



Comparison of outpatient and inpatient spa therapy in knee osteoarthritis

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Abstract

Osteoarthritis (OA) is a common condition that impacts many people worldwide and involves weight-bearing joints, resulting in chronic pain. In this study, we aimed to compare the effectiveness of inpatient and outpatient physical therapy modalities and spa combination treatments on pain and functional status in patients with knee osteoarthritis. Seventy-four patients diagnosed with primary knee osteoarthritis were included in this study. The patients were randomized into two groups, inpatient ($n = 37$) and outpatient ($n = 37$) physical therapy. All patients received a physical therapy program (superficial heater + deep heater + transcutaneous electrical nerve stimulation) for 2 weeks and spa therapy. All cases were evaluated clinically, laboratory, and radiographically. In order to evaluate pain and functional status, the Visual Analogue Scale (VAS), Western Ontario and McMaster Universities osteoarthritis index (WOMAC), and Timed Up and Go (TUG) test were used before and after treatment. There was no significant difference between the two groups in the TUG test and WOMAC scores ($p > 0.05$). However, a significant difference was found in VAS scores in favor of the outpatient group ($p < 0.05$). As a result, although there was a significant improvement in pain scores in the outpatient group, multicenter studies with larger patient groups may provide more evidence.

Keywords Electrotherapy · Hot pack · Knee osteoarthritis · Spa therapy · Ultrasound

Introduction

Osteoarthritis has an important place in musculoskeletal diseases and is the most common rheumatic joint disorder characterized by progressive cartilage degeneration (Woolf and Pfleger 2003). Osteoarthritis of the knee is the most common

symptomatic OA characterized by chronic knee pain, joint stiffness, limited daily activities, and decreased quality of life (Liu et al. 2017). The frequency of OA in society is increasing due to prolonged life expectancy and widespread obesity. Therefore, the treatment of this disease, which causes socioeconomic losses, is becoming more and more important (Cross et al. 2014; Hunter et al. 2014; Murray et al. 2014). The aim of the treatment is to improve the quality of life by relieving pain and stiffness, protecting joint functions and muscle strength, and preventing or correcting injuries. Current treatments include non-pharmacological and pharmacological treatments. Aerobic, aquatic, resistant exercises and weight control are recommended as non-pharmacological treatments. In addition, orthoses, walking aids, manual therapy, thermal applications, physical therapy, and congestive behavioral strategies are also included. As a pharmacological treatment, paracetamol is the first-choice oral analgesic. Other recommended drugs are non-steroidal anti-inflammatory drugs (NSAIDs) and opioids (Hochberg et al. 2012; Vickers 2017).

Physical therapy modalities are becoming increasingly important due to the side effects of analgesic drugs. Hot pack (HP), therapeutic ultrasound (US), and transcutaneous

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electrical nerve stimulation (TENS) are long-term physical therapy methods used in rehabilitation clinics. Previous studies have shown that TENS, US, and exercise have a positive effect on OA (Bruyn et al. 2016; Eyigör et al. 2008; Osiri et al. 2000).

In addition, spa therapy and waters containing natural minerals, which have been practiced clinically for many years, are also used in the treatment of OA. It has been reported that spa treatment can be used as an effective and reliable method in the treatment of OA in a multidisciplinary approach (Harzy et al. 2009).

Spa therapy programs can be planned as inpatient and outpatient treatments. Traditional spa treatments require people to move away from where they live and work for a long time. For reasons such as an insufficient number of hospital beds, relatively high health costs, loss of workforce, and avoiding hospital infections, patients are given outpatient physical therapy and spa therapy. The number of randomized controlled trials concerning spa therapy for knee OA is not very high, and the effectiveness of inpatient versus outpatient rehabilitation was rarely investigated (Antonelli et al. 2018; Forestier et al. 2016; Fraioli et al. 2018).

In our study, we aimed to compare the effects of inpatient and outpatient applications of HP, US, TENS, and spa combination treatments on pain and functional status in patients with knee osteoarthritis.

