (23.2%)
71-80	142 (8.7%)	81 (7.3%)	64 (19.8%)
81-90	33 (2%)	19 (1.7%)	20 (6.4%)
> 90	2 (0.1%)	0 (0%)	10 (3.2%)

Table III. Occupation of participants examined. Three populations are considered: 1627 participants examined, 1095 participants examined in order to undergo voice assessment, 322 participants examined in order to undergo swallowing assessment.

Occupation	N. participants (N = 1627 pts examined)	N. participants (N = 1095 voice evaluations)	N. participants (N = 322 swallowing evaluations)
Pensioner	515 (31.6%)	220 (20.1%)	203 (63.2%)
Clerk	222 (13.6%)	148 (13.5%)	37 (11.7%)
Teacher	166 (10.2%)	146 (13.3%)	6 (1.9%)
Student	153 (9.4%)	134 (12.3%)	0 (0%)
Labourer	104 (6.3%)	75 (6.8%)	13 (4%)
Singer	102 (6.2%)	101 (9.3%)	0 (0%)
Housewife	89 (5.5%)	78 (7.2%)	13 (4%)
Child	72 (4.4%)	63 (5.7%)	9 (2.7%)
Actor	66 (4%)	66 (6.1%)	0 (0%)
Businessman	66 (4%)	24 (2.2%)	27 (8.4%)
Salesperson	42 (2.8%)	11 (1%)	14 (4.1%)
Priest	12 (0.8%)	12 (1.1%)	0 (0%)
Phone operator	12 (0.8%)	10 (0.9%)	0 (0%)
Hairdresser	6 (0.4%)	6 (0.5%)	0 (0%)

shown in Table IV. In the subjects examined for a voice disorder, three main groups have been identified: subjects with no disease (62%), subjects with an ENT disease (18%) and subjects with diseases that could not be classified as neurological, otorhinolaryngological, oncological, gastroenterological or traumatic (11%). In the vast majority of subjects assessed for a swallowing disorder, a neurological disease was found. When speech function was assessed, mainly neurological, ENT and oncological diseases were found.

Discussion and conclusions

VES is routinely performed in otorhinolaryngological practice. For voice, speech and swallowing assessment, VES is somewhat different from the standard otorhinolaryngological VES. A careful examination of the dynamic nature of the velum, pharynx, base of the tongue and larynx is performed, as described in a detailed voice evaluation protocol for dynamic voice assessment²². Also for the swallowing assessment, VES has been well described; not only is

Table IV. Function assessed and medical discipline of diseases identified for each function.

Function assessed	No disease	Neurol. disease	ENT disease	Oncol. disease	GE disease	Trauma	Other
Voice (N. = 1095)	684 (62.3%)	17 (1.6%)	200 (18.3%)	40 (3.6%)	20 (1.8%)	15 (1.3%)	119 (11.1%)
Swallowing (N. = 322)	22 (6.8%)	210 (65.5%)	24 (7.5%)	18 (5.5%)	2 (0.6%)	2 (0.6%)	44 (13.5%)
Speech (N. = 66)	4 (6%)	16 (24%)	28 (42%)	16 (24%)	–	2 (3%)	–
Other (N. = 144)	144 (100%)	–	–	–	–	–	–
Total N. = 1627	854 (52.5%)	243 (14.9%)	252 (15.4%)	74 (4.6%)	22 (1.4%)	19 (1.1%)	163 (10.1%)

Neurol = neurological; ENT = ear, nose and throat; Oncol. = oncological; GE = gastroenterological

the anatomy and muscular physiology of the vocal tract studied, but also the complex swallowing act with different food textures⁶.

Over a three-year period, 1627 participants underwent an endoscopic examination at the Phoniatic Department of Turin. Voice and swallowing were the most important functions for which an endoscopic examination was required. It has been reported that, in phoniatics practice, dysphonia and dysphagia represent, respectively, 5.8% and 0.9% of the participants examined in the paediatric population and 44.8% and 20%, in the adult population²³. Since an endoscopic examination is necessary in almost all of these cases, we can estimate its importance in phoniatics practice.

