

## THE EFFECTIVENESS OF COMBINED PHYSICAL THERAPY AND BALNEOTHERAPY TREATMENT ON CHRONIC LOW BACK PAIN

### *Kronik Bel Ağrılı Hastalarda Kaplıca Tedavisi ile Kombine Fizik Tedavinin Dizabilite Üzerine Etkisi*

Burcu KARACA<sup>1</sup>, Sevgi Özyeğen ASLAN<sup>2</sup>

<sup>1</sup> Kırıkkale University, Faculty of Medicine, Dept. of Physical Medicine and Rehabilitation, KIRIKKALE, TÜRKİYE

<sup>2</sup> İzzet Baysal University, Training and Research Hospital, Dept. of Physical Medicine and Rehab., BOLU, TÜRKİYE

#### ABSTRACT

#### ÖZ

**Introduction:** Low back pain is the most commonly reported individual complaint of musculoskeletal origin. It is generally repetitive, and leads to important socioeconomic outcomes. The aim of this study is to investigate the effects of physical therapy involving hot pack (HP), transcutaneous electrical nerve stimulation (TENS) and therapeutic ultrasound (US) combined with balneotherapy on patients hospitalized due to chronic low back pain.

**Material and Methods:** The Oswestry Disability Index (ODI) scores of 31 patients with chronic low back pain were evaluated before (Day 0) and after (Day 10) treatment.

**Results:** Statistically significant improvements were determined in post-treatment ODI scores when compared with pre-treatment values ( $p=0.002$ ).

**Conclusion:** Physical therapy with HP, TENS, and US combined with balneotherapy has a positive effect on disability of patients hospitalized due to chronic low back pain.

**Giriş:** Bel ağrısı bireysel olarak en sık bildirilen muskuloskeletal kaynaklı ağrıdır. Genellikle tekrarlayıcıdır ve önemli sosyoekonomik sonuçları vardır. Bu çalışmanın amacı kronik bel ağrılı hastalarda hastanede yatarak hot pack (HP), transkütanöz elektriksel sinir stimülasyonu (TENS) ve terapötik ultrason (US)'dan oluşan fizik tedavi ile kombine kaplıca tedavisinin etkinliğini araştırmaktır.

**Gereç ve Yöntem:** Kronik bel ağrısı olan 31 hastanın tedavi öncesi (0. gün) ve tedavi sonrası (10. gün) Oswestry Dizabilite İndeksi (ODI) skorları değerlendirildi.

**Bulgular:** Tedavi sonrası ODI skorlarında tedavi öncesi değerlere göre istatistiksel olarak anlamlı gelişme saptandı ( $p=0.002$ ).

**Sonuç:** Kronik bel ağrılı hastalarda hastanede yatarak HP, TENS ve US'dan oluşan fizik tedavi ile kombine kaplıca tedavinin dizabilite üzerine olumlu etkisi vardır.

**Keywords:** Balneotherapy, hot pack, transcutaneous electrical nerve stimulation, therapeutic ultrasound, chronic low back pain

**Anahtar Kelimeler:** Kaplıca tedavisi, hot pack, transkütanöz elektriksel sinir stimülasyonu, terapötik ultrason, kronik bel ağrısı



**Correspondence / Yazışma Adresi:**  
Kırıkkale Üniversitesi Tıp Fakültesi, Fiziksel Tıp ve Rehabilitasyon Anabilim Dalı, KIRIKKALE / TÜRKİYE  
**Telefon:** 0318 318 444 40 71  
**Received / Geliş Tarihi:** 29.03.2017

**Dr. Burcu KARACA**  
Kırıkkale Üniversitesi Tıp Fakültesi, Fiziksel Tıp ve Rehabilitasyon Anabilim Dalı, KIRIKKALE / TÜRKİYE  
**E-posta:** rburcub@yahoo.com  
**Accepted / Kabul Tarihi:** 15.08.2017

