The Dilemma of Weight Loss in Diabetes

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People with diabetes receive mixed messages about weight loss from magazines, newspapers, friends, family, and, yes, even health professionals. Few subjects have accumulated as much misleading and potentially dangerous folklore as the subject of obesity. A common message is that losing weight is just a matter of willpower, and if you have been losing weight and reach a plateau, it's because you've lost your willpower and are no longer following your diet. Furthermore, for people with type 2 diabetes, the message often is that weight loss is the answer to improving glucose control: "If you just lose 20 lb, you won't need insulin." What does research tell us about these issues, and what should our messages as health professionals be to people with diabetes?

Obesity is a serious worldwide problem and is associated with the risk of developing diabetes. Today, more than 1.1 billion adults worldwide are overweight, and 312 million of them are obese.[1] In the past 20 years, the rates of obesity have tripled in developing countries that have adopted a Western lifestyle, with the Middle East, Pacific Islands, Southeast Asia, India, and China facing the greatest increase. Consequently, the number of people with diabetes in these countries is expected to increase from 84 million in 2000 to 228 million by 2030.

Thus, preventing obesity is a high priority for the prevention of diabetes and other chronic diseases. According to some obesity researchers, it may not be possible to decrease the current numbers of overweight and obese people in the United States, but we need to try to slow or prevent the increase that has been occurring at an alarming rate.[2] The hope is that slowing the rising prevalence of obesity will also slow the diabetes epidemic.

Can this be accomplished? Thus far, nothing seems to have slowed the increase in both obesity and diabetes. But there is general agreement in the medical field and within the government that we still need to try. As educators, we can encourage healthful eating and increased physical activity for everyone. Only in the future will we know if these efforts will positively affect the trend of increased obesity and diabetes.

For individuals who have progressed to pre-diabetes, both the Finnish Prevention Study[3] and the Diabetes Prevention Program[4] showed conclusively that intensive lifestyle interventions decreased the overall risk of diabetes by 58%. Lifestyle interventions included a weight reduction of 5% or more, reduction of total fat intake to < 30% of total calories, and increased physical activity (≥ 4 hours/week). Even more encouraging is the report from the Finnish Prevention Study follow-up period averaging 7 years, in which the intervention group saw a 43% reduction in risk of diabetes.[5] The intervention group had sustained lifestyle changes that remained even after individual lifestyle counseling ended.

But what about people who already have diabetes? Is weight loss the complete answer for improving blood glucose control? Although ~ 50% of men and 70% of women are obese at the onset of diabetes,[6] diabetes is diagnosed in nonobese individuals, and many obese people never develop type 2 diabetes. Therefore, it is likely that obesity combined with a genetic predisposition may be necessary for type 2 diabetes to develop. Furthermore, as the disease progresses from insulin resistance to insulin deficiency, it often is too late for weight loss to improve blood glucose control dramatically.[7]

The remainder of this editorial addresses what is known today about weight loss in general and how this information applies to people with diabetes. Is it harder for people with diabetes to lose weight? And, for people with diabetes, is weight loss the cure?

Weight Loss Goals

Achieving an ideal BMI has been recommended for people with diabetes.[8,9] But can the majority of people with diabetes achieve this goal? Should health professionals make recommendations that may be ideal but not achievable by most individuals? By now, many have heard about Mike Huckabee, the former governor of Arkansas, who lost 110 lb and "cured" his diabetes. Is this something that everyone can do?

To answer the question about expected weight loss from weight loss interventions, a systematic review was undertaken of randomized clinical weight-loss trials with a minimum duration of 1 year.[10] Eighty studies with a total of 24,698 subjects were identified, and the data were pooled to determine the mean weight loss from eight different interventions—diet alone, diet and exercise, exercise alone, meal replacements, very-low-calorie

diets, orlistat, sibutramine, and advice alone. A mean weight loss of 11–18.7 lb (5–8.7%) was observed during the first 6 months from interventions involving reduced-energy diets and/or weight-loss medications; weight loss reaches a plateau at ~ 6 months. In studies extending to 48 months, a mean 6.6–13.2 lb (3–6%) of weight loss was maintained. Thus, for the majority of obese dieters, achieving an ideal body weight is likely not achievable, and dieters usually become discouraged and frustrated if that is the recommendation they receive.

