Effects of a new local cold therapy for post-COVID symptoms

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Study conducted with 108 subjects suffering from post-Covid syndrome

Abstract

In the treatment of post-COVID syndrome, whole-body cold therapy has already been shown to have positive effects on the ability to regenerate and to improve the clinical picture. The present study investigates a novel, localized cold therapy based on the technology of the Alpha Cooling Professional device (ACP). The study design examines the effects of this form of therapy in terms of improving physical and mental well-being.

In contrast to whole-body cold therapy, local cold therapy is applied via the hands. The patient places both hands in the ACP, which cools the palms of the hands with the help of metal plates. Negative pressure in the cooling chamber prevents the blood vessels from closing, which to a drop in temperature in the bloodstream. The development of the procedure is based on research at Stanford University into the regeneration of athletes.

With the application of ACP local cold therapy, the subject is not exposed to cold stress, which causes whole-body cold therapy at up to -180°. The cold does not penetrate the outer layers of the body; instead, the core of the body cooled directly via the bloodstream.

The low-threshold application structure enables people with physical and mental to use the ACP safely and without stress.

The study results show a significant improvement in physical and mental well-being in 81% of participants after completing the therapy sessions. Of those who took part in the study, 32% reported a slight improvement, 23% an improvement and 26% a significant improvement in their general condition and relief of post-COVID symptoms. On a psychological level, an improvement in well-being of 49% was achieved.

The study results show significant results with high effect sizes. They suggest an effective therapy method in the treatment of post-COVID.

In the treatment of Post-COVID syndrome, whole-body cold therapies have already been shown to have positive effects on the regenerative capacity as well as improvements in the clinical picture. The present study investigates a novel local cold therapy based on the technology of the Alpha Cooling Professional device (ACP). In the study design, the effects of the therapy form are investigated with regard to the physical and psychological condition.

In contrast to the whole-body cold therapy, the local cold therapy is applied via the hands. A person/patient places both hands in the ACP, which cools down the palms with the help of metal plates. A negative pressure in the cooling chamber prevents the blood vessels from closing, resulting in a decrease in the temperature of the blood circulation. The development of the method is based on the research of Stanford University on the regeneration of sportsmen.

With the application of local cold therapy of ACP, the subject is not exposed to cold stress, which requires whole-body therapy at up to -180°. The cold does not penetrate through the outer layers of the body, but directly cools the core of the body through the bloodstream.

The low-threshold application structure enables persons with physical and psychological impairments to use the ACP in a stress-free and safe manner.

The study result shows a significant improvement in physical and psychological well-being in 83% of the participants after completion of the therapy sessions. Thereby 29% of the test persons indicated a slight improvement, 23% an improvement and 32% a high improvement of their general condition and alleviation of the post-COVID symptoms. On the psychological level, an improvement of 49% was achieved.

The significant results in the first test suggest an effective therapy method in the treatment of Post-COVID.

1 Introduction

Studies estimate the probability of developing post-COVID syndrome in the long term (from 3 months after infection) to be between 6 and 15 %[1][2][3].

A variety of different physical, cognitive and psychological symptoms are attributed to the clinical picture. A definitive list of all symptoms is not yet available, although in practice the WHO definition is usually used as a basis. The most common symptoms include coughing, hoarseness and headaches, myalgia, arthralgia, depression, odor disorders, sensory disturbances and panic attacks, sleep disturbances, dysarthria and temporal dysarthria, fatigue, shortness of breath and cognitive dysfunction.[4] The various symptoms often in comorbidity with one another. Female gender, existing depression and anxiety or psychosomatic disorders are identified as risk factors for post-COVID. [5]

To date, there is no standardized therapy for the complex symptom variations. Treatment is usually symptom-oriented and symptom-specific.

One form of therapy is whole-body cryotherapy. Its positive effects have shown above all to alleviate inflammatory symptoms in rheumatoid arthritis[6] and fibromyalgia[7] as well as vascular elasticity[8]. Some studies have shown improvements in depression and anxiety syndromes[9], fatigue in patients with multiple sclerosis[10] and sleep quality[11]. Cold therapy is also used as a recovery technique after physical activity in elite athletes[(12).]

When used in post-COVID patients, initial studies the possibility of positive effects of whole-body cryotherapy.[13] [14] However, existing clinical therapies follow a holistic strategy, which includes dietary changes or oxygen therapies.

were combined. A valid assessment of the isolated effect of whole-body cryotherapy on post-COVID symptoms is currently not possible.

However, the procedure of whole-body cryotherapy, which takes place in cold chambers or tubes filled with nitrogen at temperatures as low as minus 180 degrees Celsius, considerable mental and physical strain, which is why this type of treatment does not appear to be suitable for every patient.