Voice assessments were frequently carried out in cases with no clear disorder, while swallowing evaluations were almost always performed in dysphagic patients. This is not surprising, since phoniatics is directed both towards physiology and pathology; many individuals require phoniatic consultation, not because of a clear symptom, but to check their voice system, as occurs in the case of professional or amateur actors and singers, or to be guided in the building of their voice, as occurs with many opera students. Frequently, a singer requires phoniatic assessment because his/her teacher wants to be reassured that the vocal folds are trophic and that a specific opera role can be undertaken. In other cases, teachers of singers and actors, do not know whether the learning difficulties that their pupils are experiencing, are of a technical or pathological origin, and ask for phoniatic consultation, even if no dysphonia is present. An endoscopic examination during various voice and speech tasks, as proposed by Leonard and Kendall²⁴, is particularly useful, for this purpose. Sometimes, people require a phoniatic assessment because they had a voice impairment, which may have resolved by the time of the consultation or because they feel their voice is "not as before", but perceptual, acoustic and VES assessments are negative. The situation is somewhat different when a swallowing assessment is required; nonetheless, in some cases, subjects claim episodic choking, but VES and videofluoroscopic examinations do not reveal any alteration on bolus transit.

Both the age and occupation of the clients examined reflect the great variability of participants requiring endoscopic examination in phoniatics practice. Infants with a voice disorder or with severe dysphagia represent a small, but significant percentage of the general population examined. Professional voice users, both for artistic – such as singers and actors – and non-artistic purposes – such as teachers, account for almost one fourth of the voice assessments; with about one third represented by pensioners. Reports of various authors in the Western world have shown

similar data: retired persons, students, singers and teachers are the groups most frequently seen in voice clinics²⁵⁻²⁷.

As far as concerns swallowing, the elderly and pensioners constitute the majority of participants examined, suggesting that dysphagia is a significant disorder mainly in the adult/elderly population. In the infant population, dysphagia might also play a significant role, but an endoscopic examination is not routinely used as in adulthood, since FEES is not easily performed in participants < 10 years of age; in fact, the collaboration of the participant is required for approximately 15 minutes.

Analysis of the diseases requiring endoscopic examination, in phoniatics, reveals two main points: 1. no clear disease is detectable in the majority of individuals examined; 2. neurological diseases are at least as important as otolaryngological disorders, if an endoscopic examination is required. This latter point is not surprising: in fact, most of the causes of dysphagia and dysarthria are related to neurogenic disorders, and neurogenic voice disorders represent a small, but significant, proportion of dysphonic syndromes²⁸⁻³⁰.

The subjects in whom no clear disease was identified belonged mainly to the group of subjects examined for a globus sensation, irritable larynx syndrome symptoms or a voice disorder. Globus sensation is a frequent symptom, in the general population^{31 32}, and, frequently, gastro-oesophago-pharyngeal reflux (GERD) is suspected even if no clear signs of a posterior laryngitis are present. In those cases, the patient is sometimes referred by the ENT doctor to the phoniatician in order to exclude a hyperfunctional vocal behaviour. Irritable larynx syndrome has only recently been described and the VES signs are weak; it is not surprising, therefore, that no clear disease is identified in subjects with a history of cough and laryngospasm. As far as concerns the subjects who needed voice assessment, but in whom no dysphonia was present, different various aspects or hypotheses should be taken into consideration: 1) a large number of subjects examined were actors, singers or students in performing arts; 2) another large group of subjects were pensioners, who might experience a voice change on account of the ageing process, but show no disease; 3) another group of patients were symptom free at the time VES was performed, but had had an episode of dysphonia and wanted to exclude pharyngeal and laryngeal diseases.

In 119 of the 411 dysphonic patients, the disease identified was not neurological, otorhinolaryngological, oncological, gastro-enterological or traumatic; these patients might be included in two of the four main chapters of the Rosen and Murry voice disorders classification: functional dysphonia, which in-

cludes psychogenic dysphonia, and dysphonia related to other diseases³³.

In conclusion, VES occupies a significant proportion of daily practice in phoniatics; voice and swallowing assessments account for most cases requiring an

endoscopic examination, even though no clear disease is detectable in a significant percentage of the voice assessments. When a disease is detected, ear, nose and throat diseases are as important as those of a neurological nature.

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