“Microcirculatory characteristics in Raynaud’s phenomenon, evaluated by laser-Doppler flowmetry”

Candidate: Dr. Imre Mihály

Scientific supervisor: Prof. Dr. Brassai Zoltán

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Raynaud's phenomenon is characterized by episodic vasospasm of the fingers and toes typically precipitated by exposure to cold. Mild Raynaud's is common and is not usually a harbinger of clinically important disability; its onset, however, can be startling and uncomfortable for patients, and the well recognized association in some cases with systemic rheumatic conditions often precipitates aggressive assessments for underlying diseases. Advances in vascular physiology have shed light on the role of the endothelium as well as endothelium-independent mechanisms in the altered vasoregulation of Raynaud's.

The diagnosis of Raynaud’s phenomenon currently is based on the cold test, blood tests, and capillary microscopy. However these methods can’t illuminate completely the physiopathology, the mechanisms of the disease, as the diagnosis, the differential diagnosis and/or the prognostics of these patients. The laser Doppler flowmetry is a new method in the non invasive investigation of microcirculation, capable to offer new data, regarding the mechanism of this phenomenon.

The aim of our thesis was to determine in vivo, using this non invasive method, the physiological, physio-pathological and functional characteristics of the microcirculation in Raynaud’s phenomenon, and to correlate these findings with the clinical, paraclinical and biological characteristics of this patients.

We prospectively assessed data from anamnthesis, known diagnosis, biological findings, clinical findings, and laser-Doppler findings from 219 subjects, distributing them in four separate groups (healthy persons, patients with primary Raynaud’s phenomenon, patients with secondary Raynaud’s phenomenon, and patients with vascular affections frequently associated with Raynaud’s phenomenon, without having this symptom).

The thesis includes eight chapters. The first two chapters (composing the general part of the thesis) present the actual knowledge in the field of the vascular diseases, emphasizing the microcirculatory affection, as well as the exploratory methods used in evaluation of these illnesses.

The second part of the thesis includes all the personal contributions brought to the theme. The third chapter includes a short description about the Raynaud phenomenon, and the most important affections associated with the secondary form of this phenomenon.

The fourth chapter (Aim of the study) and the fifth chapter (Materials and methods) describe our primary, secondary and tertiary endpoints, as well as the methods used to achieve these endpoints. The most important part of the “Materials and methods” chapter is the presentation of the laser-Doppler flowmetry, and the examination protocol applied in this study, developed by our team.
134 (61%) cases were diagnosed with Raynaud’s phenomenon during the initial cold test. 15% of these patients were males, and 85% females. Evaluating the main diagnosis of our subjects, the percentages were: 21% healthy subjects, 25% patients with primary Raynaud’s phenomenon, 37% patients with secondary Raynaud’s phenomenon, and 17% patients suffering by vascular diseases often associated with Raynaud’s phenomenon, but not in their case.

Evaluating the characteristics of Raynaud’s phenomenon, we observed significant differences between the primary and secondary group. These differences were corresponding with the bibliography. We also assessed the emotive type of our patients. We found out, that in the primary group 90.74% of the patients, while in the secondary group only 32.50% of the patients were emotive.

One important step of our study was the comparison between the upper limbs (dominant and contralateral) using laser Doppler flowmetry. In this part of the investigation we have demonstrated, that there is no significant difference between the two upper limbs in healthy people, but there are significant differences between the regions of the same limb (finger and thenar). The most important result of this study is the determination of the different normal values of “time to peak”, registered during the postocclusive hyperemia test.

The highlight of the thesis is, of course, the assessment of microcirculatory reactivity in primary and secondary Raynaud’s phenomenon registered by laser-Doppler flowmetry.

In this part we used the laser-Doppler method to register the basal flow, amplitude of the pulse wave, amplitude and frequency of the “vasomotion” wave, as well as the reactivity of the microcirculation during the postocclusive reactive hyperemia test, psycho-physiological reactivity test, and cold test.

The basal flow was significantly lower in primary Raynaud’s phenomenon, and higher in secondary Raynaud’s phenomenon. The amplitude of the pulse wave wasn’t different between the groups. However the amplitude and the frequency of the vasomotion appeared to be significantly reduced in secondary Raynaud’s phenomenon, and in patients with vascular diseases.

The peak flow observed during the postocclusive reactive hyperemia test was higher in the healthy and the primary group. The difference between these two and the other (secondary and vascular) groups originates in the unaffected microcirculatory reserve.

The time to peak flow seemed to be longer in Raynaud’s phenomenon (both primary and secondary type) compared to the healthy and vascular group. This difference is caused by the increased micro-vascular tonus, associated with Raynaud’s phenomenon.
Presence of the vasomotion wave synchronism in postocclusive period is an absolute novelty in the microcirculatory field. This synchronism had an increased incidence (over 50%) in the healthy and primary group and a decreased incidence (aprox. 20%) in the other two groups.

As another novelty offered by the thesis, the psycho-physiological reactivity had an increased amplitude and incidence in the primary Raynaud’s group.

Reactivity at cold exposure was also different between the groups. The microcirculatory flow drop was affected in the secondary Raynaud’s and vascular group, likely because of the reduced capillary density, and affected microcirculatory reserve.

Reaching the minimum flow during the cold test, on the exposed hand, took much more time in patients with Raynaud phenomenon. This result suggests that in case of Raynaud’s phenomenon, there are other and/or altered mechanisms involved in the cold induced vascular response.

This theory is confirmed by the increased time amount needed by these patients (primary and secondary Raynaud’s) to reach the initial value of the basal flow, after the cold exposure is ended.

Our results suggest the importance of the laser Doppler flowmetry in evaluation of the Raynaud’s phenomenon. The method based on the protocol developed by us offers important data regarding the diagnosis, differential diagnosis and prognosis of the suffering. Allowing an early medical intervention, it may have a positive influence on the patient’s medical and socio-economical prognosis.