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ORIGINAL ARTICLE

Additional value of anaerobic threshold in a general mortality prediction model in a urban patient cohort with Chagas cardiomyopathy☆,☆☆

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KEYWORDS
Chagas disease;
Anaerobic threshold;
Chagas cardiomyopathy;
Neglected diseases;
Rassi score

Abstract
Introduction: The anaerobic threshold (AT) is an objective and direct measurement that reflects variations in metabolism of skeletal muscles during exercise. Its prognostic value in heart disease of non-Chagas etiology is well established. The risk of mortality in Chagas cardiomyopathy is relatively well assessed by the Rassi score. However, the added value that AT can bring to the Rassi score has not been studied.
Objective: To assess whether AT presents additional prognostic value to the Rassi score in patients with chronic Chagas cardiomyopathy.
Methods: In this prospective dynamic cohort study, 150 medical records were reviewed, and 45 records of patients who underwent cardiopulmonary exercise testing between 1996 and 1997 and followed until September 2015 were selected. The data were analyzed using a logistic regression model to detect associations between the study variables. The fit of the models was confirmed using receiver operating curves and the coefficient of determination R^2.
Results: Eight patients (17.78%) had died by September 2015, seven of them (87.5%) from cardiovascular causes, of whom four (57.14%) were considered high risk by the Rassi score. With the Rassi score as independent variable and death as the outcome, we obtained an area under the curve (AUC) of 0.711, with R^2=0.214. With AT as independent variable, AUC was 0.706, with R^2=0.078. When both Rassi score and AT were defined as independent variables, AUC was 0.800, with R^2=0.263.

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Conclusion: When AT is included in logistic regression, it increases the accuracy of the Rassi score for mortality prediction by 5%.

PALAVRAS-CHAVE
Doença de Chagas;
Limiar anaeróbio;
Cardiomiopatia chagásica;
Doenças negligenciadas;
Escore de Rassi

Valor adicional do limiar anaeróbio em um modelo de predição de morte geral em uma coorte urbana de pacientes com cardiopatia chagásica

Resumo
Fundamento: O limiar anaeróbico (LA) é reconhecido como medida objetiva que reflete variações no metabolismo dos músculos esqueléticos no exercício. Seu valor prognóstico nas cardiopatias não chagásicas está bem estabelecido. Entretanto, a avaliação de risco de morte em cardiopatas chagásicos está relativamente estabelecida pelo escore de Rassi. Porém, o valor adicional que o LA pode trazer ao escore não foi estudado ainda.
Objetivo: Avaliar se o LA apresenta um efeito adicional ao escore de Rassi em cardiopatas chagásicos.
Métodos: Estudo prospectivo de coorte dinâmica com análise retrospectiva de prontuários, foram analisados 150 prontuários de pacientes. Foram selecionados para a coorte 45 prontuários de pacientes que fizeram teste cardiopulmonar de exercício (TCPE) entre 1996 e 1997 e foram acompanhados até setembro de 2015. Análise dos dados para detectar associação entre variáveis estudadas pode ser vista com um modelo de regressão logística. A adequabilidade dos modelos foi verificada com curvas ROC e o coeficiente de determinação R^2.
Resultados: Oito pacientes (17,78%) morreram até setembro de 2015, sete (87,5%) por causas cardiovasculares, dos quais quatro (57,14%) eram de alto risco pelo escore. Com escore de Rassi como variável independente, óbito era o desfecho, obtivemos área sob a curva (AUC)=0,711, com R^2=0,214. Com LA como variável independente, verificamos AUC=0,706, com R^2=0,078. Com a definição do escore de Rassi mais o LA como variáveis independentes, foi obtida AUC=0,800 e R^2=0,263.
Conclusão: Quando a variável LA é incluída na regressão logística, ela aumenta em 5% a explicação (R^2) à estimativa de morte.

Introduction

Despite significant reductions in transmission, Chagas disease is still of considerable epidemiological importance in Brazil, due to the large number of infected individuals who may go on to develop severe forms of the disease. The number affected in Brazil is estimated at over a million, one-third of whom have cardiac involvement,[1] which is the most serious clinical manifestation, since up to 10% of these patients develop heart failure.[2] Mortality from Chagas disease in Brazil remains high and is strongly correlated with the presence of cardiac involvement.[2,3]

In 2006, Rassi et al.[4] published a score for predicting mortality in patients with Chagas cardiomyopathy (CCM). Briefly, of a range of demographic and clinical parameters and non-invasive studies, six were found to be independent predictors of mortality and were used in the score: New York Heart Association class III or IV (5 points), evidence of cardiomegaly (5 points), left ventricular (LV) segmental or global wall-motion abnormality on two-dimensional echocardiography (3 points), non-sustained ventricular tachycardia on 24-hour Holter monitoring (3 points), low QRS voltage (2 points), and male gender (2 points). Patients were classified as low-risk (0-6 points), intermediate-risk (7-11 points), or high-risk (12-20 points).

In individuals with LV systolic dysfunction, systolic volume and cardiac output during exercise are reduced, and there is thus inadequate oxygen (O_2) supply to the peripheral muscles. This hampers removal of lactate produced during exertion, lowering blood pH and resulting in metabolic acidosis,[5,6] which in turn affects muscle contraction. This is experienced as muscle fatigue[7] and hence exercise intolerance.

The anaerobic threshold (AT) is an objective and direct measurement that reflects variations in metabolism of skeletal muscles during exercise.[8,9] It has been shown that in