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The Effect of Physiotherapy on Pain, Functionality and Quality of Life Scores in Patients with Chronic Low Back Pain

Kronik Bel Ağrısı Olan Hastalarda Fizyoterapinin Ağrı, Fonksiyonellik ve Yaşam Kalitesi Puanlarına Etkisi

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Abstract

Objective: To evaluate whether physical therapy agents given in addition to medical treatment contribute to pain, functionality and quality of life in patients with chronic low back pain.

Materials and Methods: Patients diagnosed with chronic low back pain and planned for medical treatment (group 1, n: 30) and those who received physical therapy in addition to medical treatment (group 2, n: 30) were included in the study. Non steroid antienflamatuar drugs/myelexan selection and duration of use varied according to patients' comorbidities. Hot pack, transcutaneous electrical nerve stimulation and ultrasound were given as physical therapy agents. Patients were evaluated, as well as before and after treatment; Visual analogue scale, Oswestry disability index and short form 36 (SF-36) quality of life scale, lumbar range of motion, straight leg raising test (SLR) and finger-floor distance were evaluated.

Results: In both groups, a statistically significant improvement was achieved in all parameters, except the change in SLR and SF-36 general health perception score, compared to the pre-treatment period. However, SLR and SF-36 general health perception score changes improved significantly only in group 2 ($p<0.05$). More improvement was achieved in all parameters in the group with physical therapy than in the group with only medical treatment ($p<0.05$).

Conclusion: As a result, in our study; It has been shown that combined physical therapy agents added to medical treatment in chronic low back pain contribute to examination tests, general health perception and quality of life.

Keywords: Physical Therapy, Oswestry Disability Index, Short Form-36 Quality Of Life Questionnaire, Chronic Mechanical Low Back Pain.

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Öz

Amaç: Kronik bel ağrılı hastalarda medikal tedaviye ek olarak verilen fizik tedavi ajanlarının ağrı, işlevsellik ve yaşam kalitesine katkıda bulunup bulunmadığını değerlendirmek.

Gereç ve Yöntemler: Kronik bel ağrısı tanısı almış ve ilaç tedavisi planlanan (grup 1, n:30) ve medikal tedaviye ek olarak fizik tedavi uygulanan (grup 2, n:30) hasta çalışmaya dahil edildi. Steroid olmayan antienflmatuvar ilaçlar/miyorelaksan seçimi ve kullanım süresi hastaların eşlik eden hastalıklarına göre değişiyordu. Fizik tedavi ajanları olarak sıcak paket, transkutanöz elektriksel sinir stimülasyonu ve ultrason verildi. Hastaların tedavi öncesi ve sonrası; görsel analog skala, Oswestry sakatlık indeksi, kısa form 36 (KF-36) yaşam kalitesi ölçeği, lomber eklem hareket açıklığı, düz bacak kaldırma testi (DBK) ve parmak-zemin mesafesi ile değerlendirildi.

Bulgular: Her iki grupta da DBK ve KF-36 genel sağlık algısı skorundaki değişim hariç tüm parametrelerde tedavi öncesine göre istatistiksel olarak anlamlı iyileşme sağlandı. Ancak DBK ve KF-36 genel sağlık algısı skorundaki değişimler sadece grup 2'de anlamlı olarak düzeldi ($p<0,05$). Fizik tedavi grubunda sadece medikal tedavi uygulanan gruba göre tüm parametrelerde daha fazla iyileşme sağlandı ($p<0,05$).

Sonuç: Sonuç olarak çalışmamızda; kronik bel ağrısında medikal tedaviye eklenen kombine fizik tedavi ajanlarının muayene testlerine, genel sağlık algısına ve yaşam kalitesine katkı sağladığı gösterilmiştir.

Anahtar Kelimeler: Fizik Tedavi, Oswestry Engellilik İndeksi, Kısa Form-36 Yaşam Kalitesi Anketi, Kronik Mekanik Bel Ağrısı.

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Introduction

Classically, low back pain is defined as muscle tension-stiffness between the lower costal border and the top of the inferior gluteal folds. It is one of the most common causes of pain and disability in society today. According to a study conducted in the United States, the annual treatment cost exceeds millions of dollars (1). Low back pain is classified as acute, subacute and chronic low back pain according to its duration. Acute pain is usually self-limiting and heals within 6-8 weeks. Only about 10% of these pains become chronic (2).

