MCB, vol.16, supplemental 2, pp.72, 2019

Biomechanical Measurements of Ocular Tissues *In Vivo*

Dominick Benedetto[1,*] and Frederick H. Silver[2]

[1]Center for Advanced Eye Care, Vero Beach, FL 32960, USA.

[2] Department of Pathology and Lab Medicine, Robert Wood Johnson Medical School. Rutgers, the State University of New Jersey, New Brunswick, NJ 08901, USA.

*****Corresponding Author: Dominick Benedetto. Email: dominibene@aol.com.

Abstract: Vibrational Optical Coherence Tomography (VOCT) is new technique capable of nondestructively measuring the biomechanical properties of ocular tissues *in vivo*. The technology utilizes audible sound combined with OCT imaging to obtain the resonant frequencies of both the cellular and extracellular components of tissue. The measured value of the resonant frequency is converted into a modulus using the tissue thickness, determined by OCT imaging, and a calibration curve of tissue modulus versus resonant frequency squared divided by sample thickness obtained from *in vitro* experiments. In this presentation we extend our analysis to ocular tissues specifically the cornea and sclera and discuss how these measurements provide information about these tissues in health and disease.

We have measured the resonant frequency and imaged the cornea and sclera of human eyes *in vivo*. The resonant frequency of human cornea and sclera is between 130 Hz and 150 Hz and the calculated modulus is about 2 MPa. *In vitro* study results, using eye bank eyes, indicated that the resonant frequency and modulus increased about 10% when the intraocular pressure was increased from 7 mm to 50 mm Hg. These results suggest that the cornea and sclera of the human eye have similar moduli at low strains and that increased intraocular pressure has only a small influence on the mechanical properties of the cornea and sclera.

The results of biomechanical studies on ocular tissues are very important since it is well known that mechanical forces existing either internal or external upon biological tissues, influence normal physiology through a process termed mechanotransduction. The measurement and further understanding of tissue biomechanical forces will become particularly important in the understanding of common ophthalmic problems such as the development of presbyopia, myopia, glaucoma, corneal ectasia and its management by corneal cross-linking.

DOI: 10.32604/mcb.2019.08149