Do dieters stop losing weight after about 6 months of dieting because they no longer have the willpower necessary to continue following their diet? Probably not. In fact, if they stop following their diet, they will likely regain the weight that was lost. Research in recent years has helped us understand the adaptive mechanisms that occur with a reduced energy intake (e.g., hormonal regulation,[11–13] adaptive thermogenesis leading to a decrease in energy expenditure,[14] and decline in weight-maintenance caloric requirements, [15] to name just a few). So when dieters claim they are not eating any more calories than they were when they were losing weight but are only maintaining their weight loss, this may well be true, and we should probably believe them rather than think they are just not telling the truth, as is often thought to be the case.

Weight Loss in People With Diabetes

What about people with diabetes? Table 1 pools the data from the studies in the systematic review[10] in which the subjects had diabetes, reports weight losses at 6 and 12 months and 12-month changes in hemoglobin A_{1c} (A1C) levels, and compares the weight change of subjects with diabetes to that of subjects without diabetes.[16] Again, we see that weight loss plateaus at about 6 months but can be maintained until at least 12 months. However, to achieve this result, most of the trials had at least monthly contact with the subjects. And, yes, it does appear that in people with diabetes, weight loss may be more difficult than in people without diabetes, as was first suggested by Wing et al.[17] in 1987.

The use of exenatide seems to provide an exception to the weight-loss plateau that generally occurs at about 6 months. In subjects taking exenatide, weight loss was progressive for up to 82 weeks, at which point the mean weight loss was 8.8 lb.[18] However, it is interesting to note that the amount of weight lost is still less than what occurs with other weight-loss medications by 6 months.

Weight Loss and Glucose Control

Should the focus of nutrition therapy for type 2 diabetes be on weight loss or improved blood glucose control? Table 1 shows that achievable weight loss has a modest effect on A1C levels. However, in several studies, weight loss was not associated with improvement in glycemia.[19,20] Furthermore, other nutrition therapy interventions that tend to focus more on metabolic control and less on weight loss have been shown to improve A1C levels by 1–2%.[21]

It is likely that early in the course of the disease process, when insulin

Table 1. Weight Change and Effect on A1C From Weight-Loss Interventions in People With Type 2 Diabetes Compared to Weight Change from Similar Interventions in People Without Diabetes

Interventions	Weight Change in Subjects With Type 2 Diabetes (lb)		12-Month A1C Change (%)	12-Month Weight Change in Subjects Without Diabetes (lb)
	6-month	12-month		
Weight-loss diet (*n* = 532)	–5.3	–5.7	–0.4	–10.1 to –16.7
Orlistat, 120 mg three times a day (*n* = 574)	–11	–11.2	–0.8	–18
Sibutramine, 15–20 mg (*n* = 152)	–16.5	–15.8	–0.4	–18
Rimonabant, 20 mg (*n* = 355)*	–13	–13.2	–0.6	–18.7

**New drug that blocks endocannabinoid receptors, thus reducing appetite and the brain's craving for flavorful foods and nicotine. Adapted from ref. 16*

resistance is still prominent, either energy restriction or weight loss will improve blood glucose levels. But as the disease progresses and insulin deficiency becomes more prominent, it may be too late for weight loss to be helpful. In fact, at later stages of the disease, when medications, including insulin, need to be combined with nutrition therapy, prevention of weight gain often becomes the goal. However, glycemic control should take precedence over concerns about weight.

A question concerning the improvement of glycemic control is whether the improvement really results from the weight loss or from a decrease in total energy intake.[22,23] The beneficial effects on blood glucose control begin to occur before much weight loss occurs. Even in people with diabetes, the benefits of bariatric surgery on blood glucose occur quickly. Because improvement in blood glucose occurs rapidly and before significant weight loss, it has been suggested the improvement results from the diversion of nutrients away from the gastrointestinal tract and delivery of incompletely digested nutrients to the ileum rather than to weight loss per se.[24]

Another issue that makes weight loss even more of a dilemma is the effect of intentional weight loss on mortality in type 2 diabetes. Williamson et al.[25] reported that people with diabetes who had an intentional weight loss in the Cancer Prevention Study I experienced a 25% reduction in total mortality and a 28% reduction in cardiovascular disease-plus-diabetes mortality. Because the cohort was followed for an average of 12.9 years, this suggests a "memory" effect of intentional weight loss, which may be sustained for a long duration even if the weight loss is not fully maintained. In another analysis of 1,401 overweight adults with diabetes sampled in the National Health Interview Survey, individuals trying to lose weight had a 23% lower mortality rate than those who reported not trying to lose weight.[26] This suggests that even if weight loss is not achieved, eating less may have long-term beneficial effects.

