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The effect of the clinical pilates exercises on kinesiophobia and other symptoms related to osteoporosis: Randomised controlled trial

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ABSTRACT

Objectives: To investigate the effects of clinical pilates exercise on kinesiophobia, pain, functional status and quality of life of the osteoporosis patients.
Methods: This study involved 40 females with osteoporosis. The subjects were randomly separated into two groups. Group 1 received specific Clinical Pilates exercises provided by a qualified Physiotherapies ×3 per week for a period of 6 weeks. Group 2 acted as a control group, receiving no intervention and continuing their usual daily activities of life over the same period. All patients' kinesiophobia, pain and quality of life level and functional status were re-assessed at the end of 6 weeks.
Results: According to the measurements exercise group patients' kinesiophobia, pain decreased, functional status and quality of life statistically improved ($p < 0,05$).
Conclusion: As clinical pilates training positively effects kinesiophobia, pain, functional status and quality of life, it can be recommended to osteoporosis patients, as a safe exercise model.

1. Introduction

Clinical Pilates (CP) exercises are used to enhance functional activity and core strength as well as stimulating neuromuscular re-education. The aim of this is to increase spinal and stimulate muscular flexibility to enhance balance and stability. CP also assists in preventing kyphotic posture by improving tensor muscle stability. These exercises appear to significantly improve the static and dynamic balance in the healthy elderly population. Hence, it is proposed that these exercises would reduce the risk of falling and physical injuries [1–4]. Clinical Pilates aims to exercise the mind and the body in harmony through making sure the active participation of the patient and the correct application of the moves. This exercise model places emphasis on the relaxation of muscles through breathing movements and pain-free postures. This safe and effective exercise model has been highly recommended in the treatment of rheumatic diseases [5–7]. Pilates exercises have been used in pain treatment, especially ones caused through mechanical and postural defects [8,9] and was found to have beneficial effects on patients suffering from chronic mechanical back pain, including the general health state, flexibility, pain, motion range and lumbar spine mobility, proprioception, muscle strength of the torso, functionality status and physical aspects of the quality of life.

Osteoporosis is a disease caused by the combination of declined bone mass and deterioration of the bone tissue microarchitecture, hence leading to elevated bone fragility and increased risk of fractures. These patients develop decreases in dynamic stability. There is a strong correlation between falls and postural balance, especially dynamic balance. In turn, this leads to postural instability and swings in movements, disrupting the whole body balance [10]. Some of the most complications of osteoporosis include mainly fractures, pain, respiratory distress as a result of changes in posture and falls due to difficulty maintaining balance. Over time, patients experience social isolation, reduced functionality, disability, depression, dissatisfaction and anxiety as a result of these complications. Elevated stress levels stimulate the sympathetic nervous system, which causes the bone mineral density to decrease and further progresses of the disease, leading to a vicious cycle [11].

In the last decade, a lot of research has been conducted on chronically painful diseases of the musculoskeletal system. Results showed that these diseases lead to pain, avoidance and fear of movement (kinesiophobia), incapability of physical functioning, disability, dissatisfaction with daily life and low quality of life [9,12].

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When thinking about osteoporosis chronic painful nature and bone fragility, kinesiophobia should be taken into account. But no studies are found about kinesiophobia in osteoporosis patients' and it's treatment. Physical activities and exercises in the rehabilitation of osteoporosis had been contradictive till their positive effects have been proven in recent years. Various exercises were used in the treatment of osteoporosis but it is still difficult to recommend a specific exercise protocol [13] and also a few studies have been found about Clinical Pilates exercises used in osteoporotic patients.

This study has been carried out with the purpose of investigating the effects of Clinical Pilates on kinesiophobia and other symptoms related to osteoporosis such as pain level, functionality status and life quality of patients with osteoporosis.

2. Materials and methods

Patients who attended to the Rheumatologic Rehabilitation Unite of the Physiotherapy and Rehabilitation department with osteoporosis diagnosis (T-Score < -2.5 standard deviation) were informed by their respective physiotherapists about the study and volunteers were included in the treatment. The patients gave their consents in both oral and written forms.

The ethics committee permission required for carrying out this study was received on 24.03.2011 from the Research Assessment Commission of Hacettepe University under the registration number LUT11/16, B:30.2.HAC.0.20.05.04/No. 365.

Power analysis was carried out to determine the minimum number of subjects to be taken into the study. In each group, for a power analysis of 80% with α: 0.05, β:0.20, subject number was found to be 20 [14].

