Hypoglycemia: the lowdown on low sugar levels
(professional education)
by Ron Gasbarro, PharmD, MS Journ

Not long ago, hypoglycemia was a trendy syndrome. Embraced by 9-to-5 cubicle dwellers as well as devotees of Woody Allen movies and Psychology Today, the term was at once, threatening and deliciously hypochondrical. One was no longer merely “hungry.” One was “hypoglycemic!,” an urgent cry that sent many scrambling to call 9-1-1, or at least, the bagel shop. To declare oneself hypoglycemic was one’s ticket out of a miserably long staff meeting, a way to gracefully escape a tedious opera, a reason to do something else, like eat. Or else, one might faint dead away, creating a scene. Once stuffed with tapas and sushi and lattes, you were cured. With blood sugar levels elevated, you were free to kvetch about other neuroses, such as your fear of gaining weight from overeating.

While society’s faddish fickleness has moved on to other complaints du jour, hypoglycemia is not a lame excuse for the person with diabetes. It is a hazard of everyday life. A signal of a true medical emergency, precipitously low blood sugar levels in a diabetic must be treated quickly. Because while the person with diabetes struggles with tight glycemic control to keep long-term complications of the disease at bay, the short-term threat is possible permanent brain injury if sugar levels tumble too far for too long.

Your brain eats sugar all day.

Glucose is the fuel that runs your brain. While in some cases, such as prolonged starvation, the brain may adapt by using ketone bodies, the simple monosaccharide is the preferred combustible for normal functioning of that organ. From a survival standpoint, this makes paramount sense. If the brain had to depend on a steady gastrointestinal inflow of nutrients to satisfy its continuous jones for sugar, we would be shoveling food into our mouths 24 hours a day, with no opportunity to sleep. Instead the human body comes with its own round-the-clock glucose manufacturing plant, the liver. The liver is your main sugar daddy in that it: 1) stores glycogen, 2) converts galactose and fructose to more useable glucose, 3) maintains a normal glucose level in the blood, a process called gluconeogenesis, and 4) forms intermediary products of carbohydrate metabolism. Deny yourself carbohydrates – whether they are in the form of angel hair pasta, lemon jellybeans, or prune yogurt – and your liver runs out of the material it needs to make glucose for the brain. Luckily the hypothalamus tells us when it’s time for lunch.

Diabetics take drugs, and sometimes don’t eat.

“Persons with diabetes mellitus are likely to be taking a medication to lower blood glucose, such as insulin or an oral sulfonylurea,” says David Perrott, a certified diabetes educator and a pharmacist at Baltimore’s Mt. Washington Pediatric Hospital. “Hypoglycemia is the major side effect of the pharmacologic management of diabetes. I saw an episode of severe hypoglycemia in a man, about 65, who was a patient at the hospital where I was teaching. At first, he seemed like he couldn’t hear what I was saying to him. Then he started to act goofy and wasn’t making sense. He sounded drunk and, finally, slid down off his wheelchair and lost consciousness. After a shot of glucagon, he was fine. But the whole process was insidious and lasted 30 minutes. I didn’t even know he was a diabetic. However, the nurse informed me that he became hypoglycemic because he skipped lunch.”

As this case illustrates, the risk for hypoglycemia is increased when caloric intake is deficient.
Likewise, one is more prone to low blood sugar after prolonged exercise, when alcohol is ingested, and when more than one glucose-lowering drug is used. The chances of hypoglycemia are also greatest in those diabetics who are not educated with regard to their diabetes and the proper management of the disease as well as in those who exhibit reckless behavior.

Sometimes being too meticulous about controlling one’s glucose levels can place a diabetic at higher risk for hypoglycemia. In the Diabetes Control and Complications Trial, more than 1,400 patients with type 1 diabetes were randomly assigned to receive either intensive or conventional diabetes therapy. [1] Those patients who were in the intensive group were three times more likely to have had at least one severe hypoglycemic episode by the end of the six-year study. In fact, over 25 percent of these hypoglycemic episodes involved seizures and coma.

