



Voice therapy in pediatric functional dysphonia: A prospective study

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KEYWORDS

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Borragan's method;
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counselling

Summary

Objective: We evaluated the efficacy of voice therapy according to Borragan's method associated to S. Magnani's vocal counselling in functional dysphonia in children.

Patients and methods: We prospectively treated 16 patients with vocal fold nodules (10 males, 6 females). Age ranged from 6 to 11 years with a mean age of 9 years. We performed a full screening phoniatric evaluation. In addition psychological tests were carried out to investigate psychological background.

Results: We lost three patients at follow-up; one patient received surgery, eight patients healed (43.75%), four improved (25%). There was no statistical difference in the analysis of electroacoustical parameters while MPT significantly raised after therapy.

Conclusion: If patients have motivation voice therapy could improve functional dysphonia in children. It is also important psychological background. Further studies on bigger populations with long-term follow-up are needed.

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1. Introduction

It is difficult to evaluate the incidence and prevalence of voice disorders in children because there are different methods of evaluation and definition criteria. Approximately the 6–9% of children is thought to have voice disorders [1–14]. In children functional forms are associated to voice misuse and

abuse. Functional dysphonia refers to impairment of voice production in the absence of mucosal or neurogenic disease of the larynx. When both anatomic and neurologic aetiological factors are excluded functional voice disorders should be suspected. They can be misdiagnosed because they can have variable presentations and multiple causative factors. The particular characteristics of child larynx (anatomical solidity, high percentage of water in tissues, stiffness of the vocal ligament, immaturity of muscle system) make it more susceptible to phonation trauma. Environmental factors and the

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personality structure also play a relevant role in the aetiology. The secondary lesion most commonly found is vocal nodule, usually bilateral and symmetrical, between the anterior and the middle third of vocal folds.

The preferable treatment for nodules is still controversial [15] because there are few studies and many children improve or spontaneously heal after puberty. The most common treatment methods are: voice therapy, vocal counselling, surgery or, taking into consideration the natural history of pathology, no treatment but planned follow-up. Psychological therapy can be essential and, sometimes, if made before voice therapy, can avoid it. The counselling is an educational act. According to S. Magnani there are some unavoidable aspects in the global taking care of dysphonic child: creation of proper setting; entering into an agreement; observation of child's and family's communicative behaviour; vocal hygiene counselling [16]. The global care of the dysphonic child include: conversational rules highly adapted to children and environment and that should be respected also by other euphonic relatives as models for children. The main advice is: to hydrate mucous membranes, to respect conversational shifts, to give to the interlocutor non-verbal and verbal comprehension feedbacks, to limit background noise when talking, to distinguish fun speaking from the serious one in which the child has to stop his activities and stand in front of the interlocutor, to avoid speaking during physical exercises or during illness, to respect prosodic vocal rules, to slow rhythms of life, allowing the child to play and rest having time to relax and listen, to avoid the excessive use of heating and air-conditioning.

According to the various logopaedic schools functional dysphonia in children is treated by individual or group therapy. The individual treatment allows a more intimate relationship and the therapist can better adapt the therapy to child's specific needs, including emotional ones, making the child more collaborative to exercises. Group therapy successfully tested in various Italian centres, allows children to live important physical-emotional experiences during game situations [16, 17]. Also the usual relaxation and breathing techniques become playful and enjoyable. It is a stimulating experience during which children can share feelings regarding their voice and pathology, explaining and commenting on their condition with the help of therapist [18]. The exercises are performed in pairs so every child is alternatively patient and therapist having to check the correct performance of the exercise. In the group re-education goes on with exercises of breathing and pneumophonic coordination, communicative activities labs, focused on non-verbal communication, and