Chronic low back pain is difficult to manage. Medication, injection methods, physical therapy, exercise, back school and sometimes surgical methods are used in the treatment of chronic low back pain (3). In addition to medical treatments such as non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants, non-pharmacological treatments such as transcutaneous electrical nerve stimulation (TENS), superficial heat and therapeutic ultrasound (US) can also be applied together (4-6).

The aim of physical therapy agents applied for chronic low back pain is to increase functionality and quality of life by providing symptomatic improvement by reducing pain, inflammation, muscular symptoms, muscle spasm and joint stiffness (7). In physiotherapy programs, superficial heating modalities (such as hot packs and infrared) and deep heating modalities (such as ultrasound, shortwave, and radar therapy), along with other physical therapy agents (such as analgesic currents), are among the most commonly used treatments. However, there are contradictions about the effectiveness of the physical therapy agents given. The contribution of single or combined use of physical therapy agents for chronic low back pain to medical treatment is still not fully known (5, 6, 8). Therefore, we aimed to determine whether combined physical therapy agents added to medical treatment contribute to pain, functionality and quality of life scores.

Materials and Methods

This study is prospective and includes a control group. Ethics committee approval was received for our study from Kayseri City Hospital Clinical Research Ethics Committee with decision number 221 dated November 21, 2020. The study was conducted in accordance with the Declaration of Helsinki criteria. Informed voluntary consent form was obtained from the participants. 102 patients who applied to our Physical Medicine and Rehabilitation Outpatient Clinic with mechanical low back pain between December 2020 and December 2021, whose complaint had been present for at least 3 months and whose treatment was planned, were examined. Demographic data of patients in both groups, before and after treatment; visual analogue scale (VAS), Oswestry disability index (ODI) and short form-36 (SF-36) quality of life scoring, lumbar range of motion (LROM), straight leg raise (SLR) and finger-floor distance (FFD)were evaluated. Data recording and examination were performed by another physical medicine and rehabilitation specialist before and after treatment (day 15).

Inclusion criteria for the study were as follows:

- Aged between 18 and 65 years
- Diagnosed with chronic mechanical low back pain, for which either medical treatment alone was planned or medical treatment combined with physical therapy was planned (patients were assigned to two treatment groups using the envelope method)
- Provided informed consent to participate in the study

Exclusion criteria for the study were as follows:

- Use of opioids, antidepressants, or antiepileptics (other than NSAIDs and myorelaxants) for medical treatment
- Non-mechanical causes of low back pain
- Contraindications to the application of physical therapy agents
- Presence of inflammatory or infectious diseases
- Advanced heart failure

- Plegia due to stroke, spinal cord injury, or traumatic brain injury
- History of malignancy
- Presence of a metal implant in the lumbar region
- Presence of a pacemaker.

The flow chart of our study is shown in Figure 1.

