

Abstract Submitted
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Subject-specific modeling of vocal fold vibration for surgical planning¹ ZHENG LI, HAOXIANG LUO, Vanderbilt University, AZURE WILSON, LEANNE SAYCE, BERNARD ROUSSEAU, University of Pittsburgh — In the thyroplasty procedure for patients with unilateral vocal fold paralysis, an implant is surgically inserted into the paralyzed side of the vocal fold (VF) to facilitate VF adduction and vibration. We aim to develop a subject-specific modeling approach so that the implant shape, size and position can be determined before surgery through FSI modeling of the airflow-VF interaction. We use rabbits as subjects to develop and test the modeling approaches. We firstly reconstruct the VF geometry from MRI scans and each larynx sample has four configurations: 0 - open, 1 - two sides adducted, 2 - one side adducted, and 3 - one side adducted and the other side with the implant. We use several computational modeling tools to simulate the VF vibration at these configurations. Specifically, 1) eigenmodes of the FEM model of the tissue to analyze the deformation modes and frequencies; 2) a hybrid 1D-flow/3D-tissue model to perform FSI simulation of the vibration; and 3) full 3D FSI model to capture details of the flow and the vibration. These complementary simulations will be used collectively to enhance the subject-specific capability and to assess the effect of the implant. The modeling approaches and preliminary results will be presented during the talk.

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Haoxiang Luo
Vanderbilt Univ

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