The Haug Report
Physical methods II

BEMER® Physical Vascular Therapy

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- Science Award 2013 bestowed on Dr Sándor Iván Bernát
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Haug

Effects of various physical methods of treatment on the functional characteristics of microcirculation in the case of control deficits in organ blood flow

Results of a placebo-controlled double-blind study

Study question

Effective therapeutic options for physical, targeted stimulation of deficient blood supply to the organ are not only of great importance for preventive medicine but are also, from a complementary therapy perspective, of interest in improving the therapeutic success of established (drug) measures. The results of a comparative clinical trial were expected to yield information on whether and to what extent commercially available physical therapeutic devices holding out the promise of stimulation of impaired organ blood flow may influence in a relevant manner deficient blood flow control in the microcirculation, which is functionally the most important part of the blood circulation.

Materials and methods

The investigations, which fulfilled the requirements of GCP, incorporated a biometrically defined sample taken from male subjects aged around 50 years who had been exposed to infection and stress. At intervals of 12–14 days, the subjects underwent 3-day treatments with various commercially available therapeutic devices in accordance with the relevant manufacturers' instructions (Table 1). The investigations were placebo-controlled and double-blind (assignment by randomization generator).

With the aid of high-resolution analytical methods (combined intravital microscopy and reflection spectrometry, laser DOPPLER microflow measurement, white-light spectroscopy), measurements of representative characteristics of the functional state of the microcirculation (number of blood cell-perfused node points in the capillary network nNP, venular oxygen utilization pO_2, surface area under the envelopes of the amplitude frequency spectrum of spontaneous arteriolar vasomotion A_{VM}.) were performed in a defined subcutaneous target tissue of the abdomen.

The **measurement times** were: day 0 (baseline values), treatment day 1, 2 and 3, and day 4 (wash out).

The WILCOXON rank sum test (alpha = 5%, two-tailed) was employed for the statistical evaluation of the measurement data collected at equidistant measurement times.

Results

Although statistical analysis of the measurement data collected showed, for all characteristics investigated over days 1–3, significantly different characteristic behavior compared with the relevant baseline conditions on day 0, the levels of characteristic changes determined following use of test devices 2–8 differed considerably.

The measurement data for the characteristic "number of blood cell-perfused node points in the defined target network nNP" provide evidence on the distribution state of the plasma-blood cell mixture in the microvascular networks of the target tissue and thus on the "microcirculatory reserve". The measurement data for test devices 1–8 are set out as graphs in Fig. 7.

Fig. 8 shows the measurement data for the characteristic "venular oxygen utilization pO_2", virtually the arteriovenous oxygen partial pressure difference.

Particularly informative are the measurement data for the characteristic "surface area under the envelopes of the amplitude frequency spectrum of spontaneous arteriolar vasomotion A_{VM}", which characterizes the main (local) control mechanism of organ blood flow. Following use of test devices 2 and 4, the changes in characteristic totaled no more than 1% and are thus irrelevant. The same is true of test device 8, after the use of which changes in characteristic of approx. 2% arose on the third day. For test devices 3, 5 and 6, very small levels of change in characteristic over days 1–3 were recorded relative to the respective baseline values (max. approx. 3%). Relevant changes in characteristic occurred only after the use of test device 7: 6.6 ± 1.23% on treatment day 1; 9.7 ± 1.28% on treatment day 2; 12.4 ± 1.68% on treatment day 3, and 7.1 ± 1.34% on treatment day 4 (wash out).

Table 1 Treatment devices used in the investigation.

Test devices TD	Designation/commercial name
TD 1	Placebo device (ineffective imitation)
TD 2	Magneter
TD 3	Impulser
TD 4	Terramagnon
TD 5	Sentiplus Professional
TD 6	iMRS
TD 7	BEMER® Physical Vascular Therapy (Classic)
TD 8	QRS ("Quantum resonance system")