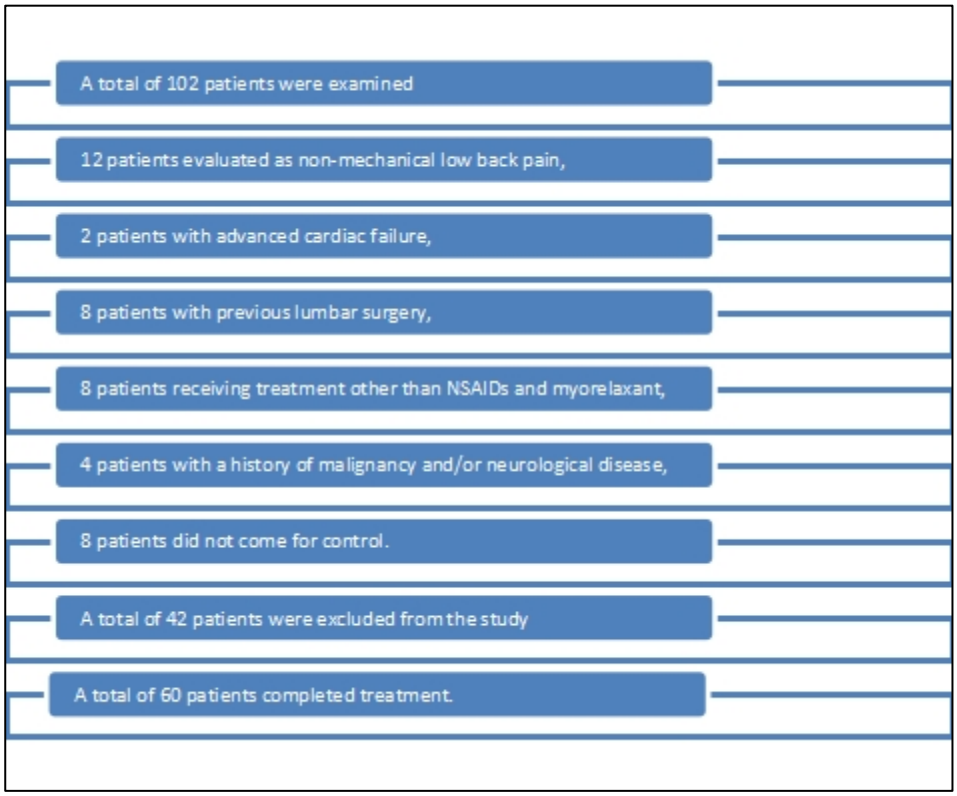


Figure 1. The flow chart of study

Patients who described chronic low back pain in their anamnesis were referred by the outpatient clinic physician. No imaging method was used to include the patients in the study. Using the envelope method, the patients were divided into two groups: Group 1, which received only medical treatment, and Group 2, which received medical treatment and physiotherapy. NSAIDs and myorelaxant were given to the group that received only medical treatment. NSAID/myelexan selection and duration of use varied according to patients' comorbidities (peptic ulcer, chronic renal failure, asthma, etc.). Physical therapy were given to the back area by physical therapy technician (hotpack 20 minutes as a superficial heater, US 1.5 watt/cm^2 8 minutes as a deep heater, TENS 100hz conventional 20 minutes). Additionally, pelvic tilt and abdominal isometric exercises were recommended for both groups (Lumbar stabilization exercises are a treatment that has been shown to be effective in chronic low back pain and were given to two groups in order not to deprive patients of this treatment during the research process) (9). A combined Chattanooga Intelect Advanced device was used for US and TENS in physical therapy.

TENS: TENS is applied transcutaneously using electrodes as an analgesic current. The electric current is gradually increased until the patient feels tingling. The application time is 15-30 minutes. The therapist follows the patient during the application. The intensity can be gradually increased. Patients with sensory deficits such as diabetes mellitus and neuropathy should be careful to avoid burns (10). In this study, conventional TENS was used as the TENS type. The application time was 20 minutes for each patient.

Hot packs: These promote muscle relaxation through vasodilation. It is wrapped in a towel before being placed on the affected area. They are typically reusable, moldable gel bags (11).

US treatment: The patient is placed in the prone position. Conductive gel is applied to the lumbosacral region after skin cleansing. US waves are transmitted to the lumbar region through the probe. US intensity (watt/cm2) is adjusted according to the patient's weight, additional disease and desired effect. It can be applied continuously or intermittently. While continuous use provides deep warming, the mechanical effects of intermittent US are utilized Application time is 6-10 minutes. The US probe is not applied fixedly to a certain point. The therapist should move the probe circularly during the application period (12). In this study, ultrasound intensity was applied as 1.5watt/cm², 8 minutes for each patient.

Visual analog scale (VAS): It is used to assess the severity of pain. The patient is asked to rate the pain on a scale of 0-10 or to select a scale of 0-10 on a marked paper. A score of 0 indicates no pain and a score of 10 indicates severe pain that can be felt (13).

Oswestry disability index (ODI): It is used to assess functional level. Turkish validity and reliability have been established (14). It is an index consisting of 10 items questioning function such as self-care, walking, sitting, traveling, etc., with each item scored between 0-5. The total score ranges from 0-100. 0-20 points indicate minimal, 20-40 points moderate, 40-60 points severe impairment. A score of 80-100 points corresponds to a bed-dependent level (15).

Short form-36 (SF-36) quality of life questionnaire: It is a form that evaluates quality of life. Turkish validity and reliability were performed by Demiral et al (16). It is a test consisting of 36 items that questions the quality of life in the last month. It has 8 subgroups (life energy, physical pain, physical functioning, mental health, social functioning, role inhibition due to emotional problems, role inhibition due to physical problems and general health) (17).