## INTRODUCTION

Low back pain is the pain and feeling of discomfort in the lumbosacral region, the area below the last rib and above the gluteal fold line. According to traditional classification system (1,2), low back pain can be described as three different types that correspond to their diagnostic characteristics: 1) Non-specific low back pain; 2) Low back pain with nerve root symptoms and 3) Low back pain originating from severe pathologies (i.e. cancer, fracture, ankylosing spondylitis). Moreover, low back pain is categorized as acute (duration <6 weeks), subacute (duration of 6-12 weeks), and chronic (duration > 12 weeks). Low back pain is the most commonly reported individual complaint of musculoskeletal origin. It is generally repetitive, and leads to important socioeconomic outcomes. Prevalence studies for low back pain are variable, and it is determined as 33% in point prevalence, 65% in one-year prevalence, and reaches up to 84% in life-long prevalence (3). The main aim of lower back pain treatment is to enable the patient to reach desired activity and participation levels as well as to protect the patient from disease recurrence and chronic complaints (4). The treatment of low back pain includes life-style changes, rehabilitation applications, and surgery. Although there are many different treatment subcategories for low back pain, there is no single application with proven superiority (4). While there is evidence to support the efficacy of some treatments for low back pain (i.e. exercise), some are considered to be ineffective (i.e. traction) (5-7). Krismer et al. (8) recommended aerobic fitness and endurance exercises, behavioral therapy, and the use of multidisciplinary treatment programs in rehabilitation procedures for chronic, non-specific lower back pain. However, the content of the multidisciplinary treatment programs is not yet clear.

Thermal spring therapy is also called *spa therapy* or *balneotherapy*. The word *spa* is derived from the Latin word *salus per aqua*, and it means health with water (10). Thermal spring therapy is, bathing in, drinking, or the inhalation of natural underground hot mineralized

water, gases, and peloids (11). The effects of balneotherapy are partially related to the water and simple physical characteristics (density, specific gravity, hydrostatic pressure, buoyancy, viscosity and temperature) as well as the minerals dissolved in the water (11). There are various studies about the efficacy of balneotherapy in low back pain treatment (9-13).

Turkey is rich in thermal springs and physical therapy applications can be conducted in some hospitals and thermal springs, as either an out- or inpatient procedure, with financial support from the social security system. In the present study, we investigated the effects of physical therapy, including hot pack (HP), TENS, and US, combined with balneotherapy, on the low back pain of hospitalized patients.

## MATERIALS AND METHODS

The present study was performed retrospectively at Kırıkkale University Physical Medicine and Rehabilitation Hospital between January and June 2014.

**Inclusion criteria:** Age between 25-75 years old, low back pain for at least the previous three months

**Exclusion criteria:** History of physical therapy, balneotherapy in the previous six months, previous surgery, metabolic, inflammatory, and infectious diseases, severe diseases related to internal medicine such as cardiac, pulmonary, hepatic, thyroid, and renal diseases, malignancy, having a metallic implant.

Initially, erythrocyte sedimentation rates, C-reactive protein, electrolyte, creatinine, hepatic function tests, whole blood count, and urine analysis, were carried out on the patients. Bi-directional lumbosacral radiography and lumbar magnetic resonance imaging (MRI) examinations of patients were performed. Additionally, permissions for therapy were obtained for patients who had diseases related to internal medicine and cardiology from related departments. Patients were informed about therapy and their written consents were

obtained. This study was approved by the ethical committee of Kırıkkale University.

Treatment efficacy was evaluated using the Oswestry disability index, of which Turkish validity and reliability had been previously performed (14,15). The Oswestry disability index is composed of ten questions that evaluate the patient's disability with a score of between 0 and 5 points. The patient's total score is divided by the maximum score the patient can reach, and multiplied by 100. The results are evaluated in percentages.

**Physiotherapy applications:** The patients received one daily session of physiotherapy for 10 days (a total of 10 sessions). During treatment, a HP, TENS, and US were applied in turn.

First, hot packs were applied on lumbar region for 20 minutes, and then TENS with pulse duration of 60 msec. with a frequency between 60-100 Hz was applied to lumbar region for 20 minutes. The frequency was increased to the level at which the patient was comfortable, and no contraction was induced. After that, ultrasound treatment at 1 MHz frequency and 1.5 W/cm<sup>2</sup> intensity was applied in circulating movements on paravertebral region for ten minutes.

**Balneotherapy procedures:** Patients had balneotherapy for one daily session lasting for 10 minutes for 10 days (a total of 10 sessions). They were immersed into the thermal spring water up to the level of their sub-sternum. The characteristics of the thermal spring water in the Physical Medicine and Rehabilitation Hospital are shown in Table 1.

**Statistical analysis:** Data were analyzed using SPSS for Windows 11.5 package program. The normal distribution of intermittent numerical variables was examined with the Shapiro Wilk test. Descriptive statistics for numerical variables are shown by mean ± standard deviation or median (minimum-maximum), whereas, the nominal variables are shown by the case number and percentage (%). The significance levels of the changes in the Oswestry disability indices before and after treatment were examined by using the Wilcoxon Sign test.