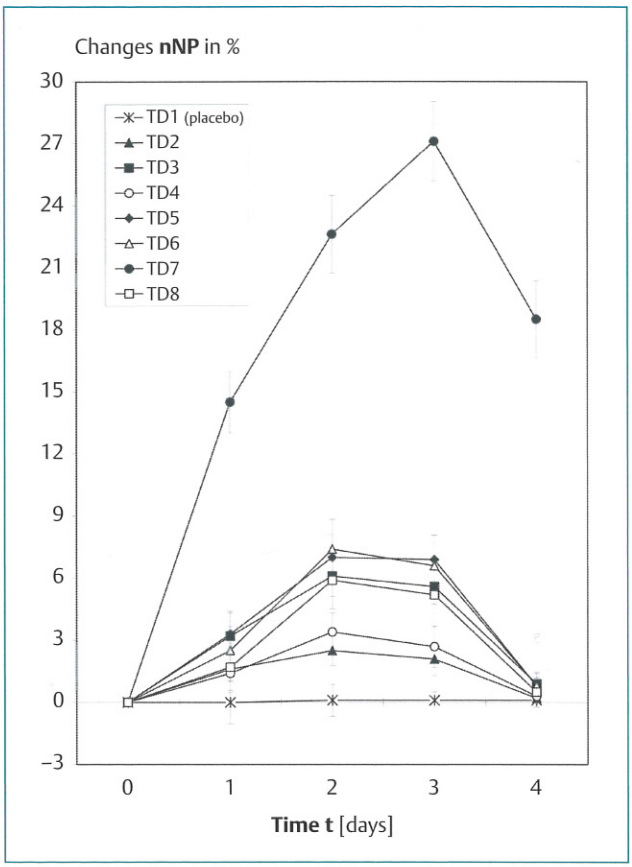

Fig. 7 Measurement values for the characteristic "number of blood cell-perfused node points in the defined network nNP" (mean values and standard deviations) after the use of test devices TD1 to TD8.

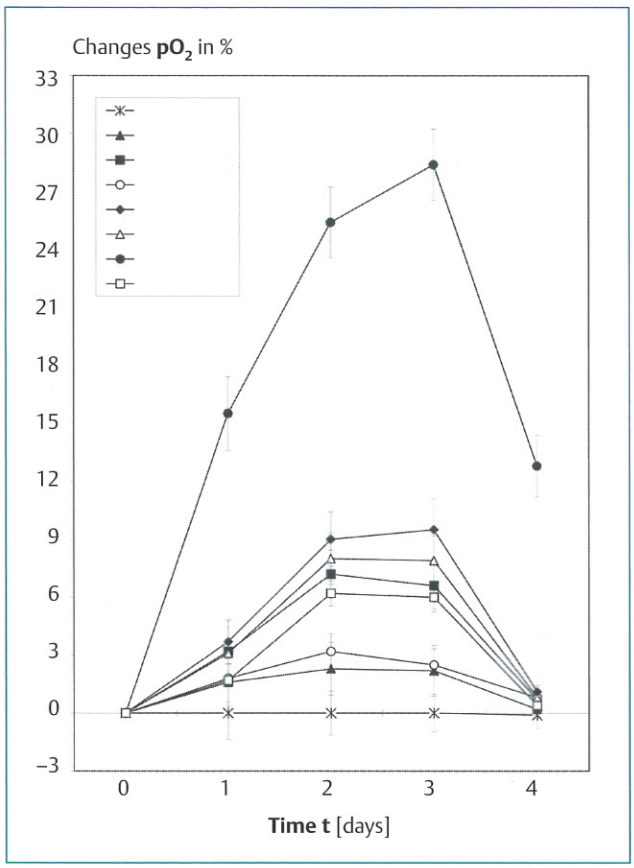

Fig. 8 Measurement values for the characteristic "venular oxygen utilization pO_2" (mean values and standard deviations) after the use of test devices TD1 to TD8.

The significantly higher levels of the changes in characteristic for nNP and pO_2, which were demonstrated after the use of test device 7 versus all other test devices examined, are to be graded as a result of effective stimulation of the (spontaneous) arteriolar vasomotion for this treatment device.

Conclusions

As part of a placebo-controlled investigative series, it was examined, based on a subject sample with high-resolution measurement methods for recording microcirculatory functional characteristics, whether and to what extent the use of various commercially available physical treatment devices can contribute to the effective stimulation of deficient organ blood flow. The results of the investigations showed that arteriolar vasomotion and thus microcirculatory blood flow control can be influenced in a relevant way only by a targeted, biorhythmically defined stimulation signal and is in this regard suitable for prophylactic use and use in complementary therapy. Out of 7 commercially available treatment devices tested, only one device fulfilled this requirement.

After teaching and research activities in physics and biophysics, Dr Rainer Klopp worked as a senior physician at the Charité Institute in the field of clinical pathophysiology and later at the Institute for Cardiovascular Diagnosis. In 1980 he founded at the Charité Institute the independent University Department for Microcirculation, which has since 1992 been the "Institute for Microcirculation" and has enjoyed cooperative relationships with a number of universities and research centers in Germany and abroad. The Institute's research work has been marked with scientific prizes. Dr Rainer Klopp has published a total of 100 scientific original papers, book contributions and patent specifications.

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