

# APPLICATION OF COHERENCE FUNCTION FOR CALCULATING TIME SHIFTS BETWEEN AXIAL CORNEAL DISPLACEMENTS AND ELECTRICAL HEART ACTIVITY

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## **Abstract**

The heart activity is one of the most important factors influencing the ocular pulsation. It is known that the high correlation between axial corneal displacements and cardiovascular system activity exists. However, phase relationships between those factors are still unknown. The main goal of the research was to measure noninvasively longitudinal corneal apex displacement (LCAD) of the left eye, applying an ultrasonic sensor. Synchronically, the electrical heart activity (ECG) was recorded in Einthoven's triangle. To find phase dependencies between these signals the coherence function was used. It is observed that coherence value, computed between the first five harmonics of both signals, is different for shifted signals along each other.

Therefore, the time delay between the ECG and LCAD signals, for which particular harmonic achieves the maximum of coherence function, was examined. It can be noticed that for increasing number of the signals' harmonic, the time delay between considered signals decreases. This tendency is clear for both of examined subjects. To receive more information about this phenomenon more subjects should be measured and the statistical test should be introduced to calculate the time delay values. The presented noninvasive method might be helpful in the future for measuring the IOP pulse and estimating hemodynamic status of the eye.

**Keywords:** longitudinal corneal apex displacement, ECG signal, coherence analysis, time shifts calculation