## RESULTS

The study evaluated the data of 31 cases aged between 27 and 75 years. The mean age was 55.8±9.3 (years); nine (29.0%) were males and 22 (71.0%) were females. Distribution of the etiological causes, duration of complaint and comorbidities of the patients are given in Table 2. There was a statistically significant decrease in the Oswestry disability index following treatment when compared with the value before treatment (p= 0.002; Wilcoxon sign test) (Table 3).

Table 1. Characteristics and content of the thermal spring waters used in the study.

	Mean/Unit
Temperature	40-42°C
Odor	Colorless
Taste	Tasteless
Color	0 Pt/Co
Turbidity	0.01 JTU
Precipitation	None within 24 h (%)
Ph value	6.68 (25.0° C)
Electrical conductivity (EC)	982 µS/cm (25.0° C)
Density	1001 gr/cm <sup>3</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	305 mg/L
Boron	0.33 mg/L
Bromide (Br <sup>-</sup> )	0.36 mg/L
Iron (Fe <sup>2+</sup> )	0.01 mg/L
Fluoride (F <sup>-</sup> )	3.01 mg/L
Iodine (I <sup>-</sup> )	0.47 mg/L
Calcium (Ca <sup>2+</sup> )	24.9 mg/L
Chloride (Cl <sup>-</sup> )	7.91 mg/L
Magnesium (Mg <sup>2+</sup> )	89.13 mg/L
Manganese (Mn <sup>2+</sup> )	0.31 mg/L
Potassium (K <sup>+</sup> )	23.01 mg/L
Silicate (SiO <sub>4</sub> <sup>4-</sup> )	48.9 mg/L
Sodium (Na <sup>+</sup> )	72.04 mg/L
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	484.4 mg/L
Sulfide (S <sup>2-</sup> )	0.16 mg/L
Total mineral concentration	1059 mg/L
Chemical O <sub>2</sub> requirement	36 mg/L
Biological oxygen requirement	34 mg/L

Table 2. Demographic and clinical characteristics of patients.

Variables	n=31
Age (year)	55.8±9.3
Age range (year)	27-75
Gender	
Male	9 (29.0%)
Female	22 (71.0%)
Etiology	
Disc herniation	20 (64,5.)
Spondylosis	23 (74.2%)
Spondylolysthesis	5 (16.1%)
Spinal stenosis	1 (3.2%)
Scoliosis	1 (3.2%)
Duration of complaint (year)	4 (0.25-20)
Comorbidity	12 (38.7%)

Table 3. Levels of Oswestry disability indices of cases before and after the treatment.

	Pre-treatment	Post-treatment	p-value †	Change
ODI	44.3±16.	33.6±16.	0.002	-
(%)	4	8		10.7±17.2

† Dependent t-test.

ODI: Oswestry disability index.

## DISCUSSION

Treatment of low back pain includes life-style changes, rehabilitation treatments, and surgery. Rehabilitation procedures include rest, exercise, cognitive behavioral therapy, traction, biofeedback, massage, TENS, US, shortwave diathermia (SWD), laser applications, balneotherapy or a combination of them. We believe that as any single treatment modality has limited effects on low back pain, a combination of treatments provide more effective outcomes.

The efficacy of balneotherapy was compared with that of routine drug treatment, flexion exercises, underwater traction, underwater massage, and improvements in pain, life quality and spinal mobility up to nine months

were reported (9-13). In the study performed by Kulisch et al. (16), efficacy of balneotherapy was compared with that of 34°C tap water therapy. Both groups received electrotherapy. Efficacy was observed earlier and lasted longer in the group which had balneotherapy. In another study comparing balneotherapy with tap water, it was reported that balneotherapy was more effective on clinical parameters and quality of life (17).

In the literature, we came across with a study comparing the efficacy of balneotherapy with physical therapy. In that study, one group received infrared, TENS, US and exercise whereas the other group received only balneotherapy and exercise. Although improvements were determined in both groups, more significant improvements were determined in life quality, spinal mobility and ODI in the group receiving balneotherapy (18).

There are still conflicting results on the efficacy of ultrasound in the treatment of lower back pain (19-21). Yet, the efficacies of TENS and SWD have not been proved by studies (8, 22,23). Contingent on our clinical experience, we believe that a combination of physical therapy with balneotherapy is effective. This present study indicated that combination of physical therapy and balneotherapy had positive effects on disability. The limitations of our study are the lack of control group and long-term efficacy results. Further studies are required to determine the efficacy of combination treatments, as well as to determine which combinations should be given, at which doses, and for how long.

In chronic low back pain, a combination of balneotherapy with physical therapy composed of HP, TENS, and US in a hospital setting is effective for disability in the short term. Further studies are required for the use of combined physical therapies.