In 2012, researchers at Stanford University developed the "palm cooling" method for the regeneration of athletes. The blood flow was cooled via the palms of the hands, while negative pressure prevented the vessels from closing.[15] This laboratory experiment was implemented as a new type of medical device for the first time in 2020 with the ACP.

The ACP procedure is carried out exclusively by cooling the palms of the hands. For use, both of the user's hands are inserted into two cooling chambers and the palms are placed on pre-formed metal surfaces. A sensor detects these and automatically starts the system. The metal surfaces are cooled down to +4 degrees and a negative pressure is generated in the device that is imperceptible to the user. An enclosing fabric membrane on the hand joints provides the necessary insulation for the cooling chamber to allow the negative pressure in the chambers. The hands are visible through transparent Plexiglas panes throughout the application, so that positioning and any corrections to the hand position can be carried out comfortably. At the end of the cooling cycle, the user pulls their hands out of the device and stretches them upwards for a short time to improve blood circulation. Each cooling cycle of a two-minute cooling of the palms and a subsequent two-minute break. The completed cycle therefore lasts four minutes until another cooling cycle can start.

Initial observations in the practical application of the ACP suggested similar effects to those of whole-body cold therapy. However, the use of the device is associated with significantly less effort and reduced stress factors, which appears to be advantageous for the treatment of post-COVID.

2 Question

Against the background of research into whole-body cryotherapy and its potential effects on post-Covid symptoms, as well as observations of positive effects when using the Alpha Cooling device, the study aims to answer the question of whether the application of localized cryotherapy using an ACP can alleviate post-Covid symptoms?

3 Study design

The participants were in advance according to a diagnosed post-Covid disease. Before starting the applications, the participants completed various scales related to a post-COVID disease (T1). When selecting the test battery, the researchers were guided by the recommendation of Swiss Insurance Medicine. All participants then received 10 applications of the Alpha Cooling Professional device. The frequency of application was 2-3 applications per week. An application itself consisted of 10 cooling cycles of 2 minutes, with a 2-minute break between each cycle. After completing the last application, the participants then completed the same test battery again (T2). The evaluation of input and output measurements was statistically analyzed using SPSS.

The sample consisted of N = 108 patients. N = 21 (19%) patients were male, and N = 87 (81%) were female. The mean age was 49 years with a standard deviation of 12 years.

4 Results

The evaluation is based on a pre-post comparison using a questionnaire. The values given by the test subjects before the start (T1) and after completion (T2) are checked for ten dependent variables. Nine of the ten results obtained are presented in tables with the mean value, the standard deviation (SD) and, if applicable, the standard error (SEM). Missing values are not calculated, therefore different sample sizes are shown in the tables.

4.1 Improvement

First, the frequency and percentage of subjective improvement is shown.

	Frequency (N)	Percent
Deteriorated	3	3
Not changed	10	9
Slightly improved	35	32
Improved	25	23
Significantly improved	28	26
Don't know	7	7
Total	**108**	100

4.2 Complaints

Mean value of complaints after Covid 19 disease (mean difference from T1 to T2: p≤.01 (one-sided test); effect size Cohen's d = 0.66).

Time	Mean value	N	SD	SEM
Complaints about T1	1,42	108	0,38	0,04
Complaints about T2	1,12	108	0,41	0,04

4.3 Complaints Post Covid-10 Functional State (PCFS scale)

Subjectively perceived functional status, i.e. how much the Covid infection restricts one's own life. Scale from 0=no restriction to 4=not able to look after themselves. The lower the value, the better the respondent can take care of themselves (mean difference from T1 to T2: p≤.001; one-sided test); effect size Cohen's d = 0.51).

Time	Mean value	N	SD	SEM
PCFS to T1	2,51	107	0,90	0,09
PCFS to T2	2,08	107	0,97	0,09

4.4 Symptoms of Covid-19 disease from the EPOCA (4.A.)

Scale: 0=no, 1= yes, occasionally, 2= yes, constantly. Mean value from 35 symptoms. The lower the value, the fewer the symptoms (mean difference from T1 to T2: p≤.001; one-sided test); effect size Cohen's d = 0.88).

Time	Mean value	N	SD	SEM
Symptoms for T1	0,81	102	0,32	0,03
Symptoms for T2	0,60	102	0,30	0,03

4.5 Emotional barometer

Scale: 0=worst health, 100= best health. The higher the value, the better the patient feels on that day (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d = 0.71).

Time	Mean value	N	SD	SEM
Feeling	44	107	18	1,8
Feeling	58	107	21	2,0

4.6 Fatique Severity Scale (leading symptom for Long Covid)

Scale: 0=does not apply to 7=applies completely. The higher the value, the more stressed the patient is (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d= 0.80).