communicative training sessions with games, reading and role playing. Because of the elasticity of the phonatory system, Borrigan has developed the "proprioceptive elastic method" that has a large employment in chronic dysphonia in children because of its strong power to get children involved [19,20]. The aim of this re-education is to obtain a good vocal quality through voice emission in an unstable equilibrium, searching for the maximum sense of freedom and eliminating the sensation of laryngeal effort. The base concept is vocal projection. Only in a situation of maximal body elasticity it is possible to project the voice without raising phonation volume but making the sound audible to greater distances with minimum effort. Vocal emission is always associated with body movements that describe and give emphasis to it to get the most harmonious melody that manifests itself with a dancing. The re-education is performed through exercises of unstable equilibrium: "Strike!", "The tower of Pisa", "The pendulum", "The equilibrist", "The egg", "The running". Once they have learned the correct vocal technique it would be possible also to teach the child to scream without laryngeal trauma. When nodules do not improve with logopaedic therapy, surgery becomes necessary using cold techniques or laser ones. In children surgery is rarely indicated because, during development, nodules can get reabsorbed into vocal folds and with surgery without changing vocal behaviour relapses are possible. Surgery is indicated as first treatment only when nodules are very big, voice is very rough and a fast improvement is required.

2. Objectives

We wanted to evaluate the efficacy of voice therapy as treatment of vocal fold nodules in children. A complete approach must take into consideration the complex interaction between organic and psychological contributors to the dysphonia. We evaluated psychological features of children with functional dysphonia to find out if psychological discomfort influenced the outcomes of voice therapy and the emotional experience regarding the perception of voice.

3. Materials and methods

All the dysphonic children from 5 to 11 years old sent to our institute from paediatricians and otolaryngologists from the province received a screening phoniatric evaluation from October 2004 to March 2005. A full informed consent was obtained from parents before the screening and the treatment.

The screening evaluation included an accurate history taking, postural analysis (observation of the soma regard the Barrè's vertical in the four standard projections, dental occlusion and deglutition evaluation), videostroboscopy, electroacoustical analysis using the software MDVP (Kay Elemetrics), spectrograms of /a/ and /aiuole/, phonetogram, perceptive voice evaluation using the GIRBAS scale, self-evaluation of the vocal problem using Voice Handicap Index (VHI) questionnaire modified for children, Pure Tone Audiometry (PTA) and impedenzometry and psychological tests for children (CPQ: children's personality questionnaire B form, drawing and telling the voice, human figure drawing) and parents (PIC: Personality Questionnaire for evolving age). All the children with organic lesions resulting from functional forms, i.e. nodules and fusiform mucous thickening, were treated according to individual treatment of Borragan [19,20] associated with the counselling according to Dr. Magnani [21–23]. All the patients received 15 treatment sessions of voice therapy (10 of voice therapy, 5 of maintenance) followed by repetition of the exams with exception of PTA and impedenzometry because all the patients were good-hearing. Only three patients showed a slight eustachian tube dysfunction that did not give any important conductive hearing loss.

4. Results

We screened 16 children, 10 males and 6 females, of ranging age from 6 to 11 years (mean age: 9 years; 9.4 years in male group, 8.3 in female one). Eleven children had vocal nodules (72%), one had nodules and intracordal cyst (7%), one fusiform mucous thickening. In the remaining two children the fusiform mucous thickening was associated in one case to a sulcus and in the other one to a pseudocyst (Fig. 1). Concomitant pathologies were often more than one. Atopy was the most frequent (seven cases), followed by malocclusion (three cases), atypical deglutition (three cases) and eustachian tube

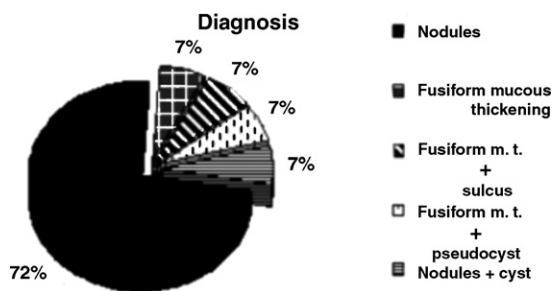


Fig. 1 Diagnosis.

