

Subjective evaluation of the effectiveness of whole-body cryotherapy in patients with osteoarthritis

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Abstract

Objectives: One of the treatments for osteoarthritis (OA) is whole-body cryotherapy (WBC). The aim of this study is to assess the effect of whole-body cryotherapy on the clinical status of patients with osteoarthritis (OA), according to their subjective feelings before and after the application of a 10-day cold treatment cycle. The aim is also to assess the reduction of intensity and frequency of pain, the reduction of the painkiller medication used, and to assess the possible impact on physical activity.

Material and methods: The study involved 50 people, including 30 women (60%) and 20 men (40%). Thirty-one patients had spondyloarthritis (62% of respondents), 10 had knee osteoarthritis (20%), and 9 hip osteoarthritis (18%). The overall average age was 50.1 ±10.9 years; the youngest patient was 29 years old and the oldest 73 years old. The average age of the women was 6 years higher. The study used a questionnaire completed by patients, and consisted of three basic parts. The modified Laitinen pain questionnaire contained questions concerning the intensity and frequency of pain, frequency of painkiller use and the degree of limited mobility. The visual analogue scale (VAS) was used in order to subjectively evaluate the therapy after applying the ten-day treatment cycle.

Results: According to the subjective assessment of respondents, after the whole-body cryotherapy treatments, a significant improvement occurred in 39 patients (78%), an improvement in 9 patients (18%), and no improvement was only declared by 2 patients (4%).

Conclusions: Whole-body cryotherapy resulted in a reduction in the frequency and degree of pain perception in patients with osteoarthritis. WBC reduced the number of analgesic medications in these patients. It improved the range of physical activity and had a positive effect on the well-being of patients.

Key words: whole-body cryotherapy, spondyloarthritis, knee osteoarthritis, hip osteoarthritis.

Introduction

One of various efficient approaches to therapeutic recovery that has been exercised for many years and remains in contemporary medical practice is whole-body cryotherapy. Treatments consist of applying short cryogenic temperatures (below –100°C) to the whole body of the patient in order to induce a physiological response. Furthermore, its significant development results in the formation of new types of cryochambers [1–5].

The treatment of patients with implementation of low temperatures inside a cryochamber, proves to be ex-

remely beneficial in rehabilitating the musculoskeletal system, particularly osteoarthritis, rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, post-traumatic alterations, multiple sclerosis and spastic paresis. Patients with fibromyalgia experience subjective improvement in reported pain and also observed slowed conduction in sensory and motor nerves and reduced muscle spasticity. Contraindications include: claustrophobia, Raynauds disease and phenomenon, cardiovascular diseases (such as cardiac failure), acute respiratory diseases and cancer [6–16]. Cryotherapy is also a highly recommended procedure for maintaining a satisfactory

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physical condition in healthy people (biological regeneration, competitive sports) [17, 18].

The best therapeutic effect of cryotherapy is achieved in the treatment of lesions located in the musculoskeletal system. It is beneficial in improving the well-being, and physical activity and helps relieve fatigue in patients. Treatments last from 1 to 3 minutes – the patients remain for about 15–30 seconds at a temperature of -60°C inside the vestibule and for 1 to 3 minutes at a temperature of -110°C to -160°C inside the actual chamber. Optimal results of systemic cryotherapy are achieved by applying temperatures ranging from -130°C to -150°C . Cryotherapy improves blood circulation. It also helps to neutralize the substances, which cause pain and inflammation.

Patients suffering from rheumatoid arthritis noticed an improvement in reducing joint stiffness, pain intensity and a smaller amount of painkillers taken upon completion of the cryotherapy sessions.

Upon completion of the cryotherapy sessions, physical therapy is a necessary component of the healing process. It is accomplished by a rehabilitation technique known as cryokinetics. The technique is associated with an individually determined rehabilitation program [14–20].

The aim of this study was to assess the effect of whole-body cryotherapy on the clinical status of patients with osteoarthritis, according to their subjective feelings before and after the application of a 10-day cold treatment cycle. The aim was also to assess the reduction of intensity and frequency of pain, the reduction of the amount of painkiller used, and the possible impact on physical activity.

Material and methods

The study was conducted at the Central Clinical Hospital of the Ministry of the Interior in Warsaw at the turn of February and March 2016, where the cryochamber was used.