Materials and methods

The study was performed according to the Helsinki Declaration and with permission from the local ethics committee (no:2019/140). All patients included in the study were informed in detail about the study, and verbal and written consent was obtained (NCT04531969).

This study was a prospective randomized study. Patients who were admitted to the Physical Therapy and Rehabilitation Department of our hospital between September 2020 and November 2020 with the complaint of knee pain and diagnosed with primary knee OA were included in the study. The diagnosis of primary knee osteoarthritis was made according to the American College of Rheumatology (ACR) criteria. A total of 74 patients who were in stage 2 and above, according to Kellgren-Lawrence radiological staging and meet the inclusion criteria of the study, were included in the study. The study flow is shown in Fig. 1.

Patients were randomly divided into two groups –inpatient group and outpatient group. A sealed envelope method was used for randomization. Both groups were given the same standard physical therapy program. All patients received spa therapy in addition to HP, therapeutic US, and TENS treatments within the scope of the standard physical therapy program. The patients in inpatient group (n = 37) were

hospitalized, and the required standard physical therapy program was applied, while the patients in outpatient group (n = 37) were received the same daily standard physical therapy program without being hospitalized.

Treatments were done by an experienced physiotherapist by Ramazan Kurul, and the follow-up and results were followed up for 10 years by an experienced physiatrist by Mustafa Fatih Yaşar observationally. Information about the cases deemed eligible to participate in the study was recorded in the patient assessment form prepared at the first evaluation session. All patients were evaluated twice routinely with knee pain and functionality measurements at the beginning and the end of the treatment program.

Patients who have secondary knee OA; patients with pronounced pathology in the waist, hip, and ankle joint; patients with active tumors; patients with bleeding disease; patients with febrile infectious disease, having had serious surgical operations in the last 6 months; patients who have undergone and/or have been injected with intraarticular steroid and hyaluronic acid into the knee joint; patients who have received balneotherapy and peloidotherapy in the last 1 year; patients with decompensated organ failure; those with inflammatory disease; those with pregnancy and breastfeeding; people with neurological diseases such as epilepsy, inner ear hearing aids, and pacemakers; and other individuals with a small metallic implant were excluded from the study.

Treatment protocol

All patients were included in the physical therapy program, one session a day, 5 days a week for a period of 2 weeks. Spa therapy was applied to both groups with ten sessions of a physical therapy program (HP application + deep heater application + TENS).

HP application

A hot pack wrapped in a towel for 20 minutes was placed on the knee and surrounding soft tissues.

Deep heater application

The application was performed with a therapeutic US device (ProSound ULS-1000-Medserve Limited, Prior Hall Business Center, UK) at a dose of 1.5 W/cm² for each string for 6 minutes.

TENS application

TENS device (Fizyomed Fizyotens, Turkey) with two electrodes surrounding the tendon was performed for 30 minutes at low-frequency current application. Its frequency was 100 Hz, the current time was 40 μ s, and the intensity of the

