



## EFFECTS OF THERMOMINERAL WATER AND HYDROTHERAPY ON LOW BACK PAIN

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### ABSTRACT

Low back pain represents one of the biggest medical and social problem today. It considers that around 80% adults had lumbal pain at least one time in life, that reoccur at least in 50% adults. The aim of this study is to establish effects of hydrotherapy on reducing of pain and improving mobility in patients with low back pain. Retrospective study analyzed history of diseases in 64 patients who were in JZU BRC „AQUATERM“ Olovo, during 10 days. Information that were examined include sex, age, intensity of pain at the begining and the ending of therapy. Parameters who were examined to evaluate effects of balneotherapy included visual analogue scale (VAS) and anteflexion of body (Thomayer's measure). Results showed that the most examinees were in group at age 56 to 65 years. Statistical analyze showed significant difference between rehabilitation measured on visual analogue scale and different types of hydrotherapy ( $p < 0,05$ ). All types of hydrotherapy had significant impact on reducing pain by VAS scale. Statistical analyze showed significant difference between grade of anteflexion and types of hydrotherapy or their combination ( $p < 0,05$ ). These results are similar with results showed previously with VAS. Different types of hydrotherapy reduce pain in back and increase mobility in patients with low back pain. In our research we compared therapies with pearl bath, underwater massage, galvanic tub and pool. Best results were shown according to VAS and anteflexion with using underwater massage. This data are limited with small sample of patients, so it is necessary to do clinical randomized and controlled studies with larger sample to confirm these results.

**KEYWORDS:** Hydrotherapy, low back pain, visual analogue scale (VAS), Thomayer's measure.

### INTRODUCTION

Low back pain represents one of the biggest medical and social problem today. It considers that around 80% adults had lumbal pain at least one time in life, that reoccur at least in 50% adults. Degeneration vertebral discus is the most often cause of low back pain. Degenerative change happens because of involutive changes in process of ageing, as well as biochemical changes and effects of mechanical force on intervertebral discus. Besides degenerative changes there are many causes of low back pain that can be related with extravertebral changes, even in visceral organs.<sup>[1]</sup>

It is manifested as non-specific or non-radical low back pain, that is not connected with neurological symptoms,

and as a specific syndrome that is connected with compression the root of spinal nerve. In most patients it is followed with less capability for work and need for medical treatment.<sup>[2]</sup>

Approach for treatment in those patients is complex and multidiciplinar, because pain in lower part of back is symptom not disease. That is the reason why it is necessary to start as soon as possible with diagnosis, treatment and rehabilitation. Low back pain is treated even today with rest, medical and physical therapy. After this therapy it continues with rehabilitation measured after acute phase of disease. In cases that don't react on this conservative treatment or are often repeated, there is surgical approach.<sup>[3,4]</sup>

The problem is assessment of physical and medical rehabilitation in process of rehabilitation of patients with low back pain because of limited number qualitative clinical studies. That is maybe the reason why non-pharmacological approaches are marginalized. That includes physical therapy, balneotherapy, while information for kinesiotherapy models are available from bigger bases about effectiveness of treatments and prevention of exacerbations of low back pain.<sup>[5]</sup>

Balneotherapy represents complex of methods which use natural factors in therapy. Response of the organism is reactive process that is expressed in stages. It's focused on reduction of symptoms and main goals are: reduction or removal of pain, improvement of local circulation, reduction of edema, local improvement of metabolism, improvement of process reparation and regeneration of tissue, improvement of elasticity of soft tissue, establishment function of seized nerve, prevention and removal of shortening muscles and contractures, improvement in coordination of movements and raising the resistance of organism.<sup>[6]</sup>

Balneotherapy with modern medicament treatment and methods of physical medicine and rehabilitation contributes to overall outcome of all diseases of locomotor apparatus. Effects of balneotherapy are based on mechanical and thermal influence of balneo factors, but it also includes chemical and mineral ingredients and absorption, and biological effects that are examined in many randomized, controlled studies.<sup>[7]</sup> There are very well documented effects such as vasodilatation, increasing impact volume, stimulation of metabolism and immune system. This therapy is complex treatment, where many natural factors are included: water, peloid or gas, change of environment, climate and atmosphere. It also makes variation in hormones that are naturally in human body.

