Turkish Standardized Reading Passage for the Evaluation of Hard Glottal Attack Occurrence Frequency

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Summary: Objective. This study aimed to develop a Turkish reading passage that can be used in evaluating the frequency of hard glottal attack (HGA) and to assess its reliability.

Study Design. This is a prospective case-control study.

Methods. The Towne-Heuer reading passage is a valuable tool that can be used for the auditory-perceptual assessment of voice. The characteristics of the first four paragraphs of the reading passage were analyzed by a linguist. Then, a Turkish reading passage with similar characteristics was developed. The control group (n = 21) consisted of individuals with no voice disorder. The study group consisted of two subgroups that were diagnosed as having vocal fold nodules (n = 11) and muscle tension dysphonia (n = 10). A total of three listeners were evaluated for the frequency of HGAs. One of the listeners was a master's student, whereas the other two listeners were speech-language pathologists. Consistency between the listeners was evaluated by using the percent agreement and the kappa statistics. Intrarater reliability was assessed by the Wilcoxon sign test. The *t* test was used to evaluate potential differences between the groups. The results were considered as significant if the *P* value was <0.05.

Results. The average attack number in the study group was found to be significantly higher than the controls ($P < 0.05$). No significant difference could be discerned between the muscle tension dysphonia and vocal nodule subgroups ($P > 0.05$).

Conclusions. Findings confirmed that HGAs are clearly related to the vocal hyperfunction; however, the mechanism of action needs more research. In addition, the relationship between syllable stress and HGA should be further researched to clarify the cause of the attack number differences between English and Turkish languages.

Key Words: Hard glottal attack–Vocal fold nodules–Muscle tension dysphonia–Vocal abuse–Vocal misuse.

INTRODUCTION

A vocal fold attack is a phenomenon related to the initiation of phonation. Such attacks can be separated into three groups according to the timing between the vocal folds and the buildup of subglottic air pressure. These groups can be ordered as follows: simultaneous (gentle), breathy, and hard vocal attacks.[1,2]

A simultaneous attack is regarded as the optimal means of initiation of phonation,[1] whereas a hard glottal attack (HGA) is generally accepted to be related to voice disorders.[3] HGA is characterized by an abrupt and complete vocal fold adduction before phonation is initiated.[1,4,5] HGA may be perceived as a grunting or clicking sound and is frequently heard on a stressed vowel in the initial position of a word.[6] Laryngeal opposing pressure is quite high during HGA, and the vocal folds are tightly closed before any high increase in subglottal pressure. Subglottal pressure reaches a level that is higher than normal to overcome the laryngeal opposing pressure. Here, the vibration of the vocal folds starts suddenly and with an amplitude higher than that seen in a simultaneous vocal attack.[7] The lateral cricoarytenoid, cricothyroid, interarytenoid, and thyroarytenoid muscles are active well before the onset of voicing.[3]

Koike[3] hypothesized that HGAs cause phonotrauma by increasing the forces present in the vocal folds. In case of phonotrauma, excessive phonatory stress can destroy tissue structure and induce a cell-mediated inflammatory process that may result in a pathologic vocal fold lesion. Particularly, the contact pressure applied on the medial surface of the vocal folds during collision is frequently considered the most likely cause of trauma.[8] The collision force is greater with increasing lung pressure and depends on the amount of vocal fold closure.[9]

To summarize, HGAs are frequently associated with excessive laryngeal tension and disruption of coordination of aerodynamic and myoelastic features at the initiation of phonation. These abnormalities accompany higher-impact (collision) stress that leads to tissue irritation and eventual breakdown.

In the literature, HGAs are frequently accepted to be related to hyperfunctional vocal patterns.[10,11] Muscle tension dysphonia (MTD) is the pathologic condition in which excessive tension of the paralaryngeal musculature leads to a disturbed voice. Psychological disorders and vocal abuse or misuse behaviors related to laryngopharyngeal reflux, upper airway infections, and organic lesions are some of the causes of MTD.[12–15] In the review study of Altman et al,[16] in which 150 subjects with MTD diagnoses were identified, HGAs were reported in 10 subjects (7%).[16] In the retrospective study of Morrison et al,[11] it is reported that 65% of MTD patients had HGAs.

Vocal fold nodules (VFNs) are the most frequently observed benign lesions associated with vocal hyperfunction.[17,18] VFNs are tissue reactions to frictional trauma between the vocal folds and are located at the junction of the anterior and middle thirds of the vocal folds. Heuer et al[4] have found that the number of

HGAs in patients with VFNs was higher than the number of attacks in healthy participants. VFNs are known to develop gradually as a result of chronic vocal abuse or misuse.[19]

Vocal abuse refers to the extreme and excessive utilization of the larynx within physiological limits.[20] Rough and extreme use of the voice by excessive speaking, vigorous coughing, frequent clearing of the throat, screaming, and shouting are among the typical examples of vocally abusive behaviors.[5,21] In addition, as Colton et al[5] stated, vocally abusive behaviors are inclined to cause trauma to the laryngeal mucosa.