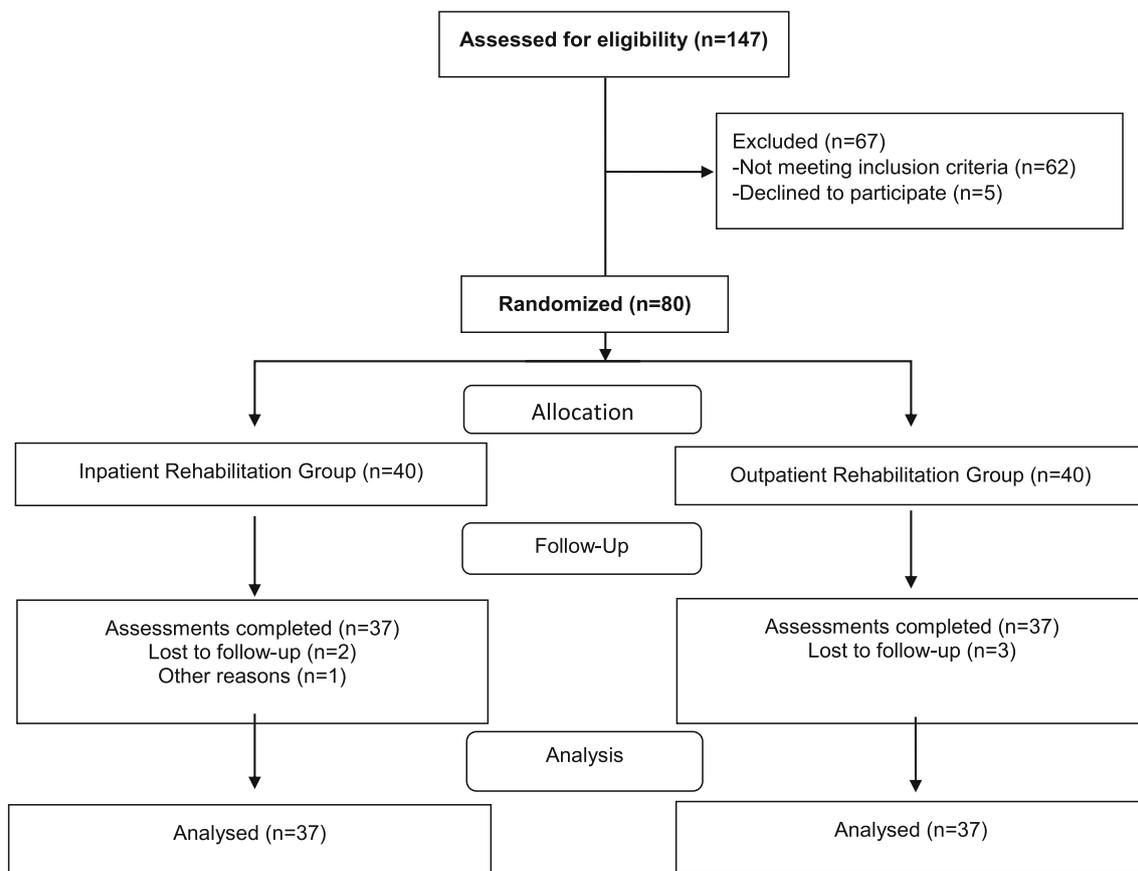


Fig. 1 Flowchart of the study

current was applied in the amplitude, which does not create muscle contraction and creates a feeling of numbness and tingling.

Spa therapy

A conventional water bath at 38 °C was applied in the pool for 20 minutes a day. The spa water has total mineralization of 1744.367 mg/L and a source temperature of 42 °C; therefore, it is classified in the “Thermo mineral waters” group according to balneological terms.

Outcome measurements

All cases were evaluated clinically, laboratory, and radiographically. Age, height, and weight of the patients included in the study were recorded. While making a definitive diagnosis, anamnesis, general physical examination, locomotor system examination, complete blood count, erythrocyte sedimentation rate, full urine test, C-reactive protein, rheumatoid factor, biochemical tests, and standard anterior-posterior and lateral joint X-ray radiographs in the standing position were used. X-ray radiographs were evaluated according to Kellgren-Lawrence radiological staging. The Visual

Analogue Scale (VAS) (0–100), Western Ontario and McMaster Universities osteoarthritis index (WOMAC), and 3-m Timed Up and Go (TUG) test were used before and after treatment to assess the pain and functional status of the patients.

Visual Analogue Scale

This scale consists of a 100-mm horizontal line and is marked from 0 to 10. In our study, patients were told that the “0” point was no pain at all, and the “10” point showed unbearable pain, and patients were asked to mark their pain intensity by considering their pain at rest.

Western Ontario and McMaster University Osteoarthritis Index

WOMAC, which is a disease-specific measure of health status, is widely used in patients with knee or hip OA.

