



Hughston Health Alert

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DIABETES AND YOU

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Diabetes and Athletics

They can go together.

Diabetes mellitus is a group of diseases marked by high levels of blood glucose (sugar) that is caused by defects in the production or management of insulin by the body or both. Insulin is the hormone that allows the body to use energy from food. The fifth deadliest disease in the United States, diabetes is a chronic disease that has no cure. Of the estimated 20.8 million people in the US who have diabetes, approximately 14.6 million of them have had their condition diagnosed.

Unfortunately, more than 6 million are unaware that they have the disease until they begin to develop one of its life threatening complications, such as high blood pressure, blindness, or stroke.¹

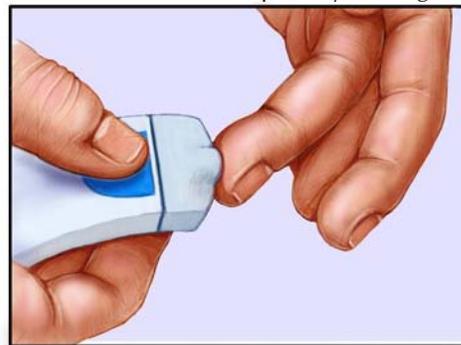
Type 1 diabetes mellitus

Although disease onset can occur at any age, type 1 diabetes, sometimes called insulin-dependent or juvenile-onset diabetes, is most commonly found in children and young adults. It accounts for 5% to 10% of all diagnosed cases of diabetes and is characterized by an inability to produce insulin.¹ Without insulin, the body's ability to use glucose (a simple sugar that is the body's basic fuel for exercise) is impaired. Some of the warning signs are frequent urination, unusual thirst, extreme hunger, unusual weight loss, extreme fatigue, and irritability. Individuals with type 1 diabetes must have insulin delivered to the body by injection or through a pump.

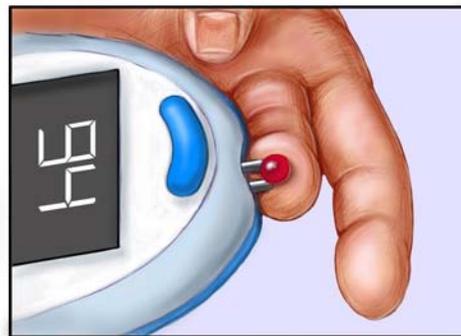
Checking Your Blood Sugar Level -There are many different tools available for monitoring your blood sugar level; check with your doctor to see which one is best for you.



This instrument pricks your finger...



...and then a second instrument reads your blood sugar level.



The diabetic athlete

Exercise not only increases energy levels, decreases stress, and aids in weight management, it also is beneficial to be physically active while living with diabetes. The list of athletes who have diabetes and have thrived athletically includes Olympic medalist Gary Hall, Mike Echols and Jay Leeuwenburg of the NFL, Chris Dudley of the NBA, and Ironman Jay Hewitt. As long as the diabetic athlete maintains proper blood sugar levels, the condition poses no additional risks. The trick is to learn how to control and maintain the proper blood sugar level.

Managing diabetes and exercise

Because of its inability to produce insulin, the body of a person with untreated diabetes is unable to use glucose properly as a fuel source. Instead, their body relies on fat and protein as fuel. Blood glucose levels rise excessively and toxins from fat break down and build up in the blood.

Therefore, the key to exercising for the diabetic athlete is managing blood glucose levels within the body.

Blood glucose testing ranges

In the beginning stages of exercise or training, blood glucose levels should be tested often to learn how your body reacts to different routines and different amounts of exercise. Here are some tips to help assist you in managing your blood glucose levels:

1. *Simulate your race or competition during training.*
2. *Write down your routine.*
3. *Consider taking slightly more insulin on competition day.*

Check your blood glucose twice before activity. Check 1 hour before you start and then check again 30 minutes before you begin. You will also need to check levels during and after exercise. The longer you exercise, the more often you need to check. It is important that the glycogen stores you lost during exercise are replenished. Individuals with type 1 diabetes have a reduced ability to store glycogen after exercise.² Testing is a trial and error process; so, you will need to try different methods based on your level of activity.

