Whole body cryotherapy and depressive symptoms

The observations made during cryotherapeutic treatment need a scientific confirmation of its positive influence on mood. In Wroclaw Institute of Clinical Physiotherapy the research evaluating the influence of a whole body cryotherapy on humans' psyche was administered.
In the introductory pilotage research the changes of mood at of people with depressive dysfunctions were analyzed after the application of the whole body cryotherapy cycle. It was assumed that the impact of extremely low temperatures on peoples' mood causes the increase of activity of serotoninergic and noradrenergic of some parts of the brain and probably through this mechanism it leads to clinical depression symptoms' withdrawal.

Method

The research was administered among the group of 23 patients: 18 women and 5 men, aged 37-70, who agreed in a written way to participate in this project. They were patients of psychiatric day department or hospital dispensary, who were treated for depressive dysfunctions. These patients were under pharmacological treatment at the same time. Before the examinations patients were familiarized with the construction of the chamber and some safety measures. The sick had some general examinations done which was the condition to administer the treatment. Before each entrance to the chamber the sick had their blood pressure measured. Patients were wearing swimming suits inside the chamber but had their nose and mouth protected by a surgeon mask, their ears by a woolen band and their feet by shoes with wooden soles.
Patients had ten cryotherapeutic treatments between the 14th of May and the 31st of July 2001. The cycle of treatments, which lasted two weeks for each patient, consisted of two series of five treatments carried out only on weekdays. Between the series there was a weekend break. Each time patient was in the chamber for l60s. The temperature applied in cryogenic chamber during the first treatment was -1l0 degrees Celsius and with the analysis of organism adaptation was gradually lowered to -150 centigrade in case of a last treatment.
The twenty one point Hamilton depression rating scale (HDRS, Hamilton 1967) was used to measure the level of depression intensity. This method is a popular and confirmed scientific tool used for depression diagnostic and rating of its intensity (with the 3-and 5-level scale of quantity rate).
The measurement was carried out in two time points, T0 - before cryotherapeutic intervention and T1 - after the cycle of 10 interventions. While analyzing the position from the scale where the pointing rate was zero during the first measurement was omitted, because this signified the absence of a given symptom at the examined person. In such cases in T1 for the same positions the pointing rate was also zero. As a result of such procedure the number of answers for particular questions was not identical. Additionally, due to the small number of answers for questions of position 16-B and 17 in Hamilton scale (only 1-5 patients from 23 gave the answer for question concerning the loss of weight in the past and for question about the insight into experienced depression symptoms), they were excluded from further analysis.

Results

For each of the depression symptoms assessed by a Hamilton scale the value of chi-square test was counted. Almost in all cases the value exceeded two- or three times the critical value (range between 9,2 - 15,1), for the critical level a = 0,001. On these bases it can be stated that the attenuation of depressive symptoms intensity observed after the cycle of treatments is statistically significantly connected with their application.
Only for position 'daily general feeling fluctuations' (position P18-A of the scale) no significant dependence was confirmed, however, the position 'ob session s, phobias' (P21 of the scale) is correlated on a critical level of a = 0,05 (the critical value of chi-square test on this level equals 7,8).
Basing on assigned values of chi-square statistics, the following Pearson's contingency C factors were counted, which can be interpreted as a measure of the strength of the connection between the conducted cryotherapeutic treatments and their effectiveness in depressive dysfunctions. It should be emphasized that these are not strict counterparts of correlation ratio counted for continuous features (for example, the maximum value of contingency factor equals in this case 0,71). For most of the positions in Hamilton scale Pearson's contingency C factors were very high (between C=0,56 and C=0,71), with the exception of position P18-A and P21 mentioned earlier (C=0,36 and C=0,38, respectively). The above data was collected and summarized in table l.

