

Elżbieta Miller

Rehabilitation Ward of the 3rd Municipal Hospital in Łódź (Poland)

Effectiveness comparison of local and whole body cryotherapy in chronic pain

Key words: chronic pain, local cryotherapy, whole body cryotherapy

Summary

Background. The purpose of this article was effectiveness comparison of analgesic local and whole body cryotherapy in the case of chronic pain – difficult interdisciplinary problem.

Material and methods. The research involved 16 patients suffering from chronic pain for the last 2 years and connected with degeneration changes including many joints. The studied groups differed in from of cryotherapy; both had kinezytherapeutich treatment in the same range. The results were obtained by McGill questionnaire which rely on score in intensity of pain scale (0-10) and functional pain estimate (chosen basic life functions) in scale (1-4). The patients were tested three times: once before treatment, after the end of 20 sessions and again 2 weeks after the end of first procedure.

Result and Conclusions. Whole body cryotherapy is more effective in chronic pain. However, the study confirmed decreased of pain both in group treated by local and whole body cryotherapy.

INTRODUCTION

Chronic pain is not a symptom but a disease, characterized by the following:

- elongated duration,
- variation of symptoms which cannot be connected with somatic changes,
- interdisciplinary diagnostic and therapeutic treatment,
- numerous diagnostic examinations,
- occurrence of characteropathic changes with pain as their focal point,
- presence of depressive symptoms,
- connection with chronic diseases [1].

Chronic pain persisting for over 6 months is an interaction of organic and physical factors with environmental and psychological ones. About 25% of patients suffering from chronic pain abuses painkillers [2], which is why one of the most important goals of treating chronic pain patients is modification or reduction of the amount of drugs taken, and modulation of response to pain [3].

One of the consequences of lingering chronic pain is deprivation of physical activity. It leads usually to body mitigation, decrease in muscle bulk, contractures, lowering of physical fitness and exertion

tolerance. Other consequences may include serious dysfunctions of static and dynamic balance, even with deterioration of biochemical conditions for static and sitting postures, leaning, and other everyday activities. This is why rehabilitation in such cases is essential. Using kinesiotherapy for such cases is justified. However, exercises after such a long break from physical activity may cause major pain afflictions [4]. Cryotherapy (using cold for treatment) is one of the analgesic methods in sports medicine, orthopedics, and rheumatology.

Using cold for therapy has a long-standing tradition. This kind of therapy was used at first by the Egyptians; also Avicenna and Hippocrates used cold in medical treatment [4-7].

Whole-body cryotherapy was introduced rather recently, in 1970, by Toshiro Yamauchi in Japan, and was used for rheumatic disorders. The first cryochamber was created in Poland in 1989 in Wrocław; the second one was established 7 years later [5].

Chronic pain patients' rehabilitation is complicated as the pain concerns many joints, which means a patient must undergo many rehabilitation treatments at the same time. This may cause concurrence or exclusion, and it may be disadvantageous for physical or economic reasons [8]. Cryochambers are a modern treatment method, which at its beginnings was used only for athletic renewal. Nowadays, cryotherapy is used mainly in sports medicine and rheumatology. It is beginning to gain more and more popularity as a modern rehabilitation method, however, there are not many clinical studies published in this field [4, 6, 8].

Using cryochamber treatment for degenerative changes of the joints is beneficial due to the fact that it is a whole-body treatment. It is an excellent facilitator for kinesiotherapy which is key for rehabilitation of degenerative lesions [2].

Starting kinesiotherapy without using cold treatment or any other analgesic method is less effective mainly due to the pain a patient is feeling [9, 10].

MATERIAL AND METHODS

This study compares the analgesic efficiency of whole body cryotherapy and local cryotherapy by means of McGill survey which included data on previous chronic pain elevation methods, other diseases, professional work, family status, rehabilitation benefits or health pensions. The patients filled out the pain intensity and function pain estimation survey before starting the treatment, after 20 treatment cycles, and 2 weeks after ending the treatment. Whole-body cryotherapy was used for 8 patients. The second group consisted also of 8 people who underwent local cryotherapy for all aching joints. Before using kinesiotherapy consisting of isometric, active, passive, active and passive, and relaxing exercises, cold therapy was used in both groups. Patients in both groups were in the age between 55 and 65, and were treated for chronic recurrent spinal pain syndrome or other joint syndromes: hips, knees, shoulders. The cause of pain was degenerative lesions of many joints.

Both groups underwent physical examination qualifying patients for the therapy. Patients weigh from 70 to 90 kg. Pain ailments were present for at least 2 years, and were treated only conservatively. The patients were instructed on the cryotherapy procedure and necessary safety precautions. Cryotherapy treatments lasted 2 minutes at start at temp. of -110°C (-166°F), but the end series were extended up to 3 minutes at temp. of -160°C (-256°F). The cryogenic chamber used in the treatment had two rooms. The first one was used for adaptation at -60°C . The second was used for the procedure with a range of temperatures between -110°C and -160°C . Liquid nitrogen was used as the cooling agent.