Late-onset hypoglycemia (low blood glucose), which can occur 6 to 24 hours after exercising, is one of the most dangerous threats for athletes with diabetes. That's why it is necessary to test your blood glucose level frequently. Ideally, you want to be at 4 to 8 mmol/L (~150 mg/dL). You should delay exercise if your blood glucose level is 10 to 14 mmol/L (~ 250 mg/dL).²

Eating before, during, and after exercise

A central component for the diabetic athlete is carbohydrate intake. Ingesting 15 grams of carbohydrates for every 30 minutes of exercise is recommended. Look for foods with low glycemic index (GI), because they can assist blood glucose control. A person with type 1 diabetes should consume a variety of these foods daily, along with vegetables, meat, poultry, eggs, and dairy products. Examples of foods that release glucose gradually are apples, unripe bananas, pears, mangoes, grapes, fruit muffins, multigrain bread, pasta, milk, low-fat fruit yogurt, and baked beans.

You should eat on a consistent basis (close to the same time everyday) and try different foods and fluid combinations around exercise to find what works best for you.

Eat a carbohydrate-based meal 1 to 3 hours before exercise. Closer to exercise time, eat a small snack. Consuming extra carbs before exercising is necessary if blood glucose levels are low. If these levels are high, avoid

exercise until you can get them to the normal range.

Adequate carbohydrate replacement during and after exercise seems to be the most important measure in preventing hypoglycemia. During activity, it is not necessary to have extra insulin if you are eating correctly during exercise. Drink sports drinks that supply carbs and eat fruit or sports bars. Consume small amounts frequently during exercise and 30 minutes after completing your activity. Through practice, you can achieve the glucose balance you need to stay healthy and active in any sport you choose.

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Symptoms of Diabetes

Blurry vision
Excessive thirst
Extreme hunger
Frequent urination
Increased fatigue
Irritability
Unusual weight loss

The symptoms caused by diabetes often go unnoticed, because the onset of the symptoms can be gradual and they can be easily blamed on something else. For example, changes in weight, fatigue, and irritability can be blamed on job stress and not a medical condition. If you have one or more of the symptoms of diabetes, see your physician right away. With just a couple of tests, your physician can quickly tell you whether your symptoms are from diabetes or not.

*Resource: American Diabetes Association

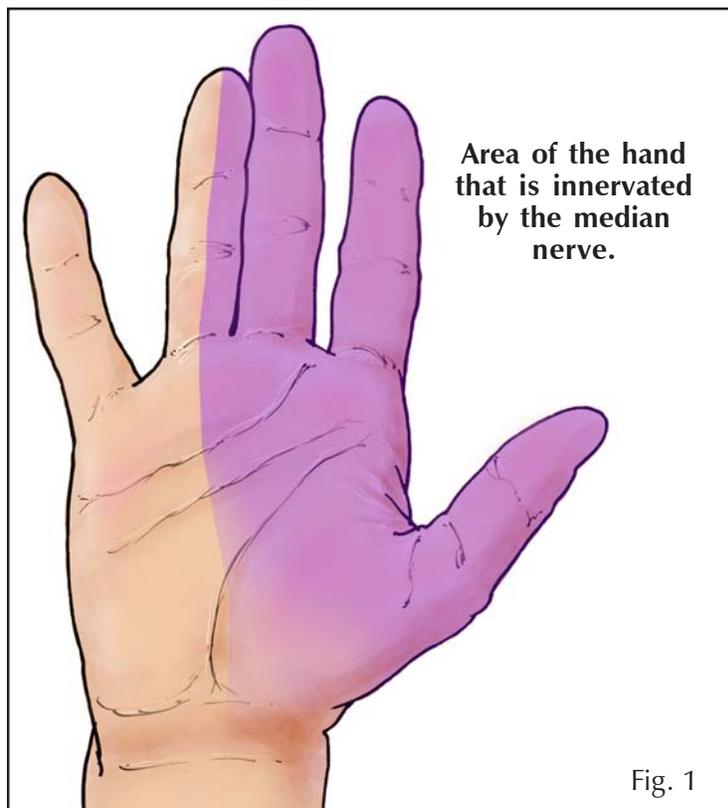
Can Diabetes Cause Carpal Tunnel Syndrome?