The form consists of three parts (pain, stiffness, and physical function) and 24 questions. High WOMAC values indicate an increase in pain and stiffness and impairment of physical function. The scores obtained from five parameters evaluating the patient’s pain complaint, two parameters evaluating the

stiffness complaint, and 17 parameters evaluating the physical function section were summed up separately and were evaluated in each control by using a Likert pain scale.

Timed Up and Go Test

While sitting in an arm-supported chair, the patient walks up to a point 3 m away at the fastest speed he can walk. The walking time is recorded in seconds, and the average speed is evaluated according to the age group.

Minimal clinical important improvement (MCII) absolute scores were based on previous studies, with MCII scores defined as -19.9 mm for the VAS, -9.1 units for the WOMAC (Tubach et al. 2005), and -1.1 s for the TUG (Alghadir et al. 2015; Forestier et al. 2010).

Statistical analysis

All statistical analyses were performed using the SPSS statistical package for Windows, version 20.0 (IBM Inc., Armonk, NY). An independent samples *t*-test was used to compare continuous variables, and the chi-square test was used to compare categorical variables between the groups at baseline. A paired samples *t*-test was used to examine the change in values before and after treatment within the group. An independent samples *t*-test was used to evaluate the difference between the pre-treatment and post-treatment scores of the patients between the groups. A *p* value of less than 0.05 was considered statistically significant. In order to achieve $\alpha < 0.05$, $\beta = 80\%$, according to VAS scores with an effect size Cohen's $d = 0.72$, it was found that at least 32 patients were required for each group (Roques and Queneau 2016).

Results

The 74 patients who met the inclusion criteria and were included in the study were randomly divided into either the inpatient group ($n = 37$) or the outpatient group ($n = 37$). While the average age, height, and weight were consecutively 59.59 ± 9.72 , 165.21 ± 7.14 , and 76.81 ± 12.45 in the outpatient group, these were 62.72 ± 5.25 , 164.10 ± 7.78 , and 81.91 ± 11.40 in the inpatient group. The baseline characteristics of the patients are shown in Table 1.

Paired samples *t*-test results show that there was a significant change between the TUG test, VAS, and WOMAC scores in both groups compared with the baseline (Table 2).

An independent samples *t*-test was used to evaluate the difference between the pre-treatment and post-treatment scores of the patients. There was no significant difference between the two groups in TUG test and WOMAC scores ($p > 0.05$). However, a significant difference was found in

Table 1 Baseline characteristics of participant group

		Outpatient ($n=37$)		Inpatient ($n=37$)		<i>p</i>
		$X \pm SD$		$X \pm SD$		
Age (years)		59.59 \pm 9.72		62.72 \pm 5.25		0.089
Height (centimeter)		165.21 \pm 7.14		164.10 \pm 7.78		0.275
Weight (kilogram)		76.81 \pm 12.45		81.91 \pm 11.40		0.070
Gender	Female	22	59.5	18	48.6	0.220
	Male	15	40.5	19	51.4	
Grade	2	17	45.9	15	40.5	0.871
	3	20	54.1	22	59.5	

SD standard deviation, $p < 0.05$, %95 confidence interval

VAS scores in favor of the outpatient group ($p < 0.05$) (Table 3).

The mean difference between the post-test and pre-test scores of the VAS was 1.95 in the inpatient group and 2.64 units in the outpatient group (MCII for VAS: -1.99). The WOMAC was 17.70 units in the inpatient group and 19.84 units in the outpatient group (MCII for WOMAC: -9.1). The TUG was found to be 2.48 units in the inpatient group and 1.85 units in the outpatient group (MCII for TUG: -1.1).

Discussion

To the best of our knowledge, this is the first study investigating the effectiveness of inpatient versus outpatient physical therapy in knee OA. The main findings of the study were as follows:

1. There were no significant differences in terms of TUG test and WOMAC scores between the groups.
2. A significant improvement was detected in terms of VAS score in the outpatient group.

