

DOES A TRANSIENT PROMINENCE OF ELECTROGLOTTOGRAPHIC WAVEFORM REFLECT THE PRESENCE OF GLOTTAL CLOSURE DURING COUGH?

T. Iwahashi¹, M. Ogawa¹, K. Hosokawa², H. Inohara¹

¹Department of Otorhinolaryngology - Head and Neck Surgery, Osaka University Graduate School of Medicine, Suita, Japan

²Department of Otorhinolaryngology, Osaka Police Hospital, Osaka, Japan

Email: tiwahashi@ent.med.osaka-u.ac.jp

INTRODUCTION: Cough is a cooperative movement associated with the larynx for removing foreign materials in the lower airway. In patients with unilateral vocal fold paralysis (UVFP), the disturbed glottal closure may lead to vocal abnormality or aspiration. In the evaluation of the glottal closure during cough, laryngeal observation using a transnasal fiberoptic scope is a standard method for daily clinical practice. However, some UVFP patients allow no clear observation of the vocal fold closure due to the covering of the supraglottic structures of the paralyzed side, making it difficult to confirm the presence of the glottal closure. Electroglottography (EGG) is a noninvasive method for analyzing the vocal fold contact condition during phonation. In the present study, we applied EGG for investigating the glottal closure condition during cough, and aimed to identify the laryngeal motion reflected by a transient EGG prominence observed at the beginning of cough motion, and to assess whether or not the presence of an EGG prominence predicted the cough efficiency in UVFP patients.

METHODS: Twenty healthy adult participants and 30 UVFP patients were enrolled in the present study. Each participant was fitted with EGG electrodes on the neck and examined using a transnasal fiberoptic scope connected to a high-speed digital camera. We asked the participants to perform weak and strong coughs while recording laryngeal high-speed digital imaging (HSDI) videos and EGG signals synchronously, followed by an aerodynamic cough examination using spirometry. Two laryngologists judged the presence or absence of a transient EGG prominence, and, subsequently identified which laryngeal motions during cough reflected by the transient EGG prominence in each video. The association between the presence of the transient EGG prominence and the peak expiratory air flow (PEAF), an aerodynamic parameter reflecting cough efficiency, was analyzed.

RESULTS: Almost all of the HSDI videos of the healthy participants (95%; 39/40) showed sufficient visibility of vocal fold closure, whereas 32% (19/60) of the videos of the UVFP patients provided no clear vocal fold view due to the supraglottic covering. Of the videos of the healthy and UVFP groups showing a good view of the vocal folds, 100% (39/39) and 59% (24/41) showed a transient EGG prominence, respectively. In addition, in all of the videos showing both good vocal fold view and EGG prominence, the timing of the EGG prominence coincided with that of the vocal fold contact just before the compression phase in the HSDI videos. In contrast, of the videos of the UVFP patients showing no EGG prominence, 59% (10/17) presented no vocal fold closure. Furthermore, the PEAF value during strong cough showed a significant difference between the UVFP patients with and without the transient EGG prominence ($p=0.0275$), but not between the UVFP patients with and without vocal fold closure.

CONCLUSION: The present study demonstrated that a transient EGG prominence during cough reflected the contact between the bilateral vocal folds just before the compression phase of cough, and that the presence of a transient EGG prominence was related to the cough efficiency. These results suggest that a transient EGG prominence may be a superior useful sign for predicting a vocal fold closure ability to fiberoptic findings, particularly in UVFP patients without a clear laryngeal view.