Experimental Measurements of Laryngeal Airflow

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Thursday, November 15, 2018
Time: 9:00 – 10:00 AM
Location: 22 Deike Building
Coffee and donuts will be provided

Abstract: Two basic questions in laryngeal biomechanics are: 1) what is the source of sound during voice production and 2) what produces vocal fold (also known as vocal cord) vibration. Classic theory suggests the source of sound is due to flow modulation at the glottal (vocal fold). Latter aeroacoustic theories suggest that flow structures produce additional sources of sound. Vocal fold vibration is due to a flow-structure interaction, but current theories differ in the exact details of this interaction. To validate and refine these theories, measurements in a tissue model are necessary. Until recently, such biological measurements were not technically possible. This talk will discuss experimental measurements of flow and vocal fold vibration in the excised animal larynx during voice production. The divergent-convergent shape of the vocal folds will be described. 2 D Particle Imaging Velocimetry of velocity fields between the vibrating folds will be shown, and the resulting pressure fields will be discussed. Tomographic PIV measurements of flow rate at the glottal exit will also be described. Differences between theory and experiments will be noted.

Biography: Dr. Khosla is an Associate Professor in the Department of Otolaryngology-Head and Neck Surgery. For the past several years, he has done research with aerospace engineers on the underlying mechanisms of vocal fold vibration and sound production. This research has focused on applications in laryngeal reconstruction and in treating unilateral vocal fold paralysis. Principles of this research have been used, in addition to standard reconstruction techniques to improve the voices of patients who had severe laryngeal trauma. One example is the laryngeal reconstruction of a patient who had not talked for 35 years; her story and voice were featured in several national and international news stories. He is also a Member of the Cincinnati Opera Board and is strongly involved in clinical and research activities with the Cincinnati College Conservatory of Music. He has had a NIH K award and a current NIH RO1. He is an active member of the American Academy of Otolaryngology-Head and Neck Surgery and is board certified by the American Board of Otolaryngology-Head and Neck Surgery. He is also a Fellow of the American Laryngological Association. Dr. Khosla received his B.S. from the Massachusetts Institute of Technology, an M.S. in Biomechanics from the University of California, San Diego, and his M.D. degree from Bowman Gray School of Medicine in Winston-Salem, North Carolina. He completed his residency training in Otolaryngology and a Fellowship in Laryngology and Voice Disorders at Barnes-Jewish Hospital, Washington University School of Medicine in St. Louis.