A low phase angle measured with bioelectrical impedance analysis is associated with osteoporosis and is a risk factor for osteoporosis in community-dwelling people: the Yakumo study

Archives of Osteoporosis

December 2018, 13:39 | Cite as

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Original Article
First Online: 05 April 2018

Abstract

Summary

Although the phase angle has been reported to be related to predictive factors and therapeutic effects in various diseases, its relation with osteoporosis is unclear. In our large prospective survey of community-dwelling people, a low phase angle was related with osteoporosis, and it could be a predictor of osteoporosis.

Purpose

The phase angle measured with bioelectrical impedance analysis (BIA) is one of the clinically important impedance parameters, and it is a predictor of prognosis and mortality for several diseases. The present cross-sectional study aimed to elucidate the association between osteoporosis and variables measured with BIA, including the phase angle.

Methods

The study included 307 participants from an annual health checkup. All participants underwent measurement of bone status by quantitative ultrasound and body composition by BIA. Osteoporosis was diagnosed according to the WHO classification, and statistical comparisons were conducted between normal individuals and osteoporosis patients.

Results

Age, proteins, minerals, and the phase angle were significantly different between normal individuals and osteoporosis patients ($p < 0.001$). Furthermore, after controlling for age and sex, proteins, minerals, and the phase angle were significantly lower in osteoporosis patients than those in normal individuals ($p < 0.001$). In multivariate logistic regression analysis, older age and a low phase angle were risk factors for osteoporosis. Additionally, multiple regression analysis showed that age, sex, proteins, minerals, and the appendicular skeletal muscle index were significantly related to the phase angle.

Conclusions

The phase angle is a predictor of osteoporosis, which is unaffected by age and sex, and a lower phase angle is associated with greater probability of osteoporosis. The phase angle can be easily measured, and osteoporosis can be confirmed even at home. This may facilitate early diagnosis and treatment, which may be useful for preventing diseases related to osteoporosis.

Keywords

Community-dwelling people Osteoporosis Quantitative ultrasound
Bioelectrical impedance analysis Phase angle

Notes

Acknowledgments

We are grateful to the staff of the Comprehensive Health Care Program held in Yakumo, Hokkaido, and Ms. Marie Miyazaki and Ms. Hiroko Ino of Nagoya University for their assistance throughout this study.

Compliance with ethical standards

All participants provided written informed consent, and the study protocol was approved by the Institutional Review Board of Nagoya University Graduate School of Medicine. Moreover, the study protocol was approved by the Committee on Ethics in Human Research of our university, and the study procedures were carried out in accordance with the principles of the Declaration of Helsinki.

Conflicts of interest

None.

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Cite this article as:
Tanaka, S., Ando, K., Kobayashi, K. et al. Arch Osteoporos (2018) 13: 39. https://doi.org/10.1007/s11657-018-0450-8

- Received 02 January 2018
- Accepted 27 March 2018
- First Online 05 April 2018
- DOI https://doi.org/10.1007/s11657-018-0450-8
- Publisher Name Springer London
- Print ISSN 1862-3522
- Online ISSN 1862-3514

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