New Evidence for the Value of Supervised Exercise Training in Type 2 Diabetes Mellitus

Exercise has been considered an important component of diabetes management for decades, although solid evidence of its effectiveness has been published mainly in the past 10 years. In the Aerobics Centre Longitudinal Study, 12-year cardiovascular and overall mortality were approximately 60% lower in diabetic individuals with moderate to high cardiorespiratory (aerobic) fitness at baseline compared with those with low baseline fitness (42% of the men). The standard recommendation for people with diabetes has historically been to perform aerobic exercise such as brisk walking, swimming, or jogging, rather than resistance exercise such as weight lifting or exercise with weight machines. Indeed, the official position of the American Diabetes Association through 2004 was that “high-resistance exercise using weights may be acceptable for young individuals with diabetes, but not for older individuals or those with long-standing diabetes.” This position was never evidence based. High-intensity resistance exercise has been found to be safe and beneficial for glycemic control in elderly people with diabetes. A 2006 meta-analysis found that aerobic exercise, resistance exercise, and combined aerobic and resistance exercise each improved glycemic control in type 2 diabetes mellitus (T2DM), and a 2009 systematic review confirmed that resistance training had beneficial effects on glycemic control, insulin sensitivity, and, in some studies, lipid levels and body composition, with no serious adverse effects.

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The Diabetes Aerobic and Resistance Exercise (DARE) trial was the first study clearly demonstrating an incremental benefit of combined aerobic and resistance exercise training on glycemic control beyond those of either type of exercise alone. In this trial, 251 patients with T2DM aged 39 to 70 years were randomized to aerobic training, resistance training, both types of training, or wait-list control for 22 weeks; the primary outcome was glycemic control as reflected in hemoglobin A1c (HbA1c) level. Training was performed 3 times a week in community-based exercise facilities, with supervision by personal trainers. Compared with the control group, HbA1c level was reduced by approximately half a percentage point with either aerobic training or resistance training alone and by almost a full percentage point with combined aerobic and resistance training.

Supervised exercise training can be labor intensive. A less resource-intensive intervention involving physical activity counseling resulted in an increase in objectively measured physical activity that was still above baseline a year later, modest improvements in glycemic control, and significant improvements in blood pressure compared with a usual care control group. However, a subsequent larger trial by the same investigators found no difference between counseling and control groups in physical activity, glycemic control, or blood pressure.

The Italian Diabetes and Exercise Study (IDES), published in this issue of the Archives, is an important addition to the literature. In this multicenter trial, 606 patients with T2DM were randomized to either an intervention group, which also performed aerobic and resistance training in exercise facilities under the supervision of personal trainers twice weekly, or a control group. Each supervised session lasted 75 minutes and included aerobic exercise plus 4 resistance exercises with either 2 sets of 15 repetitions or 3 sets of 8 repetitions. All participants (intervention and control) received structured physical activity counseling by trained physicians every 3 months, along with guidelines-based usual medical care. Compliance was excellent in this 1-year trial; 80% of prescribed exercise sessions were completed and only 7% of subjects withdrew. Total self-reported physical activity increased substantially compared with baseline in both intervention and control groups, confirming the effectiveness of the structured exercise counseling. However, compared with the counseling plus usual care control group, the group receiving facility-based training had significantly better results in essentially all outcomes, including HbA1c level (the primary outcome), aerobic fitness, strength, blood pressure, lipid levels, waist circumference, markers of systemic inflammation, and estimated 10-year cardiovascular risk.

This is an important trial for several reasons. With over 600 subjects, IDES was larger than previous exercise intervention trials in T2DM, allowing greater statistical power to detect small but clinically significant changes in a variety of important outcomes. Its multicenter design increases generalizability, since results were less dependent on local factors such as the charisma of a local exercise leader or investigator. The duration of the study was a full year, whereas most previous trials had interventions lasting 6 months or less. Sustaining a behavioral intervention in a large number of subjects with T2DM over this period, with high compliance and over many centers, is an important demonstration of feasibility and sustainability.

The degree of HbA1c level reduction (0.30–percentage points difference between intervention and
participants with a baseline HbA1c level lower than 7.5% (mean, 7.0%). HbA1c level was reduced only with combined aerobic and resistance training and not with aerobic or resistance training alone. The fact that changes and adjustments of medications were allowed in the IDES trial might be regarded as a weakness. However, in almost every case, the control group had more medication changes that would have caused improvements in study outcomes than the intervention group did, so it is exceedingly unlikely that the superior results in the intervention group were due to medication changes. In IDES, the intervention group increased physical activity more than the control group even if one excludes the supervised portion of the exercise, despite both groups receiving identical counseling aimed at increasing physical activity. This finding is in contrast to what was found in the DARE trial, in which background physical activity outside of scheduled facility-based training sessions did not change in any group. While the differences in medication adjustments and background physical activity levels between groups may make IDES a less “clean” trial than the DARE trial, we would argue that these differences show the real-world applicability of the IDES results, since superior results were achieved in the intervention group even though (as in the “real world”) physicians were making ongoing active efforts to achieve clinical targets in both groups, with no constraints on medication changes.

In conclusion, the IDES trial demonstrated effectiveness, feasibility, and sustainability of an exercise program for a large number of people with T2DM. It also demonstrated the key additional contribution of a supervised, facility-based exercise program vs simply counseling patients to exercise, even when the counseling was effective in increasing physical activity. We would argue that this trial, building on the findings of previous studies, supports the addition of supervised, facility-based exercise training to standard therapy for T2DM, just as exercise-based cardiac rehabilitation is considered part of the optimal treatment of patients with acute cardiac events. Many patients might decline to participate, but this is also true for other aspects of care, such as adherence to medication, recommended diets, and smoking cessation; a lack of complete compliance should not be regarded as a reason to withhold coverage of these therapies. Supervised exercise training should be offered as an evidence-based therapy and supported by payers in the same way as nutritional therapy and medications. The cost of delivering such therapy would probably compare favorably with the costs of many diabetes medications, none of which would have the vast range of clinically beneficial effects demonstrated in the IDES supervised exercise group.

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REFERENCES