

The influence of kinesiotaping on the loosening of the laryngeal muscles in hyperfunctional dysphones

Authors' Contribution:

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
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ABSTRACT:

Introduction: Hyperfunctional dysfunction is one of the most common functional dysphonia, characterized by voice insufficiency with excessive tightening of the muscles inside and outside the larynx during phonation. To make the treatment process more effective, new ways of rehabilitation are constantly being sought and developed. The aim of this work is to evaluate the effectiveness of laryngotaping – an innovative method of taping around the larynx and neck muscles.

Material and method: 10 patients with diagnosed hyperfunctional dysphonia participated in the study. Using the kinesiotaping principles, for 7 days, the suprahyoid and infrahyoid muscles, sternocleidomastoid muscles as well as the thyroid cartilage were taped. Before and after the therapy, the patients completed the VHI voice self-evaluation questionnaire. The evaluation of the larynx according to the L. Mathienson scale was also assessed palpation.

Results: Analyzing the results of the VHI questionnaire and evaluation of palpation evaluation of the larynx before and after the therapy, statistically significant differences were observed. The results on average decreased by half, which is the desired effect of therapy.

Discussion: The results confirm the positive impact of kinesiotaping around the larynx. However, more research is needed on a larger group of patients to fully evaluate the therapeutic effect.

Conclusions: 1. Laryngotaping is an effective way to normalize muscle tone, and thus to improve the quality of the voice. 2. The presented studies require continuation, however, positive reception of the introduced therapy by patients encourages further research on a larger group of patients.

KEYWORDS:

hyperfunctional dysphonia, kinesiotaping, laryngotaping

INTRODUCTION

The voice is one of the most important ways of communicating for people. For many, it is also a work tool. A large group of patients in the Audiology and Phoniatrics Department suffer functional voice disorders of hyperfunctional dysphonia type. Pharyngeal and laryngeal paresthesia are characteristic for this disorder. It includes hoarseness, which increases with the increasing volume of voice. The timbre changes and the scale narrows. There is increased tension in the muscles of the neck and the loins, as well as external and internal laryngeal and pharyngeal muscles. There is often tenderness and severe pain that prevents speech. Some may observe pulling of the larynx and the hyoid bone upwards. The epiglottis is inclined towards the back. Ventricular folds are displaced centripetally. Vocal folds press strongly on each other. There is redness within the vocal folds.

A very important – often key – role is rehabilitation in the process of restoring the correct voice. In voice disorders, it very often the most important method of treatment. During therapy, the patient under the supervision of a doctor learns about correct voice emis-

sion and is familiarized with exercises to relax laryngeal muscles. The science of proper breathing and manual therapy of the larynx also constitute a very important element of the whole treatment process [2,3]. The most difficult element of therapy is to maintain the developed model and proper muscular tension.

In order for the treatment of patients with hyperfunctional dysphonia to bring better results, new ways of rehabilitation are constantly being sought. This work aims to evaluate the effectiveness of laryngotaping – an innovative method of taping around the muscles of the larynx and neck. Can it significantly affect muscle tension and the fasciomuscular balance?

In the early 1970s, chiropractic Kenzo Kase began working on a new taping method. He used a tape imitating the human skin in terms of flexibility and resistance. Taped on the body at the injured site, it stimulates the mechanoreceptors and affects the neuromuscular and neurofascial conduction. The tape itself has no therapeutic properties. Only correct taping done by the therapist can bring positive results. Kinesio patches demonstrate a stimulating effect on the skin and fascia located directly above the treated

tissue. The patch affects the skin receptors, including free nerve endings responsible for communicating pain information. Cell space under the tape increases, which in turn improves the circulation of blood and lymph in the area of the taped skin. Better tissue blood flow carries better oxygenation and this leads to better regeneration. Elevation of the skin and creation of space for the tissues beneath it stimulates the regeneration of the fascia. Proper application of the tape's tension and direction of taping leads it to the right spot thanks to the anchor effect. The Kinesio tape is applied once every few days. During this time, it automatically stimulates sensory Feedback 24 hours a day; its nervous impulse travels to the brain, where the process of adaptation to the existing tissue change takes place [9].

Based on the basic and advanced principles of taping [6], we have developed a laryngotaping method at the Audiology and Phoniatrics Department. Under this concept, we have created a novel, comprehensive taping therapy covering the larynx, infrahyoid muscles (sternothyroid and thyrohyoid), suprahyoid muscles (stylohyoid and posterior digastric) and sternocleidomastoid muscles. Using the permanent and long-lasting effect of the tapes on the treated areas, it is possible to maintain the positive effect of the therapist's actions, i.e., lowering of the larynx or the hyoid bone obtained during manual therapy.