Carpal tunnel syndrome occurs when pressure is put on the median nerve in your wrist. The median nerve provides sensation to your thumb, forefinger, middle finger, and half of your ring finger (Fig.1). The median nerve and the tendons of your hand pass between your wrist bones and the carpal ligament, which forms the top of the carpal tunnel (Fig.2). When swelling occurs within the tunnel, pressure is applied to the median nerve causing numbness, burning, and pain in your hand and fingers.

Diabetes and nerve damage

Individuals with diabetes are prone to develop carpal tunnel syndrome. Diabetes is a disease that results when too much glucose (sugar) remains in your blood instead of entering your cells to produce energy. High levels of glucose can damage your nerves in several ways, but one common cause is swelling and then compression of the nerve. Peripheral nerves are susceptible to compression trauma because they extend outside the central nervous system to limbs and are exposed to mechanical injuries.

About 60% to 70% of people with diabetes have mild to severe forms of nervous system damage called diabetic neuropathy (nerve disease or disorder).¹ Diabetic patients can suffer from a variety of neurologic disorders; however, the most common is generalized peripheral neuropathy associated with carpal tunnel syndrome.



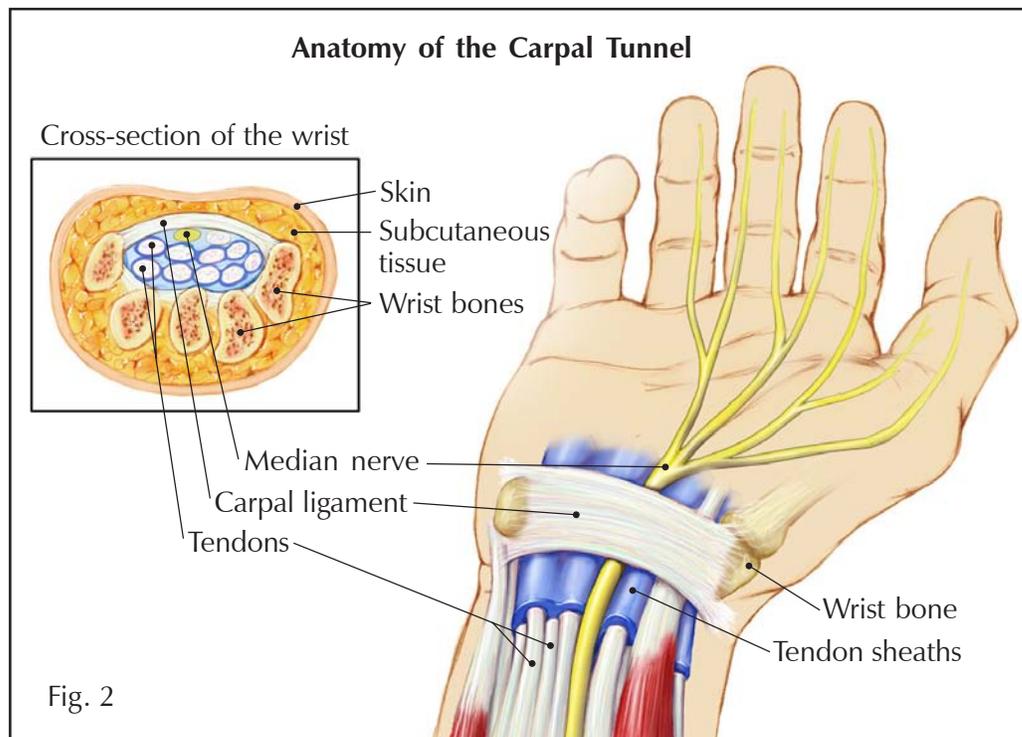
Treatment

The treatment for carpal tunnel syndrome is no different for a diabetic than for a nondiabetic patient. Nonsurgical treatment is usually tried first, except in the most severe cases. Wearing a splint on the wrist, taking anti-inflammatory medicines, or having an injection of anti-inflammatory medicine into the carpal tunnel can relieve the symptoms in most people.

