Application of Whole-Body Hyperthermia to Support "Long-COVID" (POST-COVID-19) Rehabilitation

Through wide availability of multiple COVID-19 vaccines nowadays officially approved by the European Medicines Agency (EMA), the spread of the SARS-CoV-2 pathogen can now be increasingly contained also in European countries such as Germany. Nevertheless, already approximately 8 million Germans have contracted COVID-19 since the outbreak of the pandemic until the end of 2021 - fortunately, most of them recovered.

But there is still no comprehensive official information available about how many of those patients, who have recovered from COVID-19 are indeed completely free of symptoms after their recovery. The German Robert Koch Institute (RKI) has already started such investigation. It was determined that about 40% of COVID-19 patients treated in a clinic and 10% of those who successfully recovered from mild COVID-19 without hospitalization still report health complaints after their recovery and even continue to require long-term medical support.

The literature currently distinguishes between three COVID-19 stages:

1. "acute" COVID-19
2. multisystemic inflammatory syndrome
3. "Long-COVID" (post-COVID syndrome)

Clinical studies show that after an acute COVID-19 illness (typically lasting 10-14 days), in rare cases a multisystemic inflammatory syndrome occurs about two to five weeks after the onset of infection. This usually affects multiple organs - even those that were not initially affected by the virus. In the context of COVID-19, this case is categorized as immune dysregulation [1].

Far more frequently, various symptoms still occur weeks to months after an infection. These impairments of physical and mental health as well as limitations in functioning and quality of life are summarized by the German Federal Center for Health Education as long-term consequences under "Long-COVID" or "post-COVID syndrome".

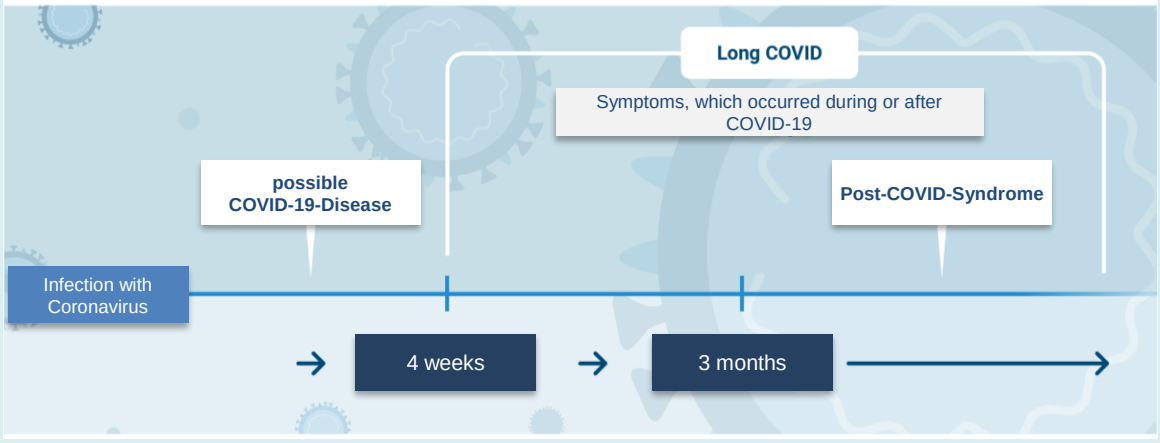

Fig. 1: Possible phases of COVID-19 disease [I].

These range from fatigue, exhaustion and reduced exercise capacity to headaches, respiratory problems, olfactory and gustatory disorders, muscle weakness and pain, concentration and memory problems, depressive disorders, as well as sleep and anxiety disorders, chest pain, palpitations, heart palpitations, ectopic beats or myocarditis. In addition, renal and metabolic diseases such as diabetes mellitus as well as thromboembolism have occurred after the actual disease phase.

To date, however, there is no clear definition of Long-COVID. Furthermore, objectively measurable pulmonary disfunctions, gas exchange or diffusion disturbances are not always available. However, these numerous and rather unspecific symptoms form a very complex clinical picture, which have been causing problems for many post-COVID outpatient clinics worldwide.

In 2020, the German Medical Journal „Ärzteblatt“ summarized the most common symptoms which were reported by patients both during the acute phase of illness and after 14-21 days as follows:

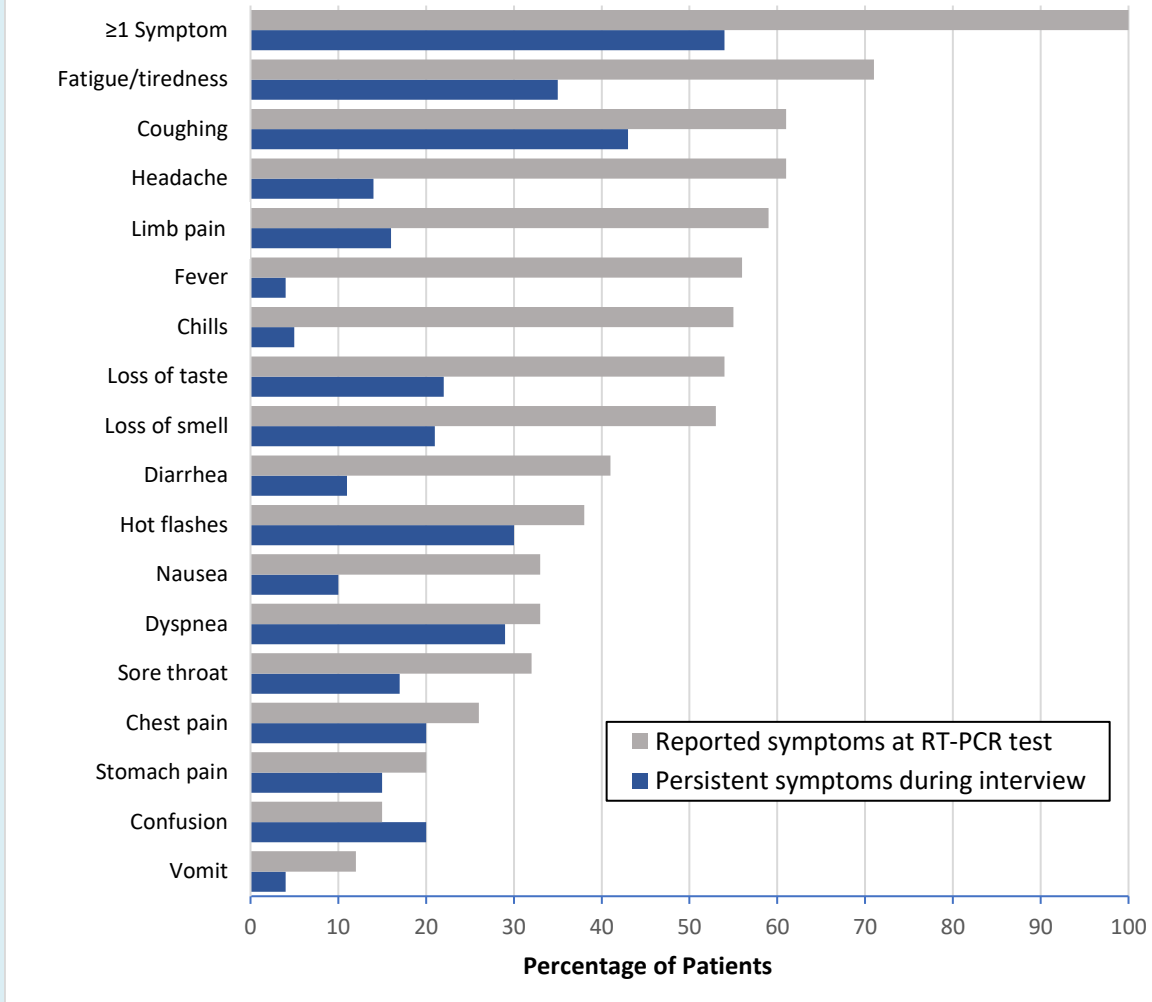

Fig. 2: COVID-19 symptoms which were complained of beyond the actual disease phase
Source: 14 US academic hospitals in 03-06/2020, n=274 [II].

Accordingly, more than 50% of the diseased confirmed one or more persistent symptoms in their follow-up interviews.

Reporting very similar results, 384 patients with COVID were followed up in a first British study in 2020. This study showed that two months after their discharge from clinical treatment, almost 70% of patients still suffered from fatigue and more than 50% from shortness of breath. While about one-third (34%) of the study participants continued to complain of cough, 14.6% also had symptoms of depression [2]. Thus, many individuals suffer from COVID-19 long-term - not only physically, but also psychologically.

It is particularly noticeable that young people are also increasingly suffering from long-term COVID-19 effects. Figure 3 depicts the age distribution of participants in a Long-COVID survey conducted in 2020. It can be seen that about 41% of those affected are between 20 and 40 years of age. Consequently, more than 70% are even not yet 50 years old.

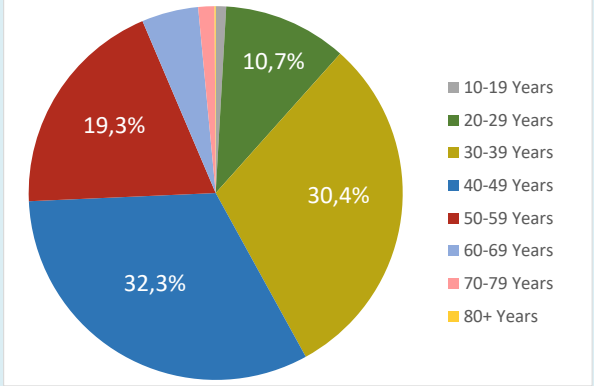

Fig. 3: Age distribution of participants in a Long-COVID survey regarding long-term outcomes [III].