Stimulative treatment of balneo factors can be specific and non-specific. Specific activity depends on specific elements and biologically active substances in mineral water, such as chemical and physical properties of mineral water. Non-specific activity includes change of environment, active and passive psychological and physical rest and climate factors as well as other condition that are present in place.<sup>[8]</sup> The aim of specific and non-specific activity is normalization of disturbed reactivity of the organism.

Process of balneotherapy doesn't end on effective apparatus, it continues after ending of natural factors, while functional systems are included one by one, until the cellular and molecular level.<sup>[9]</sup> This reaction can be positive and negative, which depends on relationship between reactive capability of organism, physical and chemical properties and dosage of natural factors.

The essence of problem is in action of natural factors in adequate relationship between dosage of natural factors and general reactivity of organism.<sup>[10]</sup>

According to analysis of thermal water in spa Olovo, which was conducted in 1887. year, temperature is 34°C, and pH is 8. Dry residue analyzed in Balneological Institute of Bosnia and Herzegovina is 0,288 kg/lit. Radioactivity of thermomineral water is 0,5961 MJ.

Aquaterm is placed in central Bosnia and Herzegovina, in city Olovo. Thermal sources are near Olovo made with contact with massive limestone and triassic sediment of the vulcanogeno-sedimentary formation. Thermal water in Olovo heals: rheumatism, arthritis, spondylosis, diseases of central nervous system.<sup>[11]</sup>

Central Hygienic Institute in Sarajevo 1953. analyzed thermal water in Olovo, which results were: 1 liter of water contains 0,2888 g dry residue and mostly calcium-carbonate, with some magnesium salts, chloride and sulphate. Water is indifferent substance with weak earth-alkaline features.

Main characteristics of water have not been changed in last 100 years, and they included healing of rheumatism, gynecological and skin diseases, gastrointestinal diseases, neurological diseases, eye diseases, injuries and some postoperative conditions.

Chemical composition of hydrocarbonate water contains 323,3 mg/l noble gases of N (nitrogen oxide 86,5%), and microelements: Sr 0,34 mg/l, Br 0,06 mg/l, Zn 0,05 mg/l, P 0,04 mg/l, Al 0,14 mg/l, Li 0,10 mg/l, Rb 0,01mg/l, I (Iodine 0,02 mg/l), Low radioactivity is made by elements such as: Rn 1,28 Bq/l, Ra 0,05 Bq/l i U 0,7 g/l.

The aim of this study is to establish effects of hydrotherapy on reducing of pain and improving mobility in patients with low back pain.

## MATERIALS AND METHODS

Retrospective study analyzed history of diseases in 64 patients who were in JZU BRC „AQUATERM“ Olovo, during 10 days. Information that were examined include sex, age, intensity of pain at beginning and ending of therapy. Parameters who were examined to evaluate effects of balneotherapy included visual analogue scale (VAS) and anteflexion of body (Thomayer's measure).<sup>[3,12]</sup> Intensity of pain is subjective parameter because it evaluates by patients subjective opinion. It is estimated on visual analogue scale (VAS), because of its simplicity. Intensity of pain is evaluated on scale of pain (0-10), where 1 is the least pain, and 10 is the strongest pain. Scale can be adjusted to kids, where instead of numbers paints or colours are used. Alternative scale that is used in this research is adjusted VAS scale that includes 100-milimeter VAS.<sup>[13]</sup>

Anteflexion of body is most appropriate scale to measure anteflexion. It measures distance between the tip of the middle finger of the hand and floor. Patient make this movement from military position when he or she tries with tip of the middle finger to touch the floor. Hands are extended and parallel to legs. This type of test was first explained by Thomayer, so it is called by his name Thomayer's measure.<sup>[14]</sup>

Statistical analysis was made using Hi-square test and Student t-test. Results of this tests showed significant results in reliability of 95% or  $p < 0,05$ .

Analysis used statistical package IBM Statistics SPSS v 23.0.

## RESULTS

From total number of examinees, 37,5%<sup>[10]</sup> were males and 62,5%<sup>[15]</sup> were females.