If symptoms do not improve, surgical treatment may be needed. During surgery, the ligament on top of the carpal tunnel is released to relieve pressure on the median nerve (Fig. 3, pg. 4). The surgery often can be done with local anesthesia on an outpatient basis, which means you do not have to spend the night in the hospital. After surgery, you may wear a splint on the operated wrist for 1 to 2 weeks. Surgery is usually successful at relieving symptoms of numbness and tingling as well as nighttime pain.

Prevention

If you keep your blood glucose levels on target, you can help prevent or delay nerve damage. Studies in the United States and abroad have

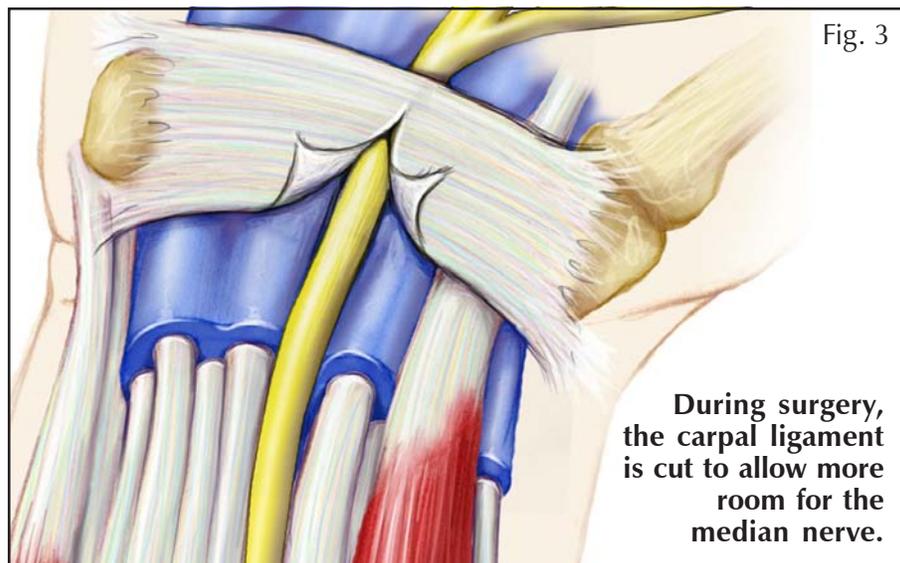


found that controlling sugar levels benefits people with diabetes. In general, every percentage point drop in A1C blood test results (a laboratory test to monitor blood glucose levels) reduces the risk of microvascular complications (such as nerve damage) by 40%.¹ Check your blood glucose with a meter regularly as recommended by your primary care physician. Treatments, such as medication, exercise, and diet can help control your glucose level and help reduce your risk of nerve damage.

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Books about Diabetes

Diabetes is a complex disease that has many other associated health problems, such as high blood pressure, nerve damage, heart disease, and stroke. Reading and learning about diabetes and its effect on your body can help you manage your sugar level and live a healthier life.

