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## Original article

# Swiss ball exercises improve muscle strength and walking performance in ankylosing spondylitis: a randomized controlled trial

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### ABSTRACT

**Objective:** The purpose was to evaluate the effectiveness of a progressive muscle strengthening program using a Swiss ball for AS patients.

**Methods:** Sixty patients with AS were randomized into the intervention group (IG) or the control group (CG). Eight exercises were performed by the IG patients with free weights on a Swiss ball two times per week for 16 weeks. The evaluations were performed by a blinded evaluator at baseline and after 4, 8, 12 and 16 weeks using the following instruments: the one-repetition maximum test (1 RM), BASMI, BASFI, HAQ-S, SF-36, 6-minute walk test, time up and go test, BASDAI, ASDAS, ESR and CRP dosage and Likert scale.

**Results:** There was a statistical difference between groups for: strength (1 RM capacity) in the following exercises: abdominal, rowing, squat, triceps and reverse fly ( $p < 0.005$ ); 6-minute walk test ( $p < 0.001$ ); timed up and go test ( $p = 0.025$ ) and Likert scale ( $p < 0.001$ ), all of them with better results for the IG. No differences were observed between the groups with respect to the functional capacity evaluation using the BASFI, HAQ-S, BASMI, SF-36, TUG, ASDAS, ESR and CPR dosage.

**Conclusions:** Progressive muscle strengthening using a Swiss ball is effective for improving muscle strength and walking performance in patients with AS.

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## Exercícios na bola suíça melhoram a força muscular e o desempenho na caminhada na espondilite anquilosante: ensaio clínico randomizado

R E S U M O

Palavras-chave:

Exercícios

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Bola suíça

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**Objetivo:** Avaliar a efetividade de um programa de fortalecimento muscular progressivo com o uso de uma bola suíça em pacientes com espondilite anquilosante (EA).

**Métodos:** Sessenta pacientes com EA foram randomizados em grupo intervenção (GI) ou grupo controle (GC). Os pacientes com EA fizeram oito exercícios com pesos livres em uma bola suíça duas vezes por semana durante 16 semanas. As avaliações foram feitas por um avaliador cego no início do estudo e após quatro, oito, 12 e 16 semanas com os seguintes instrumentos: teste de uma repetição máxima (1 RM), Basmi, Basfi, HAQ-S, SF-36, teste de caminhada de seis minutos, *Timed up and go test*, Basdai, Asdas, dosagem de VHS e PCR e escala de Likert.

**Resultados:** Houve uma diferença estatisticamente significativa entre os grupos em relação à força (capacidade no teste de 1 RM) nos seguintes exercícios: abdominal, remada, agachamento, tríceps e crucifixo invertido ( $p < 0,005$ ); teste de caminhada de seis minutos ( $p < 0,001$ ); *Timed up and go test* ( $p = 0,025$ ); e escala de Likert ( $p < 0,001$ ), todos com melhores resultados no GI. Não foram observadas diferenças entre os grupos em relação à avaliação da capacidade funcional com Basfi, HAQ-S, Basmi, SF-36, TUG, Asdas, VHS e dosagem de PCR.

**Conclusões:** O fortalecimento muscular progressivo com uma bola suíça é efetivo em melhorar a força muscular e o desempenho na caminhada em pacientes com EA.

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## Introduction

Ankylosing spondylitis (AS) is an inflammatory disease that affects the axial skeleton and causes low back pain and functional impairment. The disease causes inflammation and pain in the spine and joints, which reduces physical activity and spinal mobility and causes fatigue, stiffness, sleep disorders and depression.<sup>1</sup> Exercises are important to maintain or improve spinal mobility and physical fitness as well as to reduce pain and are included in evidence-based recommendations for the management of AS.<sup>2</sup>

One study showed that weakness of peripheral muscles of the limbs (specially the quadriceps) could be one of the most important determinant of exercise intolerance in patients with AS. Also, the study concluded that muscle deconditioning is one of the most important factor for the reduction in aerobic capacity, suggesting the importance of muscle strengthening exercises in these patients, in addition to aerobic training.<sup>3</sup>

Resistance exercises are currently used in several studies.<sup>4</sup> They can be performed using free weights, resistance bands or weight machines.<sup>5</sup> Exercise that use the Swiss ball differed from other resistance exercise because it recruits the muscles responsible for spine stabilization during movement.<sup>6</sup> Musculoskeletal and cardiovascular safety of resistance training have also been demonstrated, even in the face of co-morbidities. Currently, there is evidence to justify the use of these exercises for health promotion, rehabilitation and therapeutic purposes.<sup>4,7,8</sup>

Despite the recognized importance of exercise as part of a treatment plan for patients with AS, the benefit of specific exercise programs have not been established in the literature.<sup>9</sup>

In a systematic review of the literature, the authors reported difficulty in performing a meta-analysis due to heterogeneity of the studies. In this review, it was shown that there is moderate evidence on the effects of exercise in improving functional capacity, disease activity and chest expansion when compared to a control group without exercise. The authors conclude that literature has not established which exercise protocol is more effective in AS.<sup>10</sup>

Muscle strengthening exercises have been studied in five other trials in AS patients. In these studies, the strengthened muscles were the legs, trunk, arms, back and abdominal exercises. Most of these trials fail to not describe the methodology used to perform the strengthening exercises as: sets, number of repetitions, load maximum calculation, frequency per week, progression of loads and duration of muscle strengthening program.<sup>11-15</sup>

Resistance exercises with the aid of unstable surfaces such as a Swiss ball are hypothesized to improve the functional capacity of patients because this workout affects other aspects of physical fitness such as balance and proprioception.

The aim of this study was to evaluate the effectiveness of muscle strengthening exercises with a Swiss ball primarily in the functional capacity and, secondarily, in muscle strength, disease activity, spinal mobility, performance in walking and quality of life in patients with AS.

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