Straight leg raising (SLR): The patient is placed on his/her back. while the patient's knee is in extension, the leg is slowly flexed at the hip joint. If the patient feels pain in the back of the leg when the hip joint is flexed between 30-70 degrees, the test is positive. Although the SLR test is a guiding test for radiculopathy, it may give positive results in lumbar paravertebral muscle spasm and posterior longitudinal ligament sprain (18).

Finger-floor distance (FFD): While the patient is standing, the knees are extended, the soles of the feet are in full contact with the floor, and the hips and trunk are flexed forward. With the arms straight, the distance between the third finger of the hand and the ground is measured (19).

Statistical Analysis:

Pre-treatment and post-treatment values and intra-group changes were compared in both groups to evaluate whether physical therapy agents contributed to pain, functionality and quality of life. The suitability of the data for normal distribution was evaluated with histogram, q-q graphs and Shapiro-Wilk test. Homogeneity of variance was tested with the Levene test. In comparing clinical variables between treatment groups, the Pearson chi-square test was used for qualitative data and the Mann-Whitney U test was used for quantitative variables. To compare clinical variables before and after treatment, the McNemar-Bowker test was used for qualitative data and the Wilcoxon test was used for quantitative variables. The analysis of the data was evaluated using TURCOSA (Turcosa Analytics Ltd Co, Turkey, www.turcosa.com.tr) statistical software. $p<0.05$ level was considered significant. It could not be evaluated by power analysis before the study. However, in the post-power analysis, the change in VAS, ODI, FFD and SF-36 scores was found to be significant in the power analysis. In our study, the number of patients we included in the physical therapy and medical treatment groups was considered sufficient. Since there were differences between the two groups in some of the initial data, we compared the improvement after treatment compared to before treatment by calculating the difference.

Results

The mean age of the patients participating in the study was 41.43±11.52, and 48.3% of the patients were female and 51.7% were male. There was no significant difference in age, gender, body mass index, education level,

employment status, income level, smoking, physical activity duration (week/minute) and symptom duration (week/minute) in both groups (p>0.05) (Table 1).

Table 1.
Distributions of demographic data of patients in group 1 and group 2

Variable		Treatment groups			p value
		Group 1	Group 2	Total (n:60)	
Age (year)		42.53±12.91	40.33±10.03	41.43±11.52	0.464
Gender	**female**	14 (%46.79)	15 (%50)	29 (%48.3)	0.796
	male	16 (%53.3)	15 (%50)	31 (51.7)	
Body mass index (kg/m2)		27.23±4.47	26.76±5.31	26.99±4.87	0.713
Smoking (users)		4 (%13.3)	9 (%30)	13 (%21.7)	0.117
Physical activity duration (minute/week)		90 (67.5-172.5)	90 (60-180)	90 (62.5-180)	0.806
Symptom duration (month)		9 (7-24)	10.5 (6-24)	9 (6-24)	0.806

Group 1: Medical Treatment (n:30), Group 2: Physiotherapy (n:30), n: number of people

In both groups, statistically significant improvement was found in VAS, FFD, ODI, SF-36 sub-parameters (Physical Function Score, Physical Role Difficulty Score, Emotional Role Difficulty Score, Energy/Vitality Score, Mental Health Score, Social Functioning Score, Pain Score) compared to pre-treatment (p<0.001). Only SLR and SF-36 general health perception score score showed no statistically significant change (p>0.05) (Table 2, Table 3).

Table 2.
Analysis of changes in intra-group and inter-group evaluation parameters

Variable		Time of measurements		
		Before Treatment	Post Treatment	P value
Straight Leg Raise Test (Positive)	**Group 1**	13(43.3)	12(44.4)	0.999
	Group 2	20(66.7)	13(43.3)	**0.016**
Hand-finger-floor distance	**Group 1**	25.0(15.0-30.0)	15.0(10.0-20.0)	**<0.001**
	Group 2	22.5(15.0-42.5)	10.0(0.0-16.25)	**<0.001**
VAS	**Group 1**	9.0(8.75-9.25)	7.0(7.0-8.0)	**<0.001**
	Group 2	9.0(8.0-10.0)	5.0(4.0-5.0)	**<0.001**
ODI	**Group 1**	57.0(51.0-60.0)	46.0(37.5-52.0)	**<0.001**
	Group 2	56.0(44.0-64.5)	28.0(23.0-34.0)	**<0.001**

Group 1: Medical Treatment (n:30), Group 2: Physiotherapy (n:30), n: number of people, VAS: Visual analog scale, ODI: Oswestry disability index, p value indicates the significance level for comparison before and after treatment. Data are expressed as median (1st - 3rd quartile) or n (%). Statistically significant results are indicated in bold.

