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Three-dimensional flow patterns in a scaled, physical vocal fold model with a unilateral polyp[1] ANGELA SEAWRIGHT, BYRON ERATH, Purdue University, MICHAEL PLESNIAK, George Washington University — Trauma to the vocal folds often causes the formation of polyps; affecting the efficiency of speech and making voice rough and breathy. The change in flow characteristics due to a unilateral polyp positioned on the medial surface of a 7.5 times life-size physical vocal fold model was investigated. Previously reported phase-averaged intraglottal particle image velocimetry (PIV) investigations in a coronal plane indicated significant variations in the flow behavior on different anterior offset planes relative to the polyp. Flow three-dimensionality was investigated by resolving the temporal evolution of the flow with laser Doppler velocimetry (LDV). Data were acquired superior to the glottal exit. Physiological values of Reynolds, Strouhal, and Euler numbers were matched. Results were compared to velocity fields generated by healthy vocal fold motion. The glottal jet trajectory, flow separation points, and the velocity distribution along the vocal fold walls were influenced. Thus, a polyp significantly disturbs and modifies the airflow through the vocal folds, which has implications on both the fluid-structure energy exchange and the sound production.

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Michael Plesniak
George Washington University

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