

Vocal Fold Histology

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The vocal folds (sometimes referred to as vocal cords, or vocal chords) have special vibrating qualities based on their unique multi-layered structure. As discussed in [Benign Vocal Lesions](#), during phonation (speech) the vocal folds contact each other and produce a "mucosal wave." This wave affects the quality of vibration, and therefore the sound produced by vocalization, and also permits a controlled egress (exit) of air. If there were no egress of air past the vocal folds and the vocal folds were completely closed, then no sound would be produced. If there were too much egress of air (such as in the case of a vocal lesion preventing complete cycle-to-cycle closure of the vocal folds), then the voice would be breathy. There are other reasons why a voice may be breathy, however.

Hirano (1977) described this unique multi-layered structure microscopically to contain five layers, each with different mechanical properties. This multi-layered structure also has relevance in the development of benign vocal lesions.

The five layers, described by Hirano, include

- Squamous epithelium - maintains the shape of the vocal folds, serves as an initial boundary of protection for the underlying tissue, and helps regulate vocal fold hydration.
- Superficial lamina propria (SLP) - "Reinke's space" adds a pliant cushion with its mechanical properties consistent with a "mass of soft gelatin." It is composed mostly of loose fibrous and elastic components in a matrix.
- Intermediate lamina propria (ILP) - adds elastic mechanical integrity with the consistency of a "bundle of soft rubber bands." It is composed of mostly elastic fibers.
- Deep lamina propria (DLP) - this "bundle of cotton thread" is composed of mostly collagenous fibers, and contributes to the durability of the layer.
- Vocalis muscle - has both passive and active mechanical properties. Passively it has the consistency of "stiff rubber bands." Since it is a muscle, it also has active (contractile) properties that help control stiffness.

The different stiffness characteristics of these layers results in mechanically de-coupled groupings of the layers, to form

- Mucosa (cover) - composed of epithelium and SLP
- Vocal ligament (transition) - composed of the ILP and DLP
- Body of the vocal fold - the vocalis muscle

References

Hirano M: Structure and vibratory behavior of the vocal folds. Dynamic Aspects of Speech Production 1977;eds.13-27.

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