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Editorial

Sarcopenic Obesity, the Possible Culprit for Nonalcoholic Fatty Liver Disease or Fibrosis

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See "Association between Sarcopenic Obesity Status and Nonalcoholic Fatty Liver Disease and Fibrosis" by Wolhwa Song, et al. on page 130, Vol. 17, No. 1, 2023

Sarcopenia is a syndrome characterized by skeletal muscle loss associated with aging and is prevalent in chronic liver disease. Recent studies have reported that sarcopenia is a risk factor for the development of nonalcoholic fatty liver disease (NAFLD) and vice versa.[1] Because sarcopenia and NAFLD share similar pathological mediators, such as insulin resistance, physical inactivity, and obesity, both disorders may have overlapping clinical presentations.[2] This leads to the development of "sarcopenia obesity," characterized by a lean body mass with preserved or increased fat mass.[3]

In this issue of *Gut and Liver*, Song *et al.*[4] investigated the relationship between the sarcopenic obesity status (sarcopenia alone, obesity alone, and sarcopenic obesity) and NAFLD or liver fibrosis in 2,191 participants included in a health check-up program. This study demonstrated that sarcopenic obesity was the risk factor for presence of NAFLD. Moreover, participants with sarcopenic obesity had the highest association with liver fibrosis in participants of other groups according to sarcopenia or obesity. In this editorial, several points could be discussed.

Firstly, sarcopenic obesity could be the confounding factor for metabolic risk abnormalities in terms of liver fibrosis. Previously, Park *et al.*[5] have shown that the fibrotic burden was increased according to the number of metabolic risk abnormalities and/or diabetes in the participants in the health check-up cohort. Although Song *et al.*[4] has adjusted for several metabolic components, but it would be worthwhile to adjust for the other components of the metabolic risk abnormalities (e.g. waist circumference, triglycerides, high-density lipoprotein) or the presence of metabolic syndrome as a whole.

Secondly, there is debate regarding the optimal techniques for the assessment of muscle mass in patients with NAFLD. Skeletal muscle index (SMI) assessed by bioimpedance analysis (BIA) has limitations, especially in patients with concomitant obesity, in whom it can overestimate the prevalence of sarcopenia.[6] In general, SMI measured using BIA can be adjusted for both height (cm^2) and weight (kg). This study used the SMI calculated by the ratio between the sum of the muscle mass values and body weight. Interestingly, a National Health and Nutrition Examination Survey III population study (n=2,551) showed that compared to healthy controls, participants with NAFLD were at a significantly higher risk of developing sarcopenia, based on the weight-adjusted SMI measured by BIA.[7] However, the opposite was observed when sarcopenia was defined using height-adjusted SMI. In another study from Japan, they found that sarcopenic obesity was associated with non-obese NAFLD (body mass index <25 kg/m^2) but not with obese NAFLD (body mass index ≥25 kg/m^2) when they evaluated the presence of sarcopenia based on the measurement of bone densitometry, the gold standard diagnostic method for sarcopenia.[8] These findings represent the limitations of BIA assessment in the diagnosis of sarcopenia in NAFLD and highlight the importance of standardizing diagnostic approaches.

Thirdly, it is difficult to determine a cause-effect rela-

tionship between NAFLD and sarcopenia as they share many complex interplaying mechanisms.[2] For instance, NAFLD can lead to sarcopenia by activating myostatin, and low skeletal muscle mass can induce liver damage by activating the myostatin receptor in hepatic stellate cells.[9] Although Song *et al.*[4] provided important evidence for this association, a cause-effect relationship cannot be accurately assessed in this study of cross-sectional observational design. In this regard, Sinn *et al.*[10] recently conducted a longitudinal analysis to assess the impact of NAFLD on the loss of skeletal muscle mass in 52,815 participants who underwent at least two health check-up examinations with BIA. The 5-year loss of skeletal muscle mass was faster in participants with NAFLD (–281.3 g) than in those without NAFLD (–225.2 g). This suggests that NAFLD could be the risk factor for sarcopenia. However, an important concern remains that the characteristics of participants with and without NAFLD were quite different at baseline (i.e., lower SMI, sex, and comorbidity distribution).

In conclusion, identifying whether sarcopenia is a cause, consequence, or confounder of the metabolic risk abnormalities in the outcome of NAFLD or fibrosis remains a challenge. Nevertheless, this study demonstrated the important association of sarcopenic obesity status and increased the risk of developing NAFLD or liver fibrosis. The detailed factors of disease pathogenesis and accurate assessment method are yet to be elucidated.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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REFERENCES

1. Lee YH, Jung KS, Kim SU, et al. Sarcopaenia is associated with NAFLD independently of obesity and insulin resistance: Nationwide surveys (KNHANES 2008-2011). J Hepatol 2015;63:486-493.
2. Koo BK, Kim D, Joo SK, et al. Sarcopenia is an independent risk factor for non-alcoholic steatohepatitis and significant fibrosis. J Hepatol 2017;66:123-131.
3. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis. Report of the European Working Group on Sarcopenia in Older People. Age Ageing 2010;39:412-423.
4. Song W, Yoo SH, Jang J, et al. Association between sarcopenic obesity status and nonalcoholic fatty liver disease and fibrosis. Gut Liver 2023;17:130-138.
5. Park H, Yoon EL, Kim M, et al. Selecting the target population for screening of hepatic fibrosis in primary care centers in Korea. J Clin Med 2022;11:1474.
6. Jensen B, Braun W, Geisler C, et al. Limitations of fat-free mass for the assessment of muscle mass in obesity. Obes Facts 2019;12:307-315.
7. Peng TC, Wu LW, Chen WL, Liaw FY, Chang YW, Kao TW. Nonalcoholic fatty liver disease and sarcopenia in a Western population (NHANES III): the importance of sarcopenia definition. Clin Nutr 2019;38:422-428.
8. Kashiwagi K, Takayama M, Fukuhara K, et al. A significant association of non-obese non-alcoholic fatty liver disease with sarcopenic obesity. Clin Nutr ESPEN 2020;38:86-93.
9. Bhanji RA, Narayanan P, Allen AM, Malhi H, Watt KD. Sarcopenia in hiding: the risk and consequence of underestimating muscle dysfunction in nonalcoholic steatohepatitis. Hepatology 2017;66:2055-2065.
10. Sinn DH, Kang D, Kang M, et al. Nonalcoholic fatty liver disease and accelerated loss of skeletal muscle mass: a longitudinal cohort study. Hepatology 2022;76:1746-1754.