Books

The First Year Type 2 Diabetes: An Essential Guide for the Newly Diagnosed by Gretchen Becker

American Diabetes Association Complete Guide to Diabetes: The Ultimate Home Reference from the Diabetes Experts by The American Diabetes Association

Dr. Bernstein's Diabetes Solution: The Complete Guide to Achieving Normal Blood Sugars Revised and Updated by Richard K. Bernstein

Reversing Diabetes: Reduce or Even Eliminate Your Dependence on Insulin or Oral Drugs by Julian Whitaker

Conquering Diabetes: A Cutting-Edge, Comprehensive Program for Prevention and Treatment by Anne Peters

American Diabetes Association Complete Guide to Diabetes by American Diabetes Association

Cookbooks

Diabetes Type 2; Complete Food Management Program by Sherri Shafer, Rd

Healthy Cookbook by American Diabetes Association

Betty Crocker's Diabetes Cookbook: Everyday Meals, Easy as 1-2-3 by Betty Crocker Editors

The Diabetes & Heart Healthy Cookbook by American Diabetes Association

Organizations & Web sites

- American Diabetes Association
www.diabetes.org
- US Centers for Disease Control and Prevention
www.cdc.gov/diabetes
- National Institute of Diabetes and Digestive and Kidney Diseases www.niddk.nih.gov
- Juvenile Diabetes Research Foundation
www.jdrf.org
- Diabetes Exercise and Sports Association (DESA)
www.diabetes-exercise.org
- Children with Diabetes
www.childrenwithdiabetes.com/
- National Diabetes Educational Program
www.ndep.nih.gov/
- National Heart, Lung, and Blood Institute (NHLBI) Information Center www.nhlbi.nih.gov
- American Dietetic Association
www.eatright.org
- Diabetes Research and Action Education Foundation www.diabetesaction.org

Pre-Diabetes

There is hope for prevention.

Pre-diabetes is a phase of elevated blood glucose (sugar) levels that is not significant enough to be classified as type 2 diabetes. Forty-one million people between the ages of 40 and 74 suffer from pre-diabetes.¹ Studies show that long-term damage to the heart and circulatory system can result during the pre-diabetes phase, and individuals with pre-diabetes are at a 50% increase for suffering from heart disease or stroke.² However, the progression to type 2 diabetes can be delayed, if not prevented, by modifying your diet and exercising regularly.¹ But first, how do you know if you suffer from pre-diabetes?

Testing

Individuals suspected of having elevated glucose levels can see their doctor for 1 of 2 tests: Fasting plasma glucose test (FPG) or an oral glucose tolerance test (OGTT). For both tests, individuals fast overnight. With the FPG test blood glucose levels are checked immediately the next morning. Normal fasting levels should read below 100 mg/dL. After fasting, a person with pre-diabetes has a level between 100 to 125 mg/dL. With the OGTT test the blood glucose level is measured after fasting and is repeated 2 hours after drinking a glucose-rich drink. After the glucose-rich drink, normal glucose levels should be 140 mg/dL. If they fall between 140 and 199 mg/dL the person is

classified as pre-diabetic. In both tests, a person with results above the pre-diabetic reading (199 mg/dL) is classified as diabetic.

Research

The American Diabetes Association has published a position statement on the prevention or delay of type 2 diabetes.³ In the statement, they provide research studies supporting the use of diet and exercise modifications as a treatment method. For example, in the Finnish study of 522 middle-aged obese subjects, 2 research groups were formed.⁴ The control group, group A, received brief information on diet and exercise while the intervention group, group B, received individualized instruction on weight reduction, food intake, and increasing physical activity. At an average of 3.2 years, there was a 58% relative reduction in the number of new cases of diabetes in group B compared with group A. The average weight loss was 9.2 pounds at 1 year, 7.7 pounds after 2 years, with moderate exercise of 30 minutes a day.

Similar results were shown in a 2002 diabetes prevention program study of 3,234 subjects.⁵ In a group with glucose levels similar to those in the subjects in the Finnish study, there was again a 58% relative reduction in the progression to diabetes in the group who modified their diet and exercise. In that group, 50% of the participants reached the goal of 7% weight reduction, and 74% of participants exercised at a moderate intensity for a minimum of 150 minutes (2 ½ hours) a week.

