

**O.Ya.Vanchuliak**

Bukovinian State  
Medical University,  
Chernivtsi

**Key words:** sudden cardiac death, forensic medical examination of the myocardial structure, diagnostics.

*Received: 12.04.2015*  
*Accepted: 27.05.2015*

UDC 616.12-005.4-073.55

## **DIAGNOSTICS OF THE ACUTE CORONARY INSUFFICIENCY BY THE METHOD OF MULLER-MATRIX ANALYSIS OF THE OPTIC ANISOTROPY OF MYOSIN NETWORKS OF THE MYOCARDIUM. A STATISTICAL AND FRACTAL APPROACH.**

**ABSTRACT. Background.** The acute coronary insufficiency is a common pathology in the practice of forensic experts. A small window of opportunity to study changes in myocardial tissue after death is a challenge for forensic experts. It is known that the established methods of detecting lesions of acute ischemia that are used in forensic practice need to be considerably updated since they depend on a multitude of internal and external environmental factors, require expensive reagents and are time consuming. These are precise reasons for searching and improving existing methods of diagnostics of myocardial changes to develop objective criteria for forensic determination of acute ischemic myocardial injury. **Objective.** To study the structure of the human myocardium under the acute coronary insufficiency using Mueller - matrix analysis of the optical anisotropy myosin networks of myocardium using a statistical and fractal approach. **Methods.** The study of myocardial samples was conducted with a laser polarimeter with subsequent analysis of the results in the MathLab 6 program. The object of the study was native myocardial sections of people who died as a result of acute coronary insufficiency and chronic ischemic heart disease. **Results.** We have revealed that in acute coronary insufficiency there was a decrease (20-fold) in the number of extreme values of the "orientational" Mueller matrix element of myocardial tissue. In other words, there is a clear disorientation of the optical axes of myosin fibrils in cases of acute coronary insufficiency comparing with chronic ischemic heart disease. **Conclusion.** We can assert the essential diagnostic sensitivity of laser polarimetry to differentiate death due to chronic ischemic heart disease and acute coronary insufficiency.

© **O.Ya.Vanchuliak, 2015**  
✉ **sudmed@bsmu.edu.ua**

### **Citation:**

Vanchuliak OYa. [Diagnostics of the acute coronary insufficiency by the method of Muller-matrix analysis of the optic anisotropy of myosin networks of the myocardium. A statistical and fractal approach]. *Morphologia*. 2015;9(2):24-8. Ukrainian.

## *References*

1. Cocco L, editor. Modern Metrology Concerns. InTech; 2012. Chapter 10; Angelsky OV, Polyanskii PV, Mokhun II, Zenkova CYu, Bogatyryova HV, Felde ChV, Bachinskiy VT, Boichuk TM, Ushenko AG; Optical Measurements: Polarization and Coherence of Light Fields; p. 263-316.
2. Bachinskiy VT. [Polarization images of extracellular matrix on main types of biological tissues for the purposes of forensic medicine]. *Klinichna ta eksperymental'na patolohiya*. 2008;7(1):6-13. Ukrainian.
3. Kim NH, Yun KH, Oh SK. [Sudden Cardiac Death]. *J Korean Med Assoc*. 2010;53(3):214-27. Korean. DOI 10.5124/jkma.2010.53.3.214.
4. Arhipkin SV, Koh IA, Gorbunov NS, Gorbunov DN, Zalevskiy AA, Chikun VI, Shehovcova JuA. [Studies used in diagnosis of cardiovascular death]. *Siberian Journal of Medicine (Irkutsk)*. 2013;(4):5-7. Russian.
5. Angelsky OV, Ushenko AG, Angelska AO, Ushenko YuA. Correlation- and singular-optical approaches in diagnostics of polarization inhomogeneity of coherent optical fields from biological tissues. *Ukr J Phys Opt*. 2007;8(2):105-23. doi: 10.3116/16091833/8/2/106/2007.
6. Angelsky OV, editor. Optical correlation techniques and applications. Washington: Society of Photo-Optical Instrumentation Engineers; 2007. Chapter 4; Angelsky OV, Ushenko AG, Ushenko YuA, Pishak VP; Statistical and fractal structure of biological tissue Mueller matrix images. p. 213-66.