Exercise prescription in patients with type 2 diabetes and coronary heart disease: could less be more?

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Physical activity is a powerful nonpharmacological intervention that improves glucose metabolism and other cardiovascular risk factors in patients with type 2 diabetes; advice about physical activity should therefore be included in basic therapeutic recommendations wherever possible [1]. It is, of course, well appreciated that our patients do not always adhere to the lifestyle advice. Sometimes they challenge us about our recommendations. For example, in earlier years, one of us (S.J.) was often puzzled when people with diabetes reported that they experienced higher blood glucose levels after their strenuous 30-min exercise bout. This challenged the advice to engage in regular exercise as the patients felt they had experienced the opposite of the proposed benefit: exercise acutely exacerbated rather than alleviated their hyperglycemia. Such discrepancies between theory and practice may be difficult to satisfactorily explain in the context of a brief clinical consultation and can potentially undermine the physician–patient relationship.

Patients with type 2 diabetes who have developed coronary heart disease represent a particularly vulnerable high-risk group for whom cardiac rehabilitation is recommended. Which exercise regimens are most appropriate given the complex cardiometabolic comorbidities that often exist in such patients? The paper from Schwaab *et al.* [2] in this issue of *Cardiovascular Endocrinology & Metabolism* perhaps may help us start to understand the mechanisms underlying the experiences reported by patients who may question the advice they are given based on their personal observations.

In this small study, Schwaab *et al.* [2] used a crossover design in which each subject acted as his/her own control. The participants had newly diagnosed type 2 diabetes [determined by oral glucose tolerance tests (OGTTs)] and established coronary disease. Subjects exercised at two different intensities, that is, moderate (aerobic) and high (anaerobic). Additional 75 g OGTTs were performed after each exercise session. While the exercise sequence was not randomized, there were no confounding effects of glucose-lowering medications. The increase in postchallenge glucose levels after an oral glucose challenge varied markedly between the two regimens: after

aerobic exercise, 2-h glucose concentrations were lower when compared those after anaerobic strenuous exercise. These observations raise the intriguing possibility that less intensity might be better, at least in some patients with type 2 diabetes and coronary disease, in terms of short-term regulation of blood glucose.

What might be the practical implications of these provisional findings? Clearly, this small study could not be considered as a solid basis for changing widely accepted advice. But let us consider the following clinical scenario: endocrinologists and cardiologists usually offer broad recommendations to the patient along the lines of ‘do more exercise’ – without defining either the workload, the type of exercise or the duration; thus, we as doctors might even be a part of the problem, as we do not really prescribe exercise like we would a drug. For example, we would never tell a patient, ‘just get some angiotensin-converting enzyme inhibitor’, without any clear information about the type of drug, the dose and the time of administration (Table 1). A sound appreciation of the dose-response characteristics for benefits and potential risks of a medication would be well understood by the prescribing physician.

Table 1 Different recommendations in the clinical setting: prescription of a cardiovascular drug vs. prescription of exercise

	Drug	Exercise
Type of medication	ACE inhibitor	‘Be more active’
Prescribed form	5 mg tablet	‘Do whatever you like’
Frequency	Twice daily	‘As much as possible’
Total daily dose	10 mg	‘???’
		‘...as hard as possible’
		‘...as long as possible’

ACE, angiotensin-converting enzyme.

Of note, the European Society of Cardiology has developed a pilot evidence-based interactive decision-support for exercise prescription for patients with cardiovascular disease or cardiovascular risk factors [3].

When considering exercise regimens, we need to bear in mind the fact that many of our patients reach the anaerobic threshold at much lower workloads that we might expect; this limitation reflects low levels of cardiopulmonary fitness [1], as demonstrated by Schwaab *et al.* [2]. For practical reasons, it might therefore be helpful to have the patient exercise in the ‘comfort zone’ (= in which he/she can ‘walk and talk’) to avoid potentially detrimental anaerobic metabolic stress. This might not only improve short-term glucose regulation, but possibly also

the adherence to exercise regimens as many people will likely prefer less vigorous exercise regimens.

Clearly, the current picture is far from complete. The optimal intensity of exercise for patients with type 2 diabetes and coronary heart disease remains uncertain. The findings of Schwaab *et al.* [2] should stimulate further studies that explore issues such as the relevance of different types and intensities of exercise on short- and long-term adaptation of muscle metabolism (and hence metabolic regulation). The interactions between cardiorespiratory fitness and metabolic flexibility, that is, partitioning between carbohydrate and lipid oxidation, are complex with adiposity being only one potentially modifying factor [4]. Questions remain concerning short- and longer-term dose–response effects of different exercise regimens on insulin sensitivity, muscle GLUT4 content/activity, and mitochondrial metabolism [5]. These considerations merit further examination in the context of type 2 diabetes, insulin resistance, and associated risk factors for atherosclerosis such as fatty liver disease in the light of evidence that exercise interventions may have complex cardiometabolic effects [6]. Moreover, studies should be focused on typical patients encountered in clinical settings, including those with atherosclerotic cardiovascular disease, rather than healthy volunteers alone. Such data should help healthcare professionals feel more confident in offering advice about exercise regimens to

their high-risk patients that will safely and effectively achieve the intended objectives in a predictable manner.

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Conflicts of interest

There are no conflicts of interest.

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