Conflict of Interests: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical Approval: The study was approved by the Ethics Review Committee of Kırıkkale University.

## REFERENCES

- Krismer M, van Tulder M. Strategies for prevention and management of musculoskeletal conditions. Low back pain (non-specific). *Best Pract Res Clin Rheumatol.* 2007; 21:77-91.
- Waddell G. *The Back Pain Revolution.* 2nd edition. Elsevier Health Sciences; 2004.
- Walker BF. The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. *J Spinal Disord.* 2000; 13: 205-17.
- Haldeman S, Dagenais S. What have we learned about the evidence-informed management of chronic low back pain? *Spine J.* 2008; 8: 266-77.
- Hayden JA, van Tulder MW, Malmivaara A, Koes BW. Exercise therapy for treatment of non-specific low back pain. *Cochrane Database Syst Rev.* 2005; 3: CD000335.
- Gay RE, Brault JS. Evidence-informed management of chronic low back pain with traction therapy. *Spine J.* Elsevier. 2008; 8: 234-42.
- Wegner I, Widyahening IS, van Tulder MW, Blomberg SEI, de Vet HC, Bronfort G, et al. Traction for low-back pain with or without sciatica. *Cochrane database Syst Rev.* 2013; 8: CD003010.
- Krismer M, van Tulder M. Low back pain (non-specific). *Best Pract Res Clin Rheumatol.* 2007; 21: 77-91.
- Guillemin F, Constant F, Collin JF, Boulange M. Short and long-term effect of spa therapy in chronic low back pain. *Br J Rheumatol.* 1994; 33: 148-51.
- Constant F, Collin JF, Guillemin F, Boulangé M. Effectiveness of spa therapy in chronic low back pain: a randomized clinical trial. *J Rheumatol.* 1995; 22: 1315-20.
- Constant F, Guillemin F, Collin JF, Boulangé M. Use of spa therapy to improve the quality of life of chronic low back pain patients. *Med Care.* 1998; 36: 1309-14.
- Konrad K, Tatrai T, Hunka A, Vereckei E, Korondi I. Controlled trial of balneotherapy in treatment of low back pain. *Ann Rheum Dis.* 1992; 51: 820-2.
- Yurtkuran M, Kahraman Z, Sivrioğlu K, Afşin Y, Doğan M. Balneotherapy in low back pain. *Eur J Phys Med Rehabil.* 1997; 7: 120-3.
- Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine.* 2000; 25: 2940-52.
- Yakut E, Düger T, Oksüz C, Yörükan S, Ureten K, Turan D, et al. Validation of the Turkish version of the Oswestry Disability Index for patients with low back pain. *Spine.* 2004; 29(5): 581-5.
- Kulisch A, Bender T, Németh A, Szekeres L. Effect of thermal water and adjunctive electrotherapy on chronic low back pain: a double-blind, randomized, follow-up study. *J Rehabil Med.* 2009; 41: 73-9.
- Tefner IK, Németh A, Lászlófi A, Kis T, Gyetvai G, Bender T. The effect of spa therapy in chronic low back pain: A randomized controlled, single-blind, follow-up study. *Rheumatol Int.* 2012; 32: 3163-9.
- Kesiktas N, Karakas S, Gun K, Gun N, Murat S, Uludag M. Balneotherapy for chronic low back pain: A randomized, controlled study. *Rheumatol Int.* 2012; 32: 3193-9.
- Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, et al. Chapter 4: European guidelines for the management of chronic nonspecific low back pain. *Eur Spine J.* 2006; 15: 192-300.
- Ebadi S, Ansari NN, Henschke N, Naghdi S, van Tulder MW. The effect of continuous ultrasound on chronic low back pain: protocol of a randomized controlled trial. *BMC Musculoskelet Disord.* 2011; 12: 59.
- Savigny P, Kuntze S, Watson P, Underwood M, Ritchie G, Cotterell M, et al. Low back pain: Early management of persistent non-specific low back pain. London: National Collaborating Centre for Primary Care and Royal College of General Practitioners. 2009: 14.

22. Bekkering GE, Hendriks HJM, Koes BW, Oostendorp RB, Ostelo RWJG, Thomassen JMC, et al. Dutch physiotherapy guidelines for low back pain. *Physiotherapy*. 2003; 89: 82-96.
23. Seco J, Kovacs FM, Urrutia G. The efficacy, safety, effectiveness, and cost-effectiveness of ultrasound and shock wave therapies for low back pain: a systematic review. *Spine J*. 2011; 11: 966-77.