Type 2 Diabetes in an Aviator, Protein Diet vs. Traditional Diet: Case Report

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An experienced helicopter pilot with hypertension, hyper-triglyceridemia, elevated cholesterol, obesity, and diabetes is treated with a high-protein, low-carbohydrate diet. In 3 months, he loses 35 lbs, is normotensive without medication, cholesterol and triglycerides show significant reduction, fasting blood glucose and 2-h post glucose load are normal. At follow-up 1 yr later he has maintained hemoglobin A1C in the low 5 range. The protein diet is discussed and compared with the traditional dietary approach for type 2 diabetes.

Keywords: aviator, diabetes mellitis, protein diet, insulin resistance.

DIABETES IN AN AVIATOR is generally disqualifying. The spectrum of potential problems in flight relating to hypoglycemia, and the difficulty in regulating diet when on medications generally presents risk higher than we are willing to accept for safety. Type 2 diabetes, if adequately controlled with diet alone, represents a subset of diabetes which can be waived. Illustrated in this case is an experienced helicopter pilot with diabetes who is treated with a high-protein, low-carbohydrate diet along with a discussion of the high-protein diet and the traditional high-carbohydrate diet.

CASE REPORT

The patient is a 54-yr-old army helicopter pilot with 9000 total flying hours. He presented with a history of 4 yr of mildly elevated BP controlled with Monopril®, central obesity (weight 210 lbs, height 68 in, MAW 184), mildly elevated cholesterol (222 in 1996), and years of mildly elevated triglycerides (423 in 1996). He presented in Jan 1999 for his annual flying physical and was found to have an elevated fasting blood sugar (116), elevated cholesterol (240) and elevated triglycerides (greater than 500). His BP continued to be well controlled on 10 mg Monopril®. A 3-h glucose tolerance test was performed which was also found to be abnormal and confirmed the diagnosis of diabetes (fasting = 116, 1 h=283, 2 h=241, 3 h=101).

After documenting normal renal function, the patient adopted a recovery plan of exercise and a high-protein, low-carbohydrate diet. His exercise consisted of walking 2 mi 3–4 times a week. He kept his daily carbohydrate intake below 30 gms, but otherwise did not count calories. In a 3-mo period of time, he lost 35 lbs. His cholesterol was lowered to 204, his triglycerides lowered to 238, his fasting blood sugar lowered to 100, a 2-h post glucose load lowered to 122, and he discontinued his hypertension medication and remained normotensive. The patient has continued the high-protein, low-carbohydrate diet with a gradual increase in the amount of calories from carbohydrates and for 1 yr has maintained quarterly hemoglobin A1C in the low 5 range. He reports feeling better than he has in many years and has successfully returned to flying.

DISCUSSION

The "protein diet" is a dramatic paradigm shift for treating patients with early onset diabetes. Initially, the patient was given a choice of the traditional approach to early onset diabetes (strict caloric control, exercise, low fat, complex carbohydrate diet) vs. the high-protein, low-carbohydrate diet. He chose the high-protein plan due to weight loss failure in the past with the traditional low-fat diet. The patient did not restrict total calories, but on average limited his daily carbohydrate load below 30 gms.

The Traditional Approach

The traditional dietary approach in treating type 2 diabetes as put forth by the American Diabetes Association Clinical Practice Recommendations 2000 (1) (ADACPR) is designed to help the individual achieve and maintain glucose, lipid, and BP goals. This is accomplished by eating a diet comprised of 10–20% protein, less than 30% fat, and 50–60% carbohydrate. This diet is tailored to the individual coupled with moderate caloric restriction, spacing of meals, reduced fat intake, and oral hypoglycemic medications/and or insulin depending on individual needs. The ADACPR reports that long-term weight loss has been difficult to maintain using traditional dietary strategies even with very low-calorie diets. If the above measures do not work for refractory obesity, gastric reduction surgery is offered

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as an alternative. The premise for this diet is total caloric reduction, reduction in dietary fat coupled with exercise and possible oral hypoglycemic agents to achieve the desired goals of glycemic control, weight loss, BP control, and normalization of lipid values.

