



## Cardiovascular Disease in the Diabetic Patient

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**D**iabetes mellitus is a chronic metabolic disease characterized by a high blood sugar level. Over 17 million Americans are affected by the disease. About 10% of the US population over the age of 60 years has diabetes, with a disproportionately high number of black, Hispanic, Asian, and Native Americans affected. Furthermore, it is estimated that fully half of the population with diabetes remains undiagnosed. Diabetes may be caused by decreased insulin secretion, decreased insulin action, or both. Insulin, a hormone made in the pancreatic B-cell, assists in the transportation into cells and the use of sugar by cells throughout the body. Whether the body cannot make sufficient insulin or the insulin that is made does not function well in the body, the blood sugar level becomes elevated. Over time, increased blood sugars can damage both small and large blood vessels.

In patients with type 1 diabetes, for unknown reasons, there is an autoimmune destruction of the insulin-secreting pancreatic B-cells, and insulin injections must be taken to survive. This type of diabetes represents less than 10% of all diabetes cases. In contrast, type 2 diabetes occurs in more than 90% of all patients with diabetes and is characterized by both insulin resistance and a relative reduc-

tion in insulin production. In type 2 diabetes, the treatment goal is to match the amount of insulin that the body can make to the amount that the body needs. There are many possible treatment options that the physician may initially prescribe; however, all regimens are based on healthy food choices and daily activity. If these lifestyle changes do not work, a choice of medical therapies are available, including drugs to improve how well the insulin the body can make will work (insulin sensitivity), drugs to decrease insulin requirements (decreasing the absorption of carbohydrate or fat from the diet), drugs to make the body produce more insulin, and the addition of insulin by injection to overcome the body's resistance to insulin and normalize elevated blood sugar levels. Although the medications that improve insulin sensitivity may have some protective effects for the heart, it has not yet been proven whether these agents can reduce heart attack or stroke.

### Vascular Complications

Vascular complications of diabetes can be broken into small vessel (microvascular) and large vessel (macrovascular) disease. In patients with types 1 and 2 diabetes, an improvement in blood sugar levels has clearly been shown in several clinical studies to

reduce the risk of development of small vessel disease and to slow the progression of established small vessel disease. Such small vessel disease includes damage to the eyes that can lead to blindness (retinopathy), damage to the kidneys (nephropathy) that can cause kidney failure, which requires transplant or dialysis, and nerve damage (neuropathy).

At the first visit to a doctor specializing in the treatment of diabetes (a diabetologist), a survey for the presence or absence of complications of diabetes and for risk factors for cardiovascular disease should be made. The encounter should include a detailed history to differentiate the type of diabetes, family history of cardiovascular disease, and use of cigarettes. The physical examination should incorporate measurements of weight and blood pressure, an eye examination that includes the retina (although dilating the pupil with eye drops in most cases is performed by an eye specialist), a cardiovascular examination, and an examination of the feet. Laboratory tests should include glycohemoglobin, which measures the amount of sugar attached to the hemoglobin protein in the red blood cell (also called hemoglobin A1c) to provide a cholesterol profile and an assessment of overall blood sugar control and urine microal-

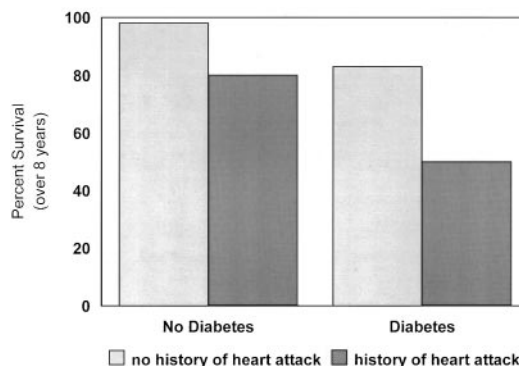
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bumin which, if elevated, can indicate both increased kidney (renal) and cardiac risk.

### Lowering Your Risk of Vascular Disease

It is well recognized that a person who has had a previous heart attack is at markedly increased risk of another heart attack. In contrast, it is less well known that a person with diabetes who has never had a heart attack carries the same risk as someone without diabetes who has already had a heart attack. The patient with diabetes who has already suffered a heart attack is at the greatest risk of a recurrent event (Figure 1). It is difficult to know if improvements in blood sugar levels can dramatically reduce the risk of large vessel disease, specifically heart attack and stroke. One possible reason is that lowering the blood sugar level to normal is not easily done, and achieving this level may be necessary to reduce the risk substantially. It is clear, however, that risk of vascular disease in the diabetic patient can be reduced by attention to other known cardiac risk factors, such as smoking, high blood pressure, high cholesterol, and excessive weight. These risk factors take on added importance in the patient with diabetes. Current practice guidelines therefore recommend that blood pressure and cholesterol levels be treated in all diabetic patients as aggressively as in the person with a prior heart attack.

