

Fully translated:

MICROCIRCULATION

IMIN: Platform collects knowledge worldwide

Scientific engagement with microcirculation is currently one of the largest fields of growth in medicine. “This year alone, we will have more than 1000 publications on the subject,” estimates Prof. Dr. Fred Harms in Vienna.

The International Microvascular Net (IMIN, www.imin-org.eu) was founded two years ago to better research the complex interactions between the large vessels, the micro vessels and the peripheral circulation. The objective of IMIN is to gather together all of the global knowledge on microcirculation and to develop new evidence-based diagnostic and therapeutic strategies, says the founder and head of the association Fred Unrath.

New standards in patient care are also to be defined and economic cost-saving therapy opportunities are to be sounded out.

At the same time, it intends to increase the awareness amongst doctors of the knowledge regarding the significance of functioning microvessels for primary, secondary and tertiary prevention. To this end, IMIN is organizing EU-wide research projects and is establishing contact with international institutes and experts in this area of research.

Therapeutic intervention at the mesenchyme

The mesenchymal interstitial space is significant for both the supply to the substrate and for immunological reactions. If it is overloaded by pathogenic stimuli, comes to a standstill of the autonomous vasomotion comes to a standstill and, as a consequence, leads to “silent inflammations”, hypoxia, acidosis and finally also to chronic pain. Physical stimulation of microcirculation can counteract this, emphasized Dr. Monika Pirlet-Gottwald from Munich.

Mesenchyme cells react to appropriate stimuli such as warmth/cold, pressure/draft or diet/hunger. This occurs via vasoactive substances and via autonomous regulation of the microvessels, therefore via vasomotion. Insufficient stimuli in contrast, such as toxins, lack of oxygen or movement, inflammations or chronic stress trigger a series of pathogenic phenomena. Influencing microcirculation opens up an important therapy approach here. “Physical Vascular Therapy cannot heal, but neither can drugs,” according to Pirlet-Gottwald.

In addition to lymphatic drainage and connective tissue massage, it was a good cornerstone because it was well tolerated.

Physical Vascular Therapy gets microcirculation into action

Impaired microcirculation in the arterioles, venules, capillaries and initial lymphatic vessels is a characteristic of numerous chronic diseases. In this respect, microvessels (around 74 percent) can barely be reached by pharmacological interventions, but can be influenced by a biophysical signal configuration.

Many chronic diseases are caused by microcirculation disorders or the course of the disease is influenced by it. A peculiarity of chronic diseases, according to Professor Dr. Fred Harms from Vienna, is that 90 percent of therapy successes are actually in the hands of the patients themselves. The objective must be to rethink the communication with the patient. By promoting self-management in a care concept which includes all healthcare professionals, health insurance schemes and industry, and which takes account of the attitude and needs of the patient, appropriate, economical healthcare can be implemented. 75 percent of our vessel supply consists of microvessels. These “transitory routes of exchange of material” are the most important part of the circulation, explained Harms.

Microvessels cannot be displayed using conventional imaging, nor can they be influenced pharmacologically, since they lack the receptors for cardiovascular drugs. Physiologically, the microcirculation is exclusively regulated by a spontaneous autorhythmic vasomotion of the arterioles and venules close to the capillaries. If it is impaired, the vasomotion can only be improved physically. Physical Vascular Therapy can thus reproduce the flow and material exchange. In electromagnetic field therapy (pulsed electromagnetic field PEMF), brief electromagnetic impulses already bring about the formation of a complex made up of calcium ions (Ca²⁺) and the protein calmodulin (CaM). The Ca²⁺/CaM complex binds an endothelial nitrogen oxide synthesis (eNOS) which thereupon produces nitrogen oxide (NO). NO itself has an effect on the microvessels and enables the impaired perfusion of organs to adapt to the cellular requirements. Furthermore, NO also has an anti-inflammatory effect, reduces pain and edema and leads the distribution of various growth factors (conveyed via cGMP), as the Nobel Prize winner Louis Ignarro discovered. With PEMF, Ignarro sees “a century of electrotherapy” on the horizon, especially physical vascular therapy, not only being simple and cost efficient, but practical and free of side-effects. With the therapy devices Classic and Professional by Bemer, which have been certified for “physical vascular therapy”, there is now a treatment option available for numerous indications, which have been clinically evaluated in a total of 14 studies listed in PubMed with around 4,000 patients, as stressed by Harms. As an example, he cited a randomized, controlled, doubleblind trial by Professor Tamas Bender from Budapest. Each of 50 patients with arthrosis of the knee or chronic lower back pain were treated with physical vascular therapy in combination with physiotherapy one a day for 15 days. The pain and fatigue in the patients with lower back pain reduced after a short period of treatment and those with arthrosis of the knee tended to benefit from longer term treatment. Using validated scales in a market observation of 658 patients with impaired microcirculation and various disease patterns also showed that after supportive physical stimulation of pre-capillary microvessels, two out of three users reported an improvement in sleep, every second significantly less pain and again two out of three a significantly improved quality of life.

At the world health congress in Taiwan in 2015, Harms presented a trial by Professor Dr. Rainer Klopp from the Berlin Institute of Microcirculation. In this trial, 60 patients with Type II diabetes took part in 60 minutes of daily treadmill training for 30 days. Twenty of them also received oxygen (26 vol. %), 20 received oxygen plus physical vascular therapy. The oxygen and even more the additional physical vascular therapy significantly improved the distribution of blood and the oxygen utilization and vasomotion (see diagram).