Table 1. The values of chi-square test and the Pearson's contingency C factors for each position of scale

Hamilton depression rating scale positions	chi	Critical value (0,001)	C
Pl - depressive mood	38,0	13,3	0,67
P2 - the feeling of guilt	42,2	13,3	0,69
P3 - dispiritedness	46,0	13,3	0,71
P4 - sleeping dysfunctions	46,0	1l,3	0,71
P5 - shallow, intermitted dream	40,5	1l,3	0,69
P6 - early waking up	44,0	1l,3	0,71
P7 - complex activity	33,8	13,3	0,65
P8 - tardiness	33,1	1l,3	0,65
P9 - jactitation	36,4	13,3	0,66
P10 - fear, depressive symptoms	39,8	15,1	0,68
P11 - fear, somatic symptoms	38,8	15,1	0,68
P12 - alimentary canal	17,5	9,2	0,56
P13 - general somatic symptoms	30,5	1l,3	0,63
P14 - libido, month cycle	32,8	1l,3	0,65
P15 - hypochondria	39,3	13,3	0,68

P16 - the loss of body mass	30,3	1l,3	0,68
P17 - presence of daily general feeling - fluctuation	6,9	1l,3	0,36
P18 - intensification of daily general feeling fluctuation	35,4	11,3	0,66
P19 - depersonalization, - derealization	21,5	13,3	0,57
P20 - illusions	28,0	13,3	0,62
P21 - obsessions, phobias	8,0	11,3	0,38

To compare the effectiveness of the conducted cryotherapeutic treatments in relation to particular depression symptoms, the change of each symptom's intensity in T1 was recounted as a percentage of intensity of measurement T0.
Among all the examined clinical depression symptoms the most spectacular was the improvement in sleep disorders. It concerned disorders of falling asleep, dream shallowing (numerous waking up during the night sleep), and early waking up in the morning (the change of intensity of symptoms equals 91 %, 98%, 100%, respectively). Such symptoms as tardiness of thinking, activity, jactitation, general somatic symptoms (headaches and others) and the loss of body mass were changed in over 80% in comparison to the state before cryotherapy. The fact of 80% improvement in position of Hamilton scale dealing with dispiritedness, suicidal thoughts and tendencies seems to be quite significant.

Application of cryotherapy in treatment of patella-thigh syndrome

Syndrome of patella-thigh overload (patella chondriomalation) is a pathological state consisting in entire or partial destruction of patella articulation cartilage depending on degree and duration of the overload. Most commonly, it concerns young and active people, often practicing such sports disciplines as: light athletics, football, judo, handball, ice-skating, karate, volleyball.

Patella chondriomalation manifests itself by:

- pain after long-time bend of knee joints,
- pain accompanying jumping,

- pain when knee twisting (in and outside),
- uncertainty of articulation when overloaded,
- knee edema after long-time training,
- feel of patella leaping while bending and straightening a knee,
- pain intensification when descending.

Numerous researches and clinical observations showed anatomic and functional complexity of capsule-ligament apparatus, dynamic system of knee articulation and functional interdependence of its elements. The complexity of knee articulation and the fact that etiology of patella chondriomalation is heterogeneous and not well known make many troubles during treatment of the disease.

Many authors pay attention to significance of traumas and micro injuries that result from damage or wear of articulation cartilage. Perturbation of kneecap balance such as:

- high patella position (Fig. 1),
- knee articulation sprain,
- patella dislocation,

are considered to be very detrimental and significant.

Dandy points out that damage of meniscus is to a high degree caused by processes of articulation sprain degeneration.

Fig. 1. Female patient, 23yo.. patella risen substantially.

The aim or research work

The aim of research work was systemic cryotherapy into rehabilitation of suffering from infantile cerebral palsy children and youth incorporation as well as determination of achieved therapeutic benefits.

Research material:

The pilotage rehabilitation program with systemic cryotherapy usage was performed under the patronage of the Health Department of Municipal Office in Wroclaw. Twenty six people, in the age of 4 to 24 years old, of low fitness from Association for Children and Youth in Wroclaw "Ostoja", took part in the program. Parents consented participation of their children in program before rehabilitation.

The method of rehabilitation:

Systemic cryotherapy:

10 procedures of systemic cryotherapy in cryogenic chamber (NZOZ KAR-MED Medical Centre in Wroclaw, at the temperature of -110℃ within time of 1,5 to 2 minutes were performed in doctors' presence with ruthless obeying of safety principles during the procedure.

