Alcohol Consumption and Myocardial Remodeling in Elderly Women and Men

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Alcohol was used daily in ancient societies primarily for purposes of preventing or reducing contaminated water utilization, although its altering effects on mood and behavior have also been determinant factors for its use by humans since the dawn of civilization. In modernity, alcoholic beverages are more frequently used for recreational, social, and other purposes, although even before industrial production and mass distribution became available, chronic heavy alcohol consumption has led to disabling and fatal health problems, including severe damage to the brains, heart, and liver, as well as a myriad of incapacitating psychological, socioeconomic, and emotional conditions. From a public health perspective, alcoholism can affect entire communities and represents an important cause of disease burden worldwide.

As far as the cardiovascular system is concerned, habitual heavy alcohol consumption causes up to one third of nonischemic dilated cardiomyopathy in many countries, and even moderate alcohol intake is associated with atrial fibrillation. On the other hand, a favorable effect of alcohol on lowering the incidence of heart failure has been suggested for light-moderate alcohol consumption. In the Framingham heart study, for example, the lowest hazard ratio for congestive heart failure was seen in men who consumed 8 to 14 drinks per week and in women who consumed 3 to 7 drinks per week. Similarly, in the cardiovascular health study which followed 5888 individuals for 7 to 10 years, moderate drinking, which consisted of 7 to 13 drinks per week, was associated with a lower risk of congestive heart failure. On the other hand, long-term heavy alcohol consumption can have toxic effects on the heart. To assess the question of a dose-response between alcohol consumption and heart failure risk, Larsson et al reviewed 8 prospective studies, including over 200,000 participants and 6000 incident heart failure, and reported that consumption of 7 drinks per week was associated with a 17% lower risk of heart failure in a dose-response meta-analysis. In a recent study by Dorans et al, who prospectively followed a Swedish cohort of 33,760 men to examine the relation of alcohol intake and incident heart failure, the authors found a U-shaped relationship for each beverage type (including beer, wine, or spirits) among men, with heavy intake (drinks per week ≥21) corresponding to a 12% increase in the risk of heart failure, whereas light to moderate alcohol consumption (≥7–13 drinks per week) was associated with a lower risk of heart failure.

However, although women are known to develop alcohol-associated cardiomyopathy at a lower level of alcohol intake, shorter duration of alcoholism, and lower lifetime dose of alcohol use compared with men, in a recent report from the Atherosclerosis Risk in Communities (ARIC) Study by Gonçalves et al, the authors found that men consuming ≤7 drinks per week had reduced risk of heart failure relative to abstainers (hazard ratio, 0.80; 95% confidence interval, 0.68–0.94), but this effect was less robust in women (hazard ratio, 0.84; 95% confidence interval, 0.71–1.00). Even though low to moderate alcohol consumption is associated with lower risk of heart failure for both women and men, that potentially protective effect of alcohol against congestive heart failure seems to be less among women.

Although the sex-related differences on the effects of alcohol consumption on risk of heart failure have been previously reported in large prospective studies, the potential mechanisms of such sex-related differences in incident of heart failure remain uncertain. In this context, the report by Gonçalves and colleagues in this issue of *Circulation: Cardiovascular Imaging* adds interesting new evidence. The authors have examined the relationship between alcohol consumption and cardiac structure and function by modern echocardiographic methods in >4000 elderly male and female participants of the ARIC study, mean age of 76±5 years, excluding those with significant valvular heart disease, as well as former drinkers who may have altered alcohol consumption in response to underlying health conditions. The authors categorized alcohol intake as nondrinkers and drinkers of ≤7 drinks per week, ≥7 to 13 drinks per week, and ≥14 drinks per week. The authors reported that increasing alcohol intake was associated with greater left ventricular (LV) systolic and diastolic diameter along with a reduction in LV-relative wall thickness both in men and women; however, although in men increasing alcohol intake was associated with greater LV mass index, in women, increasing alcohol intake was linearly associated with lower LV ejection fraction. The authors also point out that the sex-related differences in the association between alcohol intake and echocardiographic indices cannot be explained by age, body mass index, use of antihypertensive medication, systolic

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blood pressure, prevalence of diabetes mellitus and coronary vascular disease, economic status, or smoking. The authors suggest that women are more sensitive than men to the toxic effects of alcohol on cardiac function. Interestingly also, a U shape relationship between alcohol intake and parameters of LV structure and function could not be documented.

Previous population cross-sectional studies have reported that LV concentric remodeling was observed to advance with increasing age, blood pressure, and hemoglobin A1c levels.11,12 Although according to Laplace’s law, the concentric remodeling pattern may function as a compensatory mechanism to lower wall stress levels in response to pressure overload, alterations of coronary blood flow, even in the presence of normal coronary arteries,13 may contribute to reduce regional myocardial fiber shortening (myocardial strain) commonly seen in patients with concentric LV remodeling.14 In this regard, data from previous epidemiological studies indicate that LV concentric remodeling predicts incident heart failure15 and other cardiovascular events.16,17

In contrast to concentric remodeling, the data from Gonçalves et al.18 demonstrate that LV relative wall thickness was reduced and end diastolic diameter augmented with increasing alcohol intake. This indicates alcohol consumption might lead to an increased LV eccentricity and not eccentric remodeling because mean LV ejection fraction and LV end diastolic diameter were still within normal limits. Interestingly, the study’s results also suggest that nondrinker status is associated with concentric remodeling. Therefore, one might speculate that light to moderate alcohol consumption may counteract the effect of traditional risk factor burden that commonly lead to concentric remodeling. Because low to moderate alcohol consumption have salutary effects on the risk of heart failure compared with nondrinkers or heavy drinkers and because the primary phenotype of heart failure with preserved ejection fraction is LV concentric remodeling, one may hypothesize based on the article by Gonçalves et al. that one of the protective mechanisms associated with mild to moderate alcohol consumption may be the induction of mild LV eccentricity. Further longitudinal research is required to investigate whether mild to moderate alcohol consumption specifically protects against the development of heart failure with preserved ejection fraction through preventing concentric LV remodeling in the general population.

Also in relation to concentric remodeling, previous data from the Multi-Ethnic Study of Atherosclerosis show that women have higher systolic function than men characterized by higher LV ejection fraction, systolic myocardial shortening (strain), and torsion.11 Moreover, in women, LV ejection fraction is maintained in the face of greater myocardial interstitial fibrosis assessed by T1 mapping, whereas, in men, LV ejection fraction is reduced with progressive fibrosis.19 Those studies also suggest that in women, LV ejection fraction is maintained by a compensatory mechanism involving enhanced torsion.19 In this regard, in a recent experimental study, being female attenuated cardiac remodeling induced by pressure overload.19 In contrast with these findings from a general population, the author’s study obtained in a similar prospective study demonstrates that in women heavy alcohol intake is associated with lower LV ejection fraction and a tendency for worse LV global longitudinal strain, suggesting that women is more sensitive than men to the toxic effects of alcohol in part through a direct cardiac effect of alcohol on myocardial contractility.

In summary, light to moderate alcohol intake is associated with lower incident heart failure when compared with nondrinkers or heavy alcohol consumption. Heavy alcohol consumption induces increased LV eccentricity, whereas in nondrinkers, the lack of alcohol consumption may be associated with concentric remodeling in elderly men and women. Elderly women have higher systolic function than men in the general population but may experience reduced systolic function in association with increased alcohol intake. Given the results of this thought-provoking study, further research is required to investigate the mechanisms underlying the association of alcohol intake with cardiac geometry, systolic function, and incident heart failure.

Disclosures

None.

References


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