Pain intensity level was done on a 0-10 scale (0 - no pain, 1-2 - minimal pain, 3-4 - slight pain, 5-6 - medium pain, 7-8 - strong pain, 9-10 - excruciating pain, 10 - unbearable pain).

Functional estimation of pain was done on the basis of limitations regarding carrying out the basic everyday life activities: walking, lifting things, sitting, resting, and work. Evaluation of these 5 basic activities was done on a 1-4 scale (1 - no limitations, 2 - some limitations, 3 - medium limitations, 4 - heavy limitations).

RESULTS

After finishing the treatment in both groups, it was found out that the pain lessened. The group that underwent whole-body cryotherapy (Table 1., Fig. 1.) had better results in pain sedation especially in the examination done directly after the series. The pain decreased to 2 points (its value before treatment was 6.9). In two weeks after the treatment the pain increased but was still at lower levels than before the treatment, and then gradually increased to 2.3 (decrease of pain estimation of 4.6 points). This major improvement directly after the cryotherapy may be a result of antidepressive features of cold confirmed by the studies done by Rymaszewska, et al. based on an antidepressive scale survey [7].

In case of local cryotherapy (Table 1., Fig. 1.), before treatment the pain intensity level was at 6.5, right after treatment 3.8, two weeks later the pain increased slightly to 3.5 (decrease of pain estimation of 3 points). In case of functional pain estimation based on basic everyday life activities, there was also an improvement after whole-body cryotherapy (Table 2., Fig. 2.).

Tab. 1. Comparison of pain intensity on a 0-10 scale in local and whole body cryotherapy in chronic pain

Whole-body cryotherapy group						Local cryotherapy group					
Before therapy		After therapy		Two weeks later		Before therapy		After therapy		Two weeks later	
\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S
6.9	1.1	2	1.2	2.3	1.3	6.5	0.9	3.8	1.6	3.5	1.4

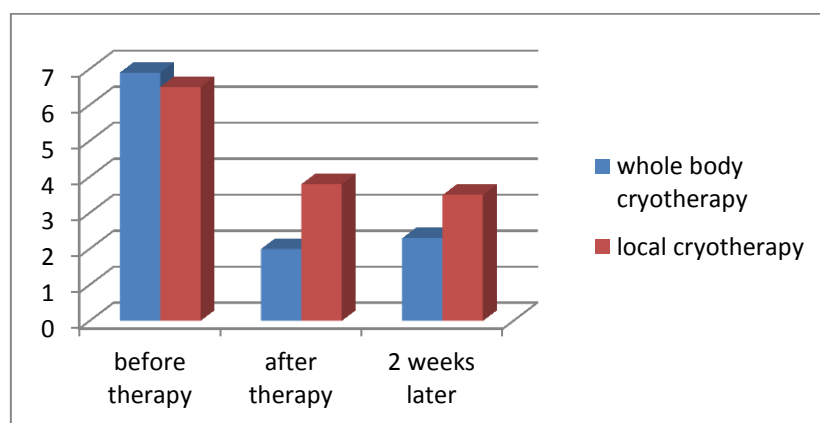


Fig. 1. Comparison of pain intensity in local and whole body cryotherapy in chronic pain

Tab. 2. Functional estimation of pain on a 1-4 scale in whole body and local cryotherapy

	Whole-body cryotherapy Group						Local cryotherapy Group					
Basic life activities	Before therapy		After therapy		2 weeks later		Before therapy		After therapy		2 weeks later	
	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S	\bar{X}	S
Walking	2,5	0,7	1,4	0,8	2,4	0,4	2,9	0,6	2,1	0,6	2,5	0,7
Lifting things	2,9	0,8	1,8	0,7	2	0,9	3,1	0,6	2,4	0,7	2,5	0,9
Sitting	2,4	0,5	1,4	0,5	1,8	0,7	2,5	0,7	1,8	0,5	2,1	0,6
Resting	2	0,9	1,3	0,7	1,5	0,5	2	0,5	1,5	0,5	1,6	0,7
Working	3,4	0,7	2,4	0,5	3,1	0,6	3,6	0,4	3,1	0,8	3,8	0,5

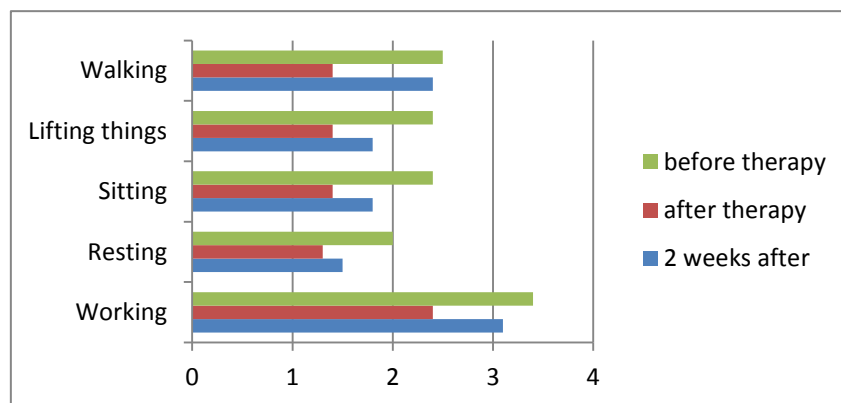


Fig. 2. Functional estimation of pain on a 1-4 scale in whole body cryotherapy in chronic pain

