ACOUSTICS2008/3060
Intraglottal pressures in a static physical model of the converging glottis: entrance loss coefficients, exit coefficients, Bernoulli effects, and viscous effects

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Pressure distributions were obtained with a static physical model (M5) at diameters d = 0.005, 0.01, 0.02, 0.04, 0.08, 0.16, and 0.32 cm for converging angles of 5, 10, 20, and 40 degrees. At each diameter and angle, transglottal pressures typically ranged from 3 to 15 cm H2O. For each angle, diameter, and transglottal pressure, the measured pressure at the glottal entrance was used to calculate an entrance loss coefficient, and the measured pressure near the glottal exit was used to determine an exit coefficient. Previous work with the uniform glottis, where the only important physical effect was viscosity, found linear fits to the intraglottal pressures to be excellent approximations. Since the widening channel of the converging glottis produces Bernoulli effects as well as viscous effects, a parabolic form for intraglottal pressures is explored. Such an analytic form for the intraglottal pressures when accompanied by tables of entrance loss and exit coefficients would be a useful tool for researchers needing expressions easily included in numerical models of phonation. The validity of the new analytic treatment will be assessed by comparing the calculated pressures with the observed M5 pressures. [Work supported by NIH R01DC03577.]