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Evaluation of allergic response using dynamic thermography

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Abstract:

Skin dynamic termography supplemented by a mathematical model is presented as an objective and sensitive indicator of the skin prick test result. Termographic measurements were performed simultaneously with routine skin prick tests. The IR images were acquired every 70 s up to 910 s after skin prick. In the model histamine is treated as the principal mediator of the allergic reaction. Histamine produces vasolidation and the engorged vessels are responsible for an increase in skin temperature. The model parameters were determined by fitting the analytical solutions to the spatio-temporal distributions of the differences between measured and baseline temperatures. The model reproduces experimental data very well (coefficient of determination = 0.805÷0.995). The method offers a set of parameters to describe separately skin allergic reaction and skin reactivity. The release of histamine after allergen injection is the best indicator of allergic response. The diagnostic parameter better correlates with the standard evaluation of a skin prick test (correlation coefficient = 0.98) than the result of the thermographic planimetric method based on temperature and heated area determination (0.81). The high sensitivity of the method allows for determination of the allergic response in patients with the reduced skin reactivity.