The study involved 50 people, including 30 women (60%) and 20 men (40%). Thirty-one patients had spondyloarthritis (62% of respondents), 10 had knee osteoarthritis (20%), and 9 hip osteoarthritis (18%). The overall average age was 50.1 ± 10.9 years; the youngest patient was 29 years old and the oldest 73 years old. The average age of the women was 6 years higher.

The study used a questionnaire completed by patients, and consisted of three basic parts:

1. The modified Laitinen pain questionnaire contained questions concerning the intensity and frequency of pain, frequency of painkiller use and the improvement of mobility. The number of points in these four categories ranges from 0 to 16, with a lower number indicating better health of the patient.

2. The visual analogue scale (VAS) was used in order for the patients to subjectively evaluate the therapy after the ten-day treatment cycle. It is a reliable and frequently used method in the evaluation of pain intensity. The patient indicated a point on a 10 cm line to show their pain severity, where 0 represents no pain and 10 represents the strongest possible pain (moderate pain is 1–3, 4–6 means strong pain, 7–9 is very strong pain).

3. Subjective evaluation of the therapy. Patients assessed the state of their health after treatment by choosing one of the available replies: significant improvement, improvement, lack of improvement or deterioration.

The study has been approved by the Bioethics Committee of the Central Clinical Hospital of the Ministry of the Interior in Warsaw (no 42/2015).

Results

After the ten-day cycle of whole-body cryotherapy (according to the subjective assessment of respondents), a significant improvement occurred in 39 patients (78%), an improvement occurred in 9 patients (18%), and no improvement was declared by only 2 patients (4%). The average baseline pain intensity in all patients was 5.1 points (VAS 5.1 ± 1.9). Upon completion of the therapy, this value decreased to 2.6 points (2.6 ± 1.6). According to the survey, in women this value dropped from 5.1 points (5.1 ± 1.8) to 2.7 points (2.7 ± 1.6), and in men from 5.2 points (5.2 ± 2.0) to 2.5 points (2.5 ± 1.7) (Table I).

Patients felt that before and after treatment, pain intensity decreased by an average of 1.6 points (1.6 ± 0.7) to 0.7 points (0.7 ± 0.5) (Tables II, VI), the frequency of pain fell from 2.1 points (2.1 ± 1.0) to 0.9 points (0.9 ± 0.6) (Tables III, VI), the use of analgesics from 1.0 points (1.0 ± 0.8) to 0.2 points (0.2 ± 0.2) (Tables IV, VI), while the limitations on physical activity decreased from 1.2 points (1.2 ± 0.8) to 0.7 points (0.7 ± 0.5) (Tables V, VI).

Table I. The average degree of severity of pain before and after treatment by VAS 10-point scale

Gender	Number of patients	Percentage (%)	Before therapy (points)	After therapy (points)	<i>p</i>
Both women and men	50	100	5.1 ± 1.9	2.6 ± 1.6	< 0.0001
Women	30	60	5.1 ± 1.8	2.7 ± 1.6	< 0.0001
Men	20	40	5.2 ± 2.0	2.5 ± 1.7	< 0.0001

Table II. The number of patients assessing the intensity of pain before and after therapy ($p = 0.0013$)

Pain intensity	Before treatment		After treatment	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
No pain	2	4	17	34
Mild	19	38	31	62
Strong	26	52	2	4
Very strong	3	6	0	0
Cannot withstand	0	0	0	0
Total number of patients	50	100	50	100

Table III. The number of patients evaluating the incidence of pain before and after therapy ($p = 0.0015$)

The incidence of pain	Before treatment		After treatment	
	Number of patients	Result (%)	Number of patients	Result (%)
There is none	0	0	11	22
Periodically	16	32	32	64
Often	19	38	7	14
Very often	9	18	0	0
Continuous	6	12	0	0
Total number of patients	50	100	50	100

Table IV. The number of patients using painkillers before and after therapy ($p < 0.001$)

The use of painkiller	Before treatment		After treatment	
	Number of patients	Result (%)	Number of patients	Result (%)
Without painkiller	13	26	41	82
On the spot	26	52	7	14
Still small doses	8	16	1	2
Still large doses	3	6	1	2
Still very high doses	0	0	0	0
Total number of patients	50	100	50	100

Table V. The number of patients evaluating limitation of physical activity before and after therapy ($p = 0.00371$)

Limitation of physical activity	Before treatment		After treatment	
	Number of patients	Result (%)	Number of patients	Result (%)
None	5	10	15	30
Partial	33	66	33	66
Preventing work	7	14	2	4
Requiring partial assistance	5	10	0	0
Requiring total assistance	0	0	0	0
Total number of patients	50	100	50	100

Discussion

Whole-body cryotherapy applied within the framework of comprehensive physiotherapy is an effective method in the treatment of osteoarthritis, contributing

significantly to improved mobility. The final outcome is definitely better when cryotherapy is used in a long-term therapeutic process. With proper application it does not cause complications and provides a valuable complementary method of primary treatment [4, 9, 10, 12].