In summary, losing a modest amount of weight (approximately 5% to 10% of total body weight) through diet and exercise, such as walking 30 minutes a day, 5 days a week can significantly reduce the chances of progression from the pre-diabetes phase to type 2 diabetes. There is no need to become frustrated if you cannot reach your target body weight; losing just 5 to 10 pounds can be beneficial to you. If you are overweight and over the age of 45, your glucose level should be tested during your next doctor's visit.

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Diabetic Foot Ulcers

Diabetes affects approximately 21 million people in the United States. As recent news articles suggest, obesity is on the rise, placing more and more people at risk for developing diabetes. People with diabetes can suffer from a number of medical problems, such as kidney disease, eyesight trouble, more frequent infections, circulation abnormalities, and more. Ulcers of the feet and toes are a common problem and one that can lead to serious consequences.

Because diabetes can cause numbness of the legs and feet, a person may not be aware that a problem is developing. Minor injuries, such as puncture wounds, skin tears, or undue pressure on some part of the foot may go unnoticed by the patient, leading to foot ulcers (Fig. 1).

Foot ulcers in individuals with diabetes can be difficult to heal, even with treatment. Physicians grade these ulcers based on their severity using Wagner's classification system (Fig. 2). If an ulcer is classified as a Wagner grade 1 ulcer, it is superficial and does not penetrate to the deep structures. A Wagner grade 2 ulcer extends to the tendons, bone, or joint capsule. Wagner grade 3 ulcers have abscess formation, or bone infection. Wagner's 4 and 5 ulcers have varying degrees of gangrene. Because these ulcers can be painless, patients should have their feet examined by family members on a regular basis (if they are unable to do it themselves), and should have their primary care physician examine their feet at each office visit. The ulcers can quickly progress from minor problems to more serious problems, and put the patient at risk for loss of limb or loss of life.



Pressure points are common sites for diabetic foot ulcers

Fig. 1

Treatment

When ulcers develop, self-treatment is strongly discouraged, and immediate medical attention is advised to ensure proper treatment is started early. It is very important that people with diabetes wear properly fitted shoes, avoid going barefoot, and have a podiatrist or other medical provider trim their toenails. Strict control of blood sugar is essential in helping to prevent many complications of diabetes.

Treatment is available for ulcers and, in most cases, can bring about successful healing. However, if left untreated too long, the consequences of a foot ulcer can be devastating.