Table 3.
Analysis of changes in intra-group and inter-group SF-36 subparameter.

Variable		Time of measurements		P Value
		Before Treatment	Post Treatment	
SF-36 Physical Function Score	**Group 1**	42.5(38.75-57.5)	67.5(58.75-75.0)	**<0.001**
	Group 2	45.0(30.0-65.0)	80.0(70.0-85.0)	**<0.001**
SF-36 Physical Role Difficulty Score	**Group 1**	0.0(0.0-0.0)	50.0(25.0-50.0)	**<0.001**
	Group 2	0.0(0.0-62.5)	75.0(50.0-100.0)	**<0.001**
SF-36 Emotional Role Difficulty Score	**Group 1**	0.0(0.0-8.25)	33.0(33.0-44.25)	**<0.001**
	Group 2	0.0(0.0-62.5)	66.0(33.0-100.0)	**<0.001**
SF-36 Energy/Vitality Score	**Group 1**	40.0(35.0-50.0)	50.0(48.75-55.0)	**<0.001**
	Group 2	30.0(25.0-50.0)	60.0(50.0-61.25)	**<0.001**
SF-36 Mental Health Score	**Group 1**	44.0(36.0-52.0)	52.0(48.0-64.0)	**<0.001**
	Group 2	34.0(23.0-52.0)	66.0(55.0-72.0)	**<0.001**
SF-36 Social Functioning Score	**Group 1**	37.0(25.7-50.0)	50.0(50.0-50.0)	**<0.001**
	Group 2	37.0(25.0-50.0)	62.0(50.0-65.25)	**<0.001**
SF-36 Pain Score	**Group 1**	32.0(30.75-45.0)	45.0(45.0-55.0)	**<0.001**
	Group 2	22.0(22.0-45.0)	65.0(52.5-67.0)	**<0.001**
SF-36 General Health Perception Score	**Group 1**	65.0(25.0-65.0)	65.0(25.0-65.0)	0.798
	Group 2	45.0(23.75-65.0)	52.5(30.0-70.0)	**<0.001**

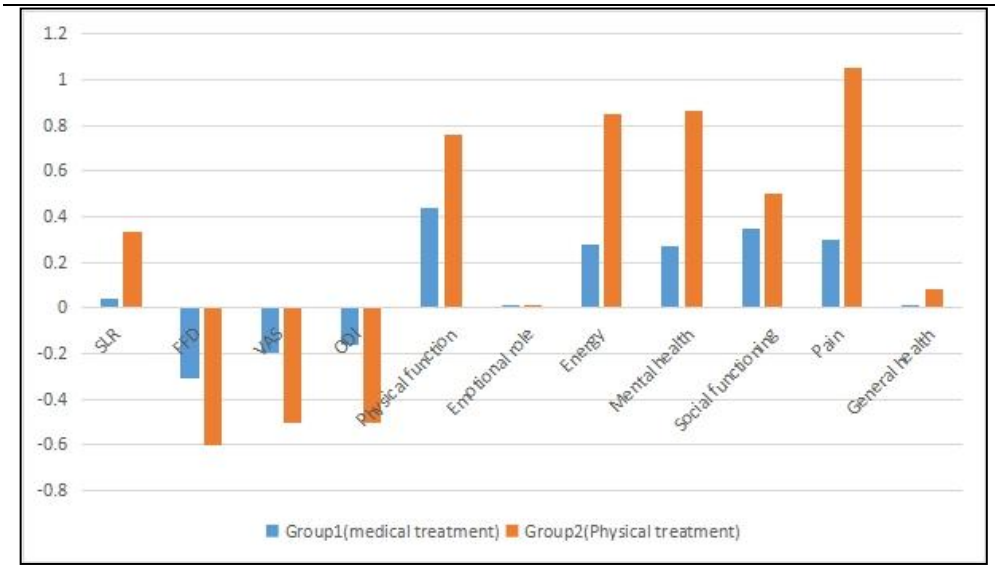
Group 1: Medical Treatment (n:30), Group 2: Physiotherapy (n:30), n: number of people, p value: indicates the significance level for comparison between treatment groups, p value indicates the significance level for comparison before and after treatment. Data are expressed as median (1st - 3rd quartile) or n (%), SF-36: Short form 36