A healthy diet and exercise program can reduce the risk of developing diabetes and is essential in managing patients with existing diabetes by lowering blood pressure, cholesterol levels, and weight. For someone with diabetes who is ready to begin an exercise program, the physician should consider an exercise stress test with or without cardiac imaging because exercise may uncover previously unknown significant coronary artery disease. If diet and exercise do not control blood pressure and cholesterol, medications should be aggressively added to the treatment regimen. In addition, low-dose aspirin should be considered for further protection of the heart.



**Figure 1.** The effect of a previous heart attack or diabetes mellitus on survival is demonstrated. A person with diabetes who has never had a heart attack has the same risk as someone who has had a previous heart attack but does not have diabetes. A person with diabetes who has already had a heart attack is at the greatest risk of all. Data adapted from Haffner SM, Lehto S, Ronnema T, et al. Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. *N Engl J Med.* 1998;339:229–234.

### Symptoms of Possible Vascular Problems

Typical symptoms of cardiac disease include the sensation of chest tightness or pressure, shortness of breath, arm or jaw discomfort, nausea, or lightheadedness especially with exercise. These symptoms should not be ignored and should be promptly reported to the doctor. Unfortunately, significant cardiac disease can exist even in the absence of these typical symptoms, particularly in patients with diabetes. For this reason, in the patient with longstanding diabetes or diabetes in the presence of other cardiac risk factors, an exercise stress test may be indicated. If significant cardiac disease is discovered, further testing is warranted. One such test, a cardiac catheterization, provides pictures of the coronary arteries (Figure 2) and helps the physician to determine if the arteries need to be fixed by a balloon stretching procedure (angioplasty), insertion of a metal coil to hold the arteries open (stent implantation), or surgical bypass procedures.

In addition to heart attacks, the diabetic patient is at risk for peripheral vascular disease. This is manifested as pain in the calf or buttocks with walking (claudication) and foot ulcers. Patients should report such discomfort to the medical team and inspect their feet on a regular basis to

detect early skin breakdown and thus prevent infection.

### Talk With Your Doctor

Control of diabetes can be achieved by working with a team of healthcare providers whose recommendations will likely include significant lifestyle modifications that might be difficult to maintain and may be accompanied by complicated medical regimens. The patient and healthcare providers must work together to find ways to implement these recommendations on a long-term basis to reduce cardiovascular risk successfully.

### STEPS TO REDUCE CARDIOVASCULAR RISK IN PATIENTS WITH DIABETES

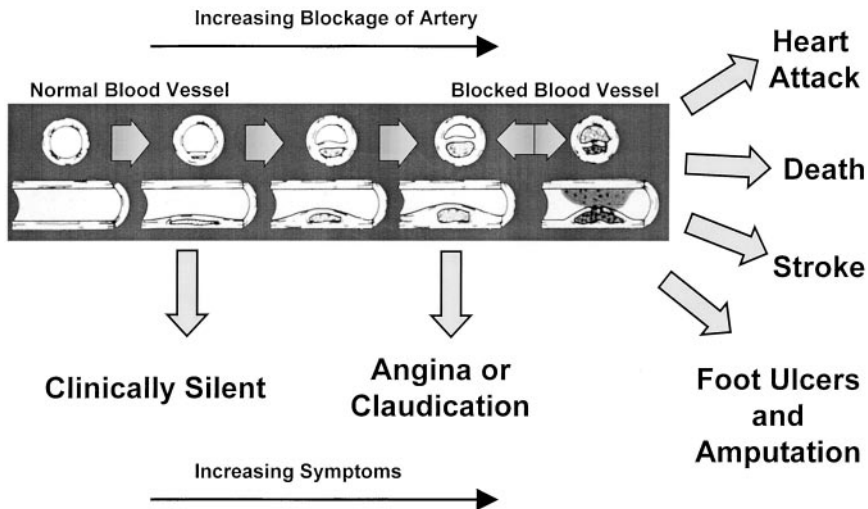
- Make healthy food choices (diet)
- Exercise
- Lose weight
- Quit smoking
- Lower blood sugar levels
- Control blood pressure
- Reduce cholesterol

### Additional Resources

Haffner SM, Lehto S, Ronnema T, et al. Mortality from coronary heart disease in subjects



## Cardiovascular Disease is a Progressive Process



**Figure 2.** Vascular disease is a progressive process. Poor control of blood pressure, cholesterol, diabetes, and smoking can all accelerate the process. The patient with diabetes may not have symptoms, even with advanced disease.

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