Musculoskeletal system diseases are a spectrum of diseases that cause serious morbidity in the elderly population. Elderly patients are suffering from chronic pain express that their general health status is worse than other individuals, and it is observed that they apply to health institutions more frequently than other elderly populations without pain and this situation creates an additional burden on health expenditures (Reyes-Gibby et al. 2002). Supplementary and non-pharmacological therapeutic options are crucial for the treatment of chronic disorders as promoted by Active and Healthy Aging (AHA) (Blain et al. 2016).

When the patients' outcome scores were analyzed and compared with the MCII scores, we found that the WOMAC and TUG scores improved enough to be considered

Table 2 Comparison of VAS, TUG, and WOMAC values within group before and after treatment

		Pre-treatment	Post-treatment		
		$X \pm SS$	$X \pm SS$	t	p
TUG test	Inpatient	20.56 ± 6.08	18.08 ± 4.96	4.893	<0.001
	Outpatient	12.57 ± 4.28	10.72 ± 2.80	8.604	<0.001
VAS	Inpatient	5.13 ± 1.87	3.18 ± 1.24	13.865	<0.001
	Outpatient	6.69 ± 1.45	4.050 ± 1.56	9.177	<0.001
WOMAC Total	Inpatient	39.86 ± 16.30	22.10 ± 15.41	12.573	<0.001
	Outpatient	41.70 ± 17.66	21.86 ± 13.67	9.843	<0.001

Paired samples t -test results, $p < 0.05$, %95 confidence interval

VAS Visual Analog Scale, WOMAC Western Ontario and McMaster Universities, TUG Timed Up and Go

clinically important, while the VAS scores showed a clinically important difference only in the outpatient group.

Pain is a condition that OA patients complain more than other symptoms. Clinical guidelines recommend conservative methods such as manual therapy, therapeutic exercise, and ultrasound for pain in these patients (Cibulka et al. 2009; Hochberg et al. 2012; Köybaşı et al. 2010). It has been shown that improvement in pain is greater when exercise treatments are supported by ultrasound and hot pack applications (Köybaşı et al. 2010). Jia et al. reported that focused low-intensity pulsed US application is more effective in reducing pain compared to placebo therapy (Jia et al. 2016). In the same study, it was observed that at the end of the 10th day, the WOMAC scores decreased statistically more in the focused low-intensity pulsed US group. In another study, it was shown that ultrasound treatment applied in addition to conventional treatment was more effective in pain relief and WOMAC sub-groups (pain, stiffness, physical function) compared to NMES applied in addition to the same treatments (Devrimsel et al. 2019).

Knee OA poses a risk for falling and decreased balance in the elderly (Mat et al. 2014). In a study conducted with OA patients, it has been shown that conventional treatment approaches, including HP, US, and TENS, give better results

in terms of TUG scores in the short term outcome compared to exercise approaches (Nazari et al. 2019). On the other hand, it has been reported that home-based balance and strength exercises are more effective in reducing the risk of falling in individuals with OA compared to conventional treatment (Mat et al. 2018). In a study in which physical therapy applications, including manual techniques, were used and these applications were compared with glucocorticoid injection, it was shown that TUG scores were lower in the physical therapy group at the end of 1 year (Deyle et al. 2020). In the same study, it was reported that the physical therapy group had better results in terms of WOMAC scores.

In a meta-analysis, it has been reported that balneotherapy reduces pain and joint stiffness in OA patients and is effective in increasing joint function (Matsumoto et al. 2017).

In a retrospective study, including the data of 819 patients, Karagülle et al. showed that spa treatment was effective on pain and function in rheumatological and musculoskeletal diseases (Karagülle et al. 2017). In their studies on patients with knee OA, Fioravanti et al. emphasized that the positive effect of spa treatment on pain, function, and quality of life in the short and long term reduces the symptomatic drug consumption and might be an alternative treatment for those who cannot receive medication due to contraindications. (Fioravanti et al. 2015; Fioravanti et al. 2010; Fortunati et al. 2016).