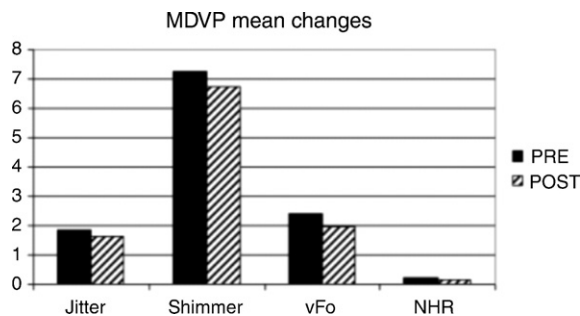


Fig. 2 MDVP mean variations.

dysfunction (three cases). We seldom found postural troubles (two cases), hyperactive attitude (one case) and GERD (one case). Three patients did not show any other pathology except the laryngeal one. The postural analysis showed in 13 patients asymmetry and lowering of shoulders (with the head turned towards higher shoulder), abnormal distribution of muscular strength with strong tension in the neck. This led in most of the cases to an hypercontraction of supraglottic structures without elevation of the laryngeal shield. The vocal attack was "hard" in most of the cases; voice therapy led to its normalization. Three patients were not available for follow-up, one had surgery because of permanence of cystic lesions, while the others improved (four cases) or healed (eight cases). We report the results of acoustic analysis before and after voice therapy. According to international literature we considered few parameters: Jitter, Shimmer, NHR, vFo, Fo. We also evaluated spectrograms, phonetograms, maximum phonation time (MPT). There was an improvement trend of all the considered parameters but no one reached statistical significance at Student's *t*-test. NHR, followed by vFo, was the most significant parameter (Fig. 2). This confirms international data [15,24–26] while differs from national ones that find Jitter more significant than NHR [27]. In the spectrograms there were more dyphophonias in /a/ spectrogram than in the /aiuole/ one; after treatment almost all dyphophonias went away (76.92% in /a/, 100% in /aiuole/); the Yanagihara class was nearly the same in /a/ and /aiuole/ and this differs from the data of Biondi that revealed a greater severity in /aiuole/ spectrogram. In almost all the cases we got an improvement of class after voice therapy. Fo changes, before and after treatment, did not show statistical significance but there is a trend for increased Fo (8 cases, 61.53%) (Fig. 3). We also evaluated the maximum phonation time (MPT) and phonetogram. Voice therapy led to a greater extension of vocal field with lowering of the lower frequency (10 cases, 76.92%), raising or maintenance of the higher frequency (9 cases, 69.23%);

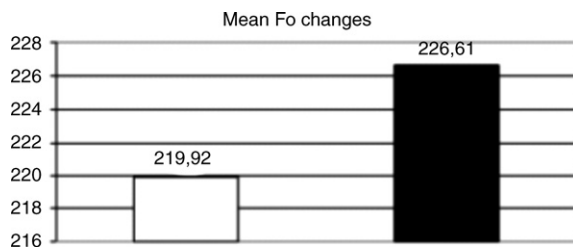


Fig. 3 Mean Fo changes.

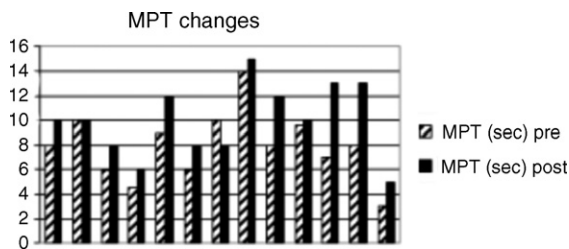


Fig. 4 MPT variation.

less variation in the minimum and maximum intensity and in the maximum intensity in the F_0 of conversation voice. There was no statistical significance ($p < 0.05$). MPT improved in 11 cases: 11 (MPT ≥ 10 arc second in 7 cases, 53.84%), 1 left unchanged (MPT = 10 arc second), 1 worsened. The cases with MPT after therapy of only 5 arc second received surgery because of a pseudocystic lesion discovered after nodule resolution (Fig. 4). We performed also the GIRBAS scale. There was nearly universal improvement of all parameters but most notably in the parameters G, R, B, and less so for I and S. There was a little change for A ratings.

5. Discussion

The preferable treatment for this form is still under controversy [15] because there are few studies and many children improve or heal spontaneously after puberty. The most common treatment methods are: voice therapy, vocal counselling, surgery or, taking into consideration the natural history of pathology, no treatment but planned follow-up in the course of time. Psychological therapy can be essential and, sometimes, if made before voice therapy, can avoid it. Therapeutic success is often the result of the combination of different treatments. According to some authors educational counselling has the same results of voice therapy [5]. According to others counselling is an adequate treatment only in selected cases involving moderate dysphonia in the initial phases [6]. And more over often children do not feel alteration in their voice that, often, spontaneously improves after puberty.

