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Modeling Vocal Fold Intravascular Flow using Synthetic Replicas[1]

AARON D TERRY, MATTHEW T RICKS, SCOTT L THOMSON, Brigham Young University — Vocal fold vibration that is induced by air flowing from the lungs is believed to decrease blood flow through the vocal folds. This is important due to the critical role of blood flow in maintaining tissue health. However, the precise mechanical relationships between vocal fold vibration and blood perfusion remain understudied. A platform for studying liquid perfusion in a synthetic, life-size, self-oscillating vocal fold replica has recently been developed. The replicas are fabricated using molded silicone with material properties comparable to those of human vocal fold tissues and that include embedded microchannels through which liquid is perfused. The replicas are mounted on an air flow supply tube to initiate flow-induced vibration. A liquid reservoir is attached to the microchannel to cause liquid to perfuse through replica in the anterior-posterior direction. As replica vibration is initiated and amplitude increases, perfusion flow rate decreases. In this presentation, the replica design will be presented, along with data quantifying the relationships between parameters such as replica vibration amplitude, stiffness, microchannel diameter, and perfusion flow rate.

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