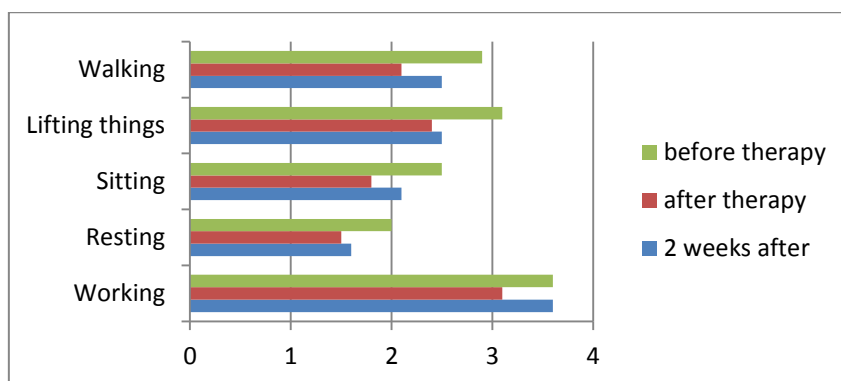


Fig. 3. Functional estimation of pain on a 1-4 scale in local cryotherapy in chronic pain

The activities with the lowest scores in the preliminary examination in these groups were: lifting things (2.9) and working (3.4). After cryochamber treatment these activities were estimated respectively at 1.8 and 3.4. After 2 weeks from the treatment, the evaluation of these activities was slightly worse. Lifting things was estimated at 2 (increase in limitations by 0.2), and working was estimated at 3.1 (increase in limitations by 0.5). Similarly, sitting after a huge improvement directly after treatment to 1.4 (from the initial value of 2.4) has increased to 1.8 after 2 weeks. The same thing happened to walking: initially at 2.5, post-therapy at 1.4, 2.4 two weeks later. More functional estimation of pain shows that although patients have declared a significant improvement at first, the

examinations after 2 weeks indicate the effect does not hold up the test of time in case of such activities as working or walking. In case of working a similar return to initial values for pain was observed in terms of local cryotherapy (Table 2., Fig. 3.) 3.6 before treatment and 2 weeks after it finished. The reason behind such a tendency might be based in the depressive state of chronic pain patients, and their reluctance to perform any physical activities.

DISCUSSION

The research on using cold in local and whole-body treatment showed good results in treating chronic pain for both methods. However, better results were obtained when using whole-body cryotherapy. This is probably a result of hormonal change in the system, increased endorphin secretion, antidepressive action, body mobilization under the influence of cold, and resulting higher physical activity [6]. Cryotherapeutic treatments (especially whole-body cryotherapy), apart from analgesic stimulation, activate the endogenous opioid system by increased releasing of endorphins from preoxidized melanocortin [7, 10]. Decreasing pain by cryostimulation enables increased intensity mobility treatment. The cold lowers the speed of nerve conduction, as well as synaptic and receptor transmission. Each lowering of temperature by 10°C gives a slowdown in afferent impulsion by ca. 60% in case of Ia-type receptors, and ca. 40% in case of Ib-type receptors, and in the Golgi bodies up to 50%. Amazingly beneficial effect of whole-body cryotherapy was observed towards the mental state of patients in treatment, especially in examinations done directly after the whole therapy series. Patients do not feel fatigued, their mood improves, they can be euphoric or in a blissful state. Patients were ready to exercise and cooperate more eagerly, which was confirmed by studies and other publications [3, 4, 7, 8]. After ca. 4 minutes from the treatment vessels expand, which may last even for a couple of hours after the treatment. But better blood circulation of inner organs is not the only benefit. This favors not only metabolism and elimination of accumulated metabolism products but also to increase in tissue oxygenation [6, 12-14].

Antioxidant effect of cryotherapy is also a clinically valid result. Free radicals take part in injuries, inflammations, and hypoxia. Reactive oxygen species take part in the process of ageing and neurodegeneration diseases. The newest studies stress the antioxidative features of cold [11, 14-17].

Taking into account that chronic pain is a multi-systemic issue, using this type of therapy needs to gain more recognition especially due to its safety, small number of contradictions and undesirable symptoms while taking the necessary precautions. The conclusions presented in this paper should be confirmed on a larger scale.

CONCLUSIONS

1. Cryotherapy is an efficient method of treating chronic pain.
2. Whole-body cryotherapy is the most effective treatment in cases of chronic pain in many joints.
3. In functional chronic pain estimation, whole-body cryotherapy was better than local cryotherapy.

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