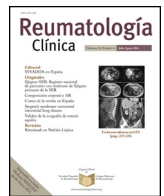




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Brief report

Value of Body Mass Index in the Diagnosis of Obesity According to DEXA in Well-controlled RA Patients[☆]

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ABSTRACT

Background: Rheumatoid arthritis (RA) has an indirect effect on body composition. Body mass index (BMI) is not a valid predictor of body fat in RA patients.

Objective: To evaluate the accuracy of BMI in identifying obesity diagnosed according to dual energy X-ray absorptiometry (DEXA) in well-controlled RA patients.

Methods: An observational, cross-sectional, descriptive, analytical study. We used 3 different cutoffs for obesity as determined by DXA: >35% total fat, >40% total fat, and >35% central fat mass (central obesity).

Results: One hundred one patients were included. We found that 35% total fat corresponded to a BMI of 24 kg/m², with a sensitivity of 90% and specificity of 75% (area under the curve [AUC] 0.917); 40% total fat to a BMI of 25 kg/m², with a sensitivity of 86% and specificity of 39% (AUC 0.822); and 35% central fat mass to a BMI of 22 kg/m², with a sensitivity of 97% and specificity of 84% (AUC 0.951).

Conclusion: Obesity according to DXA was underdiagnosed when the classic BMI cutoffs were used in well-controlled RA patients.

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Desempeño del índice de masa corporal para el diagnóstico de obesidad por medio de absorciometría de rayos X de energía dual (DEXA) en pacientes con artritis reumatoide

RESUMEN

Palabras clave:

Artritis reumatoide

Índice de masa corporal

Absorciometría dual por rayos X

Obesidad

Diagnóstico

Introducción: La artritis reumatoide (AR) tiene un efecto indirecto en la composición corporal. El índice de masa corporal (IMC) no se considera un predictor válido de la grasa corporal en pacientes con AR.

Objetivo: Evaluar el IMC para identificar la obesidad mediante absorciometría dual por rayos X (DEXA) en pacientes con AR bien controlados.

Métodos: Estudio observacional, transversal, descriptivo y analítico. Se utilizaron 3 definiciones de obesidad por DEXA: > 35% de grasa total, > 40% de grasa total y obesidad central > 35%.

Resultados: Se incluyó a 101 pacientes. Se encontró un IMC de 24 kg/m² para obesidad > 35% con una sensibilidad del 90% y una especificidad del 75% (área bajo la curva [AUC] 0,917), un IMC de 25 kg/m² para obesidad > 40% con una sensibilidad del 86% y una especificidad del 39% (AUC 0,822) y un IMC de 22 kg/m² para 35% de la grasa central con una sensibilidad de 97% y una especificidad del 84% (AUC 0,951).

Conclusión: Existe un subdiagnóstico de obesidad con el uso de los valores de tradicionales de IMC en pacientes con AR bien controlados.

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Introduction

Rheumatoid arthritis (RA) is a chronic, inflammatory, autoimmune disease. Among the extra-articular manifestations RA is associated with an increased risk of cardiovascular disease (CVD) and osteoporosis.

Body composition is indirectly affected in individuals with RA. The factors that influence it include the activation of proinflammatory cytokines that trigger metabolic changes, with the resulting degradation of lean body mass; the inactive lifestyle, which reduces muscle mass and increases body fat¹⁻⁴; the prevalence of obesity in individuals with RA *per se*; and age. More than 60% of RA patients have a body mass index (BMI) over the normal value ($>25 \text{ kg/m}^2$).^{5,6} Giles et al. found that the phenotype for obesity is overexpressed in patients with RA, especially in those whose BMI is in the normal range. Disease activity and treatment for RA are factors that can contribute to this abnormality.⁷

Body mass index is the anthropometric assessment most widely utilized to determine the presence of obesity.⁴ However, in patients who have an alteration in their body composition (as in RA), it cannot be utilized as a valid predictor of body fat nor, therefore, of CVD.^{4,8,9} Dual X-ray absorptiometry, also referred to as densitometry (DXA), is considered the gold standard for the measurement of body composition.¹⁰ Previously, in different studies, DXA has been used to evaluate body composition in RA patients,^{7,11} although the definitions of obesity according to the percentage of body fat vary depending on the population studied.

The objective of this study was to evaluate the value of BMI in identifying obesity by means of DXA in patients with well-controlled RA.

