Left ventricular diastolic function and exercise capacity in diabetes

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Abbreviations

LV Left ventricular
LVDD Left ventricular diastolic dysfunction

To the Editor: Gusso et al. [1] have reported interesting findings regarding the impairment of stroke volume responses to submaximal exercise in female adolescent individuals with type 1 and type 2 diabetes compared with non-diabetic controls. The diabetic patients also had reduced maximal oxygen uptake. Although the pathophysiological mechanism(s) underlying the reduction in stroke volume during exercise in these young people with diabetes was outside the scope of the study, the authors suggested that increased myocardial stiffness and/or altered filling characteristics related to diabetes could have been associated with the abnormal stroke volume response and might have limited exercise performance. This is an interesting viewpoint, since whether abnormal exercise capacity is affected by well-controlled, uncomplicated diabetes per se is still a matter of debate.

Diabetes has a negative impact on left ventricular (LV) diastolic function in adults [2]. Interestingly, adult patients with well-controlled, uncomplicated type 2 diabetes and left ventricular diastolic dysfunction (LVDD) have been reported

to have a reduced exercise performance compared with controls [3]. Aerobic exercise training normalises LVDD and enhances maximal oxygen uptake in well-controlled, uncomplicated type 2 diabetes [4], suggesting that LVDD could negatively affect exercise performance in these patients. What happens to variables such as stroke volume and cardiac output during exercise in patients with diabetes and an abnormal LV diastolic function or LVDD is less clear. Gusso et al. [1] provide some potential pathophysiological insights that bring our understanding one step further with their results obtained during submaximal exercise. They suggest that early cardiac impairments (such as LV diastolic function-related abnormalities) could partly explain the blunted stroke volume responses to submaximal exercise while reducing exercise capacity in young female patients with diabetes. This is an appealing explanation.

However, abnormalities in LV diastolic function or LVDD are also present in young and adult individuals with uncomplicated obesity [5, 6]. Even if diabetes has an independent effect on LV diastolic function in adults, it would have been interesting if Gusso et al. [1] had provided echocardiographic data as well as data on the prevalence of LVDD in each group. This would enable identification of any difference in the severity of abnormalities in LV diastolic function and in the prevalence of LVDD between groups, which could also have an impact on stroke volume. In addition, although it is difficult to evaluate the duration of diabetes precisely, especially in type 2 diabetes, disease duration could have influenced the severity of abnormalities in LV diastolic function in their diabetic groups.

As highlighted by Gusso et al., the reduction in exercise capacity in their individuals with diabetes could have also been related to impairment in autonomic response to exercise limiting maximal heart rate. Since LVDD has been linked to abnormal heart rate variability in patients with type 2 diabetes

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[7], LVDD could eventually affect exercise capacity indirectly via the associated impairment in cardiac autonomic function.

Their study highlights additional issues. Since it has already been shown that sex influences LV diastolic function in young people [8], are the results applicable to young male patients with diabetes? In addition, knowing that patients with type 1 diabetes were not obese, what would be the relative contribution of obesity in the presence of abnormalities in LV diastolic function in these young people with type 1 diabetes vs those with type 2 diabetes? Several issues need to be clarified regarding the involvement of an abnormal LV diastolic function in the reduced exercise capacity in young and adult patients with diabetes. The article by Gusso et al. [1] adds important details to this fascinating story.

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