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LETTER TO THE EDITOR

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Obesity paradox in sarcopenia and knee osteoarthritis: comment on the article by Andrews et al

To the Editor:

We have read the article by Andrews et al with interest (1). Their article describes an important study evaluating the association between sarcopenia and knee osteoarthritis (OA). We congratulate the authors for their efforts in drawing attention to the consequences of sarcopenia. They have found that among older men, higher appendicular lean mass (ALM) was associated with knee pain/OA. We agree with the authors that further confounders (eg, obesity paradox) could have been responsible for this surprising observation (2). We also believe that there is a methodological problem in both assessing the age-related muscle loss (regional vs. appendicular) for sarcopenia and assessing knee OA.

First, we feel obliged to question the authors' approach to the diagnosis of knee OA. The first misgiving we see is the following diagnostic criterion: "participant report that a physician has ever told them that they have OA or degenerative arthritis of the knee" (1). This statement does not explain how the physician diagnosed knee OA. (Was it after x-ray imaging, clinical examination, or taking history?) Further, self-report of knee pain can also be misleading because (other than OA) there are different causes of knee pain, eg, hip problems or disorders of other knee structures. We understand that the authors adopted this definition from other studies, but we call for cautiousness when generally interpreting such conditions as knee OA. To this end, for future studies, we suggest a different approach for initial knee degenerative joint disease assessment. To avoid the radiation exposure of asymptomatic volunteers, one can effectively use ultrasound imaging to assess for signs of degenerative knee joint diseases, eg, decrease in the distal femoral cartilage thickness, knee effusion or presence of Baker's cyst, and periarticular osteophytes (3–6).

Another major issue is the methodology for measuring the age-related loss of muscle mass (regional vs. appendicular). Age-related muscle loss is not uniform in the body. Atrophy/loss of

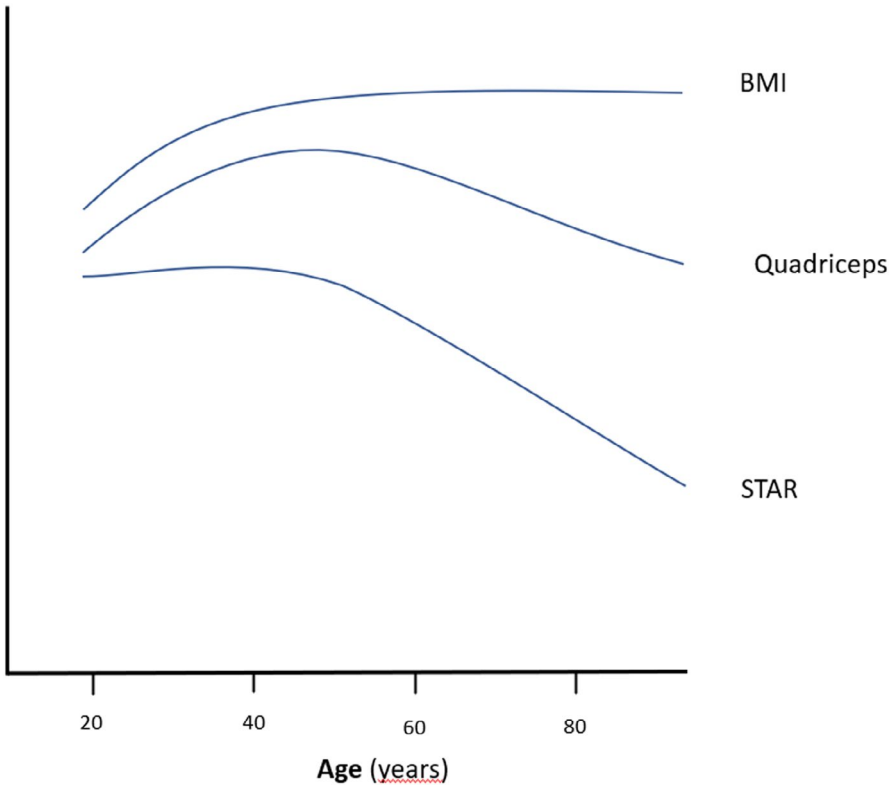

Figure 1. A theoretical graphic shows the relationship between anterior thigh muscle mass and body mass index (BMI) with aging. STAR, sonographic anterior thigh muscle thickness ratio (anterior thigh muscle thickness/BMI) (7).

type 2 muscle fibers develops during aging. As such, muscles rich in type 2 fibers, such as anterior thigh muscles, undergo atrophy earlier, and muscles rich in type 1 fibers (eg, posture muscles) are relatively spared (7). Therefore, measuring ALM instead of regional (ie, anterior thigh) muscle measurements may not suffice in the age-related muscle loss (8). Interestingly, a 12-year follow-up study showed that ALM (measured by dual-energy x-ray absorptiometry) cannot precisely detect the age-related loss of muscle mass (9). In that study, because ALM was also correlated with body stature and body mass index (BMI), having lower ALM (also lower BMI) was found to be preventive for the risk of knee OA.

