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PROGRAMA DE PÓS-GRADUAÇÃO EM ALIMENTAÇÃO, NUTRIÇÃO E SAÚDE

**ÂNGULO DE FASE E SARCOPENIA EM PACIENTES IDOSOS COM
INSUFICIÊNCIA CARDÍACA**

PATRÍCIA BIEGER

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**Porto Alegre
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Dissertação de Mestrado apresentada ao Programa de Pós-Graduação em Alimentação, Nutrição e Saúde da Universidade Federal do Rio Grande do Sul, como requisito parcial para a obtenção do título de Mestre em Alimentação, Nutrição e Saúde.

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A Comissão Examinadora, abaixo assinada, aprova a Dissertação de Mestrado “**Ângulo de fase e sarcopenia em pacientes idosos com insuficiência cardíaca**”, elaborado por PATRÍCIA BIEGER, como requisito parcial para obtenção do título de Mestre em Alimentação, Nutrição e Saúde.

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RESUMO

Introdução: A Insuficiência Cardíaca (IC) é considerada uma síndrome clínica na qual o coração apresenta capacidade reduzida de bombear sangue suficiente a fim de suprir as exigências metabólicas dos tecidos. A sarcopenia, que apresenta uma perda muscular mais acelerada e acentuada em pacientes com IC, agrava o prognóstico da doença. A relação entre o ângulo de fase (AF), mensurado pela bioimpedância elétrica (BIA), e o prognóstico de algumas doenças pode ser compreendida também pelo cenário de desnutrição prolongada e inflamação, resultando em morte celular. A avaliação do nível de integridade celular por meio do AF oferece uma abordagem de um método prático, cuja associação com a sarcopenia ainda não foi esclarecida nessa população específica. **Objetivos:** Avaliar a associação de valores de AF com a sarcopenia e seus componentes, assim como estabelecer o ponto de corte do AF para prever desfechos, como internação hospitalar e mortalidade, em pacientes idosos com IC. **Metodologia:** Estudo de coorte com pacientes ambulatoriais com IC atendidos no Hospital de Clínicas de Porto Alegre (HCPA). O AF foi mensurado através de BIA e o diagnóstico de sarcopenia seguiu os critérios do *European Working Group on Sarcopenia in Older People*. Foi realizada avaliação antropométrica, bioimpedância elétrica (AF e composição corporal) e capacidade funcional, além de analisados os marcadores inflamatórios: Proteína C-reativa ultrasensível (PCR-US), Interleucina-6 (IL-6) e Fator de necrose tumoral alfa (TNF- α). O ponto de corte para AF foi determinado pela Curva Característica de Operação do Receptor (ROC). O tempo de seguimento para avaliar internação hospitalar e mortalidade foi de três anos. **Resultados:** Foram incluídos 106 pacientes com IC, sendo a maioria do sexo masculino, brancos e com idade média de $69 \pm 7,0$ anos, predominando pacientes com fração de ejeção do ventrículo esquerdo reduzida (FEVE) (70,8%) e classes funcionais da NYHA I e II (82,1%). Provável sarcopenia foi encontrada em 36,8%, sarcopenia em 23,6% e sarcopenia grave em 4,4% dos pacientes. Sarcopênicos apresentavam maior média de idade comparativamente a não sarcopênicos ($73 \pm 8,1$ e $67,8 \pm 6,1$ anos; $p=0,001$), associação com FEVE reduzida ($p=0,027$) e índice de massa corporal (IMC) $\leq 24,9$ kg/m² ($p<0,001$), menor índice de massa corporal ($23,1 \pm 2,7$ e $28,3 \pm 4,2$ kg/m²; $p<0,001$) e maiores valores de IL-6 (2,7 [1,05,2] e 1,8 [1,0-2,7]; $p=0,39$). Valores médios de AF foram menores nos pacientes sarcopênicos ($4,9 \pm 0,9$ e $6,0 \pm 0,8$; $p<0,001$). O ponto de corte detectado para sarcopenia na curva ROC foi de $5,45^\circ$ e esse foi associado ao menor uso de IECA/BRA (83,3%; $p=0,048$) e IMC $\leq 24,9$ kg/m² (54,8%; $p=0,008$). Valores de AF abaixo deste ponto de corte foram também associados a cada um dos componentes sarcopênicos avaliados. Por fim, ao avaliar o efeito do AF $<5,45^\circ$ nos desfechos de internação e óbito, esse demonstrou ser preditor independente para internação hospitalar ($p=0,042$) em toda a amostra estudada. **Conclusão:** O AF foi associado a componentes diagnósticos da sarcopenia e o ponto de corte $<5,45^\circ$ demonstrou-se um preditor independente da mesma. O AF $< 5,45^\circ$ se mostrou também preditor independente para internação ao longo de 3 anos em pacientes idosos com IC, independente da sarcopenia.

Palavras-chave: ângulo de fase, bioimpedância elétrica, sarcopenia, insuficiência cardíaca, internação, mortalidade.

