Type 2 diabetes mellitus and physical activity

What is Type 2 diabetes mellitus?

The most common type of diabetes mellitus (type 2 diabetes, T2DM), is a disease which affects the blood sugar. The hormone insulin allows the glucose, which is an energy resource from the food, to go from the blood into the cells. When you have T2DM, your body does not produce or use insulin properly, and the glucose cannot be transferred well to the cells [1]. The result of this deficiency is an increased concentration of glucose in the blood, causing damage to the body's systems, in particular the blood vessels and nerves [2]. A 2006 study showed that 3.8% of the Luxembourg population were treated with T2DM, but about 1.5% of the population were not aware of their disease [3]. T2DM increases with age. Some of the risk factors of T2DM can be tackled, such as overweight, physical inactivity and high blood pressure [4].

What are the effects of physical activity on Type 2 diabetes mellitus?

Besides the well-known effect of physical activity in reducing the incidence of T2DM by 60% in people at risk [5], physical activity is one the three complementary treatments of T2DM, along with diet and medication. Among its plethora of benefits, aerobic physical activity (including also high-intensity interval training) improves the glycaemic control by increasing insulin sensitivity and decreasing insulin resistance and glycated haemoglobin type A1c (up to -0.6%) [6-8]. Physical activity improves local and systemic endothelial function and attenuates the capillary rarefaction in skeletal muscle associated with insulin resistance [9]. Among the general benefits on health of the resistance training, it improves glycaemic control in decreasing insulin resistance and glycated haemoglobin type A1c (from -0.3%) [10, 11]. Flexibility and balance exercises may reverse the T2DM-related limited joint mobility and can reduce the risk of falls, especially in the elderly people [12, 13]. Even if the evidence of the benefits of tai-chi on glycaemic control is still lacking [14], other alternative trainings, such as yoga, may be considered as they may have an impact on short-term glycaemic control [15].

What are the risks?

Beside the common risks of practicing a physical activity, a comprehensive list of physical activity precautions for patients with diabetes has been published by the American Diabetes Association (list available here: http://care.diabetesjournals.org/content/39/11/2065) [16]. Physical activity must be encouraged but adapted in T2DM patients with cardiovascular diseases, nerve disease, eye diseases, kidney diseases and orthopaedic limitations.

Recommendations

The first recommendation is to reduce the time spent in daily sedentarily behaviour, like long lasting sitting positions, by bouts of standing or light intensity activities. 30 min of light activity already provides benefit on blood glucose. It is encouraged to increase both the total daily incidental physical activity (non-exercise) and structured exercises and incidental movements to modify insulin action in muscles and liver. Benefits will be observed with 150 minutes or more of moderate to vigorous aerobic activities per week (e.g. walking, running, dancing) [16]. This weekly physical activity has to be spread over three days at least and with no more than two consecutive days without training. In order to increase the benefit, these aerobic exercise sessions [17] can be combined with 60 minutes of resistance exercises (lifting weights) [18] spread over two non-consecutive days per week [16]. The best is to combine aerobic and resistance training of high intensity, because it involves a larger number of muscle fibres than moderate intensity exercise and thus improves microvascular functions and insulin sensitivity [9]. Therefore, exercise training program engaging the most skeletal muscle and the most skeletal fibres within each skeletal muscle during training sessions have to be preferred [9].

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