[F23] A vertical three-mass model of phonation. Ronald Scherer, Guangnian Zhai, & Lewis Fulcher, Bowling Green State University, Bowling Green, OH, USA.

Empirical intraglottal and transglottal pressures obtained from a Plexiglas model of the glottis with multiple intraglottal pressure taps, glottal angles, and minimal glottal diameters were applied to a vertical three-mass model where two of the masses and ducts were similar to the Ishizaka & Flanagan (I&F) classical model, and the third mass was just inferior to the glottal entrance. The empirical intraglottal pressures on the lower glottal mass were less for divergent glottal shapes than in the I&F model, and thus the operational region of the model was reduced unless the stiffnesses were reduced in value. Four flow sources were included -- through the membranous and cartilaginous ducts, and vertical and horizontal vocal fold surface displacements. The latter two tend to be out of phase and partially cancel each other. The cartilaginous glottis flow (Bernoulli expression with inertance) gives rise to the DC flow and a delayed flow that adds a minor enhancement just after glottal closure. A flow hump near the flow pulse onset appears to be partly due to a reduced transglottal pressure when the glottis begins its opening phase, creating a delay in the practical flow pulse onset. This model permits the examination of the loop motion of points on the vocal fold surface. The addition of the vocal tract stabilizes the tissue motions, increases the amplitude of motion of the three masses, and decreases the phase delay between mass 2 and mass 3. Other kinematic, aerodynamic, and acoustic aspects of this model will be discussed. [NIH]