2.1. Participants

According to the World Health Organization classification system, woman diagnosed with osteoporosis between the ages 50–75 within the last year were chosen according to level of physical activity (less than 3 times per week) and mineral density of the hip and lumbar bones measured by Dual Energy X-Ray absorptiometry with a T score of less than 2.5 SD according to mean adult population. Women were excluded from the study if they had histories of fractures, joint replacements or fixation of the joints at the lower extremities or the spine, any neurological or muscle diseases, inability to continuously attend the exercise program, any secondary diseases resulting in decreased mobility or functional status and visual, hearing or mental problems that could prevent communication. After undergoing a functional status assessment, conducted by a physiotherapist, all 40 participants were asked to complete a questionnaire. Following an initial assessment, the participants were divided into an experimental group and a control group equally. In this parallel-group study, patients were randomly assigned to groups using random number table by the researcher.

2.2. Study protocol

Patients' demographic data, such as age, height, weight and body mass index, were recorded. Kinesiophobia, pain, functional status and quality of life were also assessed. The Tampa Kinesiophobia Scale (TKS) was used to measure each patient's level of fear and avoidance associated with movement [9].

A visual analogue scale (VAS) was used to evaluate the pain intensity of patients in the mornings, at rest and during performance of activities. The Short-Form McGill Pain Questionnaire (SF-McGill) was used as a multidimensional evaluation of pain. Patients' descriptions of their pain (SF-McGill S), the pain level they experienced during the study (SF-McGill VAS) and their total pain intensity (SF-McGill L) were measured by 6-point Likert-type scales [15]. The Pain Disability Index (PDI) was used to determine the influence of patients' general pain intensity on their daily life activities [16]. The Oswestry Low Back Pain Disability Scale (ODI) was used to assess the functional disability caused by the patients' lower back pain [17].

The Berg Balance Test (BBT) was used to evaluate risk of falling [18] and the Timed Up and Go Test (TUG) was used to assess patients' functional balance and mobility. During the TUG, the patient sits in a chair and waits for the therapist's signal. Upon the signal, the patient stands up and walks 3 m, turns around, walk backs to the chair and sits down. This activity is repeated three times and the shortest performance time is recorded [19]. The Chair Sit and Stand Test (CSST) was used to measure the strength and endurance of patients' lower extremity proximal muscles. During the CSST, the patient sits upright in an armless chair, crosses their arms in front of their chest and presses their feet into the ground to stand. Once standing, the patient sits again and repeats the activity. The CSST is scored according to the total number of times that the patient achieves a full standing position within 30 s [20,21]. The Chair Sit and Reach Test (CSRT) was used to assess the functional flexibility of the lower extremities by measuring the distance between each patient's fingers and toes. The Back Scratch Test (BST) was used to evaluate the functional flexibility of the patient's upper extremities. The distance between the fingers was measured. In the BST, three repetitions were performed consecutively and the best score was recorded.

The Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41) was used to assess each patient according to the five dimensions of health in osteoporosis: pain, physical functioning, social activities, general health assessment and mental functioning [22]. The Hospital Anxiety and Depression Scale (HADS) was used to assess patients' anxiety and depression levels [23], the Health Assessment Questionnaire (HAQ) was used to evaluate whether patients had chronic functional impairment caused by rheumatic diseases [24] and the Satisfaction with Life Scale (SLS) was used to assess patients' personal well-being, as well as their overall life satisfaction [25].

Clinical Pilates was chosen as the training exercise. A special session was organised for each patient to learn about the five main areas of focus for clinical Pilates (i.e. the neck, shoulder, chest, lumbopelvic posture, and breath control [during movement of these regions]). Patients qualified for group training only if they managed to successfully perform a session of clinical Pilates. Patients who qualified were asked to continue with their exercises, by performing them three times per week (for 6 weeks). Exercise sessions were 1 h in duration, including a warm-up period, a period in which to perform the main exercises, and a cool-down period. The exercise sessions were also designed to increase in difficulty over the trial, commensurate with the patient's accomplishments at each stage and in accordance with the structure of the clinical Pilates program (which progresses from closed-to open-chain kinetic exercises). The control group patients were assessed using the same tests, but they were not instructed to perform any exercises; rather, they were asked to continue with their normal daily routines. An example of one of the exercise programs performed is shown in Table 1, using original names.

Statistical analysis of the study data was done using SPSS for Windows software (ver. 15.0; SPSS Inc., Chicago, IL, USA). The eligibility of normally-distributed variables was evaluated using visual (histograms and probability graphics) and analytical (Shapiro-Wilk test) methods. Mean $\pm$ standard deviation ($x \pm SD$) values for age, height, weight and body mass index (BMI) were calculated. As the normal distribution assumption was not satisfied for all evaluation items in the between-groups analyses, these data