MATERIAL AND METHODS

The study covered 250 patients of the Audiology and Phoniatrics Department. VHI and LMPT were used for assessment. Tests were carried out on the first and last day of therapy.

All patients were taped with Kinesio tapes. The therapy lasted seven days. Each patient was taped two to three times during this time. Each taping was preceded by manual examination of the larynx, thanks to which the physiotherapist could precisely determine the direction, method of taping and tape tension most favorable for a given case. In the therapy of patients with hyperfunctional dysphonia, four applications were used. The first one is taped directly over the thyroid cartilage. Using an advanced compression technique, the tape "compresses" the cartilage on both sides. The purpose of this application is to mechanically lower and stabilize the larynx. In addition, as with any application, Kinesio tapes increase intercellular space, and thus minimize the pressure imposed on pain receptors and improve the circulation of blood and body fluids.

The second taping will cover the sternocleidomastoid muscle. Here, we use the inhibitory muscular technique. We will use a "Y" shaped tape for this application. Such an application is designed to loosen the muscle, whose increased tension most affects the area around the larynx.

The third application is to strengthen the infrahyoid muscles, which lower and fix the position of the larynx. For hyperfunctional dysphonia, tense infrahyoid muscles pull the hyoid bone together with the larynx towards the top. Strengthening the work of the sternohyoid and sternothyroid muscles, lowering of the larynx will be more effective.

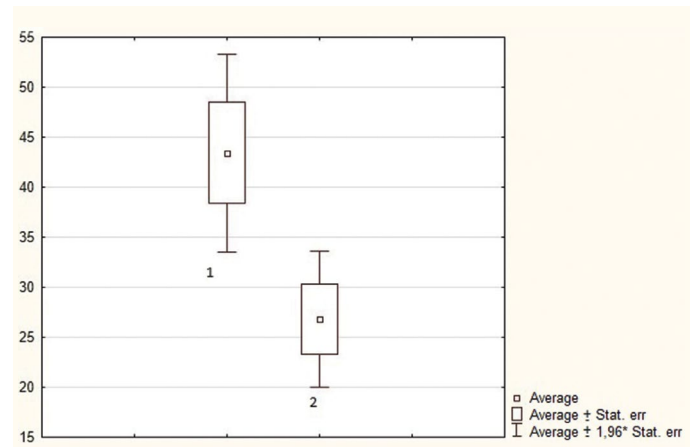


Fig. 1. VHI before therapy [1] and after therapy [2].

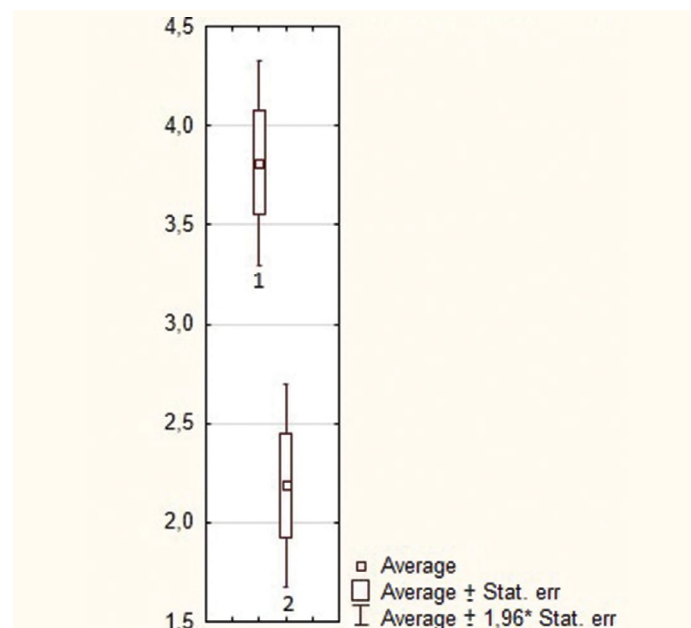


Fig. 2. Tension of right sternocleidomastoid muscle before therapy [1] and after therapy [2].