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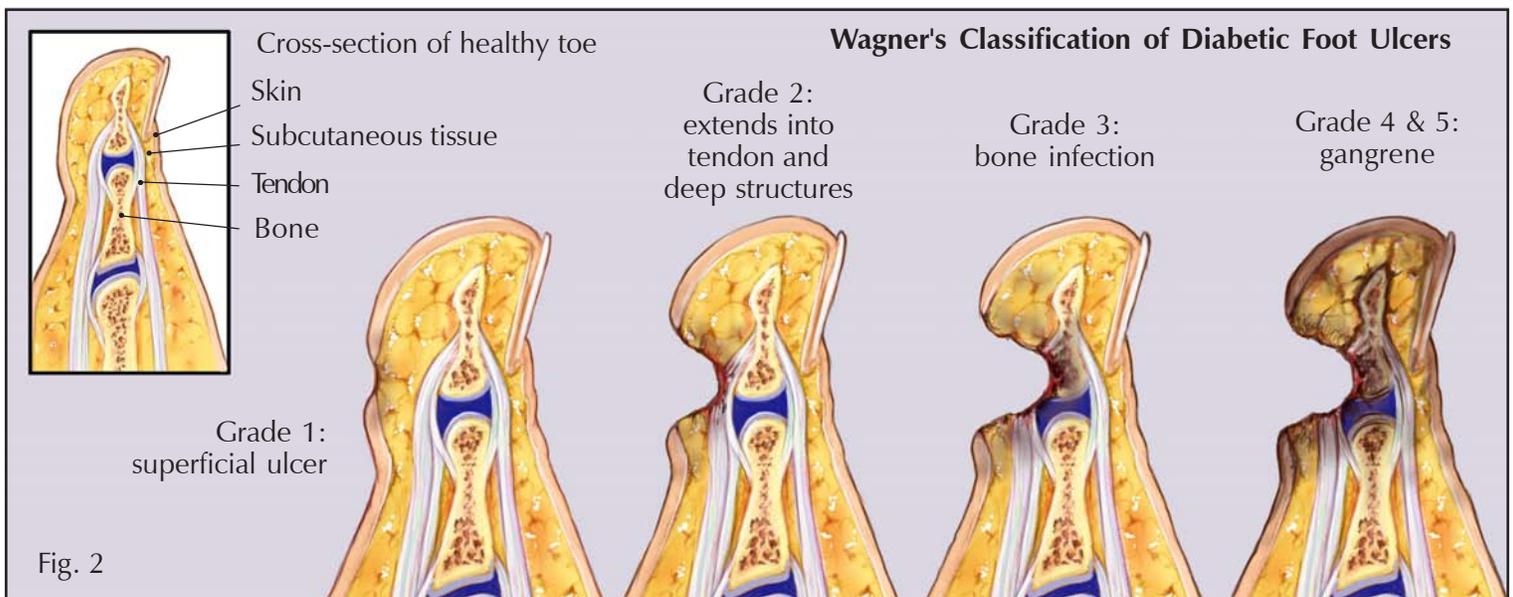


Fig. 2

New Methods of Delivering Insulin

How will you get your insulin?

For years, individuals with diabetes controlled glucose levels by injecting insulin or through oral medications that help the body process insulin better. For individuals with type 1 diabetes, injections of insulin have been their only option. Now, however, researchers have developed new ways for diabetic patients to get the insulin they need.

Many of the new methods are far less painful and more convenient; however, some do require the use of more insulin. When a patient injects insulin, it enters the blood stream quickly and with little waste. With some of the newer methods, the body absorbs the insulin and then it enters the blood stream, which means some of the insulin is lost during the process and does not make it to the blood. Therefore, for the patient to get the correct amount, more insulin has to be given from the start.

Insulin pump

About the size of a cell phone, computerized insulin pumps mimic the pancreas by its slow continuous release of insulin, taking the worry out of managing glucose levels.

The pump can carry a 2- or 3-day reservoir of short-acting insulin. It can be programmed to supply the basal insulin (the constant base line dosage), and it can be set to deliver the boluses, or the units of insulin needed to cover a meal. With the pump, diabetic patients don't worry about carrying diabetic supplies around with them, and remembering when to give an injection has been taken care of by the pump, as well.

Inside, the pump holds a clear plastic tube that ends in a small tip called a cannula. The cannula rests just below the skin in the fatty tissue of the body. The pump delivers a set amount of insulin into the fatty tissue for the body to absorb in the same way that injections deliver insulin (Fig.1). The cannula is changed every 2 or 3 days or when the reservoir is filled with a new supply of insulin.¹

New pumps hitting the market monitor glucose levels and beep when the level climbs above or falls below the patient's preprogrammed glucose range. The pump can also suggest how much insulin is needed based on the patient's preprogrammed glucose range.

Inhalable insulin

Exubera, the first inhalable insulin, is available through prescription for adult usage only. If you have type 1 diabetes, you can use Exubera in place of meal-time injections of rapid acting insulin, but you would still need injections of longer-acting insulin. If you have type 2 diabetes, you can use Exubera as an alternative to pills or meal-time insulin injections or in combination with pills or longer-acting injectable insulin.²

To use Exubera, you insert a capsule of the insulin into the inhaler, pump the handle, press a button, and then draw in a breath through your mouth. The insulin enters your lungs and is absorbed by the body. A major drawback is that you have to inhale a lot of insulin to get the amount your body needs. Only a small percentage actually reaches the blood stream and lowers blood glucose.