Time	Mean value	N	SD	SEM
Exhaustion at T1	6,23	103	0,93	0,09
Exhaustion at T2	5,01	103	1,67	0,16

4.7 Physical exertion

Scale: 0=could not stand up once to: open-ended. The higher the value, the better the patient's physical resilience (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d = 0.75).

Time	Mean value	N	SD	SEM
Get up to T1	13	107	9	0,9
Get up to T2	18	107	9	0,9

4.8 Shortness of breath: Chronic Respiratory Disease Questionaire (CRQ) (leading symptom for Long Covid)

Scale: from 1=extreme shortness of breath to: 7=no shortness of breath at all. The higher the value, the better the patient gets air (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d = 0.55).

Time	Mean value	N	SD	SEM
Shortness of breath at T1	4,86	88	1,58	0,17
Shortness of breath at T2	5,40	88	1,32	0,14

4.9 Mental state

Scale: from 0=at no time to: 5=all the time. The higher the value, the better the patient felt in the last two weeks (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d = 0.88).

Time	Mean value	N	SD	SEM
Condition at T1	1,78	106	0,92	0,09
Condition at T2	2,65	106	1,05	0,10

4.10 Perceived recovery

Scale: from 1=fully recovered to: 4=feeling worse. The lower the value, the better the patient's assessment of their recovery (mean difference from T1 to T2: p≤.001 (one-sided test); effect size Cohen's d = 0.44).

Time	Mean value	N	SD	SEM
Condition at T1	2,63	108	0,82	0,08
Condition at T2	2,29	108	0,64	0,06

Based on the sample, the study was able to show that local cold therapy with ACP led to significant to highly significant improvements in the symptoms associated with Long Covid, which are particular practical relevance based on the high effect sizes. The therapy can therefore lead to a perceptible reduction in stress for patients. The study results an improvement in physical and mental well-being in 81% of participants after completing the therapy sessions, as well as an improvement in their general condition and relief of post-COVID symptoms. The improvement in psychological indicators should be emphasized here. On a psychological level, an improvement in well-being of 49% was achieved.

Practical physical abilities, such as being able to stand up, were also by 38%. This means that patients can also cope better with their everyday lives again.

5 Discussion

The study results clearly indicate that ACP can be an effective therapy method in the treatment of post-COVID symptoms. Further studies appear promising, as the therapy apparently opens up new possibilities in the treatment of post-Covid syndrome.

The study supports the findings from previous studies based on whole-body cold therapies. An analogy between local cold therapy and whole-body application is clearly recognizable. In particular, the ease of use and the reduced stress factors of local treatment and the effectiveness in the treatment of physical and psychological complaints point to the advantages of using ACP.

The exact physiological and psychological mechanisms of action could not be researched within the study design. However, the clear effects on mental well-being are particularly interesting in light of the study by Kleinschnitz et al. at the University of Essen. The authors were unable to find any neurological disorders in 68% of the 171 test subjects examined. In other cases, they discovered multiple sclerosis, meningitis or migraine in patients who thought they were suffering from post-Covid. They suspect that post-COVID has a psycho-somatic cause in most cases.[16] As cold therapy activates the vagus nerve[17], the authors suspect that this is the cause of the positive effect on the psyche and the perception of post-COVID syndrome.

Even though the results show significant positive effects, the treatment did not lead to complete recovery in the patients. Accordingly, a combination with other therapeutic approaches should be considered for holistic treatment, depending on the individual symptoms.

The study was carried out free of charge for the participants (108 test subjects) over a period of approximately four to five weeks, some of whom had to travel several hours. From the point of view of the authors, it would therefore not have been justifiable to form a placebo group in which the participants would have had to travel to the 10 sessions.

A further limitation of the study lies in the diagnosis, as it is currently not possible to make a clear medical distinction from post-COVID syndrome and there may be overlaps between the clinical pictures.[18] Despite the medical diagnosis of post-COVID syndrome, it cannot be ruled out that the reported symptoms were already caused by other pre-existing conditions and were only noticed after the COVID illness. This is of interest when it to being able to consider psychological and physiological effects separately, especially when patients have no detectable inflammatory or neurological damage. A separate consideration would most likely provide further insights here.

In view of the nevertheless convincing results of this study, it seems sensible to carry out a more extensive clinical study with precise and uniform diagnosis as well as an even larger sample, including a control group, in the next step.

If the results are confirmed in further clinical studies, treatment with ACP from post-Covid will open up new possibilities and ACP will provide a new effective component for post-COVID therapy in the future.

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