**Table 1: Representation of examinees by age.**

Age	Number of examinees	Percentage
19-25	1	1,56
26-35	4	6,25
36-45	10	25,62
46-55	15	23,43
56-65	24	37,5
66-75	6	9,37
76-88	4	6,25
Total	64	100,0

Average age of examinees was 56,5 years, median was  $M=54,94$ , and standard deviation was  $SD=14,929$ . The youngest examinee was 19 years, while the oldest examinee had 88 years.

The most representative group of examinee had 56-65 years, which included 37,5%<sup>[10]</sup> examinees. The group with least number of examinees was from age 19-25, with one examinee 1,56%.

**Table 2: Representation of different types of hydrotherapy on examinees.**

Types of hydrotherapy	Number of examinees	Time of duration (min)
Pearl bath	54 (64,37%)	15
Underwater massage	60 (93,75%)	15
Galvanic tub	49 (76,56%)	15
Pool	54 (63,37%)	15

**Table 3: Corelation results of rehabilitation based on VAS scale and types of hydrotherapy.**

Corelation	t	df	Sig.(2-tailed)
Pain according to VAS and pearl bath	6,81	21	0,000
Pain according to VAS and underwater massage	7,96	30	0,000
Pain according to VAS and galvanic tub	4,32	20	0,000
Pain according to VAS and pool	5,78	15	0,000

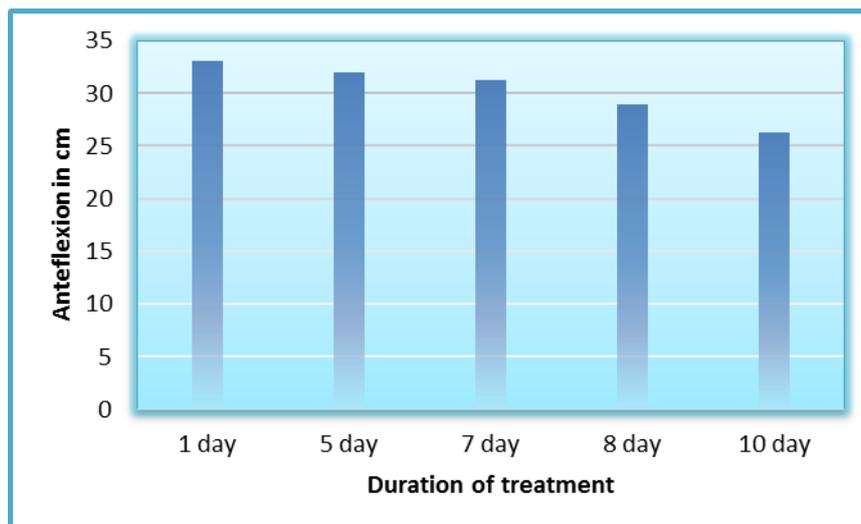
Statistical analyze showed significant difference between rehabilitation measured on visual analogue scale and different types of hydrotherapy ( $p < 0,05$ ). All types of

hydrotherapy had significant impact on reducing pain by VAS scale. Best results on VAS from different types of hydrotherapy showed underwater massage.

**Table 4: Corelation between results of anteflexion (AF) and different types of hydrotherapy.**

Corelation	t	df	Sig.(2-tailed)
AF and pearl bath	4,91	21	0,000
AF and underwater massage	6,96	30	0,000
AF and galvanic tub	5,94	20	0,000
AF and pool	4,37	15	0,000

Statistical analyze showed significant difference between grade of anteflexion and types of hidrotherapy or their combination ( $p < 0,05$ ). These results are similar with results showed previously with VAS.



**Graph 1: Anteflexion of body.**

Statistical analyze showed significant improvement of anteflexion of body on examinees with low back pain after different types of hydrotherapy. Improvement was proportional to duration of therapy. Average value of anteflexion of body was measured with centimeter pet on the sample of 20 examinees and average result was  $33,11\pm 0,69$  cm. After seven days of treatment average value was  $31,21\pm 0,71$  cm, while after ten days average value was  $26,31\pm 0,73$  cm.