Methods

Participants

We performed an observational, cross-sectional, descriptive and analytical study, for which we obtained approval from the institutional ethics committee (RE 12-020). The study involved patients with RA, in accordance with the 2010 classification criteria of the American College of Rheumatology and the European League Against Rheumatism (ACR/EULAR),¹² who belonged to the cohort of rheumatic diseases of Hospital Universitario Dr. José Eleuterio González, in Monterrey, Nuevo León, México. The period of evaluation was from January to August 2013.

We excluded patients with contraindications for DXA: presence of joint prosthesis, body weight greater than 135 kg, pregnant patients and those who were nursing. We analyzed clinical, demographic and laboratory variables. Disease activity was evaluated using the Disease Activity Score 28-erythrocyte sedimentation rate (DAS28-ESR).

Body Mass Index and Body Composition Measurements

Height was measured using a wall-mounted stadiometer. Weight was evaluated with light clothing and without shoes. Body mass index was calculated with the weight (kg) divided by height in meters squared. To define obesity, we used 2 classifications: that of the World Health Organization (WHO), which categorizes a patient depending on the resulting BMI and considers low weight $<18.5 \text{ kg/m}^2$, normal weight between 18.5 and 24.9 kg/m^2 , overweight between 25 and 29.9 kg/m^2 and obesity $\geq 30 \text{ kg/m}^2$, and the adjusted index for patients with RA (AI-RA) establishes a cut-off point to define obesity as 28 kg/m^2 , a finding that was validated by bioelectrical impedance.⁴

Body composition and the distribution of regional body fat were evaluated using a densitometer (Hologic Full Body Densitometer, Model Discovery W. APEX software 3.3.0.1, version 13.3.0.1:7). Dual X-ray absorptiometry is capable of differentiating bone, muscle and fat, and calculates the total body mass (kg), fat mass (grams), fat percentage and lean mass (grams), as well as the regional distribution of these components.

To determine the diagnostic value of BMI to establish the presence of obesity employing DEXA, it was necessary to utilize a specific definition of obesity in the Mexican population as obtained by DXA. In the absence of a validated definition, we applied different cut-off points in accordance with studies published previously. We divided the patients into 3 groups based on the results of DXA: $>35\%$ of total body fat,¹³ $>40\%$ total body fat¹⁵ and, in the third group, central obesity was defined by the presence of 35% or more of central fat mass (trunk),¹⁵ since visceral adiposity is considered an independent predictor of morbidity and mortality.

Statistical Analysis

We provide a descriptive analysis of the clinical and demographic variables. For continuous variables, after a test for normality (Kolmogorov-Smirnov), we used the mean and standard deviation (SD). For the categorical studies, we used frequencies and percentages. Receiver operating characteristic (ROC) curves were utilized to determine the optimal cut-off points for each BMI, in relation to the definition of obesity by DXA employed; sensitivity and specificity analyses were performed. Moreover, we compared the values for the definition of obesity by the WHO with those proposed for DXA. We used the SPSS (version 20) software package. We considered a *P* value less than .05 to indicate statistical significance.

Results

Participants

We included 101 RA patients, 97 (96%) of whom were women, with an overall mean age of 50.54 years (SD 12.3). The remainder of the baseline characteristics are shown in Table 1. The mean weight and height were 69.3 kg (SD 13.01) and 153 cm (SD 6), respectively, with a mean BMI of 29.29 kg/m^2 (SD 5.4).

Table 1
Clinical and Demographic Variables.

Variable	
Age in years, mean (SD)	50.4 (12.3)
Female gender, n (%)	97 (96)
Years since the diagnosis of RA, mean (SD)	9.8 (8.6)
RF ^a , n (%)	61 (71.8)
Anti-CCP ^b , n (%)	31 (57.4)
DAS28-ESR, median (IQR)	3.26 (1.29)
HAQ, median (IQR)	0.62 (0.68)
Use of DMARD, n (%)	98 (98)
Use of methotrexate, n (%)	85 (85.9)
Use of prednisone, n (%)	47 (46.5)
Hypertension, n (%)	18 (18.2)
Dyslipidemia, n (%)	15 (15)
Type 2 diabetes mellitus, n (%)	10 (10)
Hypothyroidism, n (%)	7 (7)

CCP, cyclic citrullinated peptide; DAS28, Disease Activity Score; DMARD, disease-modifying anti-inflammatory drug; ESR, erythrocyte sedimentation rate; HAQ, Health Assessment Questionnaire; IQR, interquartile range; RA, rheumatoid arthritis; RF, rheumatoid factor; SD, standard deviation.

^a Information on 85 patients.

^b Information on 54 patients.

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