Vocal misuse suggests voice production behaviors that distort the normal propensity of the phonatory mechanism to work efficiently.[5] HGA is accepted to be one of the important vocal misuse behaviors in addition to other misuse behaviors such as extreme stretching or effort, ventricular phonation, and inappropriate pitch level.[5,20] It is thought that there is a very thin line between vocal abuse and misuse; however, vocal misuse behaviors may become abusive.[5]

To summarize, although HGAs are accepted to be related to hyperfunctional vocal patterns,[4,10,11,20,22] only Andrade et al[20] specifically searched for HGAs in different voice disorder types. One purpose of the present study was to compare the frequency of HGAs between patients with MTD and patients with VFNs.

As for the evaluation of voice disorders, auditory-perceptual assessments are vital tools of analyses along with objective methods.[10] The type of stimulus used in these assessments is an important factor that may have substantial effects on the end results. Therefore, vowels and running speech are commonly used in such assessments. Running speech materials include conversational speech and standard passages or sentences. Standard reading passages are preferred over conversational speech recordings.[23] The Rainbow, Zoo, Grandfather, Marvin Williams, and Towne-Heuer reading passages are some of the reading passages that are used in auditory-perceptual voice evaluation in English.[4] By using reading passages, HGAs may also be evaluated. Heuer et al[4] have used the "Towne-Heuer passage," which they developed to determine the frequency of HGAs. The passage has seven paragraphs, and the first four paragraphs proved to be reliable material for evaluating HGAs. Because cultural and linguistic factors had to be considered when speech materials were adapted to another language, the main purpose of the present study was to develop a Turkish reading passage that can be used in the evaluation of HGAs and to determine its reliability.

METHODS

The present study was conducted according to the approval of the Hacettepe University Non-invasive Clinical Research Ethics Committee's decree (February 18, 2015; decree no. GO 15/34-13). The individuals who participated in the study were duly informed about the scope and the goal of the study, and written consent was obtained from each participant.

Participants

The patients were examined in Hacettepe University's Ear, Nose and Throat Department. Otolaryngologic evaluation of each patient was performed via a flexible 3.7-mm-diameter steerable fiberoptic laryngoscope (Optim, Sturbridge, MA) and rigid video laryngostroboscopy using a Kay Pentax digital strobe (Kay Pentax, Lincoln Park, NJ). Kay Pentax RLS 9100 B equipment (Kay Elemetrics, Lincoln Park, NJ) was used to capture images and record the patients' voices.

The diagnosis of "primary MTD" was done according to patient history, perceptual voice evaluation by the otorhinolaryngologist and speech-language pathologist (SLP),[17] and laryngostroboscopy examination by the otorhinolaryngologist.[11] The diagnosis of VFNs was done according to the laryngostroboscopy images by taking note of the appearance of the vocal fold edges and the vibratory property of the vocal fold mucosa through a nomenclature paradigm for benign midmembranous vocal fold lesions.[24]

The participants in the study group who were diagnosed with MTD or VFNs received neither medical treatment nor voice therapy. All of the participants were at least primary school graduates. The control group consisted of participants whose demographics matched those in the study group in terms of age, sex, and occupational status. The participants in the control group had no vocal complaints either before or at the time of the study.

The participants were classified according to their occupations as follows: there were 10 clergymen (23.81%), 6 teachers (14.29%), 2 secretaries (4.76%), 2 occupational safety specialists (4.76%), 4 administrative officers (9.52%), 4 students (9.52%), 6 nurses (16.29%), 2 laboratory assistants (4.76%), 2 cleaning ladies (4.76%), and 4 housewives (9.52%).

The study group consisted of 11 patients with VFN diagnoses whose mean age was 33.18 and 10 patients with MTD diagnoses whose mean age was 37.60. The control group consisted of 21 participants whose mean age was 35.29.

Preparation process of the reading passage

The Towne-Heuer reading passage is a valuable tool that can be used for the auditory-perceptual assessment of voice.[4] In addition to the parameters of breathiness, diplophonia, resonance, rate, and melody evaluated by the full passage, HGAs can be evaluated with this passage's first four paragraphs.[4]

The required permission for adaptation was obtained from Reinhardt Heuer at the beginning of the study. The characteristics of the first four paragraphs were analyzed by a linguist. Then, a Turkish reading passage with characteristics similar to those of the Towne-Heuer passage was developed. Table 1 shows the features of the Turkish reading passage (Ali ile Ela) and the Towne-Heuer passage comparatively.

Turkish reading passage (Ali ile Ela)

İşte o gün gelmişti. Ali ile Ela annelerinin elli altıncı yaş gününü kutlayacaklardı. Ona eğlenceli bir sürpriz hazırlanmalıydı.

Öncelikle Ela annesinin en sevdiği arkadaşlarını aradı. Onları yaş günü için evlerine davet etti. Oya Abla, İlyas Abi ve Umut Amcayla, en sevdiği komşusu Elmas Teyze partiye gelebileceklerini söylediler.

Ardından enfes bir pasta alabilmek için işe koyuldular. Alışveriş vaktiydi artık. Anneleri antep fıstığına, ananasa bayılırdı. O yüzden Ela antep fıstıklı, ananaslı bir pasta seçti.