This is also the result of a big study made in Kurume on 179 children ranging in age from 3 and 12 years over a period of 25 years [15]. Offered treatments included surgery, voice therapy, vocal counselling, no treatment. Short-term follow-up outlined improvement in 16% of the vocal counselling group, 57% of voice therapy group, and 89% of surgery group. These improvements were lost at long-term follow-up and statistical analysis did not show significative differences between groups. Furthermore 12% of patients did not improve after puberty; this was maybe due to minor organic lesions such as sulcus or psychological troubles. According to some authors [6] surgery should be reserved to big lesions such as cyst and polyps. In all the other cases surgery should come only after an intensive voice treatment. Biondi et al. [27] studied 16 children ranging in age from 6 to 13 years receiving voice therapy. Results showed good improvements in vocal capabilities even if the objective and electroacoustical exams improved a little or nothing. Furthermore, while in international literature [25,26] the MDVP parameter that changes more significantly is NHR, in this study is Jitter.

In our study, according to international literature, we considered few parameters: Jitter, Shimmer, NHR, vFo, Fo of MDVP. There was an improvement trend of all the considered parameters but no one reached the statistical significance at Student's t -test. NHR, followed by vFo, was the most significant parameter (Fig. 2). This confirms international data [15,24–26] while differs from Italian ones that find Jitter more significant than NHR [27]. We also evaluated the maximum phonation time (MPT) and phonetogram. Voice therapy led to a greater extension of vocal field with lowering of the lower frequency; less constant the variations in the minimum and maximum intensity and in the maximum intensity in the F_0 of conversation voice. There were no statistically significant acoustical changes following therapy for any of the parameters except MPT; although all changed in a manner consistent with voice improvement. This is consistent with previous reports ([15,24–26], but see [27] also). Changes in mean MPT, before and after therapy, showed statistical significance ($p < 0.05$) in contrast to Biondi's study where MPT did not show any significance. Further studies on long-term follow-up are needed.

6. Conclusions

Whether or not voice therapy for children is effective remains open for debate. Data from the current study suggest that the voice therapy may be helpful

in treating functional dysphonia in children. Voice therapy may prove to be a valid alternative to surgery, and in the cases where surgery is needed, may prevent subsequent voice problems by changing the child's speaking behaviours and attitudes. The trouble is to understand if it is worthwhile treating patients that, in the natural history of pathology, may spontaneously improve or heal after puberty. Moreover most children do not perceive their voice as pathological, so therapy may appear to be long, exacting and without sense in their perspective. In our study, many children became aware of their trouble and appreciated improvements during and following therapy. Voice therapy requests expenditure of time, cares and money and it is often seen like a coercion by child and parents and few are constant in care until the end of treatment. So we must consider every single case and understand which improvement therapy could provide. Because often there is an important psychological component it is necessary a multidisciplinary approach in diagnosis and treatment. The rehabilitative course must involve comprehension and confidence between therapist and parents and between therapist and child. In our experience active collaboration of parents is fundamental to reach objectives. In fact delegation to therapist, irregularity in participation to treatment and inconstancy in home exercises gave bad results. Also scholastic environment is very important. So we should give importance to vocal behaviour of teachers that are the first vocal model for children out of home. It should be worthwhile to organize some meetings with teachers of all the school of primary cycle to make them understand the communicative capabilities in different ages and to prevent voice problems. Anyway therapeutic course, always interdisciplinary, should be adapted to every single case and sometimes therapeutic abstention should be, beyond a valid and rational choice, the only possible one if therapy gives more discomfort than benefits and creates in child and parents clashes. When, instead, familiar and scholastic environment is receptive and active in voice therapy and the child, informed of his problem, hardly works, voice therapy has good chances to "heal" the functional pathology and the organic resulting one or, anyway, to correct the wrong attitude and to lead to an improvement of organic pathology. So a careful initial evaluation of every single case is the best factor to choose the type of treatment and the best prognostic factor to forecast the success of this one. Further studies on bigger populations with long-term follow-up are needed.

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