Skin absorption

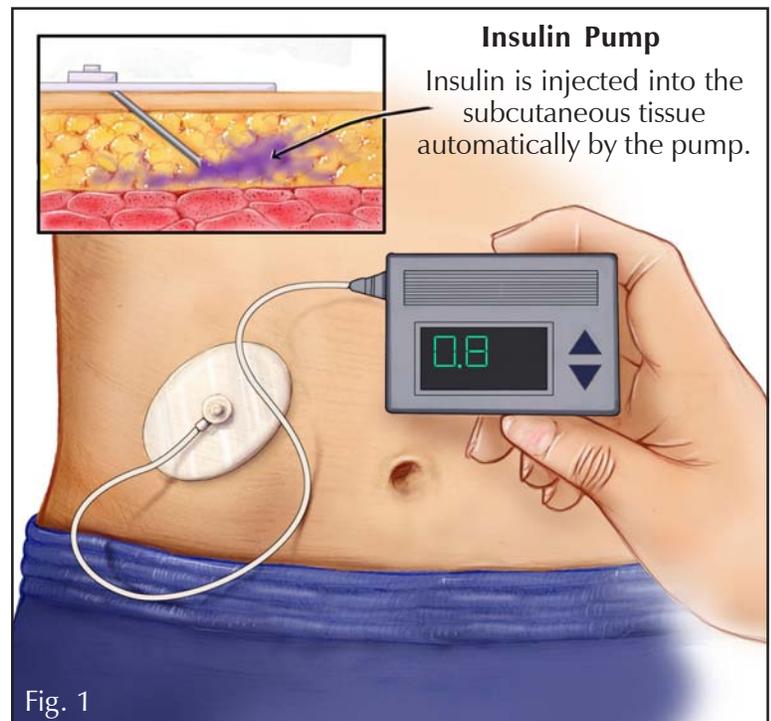
Transdermal or through the skin delivery of medication is popular these days. Patches are used for birth control, pain management, smoking cessation, hormone replacement therapy, and for the treatment of heart disease. Patches are popular because they are convenient, easy to use, and they provide a steady supply of medication or hormones to the body over a period of time. Unfortunately, unlike nicotine, hormones, and some medications, insulin molecules are too large to be absorbed by the skin without some sort of help from chemicals or electrical currents. Researchers are looking for ways to help the skin absorb insulin to provide a slow, moderate delivery of insulin.

Decreasing the time it takes insulin to reach the blood stream and cutting down on waste keeps researchers looking for better ways to control glucose levels and to make painful, daily injections a thing of the past.

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Courtney McQuaker, ATC, is a native of Crestview, Florida. She received her Bachelor of Science Degree in Athletic Training from Troy State University in Troy, Alabama. Upon graduation, she was a recipient of The Kenny Howard Athletic Training Fellowship in Auburn, Alabama and graduated from Auburn University with a Master of Education in Exercise Science, emphasizing Motor Development and Sport Psychology.

Courtney is the Manager of Athletic Training at Hughston Orthopedic Hospital and is the Director of the Hughston Athletic Training Fellowship Program, which is a joint venture between the Hughston Campus and Columbus State University. Participants in the two-year fellowship come from accredited athletic training programs across the country and work toward the attainment of a Masters of Education, with teacher certification, while also serving as the athletic trainer for local high schools and at various community athletic events in the Columbus area. Courtney also coordinates the Hughston Explorer Post and is involved in a variety of high school programs, including the Advisory Board for Healthcare Science Technology Education and Partners In Education. She is certified by the National Athletic Trainers Association Board of Certification (BOC) and is a member of National Athletic Trainers' Association, Georgia Athletic Trainers' Association and the South East Athletic Trainers Association and serves on the Institute of Athletic Healthcare and Research Board.

In her free time, Courtney and her husband, Jamie, enjoy spending time with family and friends.



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