In our study, in accordance with previous studies, we found that spa treatment has positive effects on pain and functional status in patients with knee OA. Although the studies on knee OA treatment have been designed in a variety of ways, they have been generally carried out either by staying at the spa facility or by going to the spa facility daily (Fioravanti et al. 2011; Karagülle et al. 2016). In a prospective study, Zwolińska et al. examined the effect of inpatient spa therapy on generalized OA (Zwolińska et al. 2018). In this study, it has been shown that spa therapy is generally useful and emphasized the necessity of a randomized controlled trial evaluating the effectiveness of spa therapy in patients with OA. In addition, Koyuncu et al. reported that spa therapy, which is applied in addition to standard physical therapy methods, is more effective

Table 3 Comparison of VAS, TUG, and WOMAC values between groups before and after treatment

	Outpatient ($n=37$)	Inpatient ($n=37$)		
	$X \pm SS$	$X \pm SS$	t	p
TUG test	1.85 ± 2.50	2.48 ± 1.75	0.873	0.385
VAS	2.64 ± 1.26	1.94 ± 1.28	2.443	0.017
WOMAC total	19.84 ± 10.46	17.75 ± 10.97	-1.295	0.199

Independent t test result of mean differences between groups, $p < 0.05$, %95 confidence interval

VAS Visual Analog Scale, WOMAC Western Ontario and McMaster Universities, TUG Timed Up and Go

on pain, disability, and quality of life in patients with chronic neck pain (Koyuncu et al. 2016). In our study, in light of these data, we applied spa therapy in addition to the standard physical therapy for both outpatient and inpatient patients.

There are different opinions about whether spa therapy programs are more effective in hospitals or outpatient. In a study conducted by Nguyen et al., it was shown that the patient's moving away from their dwellings or working environments had a positive effect on the treatment (Nguyen et al. 1997). In a meta-analysis, the effectiveness of inpatient and home-based rehabilitation was investigated, and home-based rehabilitation was shown to be as effective as rehabilitation in the hospital. They pointed out the importance of home-based rehabilitation and especially focused on functional improvement in musculoskeletal diseases. They emphasized that it can be beneficial in terms of hospital waiting times. As a result, it was recommended to investigate both treatment methods in terms of cost-effectiveness and the use of resources (Stolee et al. 2012). In our detailed literature search, we did not find any study comparing the effectiveness of inpatient and outpatient physical therapy applications in the treatment of pain in knee osteoarthritis. In our study, an outpatient physical therapy program was found to be more effective than an inpatient physical therapy program in pain control.

Spa centers are not only environments for pain relief for the elderly but also where they get rid of stress, feel fit, and socialize. In our study, we evaluated the effect of the treatment environment and environmental change in addition to the effectiveness of the spa treatment. We have shown that the benefits of spa therapy on pain and functional status can be effectively utilized without hospitalized treatment.

In their study on 150 patients with generalized OA, Ozkuk et al. applied inpatient and outpatient spa therapy to two groups and only NSAID therapy to the third group. They studied the pain, quality of life, and anxiety levels of the groups and reported that non-pharmacological treatment is effective. Additionally, they found inpatient spa treatment was more effective than outpatient (Özkuk et al. 2018). In our study, we found that the pain scores in the outpatient group were significantly lower than those in the inpatient group. We consider that this may have been since knee OA causes less painful stimulation and anxiety disorder than generalized OA.

The limitations of the current study were its single-center design, absence of long-term results, and physical therapy application as combination therapies. The lack of follow-up data of the patients reduces our findings' reliability; however, due to the pandemic, the patients were reluctant to come to the follow-up assessment. Therefore, the follow-up data could not be reported.

Conclusion

As a result, it was found that inpatient and outpatient treatment did not differ in quality of life and functionality in patients with knee OA. Multicenter studies with larger patient groups may provide more evidence that the outpatient physical therapy program is statistically more effective than an inpatient physical therapy program in pain control.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00484-021-02122-z>.

Declarations

Conflict of interest The authors declare no conflict of interests.

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