226 TREATMENT AND REHABILITATION OF THE CRITICALLY ILL PATIENT ON THE INTENSIVE CARE UNIT (ICU) – THE ROLE OF IMPAIRED MICROCIRCULATION

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Introduction: Impaired microcirculation contributes substantially to mortality of ICU patients and to prolonged rehabilitation.

Purpose: To describe microcirculatory impairment in critically ill patients and its consequences for treatment and rehabilitation.

Methods: Narrative review and presentation of preliminary data from the MicrocircMODS trial.

Results: Microvascular dysfunction contributes to a variety of disease states by triggering inflammation, thrombosis and fibrosis (1-3). Noninvasive optical techniques (e.g. Microscan) allow visualization and quantitative analysis of the sublingual microcirculation in patients at the bedside (4-6). The percentage of perfused small vessels (<20 μ m) is lower e.g. in patients with severe sepsis (2), heart failure and even less in patients with cardiogenic shock (92% vs. 63% vs. 49%; $p < 0.001$); with a higher proportion of perfused vessels in surviving patients (3). Topical application of acetylcholine reverses microvascular impairment (3) documenting – in principle – reversibility of these alterations. No medication is available which specifically attenuates microcirculatory dysfunction.

In the ongoing monocentric prospective **MicrocircMODS-trial** we try to improve impaired microcirculation of patients with multiple organ dysfunction syndrome (MODS) with a biorhythm-defined physical stimulation of impaired spontaneous arteriolar vasomotion by an electromagnetic alternating field of low magnetic flux density (“Physical Vessel Therapy BEMER®”), which has been shown to reduce disturbed microcirculation in diabetic patients (7). In the MicrocircMODS-trial 10 patients with MODS are to be treated for four days - three times a day - for 8 min each with physical stimulation, with a flow density of 10.5 to 21 μ T. Primary end point is the effect on impaired sublingual microcirculation. In April 2018 the last patient has been included, and 6-month-survival rate will be obtained in October 2018.

Conclusion No pharmacological approach is yet at hand to improve impaired microcirculation of ICU patients. A positive result of the MicrocircMODS trial could lance a new physical concept of treatment and rehabilitation of ICU patients.

References: 1) Circulation 2016;118:157; 2) Crit Care Med 2013;41:791; 3) Am Heart J 2004;147:91; 4) Crit Care 2012; 16:224; 5) Crit Care 2015;19:388 6) Crit Care 2016;20:35; 7) Z Gerontol Geriat 2013;47:415.

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Study Protocol
 Effect of electromagnetic field of low flux density with biorhythmically-defined impulse configuration („Physical Vessel Therapy BEMER®“) on impaired microcirculation in patients with MODS (multiorgan dysfunction syndrome)
Acronym: MicrocircMODS Trial
 University Hospital Halle(Saale), Germany

MicrocircMODS Trial

- Monocentric, prospective pilot study, single-armed
- Medical ICU, University Hospital Halle(Saale), Germany
- 10 patients with multiple organ dysfunction syndrome (MODS) of cardiogenic and septic origin
- **Treatment:** Physical Vessel Therapy BEMER®
 ⇒ 4 consecutive days (increasing flux densities: 10,5;14,0;17,5, 21,0 μ T) for 8 min each at hours 9, 13 & 17;
- **Endpoints** (from day 0→4) (primary = P, secondary = S):
 ⇒ **P:** Change in sublingual microcirculation
 ⇒ **S:** Change in MODS, hemodynamics (cardiac index)
 ⇒ Safety; ⇒ Mortality (ICU-, 28- and 180-day mortality)
- **Financial support:** BEMER Co., Triesen, Liechtenstein

Semiquantitative Analysis
Microvascular Flow Index (MFI)

Scoring of Flow in Four-Quadrant
 0 Missing 1 Intermittent
 2 Sluggish 3 Normal
 Σ Total Points in Four-Quadrant / 4 = MFI (Maximum: 3)