ABSTRACT

Introduction: Heart failure (HF) is considered a clinical syndrome in which the heart has a reduced ability to pump enough blood to meet the metabolic demands of the tissues. Sarcopenia, which presents a more accelerated and accentuated muscle loss in patients with HF, worsens the prognosis of the disease. The relationship between the phase angle (PA), measured by bioelectrical impedance (BIA), and the prognosis of some diseases can also be understood by the scenario of prolonged malnutrition and inflammation, resulting in cell death. The assessment of the level of cellular integrity through PA offers an approach of a practical method, whose association with sarcopenia has not yet been clarified in this specific population. **Objectives:** To assess the association of PA values with sarcopenia and its components, as well as establish the PA cut-off point to predict outcomes, such as hospital admission and mortality, in elderly patients with HF. **Methodology:** Cohort study with outpatients with HF treated at Hospital de Clínicas de Porto Alegre (HCPA). PA was measured using BIA and the diagnosis of sarcopenia followed the criteria of the European Working Group on Sarcopenia in Older People. Anthropometric evaluation, bioelectrical impedance (PA and body composition) and functional capacity were performed, in addition to analyzing the inflammatory markers: Ultrasensitive C-reactive protein (US-CRP), Interleukin-6 (IL-6) and Tumor necrosis factor alpha (TNF- α). The cut-off point for AF was determined by the Receiver Operating Characteristic Curve (ROC). The follow-up time to assess hospital admission and mortality was three years. **Results:** 106 patients with HF were included, most of them male, white and with a mean age of 69 ± 7.0 years, with a predominance of patients with reduced left ventricular ejection fraction (LVEF) (70.8%) and functional classes of NYHA I and II (82.1%). Probable sarcopenia was found in 36.8%, sarcopenia in 23.6% and severe sarcopenia in 4.4% of patients. Sarcopenic patients had a higher mean age compared to non-sarcopenic patients (73 ± 8.1 and 67.8 ± 6.1 years; $p=0.001$), association with reduced LVEF ($p=0.027$) and body mass index (BMI) $\leq 24,9$ kg/m² ($p<0.001$), lower body mass index (23.1 ± 2.7 and 28.3 ± 4.2 kg/m²; $p<0.001$) and higher IL-6 values (2.7 [1.05.2] and 1.8 [1.0-2.7]; $p=0.39$). Mean PA values were lower in sarcopenic patients (4.9 ± 0.9 and $6.0\pm 0.8^\circ$; $p<0.001$). The cutoff point detected for sarcopenia in the ROC curve was 5.45° and this was associated with lower use of ACEI/ARB (83.3%; $p=0.048$) and BMI ≤ 24.9 kg/m² (54.8 %; $p=0.008$). PA values below this cut-off point were also associated with each of the sarcopenic components evaluated. Finally, when evaluating the effect of PA $<5.45^\circ$ on hospitalization and death outcomes, it proved to be an independent predictor for hospitalization ($p=0.042$) in the entire sample studied. **Conclusion:** PA was associated with diagnostic components of sarcopenia and the cutoff point $<5.45^\circ$ proved to be an independent predictor of sarcopenia. PA $< 5.45^\circ$ was also an independent predictor of hospitalization over 3 years in elderly patients with HF, regardless of sarcopenia.

Keywords: phase angle, electrical bioimpedance, sarcopenia, heart failure, hospitalization, mortality.

FORMATO DA DISSERTAÇÃO

Essa dissertação segue o formato proposto pelo Programa de Pós-Graduação em Alimentação, Nutrição e Saúde da Universidade Federal do Rio Grande do Sul:

1. Introdução
2. Revisão da literatura.
3. Artigo original.

LISTA DE ABREVIATURAS E SIGLAS

AF	Ângulo de fase
ASHT	<i>American Society of Hand Therapists</i>
AWGS	<i>Asian Working Group for Sarcopenia</i>
BIA	Bioimpedância elétrica
BRA	Bloqueadores de Receptores da Angiotensina
CMB	Circunferência muscular do braço
CP	Circunferência da panturrilha
DATASUS	Departamento de informática do Sistema Único de Saúde do Brasil
DEXA	Densitometria por dupla emissão de raios-X
DPOC	Doença Pulmonar Obstrutiva Crônica
ESPEN-SIG	<i>European Society for Clinical Nutrition and Metabolism Special Interest Groups</i>
EWGSOP	<i>European Working Group on Sarcopenia in Older People</i>
FEVE	Fração de ejeção ventricular esquerda
FNIH	Fundação para o Instituto Nacional de Saúde
FPP	Força de prensão palmar
IC	Insuficiência Cardíaca
ICC	Insuficiência cardíaca crônica
ICFEi	Insuficiência cardíaca com fração de ejeção intermediária
ICFEp	Insuficiência Cardíaca com fração de ejeção preservada
ICFEr	Insuficiência Cardíaca com fração de ejeção reduzida
IECA	Inibidores da Enzima Conversora de Angiotensina
IGF-1	Fator de crescimento semelhante à insulina tipo 1
IL-6	Interleucina – 6

IMC	Índice de massa corporal
IWGS	<i>International Working Group on Sarcopenia</i>
MMEA	Massa muscular esquelética apendicular
NYHA	<i>New York Heart Association</i>
PCR	Proteína C reativa
R	Resistência
RM	Ressonância magnética
ROC	Curva Característica de Operação do Receptor
SARC-F	<i>Strength, Assistance with walking, Rising from a chair, Climbing stairs, and Falls</i>
SPPB	<i>Short Physical Performance Battery</i>
TC	Tomografia computadorizada
TNF- α	Fator de necrose tumoral alfa
TUG	<i>Timed Up and Go</i>
Xc	Reatância
Z	Impedância

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