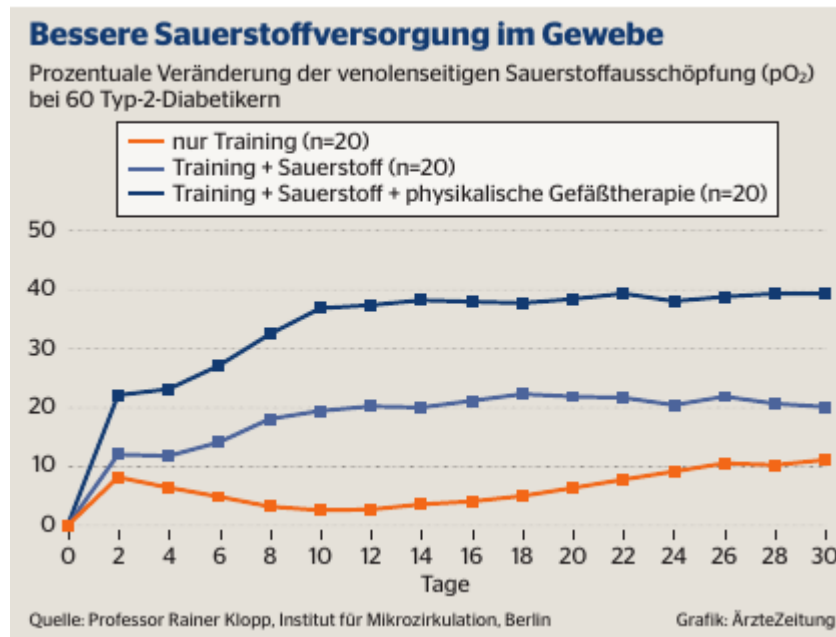
According to Harms, Professor Pastore in Rome has promising data for this supportive treatment for diabetic foot.

The vascular system is to 74 percent made up of microvessels

Diseases which can accompany a microcirculation disorder:

- chronic degenerative musculoskeletal diseases
- chronic fatigue, fatigue
- metabolic disorders (e.g. diabetes or lipometabolic disorders)
- chronic wound healing disorders
- acute and chronic pain
- suffering with limited quality of life
- PAOD
- polyneuropathy caused by diabetes

Better oxygen supply in the tissue
 Percentage change in the venule's oxygen utilization (pO₂) in 60 type II diabetic patients
 -- Only training (n=20)
 -- Training + oxygen (n=20)
 -- Training + oxygen + physical vascular therapy (n=20) Days
 Source: Professor Rainer Klopp, Institute for Microcirculation, Berlin.



NO is crucial for healthy vessels

Physical vascular therapy can improve the production and supply of nitrogen oxide (NO) and thus normalize an impaired flow profile. The endothelium as a systemically effective organ controls the homeostasis of the entire vascular system and the energy supply for all the somatic cells. "The endothelium is the chief director of the human body," explained Dr. Rainer Pawelke, specialist in Internal medicine, natural medicine, sports medicine and endothelial medicine from Brannenburg.

The single layer of cells which lines the inner walls of arteries, capillaries, lymphatic vessels and veins, reacts as a biological network system to internal and external influences with the expression of receptors and by the production of vasoactive peptides and hormones.

The endothelium uses this to control the hemostasis of the vascular system and the energy supply for all somatic cells. The production of vessel-dilating nitrogen oxide (NO) and the regulation of the shearing force occurring in the capillaries are crucial for hemostasis.

Pawelke cannot stress enough the function of NO as the most important protective factor for the endothelium against inflammatory processes. Too little NO acts as a generator of endothelial dysfunction. The glycocalyx, a protective layer of sugar molecules is also important here. If the endothelial glycocalyx is impaired, it can lead to atherothrombotic processes. In addition, the spontaneous autorhythmic vasomotion of the precapillary vessels and lymphatic vessels tire with age.

With physical vascular therapy, "PEMF", specifically this smooth musculature can be stimulated which improves the microcirculation dependent on NO, according to Pawelke. "When the signal works, we have unbelievable possibilities for formation and remodeling."

The Bemer lymph study is addressing the question of whether documented volumeimproving influences by PEMF frequency spectrum signals in patients with leg lymphedema also reduce inflammation and impaired flow profiles.

In a pilot study with ten patients with primary and secondary lymphedema of the legs in stage II, after three weeks of intensive therapy there was a reduction in lymphedema volume, an improvement in their moods and an improvement in CRP, IL6 and 8 and TNF alpha lab results. This is currently being tested in a randomized placebo-controlled double-blind trial with 208 patients.

EVENT
 121st Annual congress of the Deutsche Gesellschaft für Physikalische Medizin und Rehabilitation e.V., (DGPMR)
 [German society for physical medicine and rehabilitation]
 Justus-Liebig University Giessen, October 2008, 2016
 Session 16 "Physical Vascular Therapy – Microcirculation"

PUBLICATION DETAILS
 Springer Medizin Verlag GmbH, Corporate Publishing, Heidelberger Platz 3, 14197 Berlin
 > Managing Director: Joachim Krieger > Fabian Kaufmann > Editing: Inge Kunzenbacher
 > Responsible person: Ulrike Hafner > Report: Dr. Andrea Hackel, Frankfurt am Main
 © Springer Medizin Verlag GmbH is part of the academic publishing group Springer Nature
 Print: Coldsetinnovation Fulda GmbH & Co. KG, Eichenzell
 With kind support from IMIN International Microvascular Net, Lossburg