The High Protein/Low Carbohydrate Approach

The high-protein diet, as described by Dr. Michael and Mary Dan Eades in their book, "Protein Power"(2), recommends phase I intervention consisting of 30 g or less of carbohydrates each day. This is indicated for individuals overfat by 20% or more, or who have hypertension, diabetes, glucose intolerance, or hyperlipidemia. Phase II intervention consists of 55 g or less of carbohydrates per day and is indicated for individuals who need to reduce their body weight by less than 20% and who do not have any of the conditions listed above. The remainder of the calories are obtained from protein and fat. The dietary protein requirement is calculated on activity level and lean body mass calculations. Fat will be a natural part of the diet associated with protein, but is not calculated as a specific quantitative requirement.

The high-protein diet, as described by Dr. Eades, operates on the premise that when we eat a high-carbohydrate meal, the natural response of the body is to secrete insulin and reduce the level of glucagon. A pattern of high insulin secretion over time is postulated to result in insulin resistance, which results in higher levels of insulin being produced by the pancreas in an attempt to achieve glycemic control. Eventually, the pancreas reaches its production limit when it is not able to produce sufficient endogenous insulin to achieve glycemic control. This is called type 2 diabetes. Insulin in excessive amounts, (hyperinsulinemia), and the body's resistance to insulin (insulin resistance) are also implicated as a contributing factor in high BP, heart disease, obesity, elevated cholesterol, elevated triglycerides, and diabetes. The protein diet lowers the insulin levels by significantly limiting dietary carbohydrates, thus decreasing the stimulus for insulin secretion. The reduced levels of insulin/increased levels of glucagon stimulate mobilization of stored fats for energy, decrease cholesterol production, and stimulate the regression of arterial smooth muscle cells. While low density lipoprotein (LDL) values are lowered, high density lipoprotein (HDL) are maintained or raised resulting in a lower total cholesterol to HDL ratio. The reduction in insulin level also allows for a reversal in some instances of the insulin resistance syndrome. These changes are reported to lead to weight loss, normalization of high BP, improved lipid profile–both cholesterol and triglycerides, and normal blood sugar control.

Eades recommends transitioning to the maintenance diet after a period of several weeks to months, or when the treatment goals have been met. Specifically, when the requirement for medications used to control BP, blood sugar or lipids is reduced or eliminated, when body weight has been recomposed to the desired lean and fat percentages, or when the individual is within 5% of his/her ideal body weight. The maintenance diet consists of gradually increasing the per-meal carbohydrate level until total carbohydrate gram intake is roughly equal to or slightly more than the daily protein gram intake. The carbohydrate levels can be increased if needed to maintain desirable weight level up to 30% more than the protein intake.

Literature Search

In 1996, Gutierrez published a study of type 2 diabetic patients who did not achieve target levels despite conventional diabetic treatment. The 28 subjects were placed on a diet based on ideal body weight, but limited to 25% carbohydrates. After 8 wk they were switched to a calorically equivalent diet, but composed of 55% carbohydrates. After 8 wk on the 25% carbohydrate diet, the subjects showed significant improvement in fasting blood sugar levels and hemoglobin A1C levels. Those subjects who had previously been treated with oral hypoglycemic agents also demonstrated a significant decrease in weight and diastolic BP despite the discontinuation of their oral agent. When the subjects were placed on the 55% carbohydrate diet, the hemoglobin A1C rose significantly over the next 12 wk.(3)

CONCLUSIONS

Diabetes in the aviator can be career-ending. The traditional approach relies on high-percentage carbohydrate, low-fat and -protein, calorie-restricted diet with oral hypoglycemic agents as needed to achieve the goals of glycemic control and reduction in cardiovascular risk factors. The protein diet uses a high-percentage protein, low-carbohydrate approach that, in many instances, achieves glycemic control without oral hypoglycemic agents and a prompt reduction in the major cardiovascular risk factors. The protein diet is a promising new approach to diabetes and, certainly, warrants more research.

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