The Bottom Line in 2007

Until all the dilemmas are solved, what are appropriate messages concerning weight loss for people with diabetes? Consider the following:

- The majority of individuals can expect to lose 5–10% of their starting weight. So, if you recommend that an individual with or without type 2 diabetes lose weight, help him or her accept and set realistic weight loss goals. Grave et al.[27] investigated the influence of weight loss expectations (expected 1-year weight loss, dream weight, and maximum acceptable weight) in 1,785 obese subjects enrolled in weight-loss programs. At 12 months, one of the strongest predictors of attrition was a higher expected 1-year weight loss with the risk being particularly high in the first 6 months. Thus, they suggested that unrealistic weight goals should be addressed at the beginning of treatment.
- When weight loss plateaus, continue to encourage the same lifestyle strategies that led to weight loss to prevent the weight regain. Prevention of weight regain is possible. Successful long-term weight management generally requires attention to total energy intake, physical activity, and behavioral modifications. There are no magical diets or specific foods to eat. Dansinger et al.[28] randomized free-living subjects to the Atkins, Ornish, Weight Watchers, or Zone diets. Each diet modestly reduced body weight and several cardiac risk factors at 1 year. The amount of weight lost was not associated with the diet type but rather to adherence level to whatever type of diet participants were following.
- Although not discussed here in great detail, encourage regular physical activity. Low cardiorespiratory fitness and physical inactivity have been shown to be independent predictors of all-cause mortality in men with type 2 diabetes regardless of their weight,[29] and even increased BMI did not increase mortality risk in fit men with type 2 diabetes.[30] A stepwise relationship between fitness and mortality is evident within all BMI strata and is independent of body fat percentages. These results highlight the importance of counseling people with diabetes to increase physical activity and improve fitness, not only as a means of controlling weight, but also for the benefits of fitness that are independent of weight loss.

In the end, setting realistic weight goals and aiming for moderation is generally the best approach: eating a healthful diet, being more physically active, and keeping food records along with blood glucose records so that blood glucose levels can be kept under optimal control and medications can be added or adjusted when needed. Eating fewer calories and getting regular physical activity improves blood glucose control independent of body weight and weight loss.

References

[1]Hossain P, Kawar B, El Nahas M: Obesity and diabetes in the developing world—a growing challenge. *N Engl J Med* 356:213–215, 2007

[2]Dautsch JG: The obesity epidemic: what's being done? *J Am Diet Assoc* 102:638–639, 2002

[3]Tuomilehto J, Lindstrom J, Eriksson JG, for the Finnish Diabetes Prevention Study Group: Prevention of type 2 diabetes by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 344:1343–1350, 2001

[4]Diabetes Prevention Program Research Group: Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 346:393–403, 2003

[5]Lindström J, Ilanne-Parolla P, Peltonen M, Aunola S, Eriksson JG, Hemiö K, Hämäläinen H, Härkönen P, Keinänen-Kiukaanniemi S, Laakso M, Louheranta A, Mannelin M, Paturi M, Sundvall J, Valle TT, Uusitupa M, Tuomilehto J, on behalf of the Finnish Diabetes Prevention Study Group: Sustained reduction in the incidence of type 2 diabetes by lifestyle interventions: follow-up of the Finnish Diabetes Prevention Study. *Lancet* 368:1673–1679, 2006

[6]American Diabetes Association: *Diabetes 2001 Vital Statistics*. American Diabetes Association, Alexandria, Va., 2001

[7]Watts NB, Spanheimer RG, DiGirolamo M, Gebhart SS, Musey VC, Siddiq K, Phillips LS:

Prediction of glucose response to weight loss in patients with non-insulin-dependent diabetes mellitus. *Arch Intern Med* 150:803–806, 1990

[8]Anderson JW, Randles KM, Kendall CWC, Jenkins DJA: Carbohydrate and fiber recommendations for individuals with diabetes: a quantitative assessment and meta-analysis of the evidence. *J Am Coll of Nutr* 23:5–17, 2004

[9]Mann JI: Nutrition recommendations for the treatment and prevention of type 2 diabetes and the metabolic syndrome: an evidenced-based review. *Nutr Rev* 64:422–427, 2006

[10]Franz MJ, VanWormer JJ, Crain LA, Boucher JL, Histon T, Caplan W, Bowman JD, Pronk NP: Weight loss outcomes: a systematic review and meta-analysis of weight loss clinical trials with a minimum 1-year follow-up. *J Am Diet Assoc* In press