Table 1. The comparison of observed reaction of children and youth subjected to systemic cryotherapy.

	educators and assistants		physiotherapists		parents and carers	
	behaviors	patient quantity	behaviors	patient quantity	behaviors	patient quantity
positive reactions	better mood, increased activity during exercises, decreased spasticity - easier dressing	14	better mood, exercises acceptance, better contact with a child, decreased spasticity, increased activity in spontaneous	16	better mood by day, calm sleep by night, increased activity in spontaneous motor activity, decreased spasticity - easier dressing and feeding, decreased	18

	and feeding		motor activity	incidence of disease	
negative reactions	increased sialosis, Hyperexcita-bility, somnolence by day	9	weeping, negative excitability	7 negative excitability, difficulties in falling asleep	5
unchanged behaviors	3		3	3	

Individual program performed in Rehabilitation-Educational Centre:

- poli-sensorial simulation of development:
- Bobath method, the method of controlled teaching - Peto and finally the method of developing movement by W. Sherbone,
- relaxation massage,
- music therapy
- activities with speech therapist
- pedagogical therapy

Systemic cryotherapy was included as additional therapeutic element of existing individual program of children and youth. It enabled to evaluate cryotherapy effects in observed group of children and youth.

Methods of observation:

Before the cryotherapy the neurokinesilogical evaluation was performed (neurologist, physiotherapist). All therapists, working with children and the youth, their carers as well as parents, were performing systematic observation of potential changes of children's behavior, using specially prepared observation cards.

Results

During rehabilitation and 1 month after observations were performed in order to evaluate therapeutic benefits.

The observations of educators, physiotherapists as well as parents and carers prove positive change in behavior of most children and youth. Detailed observations are shown in Table 1.

Taking into account all observations, positive changes in 14 patients were achieved. However 3 children revealed negative changes. Most of positive changes were observed among home environment.

Discussion

Significant increase of interest of treatment with cold usage has been observed in recent years.

On the basis of actual literature reports as well as experiences, following indications for cryotherapy as an individual method and also element of complex rehabilitation must be noted:

- inflammatory diseases and various etiology degeneration of motion organ,
- diseases of centrifugal and peripheral nervous system,
- psyche based diseases,
- autoimmunological based diseases
- sports medicine and also biological renewal.

On this basis the authors applied rehabilitation, of suffering from infantile cerebral palsy with cryotherapy usage.

The application of cryotherapy in neurological patients is indicated for its congestion, analgesic, antioedematous and also decreasing spasticity actions. Direct influence of extremely low temperatures onto muscular tissue does not cause muscle force decrease but along with suppression of reflex movement of spinal cord mainly, determines decrease of muscle spasticity as a result of either algaesthesia (analgesia synergy) or central nervous system damage.

In conditions of low temperatures, in which steam and expiratory carbon dioxide change into ice dust, respiratory anoxia can not happen, because oxygen concentration does not decrease below 21 %. The safety of method displays also in fact, all of internal organs function in proper temperature of the blood, well oxygenated along with efficient microcirculation. Thus, systemic cryotherapy offers unique combination - both high intense stimulation effect and relatively low discomfort.

The application of the whole body cryotherapy in sport

Low temperatures are widely applied in treatment of every description of sports injuries. It adjuncts rehabilitation after surgical procedures, limits secondary lesions of tissues. Nowadays covering the athlete's leg with ice is a common sight. The favorable effects of cryotherapy have been known for many years. In local cryotherapy ice compresses are replaced with the demister of liquid nitrogen. At present to eliminate the negative consequences of professional sport more and more often systemic cryotherapy, also known as the whole body cryotherapy, is applied. It is common knowledge that low temperatures cause reaction cycle in organism which improves significantly the efficacy of kinesitherapy. The influence of low temperatures on training results has not been discovered so far. The innovative examination were performed at University School of Physical Education in Wroclaw.
The systemic cryotherapy meets with athletes' and trainers' approval. A few cryogenic chambers were installed in sport centers among others in Wroclaw, Spala, Zakopane, Warszawa, Ciechocinek, Łódz, Rawa Mazowiecka, Kołobrzeg.

Synthetic Liquid Air

Employing liquid air in powering the cryochamber is far more efficient than using liquid nitrogen because there is no need to air the chamber in order to provide a sufficient oxygen level. There is enough oxygen in the liquid synthetic air for the patient to be safe and comfortable during the treatment. Apart from a significant increase in safety level we also avoid airing the chamber thus saving the cooling agent - a process that makes use of liquid air simply more economical. Another aspect which argues for this solution is the fact that in the air sprayed inside the chamber, content of oxygen is a few percent higher than in the atmosphere, so the whole process is a kind of oxygen therapy (the patient breathes the air with an oxygen content of not 18% but about 22%).

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