Since there were differences between the two groups in some of the initial data, we compared the improvement after treatment compared to before treatment by calculating the difference. According to the difference analysis, greater improvements across all parameters were observed in the group receiving physical therapy compared to the group receiving only medical treatment (Table 4). Comparison of response to treatment with baseline measurements is presented in graph 1.

Table 4.
Analysis of Differences

Variable of Differences	Treatment Groups		P value
	Group 1	Group 2	
HFFD	-0.31(-0.50-(-0.17))	-0.60(-1.00-(-0.43))	**<0.001**
VAS	-0.20(-0.26-(-0.11))	-0.50(-0.55-(-0.44))	**<0.001**
ODI	-0.16(-0.23-(-0.11))	-0.50(-0.55-(-0.40))	**<0.001**
SF-36 Physical Function Score	0.44(0.19-0.67)	0.76(0.28-1.23)	**0.018**
SF-36 Physical Role Difficulty Score	0.00(-0.38-2.25)	0.00(0.00-0.00)	0.835
SF-36 Emotional Role Difficulty Score	0.00(0.00-2.03)	0.00(0.00-0.00)	0.359
SF-36 Energy/Vitality Score	0.28(0.08-0.50)	0.85(0.33-1.20)	**0.001**
SF-36 Mental Health Score	0.27(0.15-0.50)	0.86(0.30-1.89)	**0.001**
SF-36 Social Functioning Score	0.35(0.00-0.53)	0.50(0.35-1.01)	**0.010**
SF-36 Pain Score	0.30(0.00-0.68)	1.05(0.42-1.68)	**<0.001**
SF-36 General Health Perception Score	0.00(0.00-0.00)	0.08(0.00-0.21)	**<0.001**

Group 1: Medical Treatment (n:30), Group 2: Physiotherapy (n:30), n: number of people, VAS: visual analog scale, ODI: Oswestry disability index, HFFD: Hand-finger-floor distance, SF-36: short form 36, p value : indicates the significance level for comparison between treatment groups, p value indicates the significance level for comparison before and after treatment.



Graphic 1. Score compared to baseline measurements

SLR: Straight leg raising, FFD: Hand-Finger-floor distance, VAS: Visual analog scale, ODI: Oswestry disability index

Discussion

It has been shown that medical treatment and physical therapy agents provide significant improvement in pain and functional status in chronic low back pain. Since there was a difference between the two groups in some initial data, the difference between the two groups was calculated according to the calculation of the difference before and after treatment: significant improvement was achieved in all parameters except SLR and SF-36 general health perception score in both groups. More improvement was achieved in all parameters in the group where physical therapy was added. However, SLR and SF-36 general health perception score changes improved significantly only in group 2. In addition, this study showed for the first time that the change in SLR and SF-36 general health perception score improved significantly with the contribution of physical therapy agents, independent of medical treatment.

Physical therapy agents have long been used to treat chronic low back pain. These agents reduce chronic pain, inflammation, or tissue stiffness. It increases movement and recovery through vasodilation and neurostimulation. However, the effects of these agents are still debated (18). In addition, not only hot pack, TENS and US, but also interference, laser, extracorporeal shock wave therapy... many other physical therapy agents can be used in chronic low back pain (21). The application method, duration and dosage of physical therapy agents depend on the doctor's preference. For this reason, in our study, we included patients who received the same physical therapy agents for the same period of time. Although the role of physical therapy agents in reducing pain has been investigated in many studies (22); we came across a study that compared combined physical therapy agents in addition to medical treatment similar to ours. In this study, exercise therapy and paracetamol when necessary were applied to the control group, and combined physical therapy agents (hot pack, TENS, US) were applied to the study group in addition to these. The patients were evaluated using VAS, Oswestry Disability Index and Istanbul Low Back Pain Disability Index. Similar to our study, although there were statistically significant improvements in both groups, statistically significant greater improvements were found in the group that added combined physical therapy (23).