Table VI. The results of the laيتين questionnaire before and after treatment

	Before therapy average (points)	After therapy average (points)	<i>p</i>
The intensity of pain	1.6 ±0.7	0.7 ±0.5	< 0.0001
The incidence of pain	2.1 ±1.0	0.9 ±0.6	< 0.0001
The use of painkiller	1.0 ±0.8	0.2 ±0.2	< 0.0001
Limit physical activity	1.2 ±0.8	0.7 ±0.5	< 0.0001

The results are a confirmation of the beneficial therapeutic effects of cryotherapy in patients with degenerative arthritis. Cryotherapy has analgesic, anti-inflammatory and anti-edematous effects, decreases muscle tension and improves microcirculation and systemic reactions (hormonal and immune) [9–11, 13, 14].

In research connected with evaluation of the remedial influence of whole-body cryotherapy in patients with chronic neck pain syndrome, Daniszewska et al. [21] declared that a series consisting of 10 sessions, with the combination of kinesitherapy, greatly reduces the pain-related symptoms and increases the movement range of the cervical spine linked with osteoarthritis. Likewise, Stanek et al. [22] reached the same results with a significant reduction of pain symptoms in patients with ankylosing spondylitis, who have undergone 10 sessions of whole-body cryotherapy treatment. Indeed, the gathered data emphasize that the decrease in pain intensity in the selected groups of patients who have attempted cryotherapy with kinesitherapy is considerably greater than in groups of patients treated with kinesitherapy alone. Before beginning and after ending the treatment cycle, patients have reported their findings based on the VAS pain scale.

In research comparing the analgesic effectiveness of local and whole-body cryotherapy in patients with chronic pain linked with degenerative changes, Miller [23] claims success of the therapy with both procedures, although the outcome is best achieved with whole-body cryotherapy. Furthermore, a favorable effect of cryotherapy on the mental state of patients has also been observed. The effect manifested itself in fatigue relief and mood improvement. In addition, the success of local and whole-body cryotherapy of knee osteoarthritis was found in the study of Osowska et al. [24], where both procedures are viewed as similarly effective. After the whole-body cryotherapy sessions, the level of pain symptoms rated on the numerical rating scale (NRS), along with a modified Laitinen questionnaire, diminished by 26% and 38%, respectively. However, in the group of patients treated with local cryotherapy, the pain level also dropped, by 28% and 35%, respectively [24].

Further investigations referring to the impact of whole-body cryotherapy in subjects suffering from rheumatoid arthritis confirm a positive remedial response.

Krekora et al. [25] discovered that a 10-session whole-body cryotherapy cycle combined with exercise, greatly minimizes the frequency and intensity of pain, morning stiffness, amount of painkiller taken and improvement in the context of motor activities.

The analgesic effect of whole-body cryotherapy was also observed in studies conducted by Cholewka and Drzazga [26] who attempted to compare the effectiveness of procedures performed in a two-tier cryochamber and a cryochamber of lingering cold. The results of the research were approximate. The authors highlight the fact that both types of cryochambers contributed to an overall improvement of the overall clinical status of patients [26].

In my study almost 80% of respondents felt that after the whole-body cryotherapy treatment, a significant improvement occurred. In the subjective assessment, patients focused in particular on the analgesic effect, the ability to undertake various activities in daily life (improvement of physical activity), relaxation and their generally improved well-being. The therapy has been proven effective, as indicated by the results obtained through the Laitinen questionnaire, the VAS and the subjective approach.

Conclusions

1. Cryotherapy resulted in a reduction in the frequency and degree of pain perception in patients with.
2. A 10-day cycle of cold treatment reduced the number of analgesic medications in these patients.
3. Cryotherapy treatments improved the range of physical activity and had a positive effect on the well-being of the patients.

The author declares no conflict of interest.

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