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Investigating the effects of a multidimensional exercise program on symptoms and antiinflammatory status in female patients with ankylosing spondylitis



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ABSTRACT

Objective: The purpose of this study is to investigate the effects of a multidimensional exercise program on symptoms and antiinflammatory status in female patients with ankylosing spondylitis (AS).

Methods: The BATH Indexes, Dougados Functional Index (DFI), Health Assessment Questionnaire in Spondyloarthropathies (HAQ-S), Ankylosing Spondylitis Quality of Life (ASQoL) and Beck Depression Inventory (BDI) were used to evaluate twenty-four female AS patients. ESR, CRP, TNF- α and IL-6 were also analyzed. All patients were assessed at baseline and with 3 weeks intervals till 12 week. A multidimensional exercise program was applied for three times a week.

Results: There were significant differences in Bath Ankylosing Spondylitis Global Index (BAS-G) and Disease Activity Index (BASDAI), HAQ-S, ASQoL and BDI scores ($p < 0.05$). The level of the ESR, CRP and IL-6 fluctuated slightly. There was only significant difference at 3 and 12 weeks as compared to baseline levels in TNF- α values ($p = 0.048$, $p < 0.001$).

Conclusion: We concluded that multidimensional exercise program should be taken into consideration for AS patients due to its positive effects on symptoms and antiinflammatory effects.

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1. Introduction

The chronic nature of the Ankylosing Spondylitis (AS) accompanies a symptomatic process that leads to functional disability, difficulties in daily living activities, mood disorders due to pain and restriction of movements. AS also impairs the quality of life of the patients [1,2]. The effects of exercise on symptoms have been studied extensively and exercise has been suggested as the basic treatment option for the management of AS along with the medical treatment [3].

Apart from the symptomatic treatment, the antiinflammatory effects of exercise have attracted attention over the last decade [4,5]. Cytokines have been shown to have important effects on the inflammatory pathways due to their antiinflammatory and/or proinflammatory roles. It has been suggested that Tumor Necrosis Factor Alpha (TNF- α) and Interleukin-6 (IL-6) regulate AS inflammation and elevated levels of these cytokines have been shown in biopsies taken from sacroiliac joints of AS patients [6].

Inherently, chronic inflammation causes muscle weakness, disuse atrophy and restriction of joint movements. On the other hand, there are studies indicating that contractile dysfunction in muscles is related to TNF- α [7]. While TNF- α is a proinflammatory cytokine, IL-6 has both anti and proinflammatory roles [8]. In other words, exercise induced IL-6 release from the muscle tissue has an antiinflammatory role and inhibits TNF- α with a different receptor pathway [9]. Therefore evidence suggests that in the management of AS, the antiinflammatory response of exercise training should be taken into consideration.

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While there are numerous studies investigating symptoms such as musculoskeletal dysfunction, flares in disease activity and impairments in daily living activities in AS patients, there are no studies regarding specific exercise models and their potential anti-inflammatory effects. Accordingly, the aim of this study is to investigate the effects of multidimensional exercise program on symptoms and its antiinflammatory effects in patients with AS.

2. Methods

2.1. Subjects

Patients with Ankylosing Spondylitis according to Modified New York criteria were included into this study. Patients with allergic conditions, cardiopulmonary diseases, endocrine system diseases, psychological problems, pregnancy and malignancy states were excluded from the study. Patients who were on treatment with anti-TNF agents and patients who were regularly exercising within the last three months were also excluded.

Demographic and clinical data such as age, weight, height, gender, duration of disease, medication regimen were recorded at baseline.

The procedures were followed in accord with the Helsinki Declaration of 2008. Subjects were informed about the study and both verbal and written consents were taken. The research ethics committee approval was obtained from the Hacettepe University Clinical Research Ethic Committee (07.01.2010, No: 57, LUT09/159). This study was supported by the Hacettepe University Scientific Research Committee (Project number: H.U.B.A.B. 011D07401001).

2.2. Study protocol

The first session was planned as an "Evaluation Session". In this session blood samples were collected and the questionnaires were administered to the subjects. All assessments were repeated at week 3., 6., 9., 12. All subjects attended the exercise program regularly, three times a week over 12 weeks duration.

