

From vocal fold vibration to sound - why is glottal closure important?

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When assessing healthy or pathologic voices in laryngology, a major focus is on the vibratory pattern of the vocal folds, as provided by laryngeal endoscopic recordings. In particular, a symmetric and periodic vibration with a pronounced closed phase is often found desirable for healthy voices. The causal connection between vocal fold vibratory patterns and the resulting sound is often only considered implicitly.

In this basic introductory lecture, the fundamental physical and physiological principles of laryngeal sound generation are reviewed. In particular, it is shown that a main determinant of the radiated sound (constituting the “voice”) is the glottal airflow, a quantity often overlooked when medically assessing the voice.

Some causal relations between vocal fold vibration, glottal airflow and sound quality will be reviewed. Furthermore, the possibilities to control the quality of glottal airflow (and hence the quality of the produced sound) are discussed on a physiological level, and some psychoacoustic (perceptual) consequences of this airflow control are considered.

References:

[1] C. T. Herbst, D. M. Howard, and J. G. Svec, “The sound source in singing – basic principles and muscular adjustments for fine-tuning vocal timbre,” in *The Oxford Handbook of Singing*, G. Welch, D. M. Howard, and J. Nix, Eds. Oxford, UK: Oxford University Press, 2016.

[2] C. T. Herbst, “Biophysics of Vocal Production in Mammals,” in *Vertebrate Sound Production and Acoustic Communication*, W. T. Fitch, A. N. Popper, and R. A. Suthers, Eds. New York: Springer, 2016, p. 328.