Abstract

Outcome Objectives: 1. Assess vocal fold vibration of patients with Reinke’s edema using high-speed digital imaging (HSDI) and videostroscopy. 2. Confirm that HSDI is useful for examining the vocal folds with severe Reinke’s edema. Methods: The subjects were 7 patients with Reinke’s edema (6 severe, 1 moderate; 6 females, 1 male, 55–74 years of age, mean 64.7 years). Their vocal folds were examined with HSDI system (1200 fps) and videostroscopy before microphonosurgery from October 2009 through February 2012. The following characters of vocal fold vibration were analyzed in patients with severe Reinke’s edema: glottic closure, mucosal wave propagation, symmetry, phase shift, frequency difference, periodicity and contact with false vocal fold. The postoperative examinations were also performed in 5 subjects.

Results: HSDI revealed periodic or quasi-periodic vibration, anterior-posterior phase shift and contact of true and false vocal folds in patients before surgery. Distinct left-right asymmetry of vibration was observed in six patients. The vocal fold vibrations could not be tracked by strobolights in four with severe edema. After surgery the vibrations became periodic and synchronized with strobolights in all patients. Little left-right asymmetry of vibration was observed only in all patients. HSDI revealed periodic or quasi-periodic vibration, anterior-posterior phase shift and contact of true and false vocal folds in all patients. Though the vocal fold vibrations with Reinke’s edema were periodic or quasi-periodic, they were often difficult to be observed with videostroscopy in severe cases. HSDI revealed periodic vibration and small left-right asymmetry in all 5 patients. The vocal fold vibration was synchronized with strobolights in all.

Keywords: High-speed digital imaging, Vocal fold vibration, Reinke’s edema

Introduction

Videostroscopy is used to observe vocal fold vibration, but its clinical use is limited because it relies on periodic vocal fold vibration and a stable phonation frequency to activate the strobe light. On the other hand, high-speed digital imaging (HSDI) can visualize aperiodic vocal fold vibration or an unstable phonation frequency. We assessed vocal fold vibration in patients with moderate to severe Reinke’s edema (type II or III) using HSDI and videostroscopy to confirm that HSDI is useful for examining vocal folds in such patients.

Methods and Materials

- 7 patients with Reinke’s edema
  - 6 type III, 1 type II
  - 6 females, 1 male
  - 55–74 years of age (mean 64.7 years).
- Examined with HSDI system (1200 fps) and videostroscopy before microphonosurgery in all patients and after in 5 patients.
- The following characters of vocal fold vibration were analyzed (1) Complete glottic closure (2) Mucosal wave propagation (3) Symmetry (4) Phase shift (5) Frequency difference (6) Periodicity (7) Contact with true and false vocal fold.

Results

- Before surgery (Table1) HSDI revealed:
  a) Periodic or quasi-periodic vibration, complete glottic closure, anterior-posterior phase shift, and contact with true and false vocal folds in all patients
  b) Left-right asymmetry of vibration in 6 patients
  c) Left-right phase shift and frequency difference in 4 patients
  d) Mucosal wave propagation increased in 6 patients and decreased in 1 patient.
  The vocal fold vibration could not be tracked by strobolights in 4 type III edema.
- After surgery HSDI revealed periodic vibration and small left-right asymmetry in all 5 patients.

Discussion

HSDI revealed that vocal fold vibrations in our patients with severe Reinke’s edema were periodic or quasi-periodic, but the vibrations could not be synchronized using the strobe light in 4 of the 7 patients. Extraction of the fundamental frequency from the gruff voice of patients with severe Reinke’s edema using videostroscopy appeared difficult. In the present study, anterior–posterior phase shift and contact with true and false vocal folds were observed in all patients. We consider that it is important to observe vocal fold vibration in patients with severe Reinke’s edema using HSDI in order to detect scarring and tumors before surgery.

Conclusions

- Observation of vocal fold vibrations in patients with severe Reinke’s edema using videostroscopy was difficult.

- HSDI can be a very useful tool for examining vocal folds of patients with severe Reinke’s edema.

Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Grade (Yonekawa’s classification)</th>
<th>Glottic Closure</th>
<th>Mucosal wave propagation</th>
<th>Left-right asymmetry</th>
<th>Frequency difference</th>
<th>Periodicity</th>
<th>contact with true and false vocal fold</th>
<th>Synchronization with strobolights</th>
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References