Many of the reported symptoms such as joint and muscle pain as well as fatigue/tiredness are a clear indication of a reduced supply of tissue perfusion, a slowed metabolism and a generally impaired immune status. From a physiological point of view, this is exactly the starting point where an increased body-core temperature can naturally counteract. It has already been medically proven that body-core temperatures up to 39°C significantly stimulate the immune system [3, 4] and that whole-body hyperthermia (WBH) in particular can significantly reduce musculoskeletal pain [5, 6].

Based on the above-mentioned findings, whole-body hyperthermia is an innovative and easily feasible way to significantly improve the regeneration and recovery of patients with long-term effects from COVID-19. Predominantly important is that the accelerated regeneration occurs without additional medication and with very low risk of side effects.

The Von Ardenne Institute of Applied Medical Research GmbH therefore renews its active recommendation for using whole-body hyperthermia as adjuvant treatment method of patients suffering from long-term COVID-19 effects.

Whole-body hyperthermia treatments can be carried out in a very patient-friendly way with an IRATHERM®1000M system (Fig. 4). It is advised to start with an reduced radiation intensity for severely affected or weakened patients. The following therapeutic procedure is recommended for WBH treatment:

- 3-6 hyperthermia sessions, each with a duration of 75 min
  (45 min temperature rise phase + 30 min plateau phase)
- Attaining a body-core temperature of 38.5 - 39.0 °C

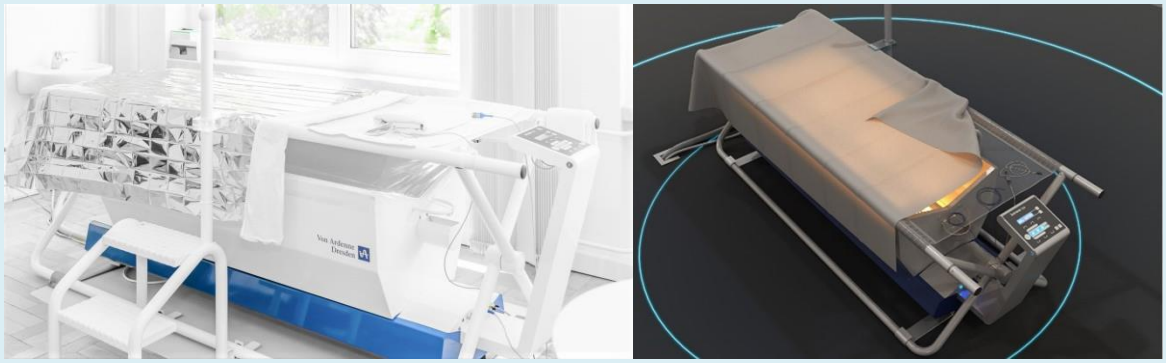

Fig 4: IRATHERM®1000M - device for hyperthermia treatments [IV].

Furthermore, additional application of oxygen in the frame of an OXITHERMIE therapy, should beneficially be considered in combination with the whole hyperthermia treatment. In this case, an Oxygen flow of 10 l/min is recommended in order to perfectly match with the increased respiratory requirements. Finally, also an administration of vitamin C is recommended at the physician's discretion during the treatment.

In conclusion, whole-body hyperthermia offers a promising treatment method for many symptoms of Long-COVID. The Von Ardenne Institute continues actively collaborating and to reach out to our medical partners to collect additional clinical evidence on the efficacy of hyperthermia treatments. In this respect, there are experimental and clinical studies already being conducted at two locations in Germany explicitly with regard to the treatment of Long-COVID using IRATHERM® systems. We therefore encourage patients suffering from Long-COVID to ask your treating physician about whether a whole-body hyperthermia treatment is a viable option for you.

References:
[1] Datta et al., JAMA 2020; 324:2251-2252
[2] Mandal et al., Thorax. 2020, Epub: thoraxjnl-2020-215818
[3] Kobayashi et al., Imm Letters 2014; 162:256-61
[4] Baronzio et al., Hyperthermia in Cancer Treatment, Landes Bioscience 2006; 247-275
[5] Brockow et al., Clin J Pain 2007; 1:67-75
[6] Walz et al., Schmerz 2013; 27:38-45

Images:
[I] Bundeszentrale für gesundheitliche Aufklärung, Accessed: 26.01.2021
[II] Dtsch Ärztebl 2020; 117(49): A-2416 / B-2036
[III] Dtsch Ärztebl 2020; 117(49): A-2416 / B-2036
[IV] Von Ardenne Institut für Angewandte Medizinische Forschung GmbH, www.iratherm.com, Accessed: 11.03.2022

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