2.2.1. Assessment of musculoskeletal symptoms

BATH Indexes (The Bath Ankylosing Spondylitis Mobility Index (BASMI), The Bath Ankylosing Spondylitis Global Index (BAS-G), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Bath Ankylosing Spondylitis Functional Index (BASFI) and Dougados Functional Index (DFI) were used for evaluating special musculoskeletal symptoms of patients with AS.

2.2.2. Assessment of quality of life and depression

Health Assessment Questionnaire in Spondyloarthropathies (HAQ-S) and Ankylosing Spondylitis Quality of Life (ASQoL), Beck Depression Inventory (BDI) were used for assessing the quality of life and depression.

2.2.3. Blood analysis

Blood samples were taken for analysing erythrocyte sedimentation rate (ESR), C reactive protein (CRP), TNF- α , IL-6. ESR and CRP were measured by standard laboratory procedures. Serum separator tubes were used for TNF- α , IL-6, at least 3 cc of blood samples were taken and preserved at -20°C until programs for all patients had been completed, after which, for TNF- α *Quantakine DTA00C Human TNF- α ELISA Kit R&D System* and for IL-6, *Quantakine D6050 Human IL-6 ELISA Kit R&D System* were used for the analysis.

2.3. Exercise program

A group exercise program resumed accordingly to a

multidimensional exercise program named as BİLİŞSEL EGZERSİZ TERAPİ YAKLAŞIMI (BETY). This program translated into English as Cognitive Exercise Therapy Approach, is a biopsychosocial model developed by Edibe Unal [10]. This approach is an innovative technique including cognitive processes in pain and sexual information management, clinical pilates exercises (Appendix.1.) and awareness of mood state via dancetherapy. Each session was included dancetherapy for 10 min, clinical pilates exercises for 40 min and dancetherapy for 10 min again. Cognitive processes in pain and sexual information management were added to clinical pilates exercises' periods.

2.4. Statistical analysis

For statistical analysis IBM SPSS Statistics version 21.0 were used. Descriptive data was expressed as Mean \pm Standard Deviation ($X \pm SD$). For assessing the significance of change in time of repetitive measures of indexes (BASMI, BAS-G, BASDAI, BASFI, DFI), quality of life and health assessment questionnaires (HAQ-S, ASQoL), questionnaire which assess depression (BDI), blood analysis (ESR, CRP, IL-6, TNF- α) linear mixed models were used. For all analysis statistical significance level was considered as $p < 0.05$.

3. Results

This study aimed to investigate both the symptomatic and antiinflammatory effects (IL-6 and TNF- α profile) of a multidimensional exercise program in time in patients with AS. At baseline, 35 subjects (24 women, 11 men) were eligible. All of the 11 male patients rejected to participate in the study. They reported that they will not be able to attend exercise sessions regularly (because of the inability to get permission from work). After the study entry, some subjects could not continue to the exercise program due to personal reasons (Fig. 1).

Therefore, only 24 female subjects were included in this study. Their mean age was 39.88 ± 9.96 years, duration of disease was 5.12 ± 4.46 years, mean height, weight and BMI were 162.46 ± 5.24 cm, 61.54 ± 9.20 kg and 23.41 ± 3.44 kg/cm² respectively.

3.1. Assessment of musculoskeletal symptoms

The Questionnaires were administered to the subjects every 3 weeks, Table 2 shows the results of the questionnaires' scores. BASMI, BASDAI, BAS-G, BASFI and DFI scores were improved compared to the scores at baseline. Additionally, there were statistically significant differences in BAS-G scores between baseline and 6, 9, and 12 weeks ($p = 0.016$; $p = 0.008$; $p < 0.001$ respectively) and in BASDAI scores between baseline and 12 weeks ($p = 0.023$) (Table 1).

3.2. Assessment of quality of life and depression

The scores of the HAQ-S and ASQoL were decreased compared to the scores at baseline, however there was only statistically significant difference in HAQ-S scores between baseline versus 9 and 12 weeks ($p = 0.051$ (borderline significance); $p = 0.041$ respectively) and ASQoL scores between baseline and 12 week ($p = 0.007$) (Tables 1 and 2).

The BDI scores were decreased compared to the score at baseline, and there were statistically significant difference between baseline and all follow-up weeks ($p < 0.001$ for all) (Tables 1 and 2).

3.3. Blood analysis

The level of the ESR, CRP and IL-6 fluctuated slightly during

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