

Introduction: Background Sarcopenia is frequently observed in patients with rheumatoid arthritis (RA) and contributes to decreased physical function, reduced quality of life, and increased frailty [1]. Phase angle (PhA), derived from bioelectrical impedance analysis (BIA), reflects cellular health and muscle quality, and has been highlighted as a biomarker for predicting sarcopenia-related outcomes [2]. This study evaluated the diagnostic utility of PhA in identifying rheumatoid sarcopenia and compared their effectiveness with conventional diagnostic criteria. 1 Li TH, Xu H, Sun Y, et al. The prevalence and risk factors of sarcopenia in rheumatoid arthritis patients: a systematic review and meta-regression analysis. *Semin Arthritis Rheum.* 2021;51(2):236-245. 2 Yamada Y, Nishizawa M, Yoshida T, et al. Association of bioelectrical phase angle with aerobic capacity, complex gait ability and total fitness score in older adults. *Exp Gerontol.* 2021; 150: 111350.

Methods: This study included 276 female RA patients who participated in a prospective cohort study (Fairy study) between March 2021 and December 2022, receiving outpatient treatment at Nagoya University Hospital (Nagoya, Japan). All patients underwent assessments of body composition and physical function. Subsequently, the patients were divided into a sarcopenia group (n = 54) and a non-sarcopenia group (n = 222) based on the sarcopenia diagnostic criteria established by the Asian Working Group for Sarcopenia. PhA was measured using a standardized BIA method. Pearson correlation analysis was conducted to investigate the association between PhA and other body composition and physical function parameters, followed by further analysis adjusted for age, body mass index (BMI), DAS28-CRP, and disease duration. The association between PhA categories and the prevalence of sarcopenia was assessed using the Cochran-Armitage test for trend, and receiver operating characteristic curves were applied to evaluate the diagnostic accuracy of these risk factors.

Results: Sarcopenia versus Non-Sarcopenia showed significant differences in terms of age (69 vs. 62 years), disease duration (17 vs. 11 years), RF positive rate (92 vs. 73%), Steinbrocker stage III/IV (70 vs. 40%), but there were no differences in DAS28-CRP (2.07 vs. 1.89). The baseline body composition and physical function of the participants were as follows (Table 1). Sarcopenia group showed significantly lower PhA values compared to non-sarcopenia patients ($3.46 \pm 0.58^\circ$ vs. $4.12 \pm 0.72^\circ$), and the total muscle mass and another segment were inferior ($p < 0.001$). It was also inferior in all categories of physical function. PhA correlated to handgrip strength ($r = 3.25$), walking speed ($r = 0.11$), total muscle mass ($r = 1.39$) ($p < 0.001$), nor SMI ($r = -0.02$, $p = 0.721$), after adjustments for age, BMI, DAS28-CRP, disease duration. The lower the value of the relative phase angle, the higher the prevalence of sarcopenia ($p < 0.001$) (Figure 1). The cutoff value of PhA for sarcopenia is 4.00 (95%CI, 0.70-0.83, $P < 0.001$).

Discussion: PhA showed significant correlations with handgrip strength, walking speed, and

muscle mass ($p < 0.001$), indicating a strong association with key components of sarcopenia diagnosis, namely physical function and muscle quantity. Notably, the absence of a significant correlation with the SMI suggests that PhA may reflect muscle “quality” rather than quantity.

Significance/Clinical Relevance: PhA, as a non-invasive and easily obtainable parameter from bioelectrical impedance analysis, may serve as a practical and reliable marker for the early detection of sarcopenia in patients with RA. Given the high prevalence of sarcopenia and its negative impact on functional outcomes in RA, incorporating PhA into routine assessments could facilitate timely intervention and personalized management strategies. This may ultimately improve patient quality of life and reduce the burden of disability associated with rheumatoid sarcopenia.