In addition, in our study, significant improvement was achieved in all parameters except SLR and SF-36 general health perception score in both groups. However, SLR and SF-36 general health perception score changes improved significantly only in group 2. This situation may be due to the fact that superficial and deep heating added to the medial treatment provided more effective relaxatıon of muscle spasm. The application of additional physical therapy agents to the patients in group 2, unlike group 1, may have increased patient satisfaction and caused a significant change in the SF-36 general health perception score.

Superficial heat applications such as hot packs accelerate tissue healing by reducing collagen elasticity and reducing muscle spasm through vasodilation, thus increasing the pain threshold (24). Despite studies reporting that TENS reduces pain intensity, improves disability, and reduces medication consumption in patients with chronic nonspecific low back pain (25); there are also studies showing that it does not reduce pain scores. In addition to studies showing that US added to the exercise program significantly improves function, lumbar joint range of motion and endurance (26); There are also studies indicating that the effectiveness of therapeutic US added to exercise is uncertain (5, 6).

In most studies, physical therapy agents were used as monotherapy +/- exercise. Evidence for physical therapy agents as monotherapy in chronic low back pain is insufficient in systematic reviews and meta-analyses (27, 28). Studies on the combined use of physical therapy agents are limited. The combined use of physical therapy agents in chronic low back pain has been shown in a limited number of studies to be more effective in controlling pain, joint range of motion and other symptoms than monotherapy (29, 30). In our study, consistent with these studies, further improvement was achieved in all parameters we measured with combined physical therapy agents added to medical treatment.

Chronic low back pain is often progressive and due to its resistant nature, has a poor prognosis and response to treatment. Apart from the NSAIDs and Myorelexans that we frequently use, long-term use of antiepileptics and antidepressants may be required in resistant cases (4). Studies have reported that despite the beneficial effects of medical treatments in chronic low back pain, caution should be exercised in long-term use due to their systemic side effects (31, 32). In our study, improvements were detected in VAS, ODI, LROM and FFD in the group that received only medical treatment. These improvements were greater in the group that received

combined physical therapy in addition to medical treatment. Therefore, combining medical treatments with physical therapy agents can not only improve general health perception but also prevent chronic drug use.

The strength of our study is the physicians who gave the treatments and the physicians who evaluated them before entering the treatment and those who evaluated them after leaving the treatment were different. Both groups were given medical treatment and exercise therapy. Unlike other studies, the effect of combined use of physical therapy agents rather than single use was examined. Unlike comparing two physical therapy agents that we frequently observe in the literature; physical therapy agents were compared with the group receiving medial therapy.

Our study had some limitations. First, we evaluated our patients before and after treatment. A longer follow-up period is needed to understand the effects of physical therapy in the future. Secondly, the number of patients in the groups could have been larger to sample the universe. Thirdly, while the same treatment was given to the patients in the physical therapy group; The medical treatments chosen between and within the groups may differ in both groups.

Conclusion

As a result, in our study; It has been shown that combined physical therapy agents added to medical treatment contribute to both the specific tests affected by chronic low back pain and the general health perception and quality of life. However, more research, especially systematic review and meta-analysis, is needed to more clearly evaluate the effectiveness of the combined use of physical therapy agents.

Ethics Committee Approval: The study was approved by the Kayseri City Hospital Clinical Research Ethics Committee (date: 21.11.2020 and decision number: 221).

Informed Consent: Written consent was obtained from the participants.

Conflict of Interest: Authors declared no conflict of interest.

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Author Contributions: Idea/Concept: H.T.Ç; Design: F.C., H.T.Ç.; Supervision: F.C., A.G.; Funding: H.T.Ç.; Materials: F.C.; Data Collection/Processing: A.G.; Analysis/Interpretation: H.T.Ç., A.G.; Literature Review: A.G.; Drafting/Writing: F.C., H.T.Ç.; Critical Review: F.C., H.T.Ç. The authors have accepted responsibility for the entire content of this manuscript and approved its submission.

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