

EDITORIAL

Tipping the Scales for Older Adults: Time to Consider Body Fat Assessment and Management for Optimal Atherosclerotic Cardiovascular Disease and Stroke Prevention?

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Obesity is known to have many adverse effects on major cardiovascular disease (CVD) risk factors, including glucose abnormalities, such as metabolic syndrome and diabetes mellitus, as well as hypertension, plasma lipids, and systemic inflammation, all of which markedly increase the risk of coronary heart disease.¹ Obesity also has adverse effects on cardiac structure, including left ventricular geometric abnormalities, and function,² and these factors, along with increased coronary heart disease, hypertension, and diabetes mellitus, lead to marked increases in the risk of CVD, especially heart failure (HF) and stroke.^{3,4} Therefore, it is not surprising that there are marked increases in CVD and stroke in patients with obesity.^{1,4} However, most obesity studies, including in older cohorts, are based solely on body mass index (BMI). BMI reflects both fat and muscle. Obesity measured by BMI has been associated with an obesity paradox in cohorts with CVD^{1,3} as well as in older populations.⁵ In addition, healthy skeletal muscle structure and function may be protective against CVD, including in elderly individuals.^{6,7} Therefore, studies assessing adipose regional distribution, such as visceral adipose tissue (VAT) and skeletal muscle density (SMD), as a proxy

for fat infiltration in muscle, may be important to assess CVD risk, including stroke, in older populations.

See Article by Ballin et al.

In the study by Ballin and colleagues in this issue of the *Journal of the American Heart Association (JAHA)*, VAT and SMD were assessed by dual-energy x-ray absorptiometry and peripheral computed tomography in 3294 70-year-old research participants (half women) from Sweden.⁸ During a median follow-up of 3.6 years, there were 108 cases of stroke or myocardial infarction (MI) and 97 deaths. Greater VAT, but not lower SMD, was associated with a significant 56% increased risk of stroke and MI, but neither VAT nor SMD predicted all-cause mortality. Higher VAT predicted an 86% increased risk of MI and stroke in men, but this did not predict increased risk in women.

There are some limitations to these data, however. Dual-energy x-ray absorptiometry–based VAT measurement tends to underestimate VAT at low BMI and overestimate VAT at high BMI when compared with the gold standard magnetic resonance imaging.⁹ For older adults with usually lower mass muscle/lower BMI, VAT may be slightly underestimated in this

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study; nevertheless, it could be that the magnitude of the associations of VAT with MI and stroke might actually be greater because VAT could be underestimated in this cohort. This could be particularly true for women, because those associations were null: women tend to have lower VAT in the first place, so dual-energy x-ray absorptiometry could underestimate further and make it difficult to find associations in women. In addition, the outcomes of MI, stroke, and mortality are important, but HF is missing; and this may be more important in people 70 years of age in 2021^{1,3,7} as HF among elderly individuals is a major problem, and one could posit that both VAT and muscle fat infiltrate (lower SMD) would correlate with HF diagnoses. Further assessments of HF are something that the authors or others could investigate in the future in such a cohort. Third, they did not adjust their findings for BMI, and it may be interesting to know if their findings were independent of BMI. This could especially be of interest in elderly individuals, where the combination of low BMI+high VAT could signify high CVD risk. It would have also been informative to see associations by these types of discordant/extreme phenotypes.

Despite these limitations, however, the authors have presented a well thought out study that demonstrates VAT is associated with stroke and CVD in male Swedish patients who are 70 years of age after controlling for CVD risk factors, educational status, medications, and exercise. No association was found with all-cause mortality over a period of \approx 4 years. Factors that make this study unique include the evaluation of fat deposition with both VAT and SMD, the high participation of research candidates, and the completeness of the outcome data. The findings support prior reports of associations of CVD/stroke risk and abdominal fat. However, the ability to more broadly infer similar associations with other cohorts may be limited. Also, there is still much to be learned about how and when VAT becomes most pathologic, including the following:

1. *Generalization of the results to other study populations:* This study population includes patients only from Sweden, and it has been reported that the proportion of patients who have stroke causally related to obesity is much less in this region than in many other countries, including the United States.¹⁰ Also, the high degree of participation of subjects (84%) within this cardiovascular lifestyle study is also important to consider. Other regions with higher concentrations of obesity and CVD may or may not have this degree of freely available healthcare resources, and the high percentage of research engagement and participation in this cardiovascular study is

not always replicated in others. In addition, the association between abdominal adiposity and CVD may be partially related to underlying biologic or genetic differences.¹¹ Also, the social and lifestyle factors that were included in this study do not include other social factors that are important to also consider, particularly in some minority groups, which may have a disproportionate prevalence of obesity, stroke, and CVD and face unique social constructs and barriers that affect health outcomes.¹²

2. *The role of sex:* As the authors point out, the association between sex and VAT-related CVD varies between studies. In this study, men in particular had a higher degree of VAT in comparison to woman, and thus they had more CVD events and stroke. However, the association between sex and VAT is still unclear. Abdominal obesity may accumulate differently between men and woman.^{13,14} This is likely secondary to both the complex signaling associated with hormones and the changes in hormone levels that occur in adults over time. Genetics, diet, exercise, pregnancy, menopause, and environmental exposures add to that complexity. Thus, more longitudinal studies with hormone levels and exposures are needed to better define the influence of sex on VAT and its association with stroke and CVD.
3. *The role of age:* As mentioned by the authors, conflicting results reported from other cohort studies about the association between VAT and CVD events and stroke could be related to differences in the age groups included in the different cohort populations. By picking one isolated age group, CVD events and stroke could have been undercounted if most of the events occurred before the initiation of data collection. Two additional factors to consider include the increasing prevalence of obesity and changing medical practices, which cannot be addressed with this study population. For example, we now having an increasing population of stroke in younger patients,⁴ which is thought to be partially secondary to the increased prevalence of metabolic disease and obesity.^{4,10,15} Thus, more longitudinal studies on obesity that include tracking of children and possibly families may be more informative. Also, because our medical practices have advanced, the mortality rate from CVD, such as stroke, has decreased.⁴ The same can be said for many medical conditions, and this is in line with the reported increase in life expectancy in many countries. Thus, effect sizes for all-cause mortality may in fact be lower, depending on the population and access to health care. Last, we do not know what the effect size of VAT loss could be on reduction of CVD stratified by age or in comparison to management of other traditional stroke and CVD risk factors.

4. *What about VAT and COVID-19:* It is also important to consider these results in the context of the viral pandemic caused by severe acute respiratory syndrome coronavirus 2 infection, COVID-19, which has proved to be a new leading cause of death in the United States.¹⁶ The predilection for COVID-19 to cause the most morbidity and mortality in patients with CVD risk factors, such as obesity, makes these results even more relevant and timely.^{17,18} Patients with COVID-19 and preexisting CVD risk factors are at increased risk of thrombotic events, such as acute coronary syndrome and stroke.¹⁹ Also, patients with CVD risk factors, such as obesity, may be at increased risk of long-standing COVID-19–related impact on the cardiovascular system.¹⁹ There are also indirect consequences of the COVID-19 pandemic on the prevalence of obesity. Changes in lifestyle and access to routine preventative health care during the COVID-19 pandemic have already been linked to weight gain,²⁰ and this could also lead to an increase in prevalence of excessive VAT. We have yet to see the full ramifications of the COVID-19 pandemic. Given the already climbing rates of obesity,¹ COVID-19–related weight gain could exacerbate the already brewing epidemic of obesity, or as we recently described an epidemic and pandemic colliding.¹⁷

Finally, Ballin and colleagues should be applauded for their study, which leads to a major question of whether routine assessment and management of body fat and body fat distribution is needed in the older population for better CVD and stroke prevention and management.²¹ The toll of increased stroke and CVD with obesity, along with the recent devastating toll of obesity on the severity of COVID-19 complications, stresses that an urgent call to action is needed.

ARTICLE INFORMATION

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Disclosures

None.

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