[11]Schwartz MW, Woods SC, Porte D, Seeley RJ, Baskin DG: Central nervous system control of food intake. *Nature* 404:661–671, 2000

[12]Korner J, Leibel RL: To eat or not to eat—how the gut talks to the brain. *N Engl J Med* 349:926–928, 2003

[13]Schwartz MW: Progress in the search for neuronal mechanisms coupling type 2 diabetes to obesity. *J Clin Invest* 108:963–964, 2001

[14]Major GC, Doucet E, Trayhurn P, Astrup A, Tremblay: Clinical significance of adaptive thermogenesis. *Int J Obes* 31:204–212, 2007

[15]Astrup A, Gotzche PC, van de Werken K: Meta-analysis of resting metabolic rate in formerly obese subjects. *Am J Clin Nutr* 69:1117–11122, 1999

[16]Franz MJ: Rimonabant: a new weight-loss medication. On the Cutting Edge. *Diabetes Care and Education* 6:19–21, 2006

[17]Wing RR, Marcus MD, Epstein LH, Salata R: Type II diabetic subjects lose less weight than their overweight non-diabetic spouses. *Diabetes Care* 10:563–566, 1987

[18]Riddle MC, Henry RR, Poon TH, Zhang B, Mac SM, Holcombe JH, Kim DD, Maggs DG: Exenatide elicits sustained glycaemic control and progressive reduction of body weight in patients with type 2 diabetes inadequately controlled by sulphonylureas with or without metformin. *Diabetes Metab Res Rev* 22:483–491, 2006

[19]Manning RM, Jung RT, Leese GT, Newton RW: The comparison of four weight reduction strategies aimed at overweight patients with diabetes mellitus: four-year follow-up. *Diabet Med* 15:497–502, 1998

[20]Wolf AM, Conaway MR, Crowther JQ, Hazen KY, Nadler JL, Oneida B, Bovbjerg VE: Translating lifestyle intervention to practice in obese patients with type 2 diabetes. *Diabetes Care* 27:1570–1576, 2004

[21]Pastors JG, Franz MJ, Warshaw H, Daly A, Arnold M: How effective is medical nutrition therapy in diabetes care? *J Am Diet Assoc* 103:827–831, 2003

[22]Kelley DE, Wing R, Buonocore C, Sturis J, Polonsky K, Fitzsimmons M: Relative effects of caloric restriction and weight loss in non-insulin-dependent diabetes mellitus. *J Clin Endocrinol Metab* 77:1287–1293, 1993

[23]Wing RR, Koeske R, Epstein LH, Nowalk MP, Gooding W, Becker D: Long-term effects of modest weight loss in type 2 diabetic patients. *Arch Intern Med* 147:1749–1753, 1987

[24]Guidone C, Manco M, Valera-Mora E, Iaconelli A, Gniuli D, Mari A, Nanni G, Castagneto M, Calvani M, Mingrone G: Mechanisms of recovery from type 2 diabetes after malabsorptive bariatric surgery. *Diabetes* 55:2025–2031, 2006

[25]Williamson DF, Thompson TJ, Thun M, Flanders D, Pamuk E, Gyers T: Intentional weight loss and mortality among overweight individuals with diabetes. *Diabetes Care* 23:1499–1504, 2000

[26]Gregg EW, Gerzoff RB, Thompson TJ, Williamson DF: Trying to lose weight, losing weight, and 9-year mortality in overweight U.S. adults with diabetes. *Diabetes Care* 27:657–662, 2004

[27]Grave RD, Calugi S, Molinari E, Petroni ML, Bondi M, Compare A, Narchesini G, the QUOVADIS Study Group: Weight loss expectations in obese patients and treatment attrition: an observational multicenter study. *Obes Res* 13:1961–1969, 2005

[28]Dansinger ML, Gleason JA, Giffith JL, Selker HP, Schaefer EJ: Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction. *JAMA* 292:43–53, 2005

[29]Wei M, Gibbons LW, Kampert JB, Nicaman MZ, Blair SN: Low cardiorespiratory fitness and physical activity as predictors of mortality in men with type 2 diabetes. *Ann Intern Med* 132:605–611, 2000

[30]Church TS, Cheng YJ, Earnest CP, Barlow CE, Gibbons LW, Priest EL, Blair SN: Exercise capacity and body composition as predictors of mortality among men with diabetes. *Diabetes Care* 27:83–88, 2004

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