Laryngeal configuration of 99 dysphonic patients

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Summary. The aim of this investigation was to study a wide range of dysphonic patients and determine the best matches among the laryngeal configurations on phonation for each patient and those previously established for control data, which were obtained from a professional voice user producing the whole range of voice qualities. Ninety-nine patients were selected and laryngeal photographs were produced for each patient. Fifteen laryngeal parameters were quantified and normalized. The data were sorted, scalar values assigned and a measure of similarity between configurations applied. The best, second-best, third-best and worst matches between each patient separately and the control data were then examined. Although 41% of the patients did not have particularly unusual configurations, 59% exhibited a narrowing of the laryngeal vestibule caused by epiglottic retraction, cuneiform fronting and/or false adduction. This suggests that clinical reports for patients with dysphonia should contain information not only on any lesions present but also on laryngeal configurations and, in particular, vestibular narrowing.

Key words: Dysphonia – Laryngeal configurations

Introduction

In a previous report from our voice laboratory [2], a method was reported for describing laryngeal configurations and for quantifying similarities and contrasts between different laryngeal configurations. In a second report [3] the method was used to describe the laryngeal configurations of a professional voice user during an experimental session in which the whole range of voice qualities was produced. It was shown that the best voice quality study to date – that by Laver [1] using the trained ear of the phonetician – could be replicated using instrumental techniques and that his conclusions were essentially correct.

The aim of the present investigation was to examine a wide range of dysphonic patients and then discover the best matches between the laryngeal configurations for each patient and norms previously established for a control speaker [3]. This was done specifically to determine the range and type of laryngeal configurations for dysphonic patients with different pathologies. In particular, the following potential hypotheses were discussed:

1. that the laryngeal configurations for all dysphonic voices would be similar to that for modal voice (V);
2. that the laryngeal configuration for no dysphonic voice would be similar to that for modal voice;
3. that the laryngeal configuration for no dysphonic voice would be similar to that for deep inhalation;
4. that, conversely, the laryngeal configurations for all dysphonic voices are least similar to that for deep inhalation; and
5. that voice types might have specific (reproducible) configurations.

Subjects and methods

The authors first examined approximately 1000 video recordings from the library of patient tapes kept in the Speech Science Laboratory at Washington University School of Medicine. From these, 112 were chosen because they exhibited most of the parameters required for the study and because they represented a balanced and wide range of problems, including 11 cases of vocal fold paralysis, 15 cases of nodules, 8 cases of polyps, 6 cases of cancer and 28 cases of functional dysphonia or aphony. Thirteen cases were subsequently rejected because they failed to allow a sufficient number of reliable measurements to be made, leaving 99 patients in the present study.

Video tapes were first reviewed by the second author (H.W.) to determine which ones would be useful for further analysis. Using
Once this was done, it was possible to assign scalar scores as a measure of similarity between configurations. Other statistical techniques for pattern analysis could have been used, but the scalar values captured quite clearly what was seen when studying photographs of the larynx, especially the extreme and mid-range values for each parameter. When two photographs were compared, i.e.

When a parameter could not be measured, it was assigned a scalar value of "-1" in the raw data, it was assigned a scalar value of "0".

The values for the photographs were sorted parameter by parameter from best to worst. Special note was made of the best match, the second- and third-best matches and the worst match.

The scalar values are derived from the raw data (which have been normalized against GL on deep inhalation, i.e. the maximum GL). The latter was arbitrarily given a value of 23 mm. This made it possible to do this post hoc when an inspiration volume is immediately followed by a steady-state vowel. For each patient two color photographs were then produced using the Hitachi VX-50 frame grabber, appropriate views were stored on disk, making sure that for each patient studied there was one set of data for each patient's pair of photographs (phonation and inhalation) were normalized against GL on deep inhalation, i.e. the maximum GL. The latter was arbitrarily given a value of 23 mm. This made it possible to assign scalar scores as a measure of similarity between configurations. Other statistical techniques for pattern analysis could have been used, but the scalar values captured quite clearly what was seen when studying photographs of the larynx, especially the extreme and mid-range values for each parameter. When two photographs were compared, i.e.

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