## DISCUSSION

Balneotherapy, as part of medical science, examines on effects of healing waters. Pain in back is one of the most often muscle and bone disorder that is present within most people during lifetime. Although there are not many studies that examined balneotherapy, all of them were controlled and showed benefits of balneotherapy.<sup>[16]</sup>

Analyzing types of hydrotherapy results showed that underwater massage was the most common (93,75%), and the least common was galvanic tub (76,56%).

Statistical analyze showed there is significant improvement in rehabilitation according to VAS before and after different types of hydrotherapy. From total number of examinees 35 which improvement was observed, 5,55% had improvement on VAS scale for ten graduation, while 22,22% had improvement for five graduation. Our research showed correlation with study made by Tefner et al.<sup>[17]</sup> Study examined effects of thermal water with high content minerals on clinical parameters and quality of life in patients with chronic low back pain. This study included 60 examinees with chronic low back pain, who were randomized, and divided in two groups. One group had treatment of balneotherapy with thermomineral water, while control group had treatment with water from tap. Changes were evaluated based on: visual analogue scale (VAS) for pain, range of movement for lumbal spine, Oswestry index, EuroQoL-5D and Short Form-36 questionnaire. In examinee group which had treatment with thermomineral

water, mobility of lumbal spine, Oswestry index, results of VAS, index EuroQoL-5D and SF-36 questionnaire were significantly improved. Research showed benefits of balneotherapy with thermal water comparing with water from tap, based on clinical parameters and quality of life.<sup>[17]</sup>

Statistical analyze showed significant improvement in anteflexion of body in examinees with low back pain after different types of hydrotherapy. Average value of anteflexion of body that was measured with centimeter pet on 20 examinees was  $33,11\pm 0,69$  cm. After seven days of treatment average value was  $31,21\pm 0,71$  cm. After ten days of treatment average value was  $26,31\pm 0,73$  cm. In study that was conducted with Konrad et al., three treatments for unspecified low back pain were compared: balneotherapy, bath (tub), and underwater massage in randomized prospective controlled study with 158 examinees. Each group was treated during period of four weeks, and review was done after treatment and year after treatment. Results showed that usage of analgetics was reduced in all three groups.<sup>[18]</sup>

Best results according to VAS, comparing different types of hydrotherapy showed underwater massage. Statistical analyze showed there is significant difference according to VAS and after treatment of different types of hydrotherapy ( $p < 0,05$ ). Results showed there is significant difference in graduation of anteflexion after different types of hydrotherapy ( $p < 0,05$ ). Results are similar to the one that exists and are showed according to VAS scale, and are in correlation with many randomized clinical studies.<sup>[19]</sup>

Our results are in correlation with researches of influence of thermal water and electrotherapy on chronic low back pain, for example double blinded, randomized study that was conducted by Kulisch et al. Aim of their research was to evaluate effectiveness of thermal water comparing with water from tap. Study included 71

patient, who had treatment for 20 minutes daily with healing water or water from tap, on temperature of 34 °C, during 21 day. All patients had additional electrotherapy. Results were estimated based on VAS, Schober sign, Domján sign, Oswestry test and Short Form-36 questionnaire. Parameters were followed at the beginning, at the ending of treatment and after 15 weeks. After treatment, there has been significant improvement in all parameters in examinee group who were treated with thermal water. This improvement was evident even after 15 weeks. Improvement in control group was less significant comparing with values at beginning. In examinee group treated with thermal water, improvement was noticed before and lasted longer time.<sup>[20]</sup>

Success of conservative treatment of low back pain is often the best treatment in combination of healing that includes all methods of healing. Often it is not possible to separate available methods one from another and follow them separately. However, problem in objective assessment of physical therapy is in process of healing and rehabilitation of low back pain is limited number of clinical studies.

## CONCLUSION

Different types of hydrotherapy reduce low back pain and increase mobility in patients. In our research we compared therapies with pearl bath, underwater massage, galvanic tub and pool. Best results were shown according to VAS and anteflexion with using underwater massage. This data are limited with small sample of patients, so it is necessary to do clinical randomized and controlled studies with larger sample to confirm these results.

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