Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Investigating Blunt Force Trauma to the Larynx: The Role of Superior-Inferior Vocal Fold Displacement on Phonation MOLLY STEWART, BYRON ERATH, Clarkson University — Blunt force trauma to the larynx, which may result from motor vehicle collisions, sports activities, etc., can cause significant damage, often leading to displaced fractures of the laryngeal cartilages, thereby disrupting vocal function. Current surgical interventions primarily focus on airway restoration to stabilize the patient, with restoration of vocal function being, at best, a secondary consideration. Due to laryngeal fracture, asymmetric vertical misalignment of the left or right vocal fold (VF) in the superior-inferior direction often occurs. This affects VF closure and can lead to a weak, breathy voice requiring increased vocal effort. It is unclear, however, how much vertical VF misalignment can be tolerated before voice quality degrades significantly. To address this need, the influence of superior-inferior VF displacement on phonation is investigated in 1.0 mm increments using synthetic VF models in a physiologically-representative facility. Flow rate, fundamental frequency, sound pressure level, subglottal pressure, onset pressure, and glottal area are acquired simultaneously. High-speed video of the VF oscillations is also recorded, and the phase lag between the opposing VF oscillations is computed. Results show that increased displacement introduces breathiness, with a rapid decline in measures of vocal quality as the displacement increases beyond a critical value. Increased VF adduction helps regulate the detrimental effects of vertical misalignment.

Byron Erath
Clarkson University

Date submitted: 03 Aug 2020 Electronic form version 1.4