Second, an aging-related increase of BMI results in an increase in the anterior thigh (ie, quadriceps) muscle mass until the middle of the fifth decade (Figure 1). This increase in BMI with aging can also lead to age- and obesity-related metabolic diseases, such as hypertension, dyslipidemia, insulin resistance, and metabolic syndrome, over time; thus, type 2 muscle fiber atrophy and loss may be accelerated in the anterior thigh (10). Importantly, the anterior thigh muscle can compensate for lifting extra body weight up to a certain time/age. However, when the anterior thigh muscle mass does not increase (or even decrease) despite the increase in BMI with aging, physiological functions, such as muscle strength and power, may be affected. In such a scenario, the patient presents with difficulty in squatting, standing from a chair, and climbing upstairs and going downstairs (8). In addition, the combination of load on the knee joints, sarcopenia, and an increase in BMI leads to muscle failure in the quadriceps muscle, which accelerates the development of knee OA.

In conclusion, because the anterior thigh muscle is the most commonly affected group with aging, is important for mobility, and is related to adverse outcomes, including knee OA, we should measure the anterior thigh muscle mass (rather than ALM) for sarcopenia assessment (11). Last but not least, although increased BMI is protective for muscle mass up to a certain degree/age, together with its related metabolic diseases (obesity paradox during aging) (2), obesity accelerates anterior muscle loss/atrophy, which also causes sarcopenia and increases the risk of knee OA. Sarcopenia is an important public health problem that is potentially modifiable. Of note, we believe that it should become the target of further studies and awareness of practicing physicians across specialties. Likewise, one important step to enhance scientific research was the establishment of simple criteria with no need for special and expensive equipment to diagnose sarcopenia (8).

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1. Andrews JS, Gold LS, Nevitt M, Heagerty PJ, Cawthon PM. Appendicular lean mass, grip strength, and the development of knee osteoarthritis and knee pain among older adults. ACR Open Rheumatol 2021. E-pub ahead of print.
2. Chapman IM. Obesity paradox during aging. Interdiscip Top Gerontol 2010;37:20–36.
3. Kandemirli GC, Basaran M, Kandemirli S, Inceoglu LA. Assessment of knee osteoarthritis by ultrasonography and its association with knee pain. J Back Musculoskelet Rehabil 2020;33:711–7.
4. Angerová Y, Mezian K, Kara M, Pudilová V, Sobotová K, Michalčinová K, et al. Ultrasonographic evaluation of the distal femoral and talar cartilage thicknesses in patients with poliomyelitis: a cross-sectional observational study. Eur J Phys Rehabil Med 2020;56:421–6.
5. Mezian K, Ata AM, Kara M, Şahin Onat Ş, Gürçay E, Çalışkan A, et al. Ultrasonographic evaluation of the femoral cartilage, Achilles tendon, and plantar fascia in young women wearing high-heeled shoes. PM R 2019;11:613–8.
6. Özçakar L, Kara M, Chang KV, Tok F, Hung CY, Akkaya N, et al. EURO-MUSCULUS/USPRM. Basic scanning protocols for knee. Eur J Phys Rehabil Med 2015;51:641–6.
7. Kara M, Kaymak B, Ata AM, Özkal Ö, Kara Ö, Baki A, et al. STAR: sonographic thigh adjustment ratio: a golden formula for the diagnosis of sarcopenia. Am J Phys Med Rehabil 2020;99:902–8.
8. Kara M, Kaymak B, Frontera W, Ata AM, Ricci V, Ekiz T, et al. Diagnosing sarcopenia: functional perspectives and a new algorithm from the ISarcoPRM. J Rehabil Med 2021;53:jrm00209.
9. Shimokata H, Ando F, Yuki A, Otsuka R. Age-related changes in skeletal muscle mass among community-dwelling Japanese: a 12-year longitudinal study. Geriatr Gerontol Int 2014;14 Suppl 1:85–92.
10. Ekiz T, Kara M, Ata AM, Ricci V, Kara Ö, Özcan F, et al. Rewinding sarcopenia: a narrative review on the renin-angiotensin system. Aging Clin Exp Res 2021. E-pub ahead of print.
11. Kara M, Frontera WR, Özçakar L. Measure what matters most in sarcopenia: regional vs. appendicular muscle mass? [letter]. J Am Med Dir Assoc 2021;22:883–4.