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Effect of subglottic stenosis on the flow-induced vibration of a self-oscillating computational vocal fold model SIMEON L. SMITH, SCOTT L. THOMSON, Brigham Young University Mechanical Engineering — The subglottis plays an important role in voice production; however, in general the role of subglottal geometry in phonation is not well understood. This research focuses on studying how subglottic stenosis, or a narrowing of the airway below the vocal folds, affects the response of a self-oscillating computational vocal fold model. Methods are described for computational model development, including stenotic geometry definition from CT scan images, incorporation of the stenosis into a finite element fluid-structure interaction model, and parametric variation of the degree of stenosis severity. Results are presented for a normal (no stenosis) case and five cases of varying degrees of stenosis severity. Qualitative and quantitative comparisons of vocal fold vibratory motion and of flow behavior for the six cases are made, including characterization of flow patterns in the subglottis, glottal width and flow rate time histories, vibration frequency, and airway resistance.

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