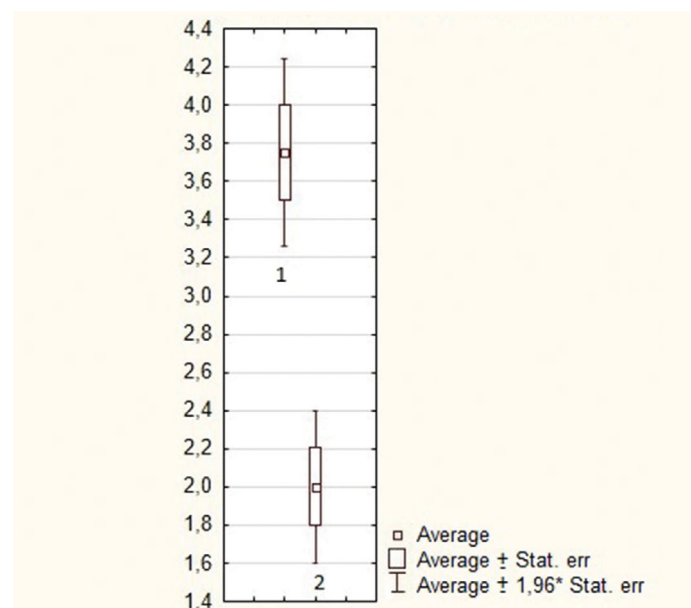


Fig. 3. Tension of left sternocleidomastoid muscle left before therapy [1] and after therapy [2].

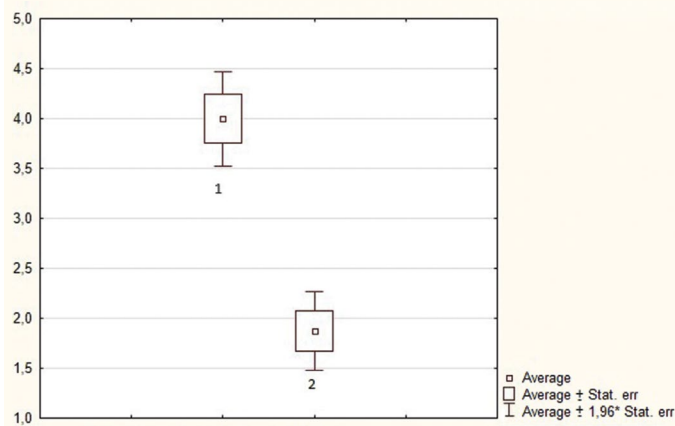


Fig. 4. Supralaryngeal area before therapy [1] and after therapy [2].

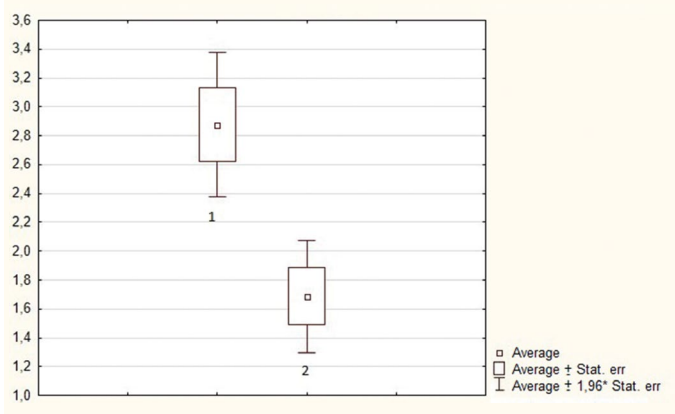


Fig. 5. Laryngeal resistance against side pressure before therapy [1] and after therapy [2].



Fig. 6. Laryngotaping.

The last application is taped to the suprahyoid muscles, which pull the larynx and the hyoid bone up when excessively strained. The purpose of these tapes is to stimulate the muscular and hyoid muscles of the stylohyoid and posterior digastric muscles in order to loosen them.

Ultimately, 10 patients were qualified for initial analysis. The studies were developed in Statistica 31.1 and Excel. All parameters assessed in the work were presented as mean values \pm standard deviation. Independent Samples t Test was used for the analysis. Statistically significant values of $p < 0.05$ were assumed.

RESULTS

Analyzing the results of the VHI questionnaire, there is a noticeable and statistically significant difference between the first and last day of the rehabilitation and therapeutic program. Figure 1 shows a graph of average self-evaluation results before and after therapy. After five days, patients rated their voice much better than on the day of admission. Their well-being improved and they noticed a significant improvement in communication with the environment. The average score of the VHI questionnaires before therapy was 40.5 points. After rehabilitation, the average score decreased to 26.8 points. $p = 0.011120$, so the result is statistically significant.

