

The Anisotropic Elasticity of the Human Vocal Fold

Abstract

Objective: To verify the anisotropic nature of the vocal folds by reproducing an experiment led by Rholfs that measured vocal fold elasticity in the transverse and longitudinal directions. To present a physiological explanation of the measured phenomena using immunochemical results.

Methods: 6 cadaveric human excised larynges were hemi-sectioned in the mid-sagittal plane exposing the vocal folds, and orthogonal measurements of tension made at 3 equally spaced points. Immunohistochemistry carried out by Ichiro Tateya was used to visualise collagens and elastins in the deep layer of the lamina propria.

Results: The LSR results indicate that the measured elasticity of the vocal folds are highly anisotropic. The immunohistochemistry results show that there is a strong alignment of collagens and elastins along the longitudinal axis of human vocal folds.

Conclusion: The measured anisotropic behaviour is due to the alignment of collagens & elastins in the lamina propria.