AbstractID: 13997 Title: Ultrasound Elasticity Evaluation of Vocal Cord Function

Ultrasound Elasticity Evaluation of Vocal Cord Function

Purpose: Treatment of oral and oropharyngeal cancer often injures the vocal cords affecting the patient's speech and quality of life. Current clinical speech evaluations are hampered by their subjectivity. The purpose of this study is to develop a quantitative ultrasound technique to accurately capture vocal cord function. **Method and Materials:** We adapted an elastography technique to measure the stiffness of the vocal cord. Changes in vocal cord stiffness correlate with pathological phenomena and are indicators of vocal cord injury. For this initial investigation, 12 healthy volunteers were scanned using a clinical ultrasound scanner with a 14 MHz linear array transducer. Each volunteer was asked to pronounce four vowels: "e," "o," "i," and "a." 120 consecutive frames of radio-frequency data were acquired in 5-second intervals while the volunteers pronounced each vowel. A 4 mm (110 sample points) by 6 mm (40 lines) region of interest of the true fords was analyzed. The displacement of two consecutive frames was computed with the multilevel hybrid 2D cross-correlation algorithm. The strain (stiffness) was obtained by slope estimation of the displacement using a least-square calculation. The accumulated displacement and strain were integrated over time and compensated using boundary conditions assuming the vocal cord should return to its initial position. To ensure reproducibility measurements were repeated 2 to 6 times. **Results:** Each vowel exhibited a distinctive displacement and strain curve; however, particular vowel curves are similar across volunteers. The displacement ranged 1-2 cm and strain value amplitude was 0.18-0.25. The displacement and strain curves from the same volunteer are reproducible. The curves produced by pronouncing "a" were the most consistent. **Conclusions:** The displacement and strain curves provide measures of the vocal cord stiffness and may be used to identify early vocal cord injury for oral and oropharyngeal cancer patients.