During analysis of the evaluation of laryngeal palpation, there are also differences in the tone of the muscles around the larynx, as well as the position and the mobility of the larynx. Figures 2 and 3 show a graph of the mean results of sternocleidomastoid muscular tone of left and right muscles before and after therapy. The kinesiotaping method applied directly to the sternocleidomastoid, suprahyoid and infrahyoid muscles allows to observe a big improvement in the return to normal muscular tension. Uninterrupted stimulation of the taped within 7 days allowed us to achieve a statistically significant effect. The tension of sternocleidomastoid muscles during the first examination was on average 4 points as per the L. Mathienson scale. In 40% of patients, tension of the right and left muscles was evaluated at 5 points. In half of the patients, tension was at a level of 4. The most desirable score of 0 was not obtained by anybody. After the therapy, the muscles showed an average reduction of 50% compared to the first examination. Muscular tension on the right side at level 5 is only present in 10% of patients. The same number of patients scored 4 points. The largest number of patients, as many as 40%, obtained tensions at the level of 2 points according to the L. Mathienson scale. Better results were observed on the left side. Tension of the left sternocleidomastoid muscle was estimated at 2 points in 50% of the subjects. There was no tension at level 4 or 5 in any patient. Muscle tension at a level of 1, which was not attainable before right-sided therapy was obtained in 20% and on the left side in 10%.

The same observations were noted for suprahyoid and infrahyoid muscles. Figure 4 presents the average results for laryngeal area tension before and after therapy. Upon the first examination of the laryngeal area, the mean score oscillated around 4. On the last day of the study, it decreased to 2 points. On the first day, the above-mentioned muscles were very tense. As many as 40% of respondents displayed a tension level of 5. On the last day, no subject rated their tension at more than 3 points. The most, as much as 60%, obtained 2 points, which was not available to any person examined on the first day of therapy. The research also confirmed the positive effect of therapy on the laryngeal mobility and positioning. Figure 5 shows the average resistance of the larynx to lateral pressure on the first and last day of the study. On the first day, the average resistance of the larynx against lateral pressure was 3 points. On the last day of the study, this result changed to 2 points according to L. Mathieson scale. After the end of the therapeutic and rehabilitation process, the larynx which had been arranged high in all patients on the first day of the study, changed its position to neutral in as many as 80% of the respondents.

DISCUSSION

Kinesiotaping is a therapeutic method consisting in taping patients with special tapes, similar to human skin in their structure and thickness. The tape lifts the skin over the target tissue. Thanks to this, the skin receptors decompress, intercellular space increases, and thus the circulation of blood and lymph improves. By increasing the amount of oxygen in the cells, the regenerative process accelerates. Thanks to its elasticity, the tapes are very popular in orthopedic, neurological, and pediatric rehabilitation [1,4,7]. There are also reports of attempts to tape around the perilaryngeal area [12]. In 2015, the authors Heo and Kim proved the positive effect of taping of the hyoid and epiglottic bones. Twenty-two stroke patients were divided into two groups: the study group, which was subjected to kinesiotaping and control group in which no therapy was used. The study group demonstrated a statistically significant improvement in kinematic changes in vertical deflection of the hyoid bone [5]. There are also positive reports of taping patients with diagnosed childhood cerebral palsy who are also struggling with swallowing difficulties. There are references in the literature regarding the positive effect of kinesiotaping in this group of subjects, however, further studies are required to prove their effectiveness [8,11].

The topic of kinesiotaping in otolaryngology or phoniatrics does not really exist. In 2017, Mazzedimi, Livi and Spinosi made an attempt to tape the perilaryngeal areas in patients with diagnosed hyperfunctional dysphonia. Fifteen patients were subjected to voice therapy and had their infrahyoid muscles taped. The control group consisted of patients who participated only in voice therapy. The

results did not show a statistically significant difference between the control and the test group. As the authors themselves point out, despite the lack of a large difference between the groups studied, positive opinions of patients mobilize to conduct further research [10]. Analyzing the taping proposed by the authors, it can be observed that they focused only on the normalization of the infrahyoid muscle's tension.

Perhaps a wider use of tapes covering other muscle groups would significantly affect the results of the study. It has been over a year that we have been working on the entire taping system at the Institute of Physiology and Pathology of Hearing in Kajetany to elaborate one which would significantly improve the quality of rehabilitation conducted at the Department of Audiology and Phoniatrics. The taping system which we have developed is shown in Figure 6. By investigating and analyzing muscular tone and through self-assessment of the voice in over 250 patients, we have created an innovative method of taping around the laryngeal area. Laryngotaping is based on the use of basic and advanced kinesiotaping techniques.

CONCLUSIONS

1. Laryngotaping is an effective way to normalize muscular tone, and thus to improve voice quality.
2. The presented research requires continuation, however, the patients' positive reception of the introduced therapy encourages further research on a larger group of patients.

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