

Comparative Study to Discriminate between Skin and Muscle Blood Flow to Contracting Muscle — Design of Optical Probe and Influence of S-D Separations —

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The basic data for designing an optical probe to study the layered model of biological tissue during muscle contraction are presented. Some optical characteristics of tissue, which depend on the wavelength of light and the influence of separation between the source (S) and the detector (D) of the probe, were studied. Appropriate S-D separations in the probe which can simultaneously measure the change of skin and muscle blood flows were determined. It was proven through measurements using three kinds of instruments that the blood flows in the two layers can be discriminated by our newly designed probe.

1. Introduction

Optical methods are known to provide a useful noninvasive means of assessing changes in microcirculatory perfusion.⁽¹⁻³⁾

To obtain the information on blood flow in tissue, the laser Doppler blood flowmeter (LDF) and photoplethysmography (PPG) are used in the reflective or transmissive mode. LDF can measure blood flow in the skin (dermal) layer, while conventional PPG using infrared light records arterial pulsations from the full thickness of the skin tissue.