Drugs, while they usually help, can also be harmful in this regard. While all sulfonylureas may produce severe hypoglycemia, some are more guilty than others. For instance, first-generation chlorpropamide, is not only the most likely member of its class to cause hypoglycemia [2], its long half-life of 36 hours makes a recurrence of the hypoglycemic episode likely for three to five days after the initial attack [3]. Other drugs such as acarbose or miglitol cannot cause hypoglycemia by themselves because of their mechanism of action. However, when used in combination with a sulfonylurea, they can cause a further lowering of glucose, and thereby, increase the hypoglycemic potential of the sulfonylurea.

“The new drugs are definitely better but patients need instructions,” says Linda Haas, president of health care and education at the American Diabetes Association and an endocrine clinical nurse specialist at the Veterans’ Administration Medical Center in Seattle. “If a patient who has been on a sulfonylurea is put on another drug, such as acarbose, and starts to experience hypoglycemia, I usually instruct him to cut back on the sulfonylurea dose.”

Hypoglycemia is also one of the most common side effects of insulin therapy. Failure to reduce the insulin dose around exercise times or the use of regular insulin at bedtime – with the subsequent 3AM “crash” – illustrate the balancing act many diabetics must perform to keep glucose levels not too high and not too low.

**The clinical picture: Dr. Jekyll and Mr. Hy-Poglycemic.**

Abnormal electroencephalograms have been observed when patients have been put in hypoglycemic states. [4] On a tissue level, hypoglycemia causes cortical lesions, especially in the temporal lobes. Hypoglycemia also injures middle layers of the cerebral cortex and hippocampus. Chronic recurrent hypoglycemia can result in a predominantly motor-sensorimotor peripheral neuropathy. Experimentally induced hypoglycemia has caused impaired cognitive function, notably reaction time and decision making. [2]

Clinically, the hypoglycemic patient, because of abnormal brain function, is placed in the jeopardizing situation of being unable to take corrective action before the episode becomes severe. One moment: calm, cool, collected. The next moment: sweating, trembling, anxious, confused, hungry, seeing double, aching head, unable to concentrate. Ignore these and you see: abnormal behavior, seizures, amnesia, and coma. To those who do not know your status, you might appear drunk, flaky, belligerent, even combative. Beware the hypoglycemic who bops you on the nose. Get him some orange juice, stat!
Jellybeans in your diaper bag can cure hypoglycemia.

Ideally, when the warning signs occur, the person with diabetes should take a glucose monitor reading. If the reading is less than 70 mg/dl, then it is low. But from a more practical standpoint, especially in the seasoned diabetic, eating sugar or a sugar-sweetened product will often correct the condition in a few short minutes and prevent more serious symptoms. The American Diabetes Association recommends that when one feels a hypoglycemic reaction coming on, one needs to eat 15 grams – or one-half ounce – of carbohydrates. More than 15 grams will make blood sugar skyrocket; less than 15 grams may not solve the problem. There are 15 grams of carbohydrates in four ounces of orange, apple, or grapefruit juice, 10 jellybeans, two tablespoonfuls of raisins, 8 LifeSavers, 4 teaspoonfuls of sugar, or one tablespoonful of honey. Over-the-counter glucose tablets – Dex4 Glucose by Can-Am Care and B-D Glucose by Becton Dickinson – contain five grams of the sugar; about four tablets should be taken. Glucose gel – Glutose by Paddock, Insta-Glucose by ICN, and Insulin Reaction by Sherwood – is another oral form of glucose. Injectable glucagon counteracts severe hypoglycemic reactions only if liver glucagon is available and is of no use in states of starvation. In children with type 1 diabetes, blood glucose levels do not respond as well as in adult stable diabetics and, thus, supplemental carbohydrates should be given as soon as possible. [3]

“‘In terms of glucagon,’” says Haas, “‘I tell people that everyone should know how to give an intramuscular injection before there is an emergency. That means you should give a saline shot to your husband or someone else close to you so that the first time you do it is not during a crisis.’”

The savvy diabetic stashes sugar everywhere – glove compartments, attics, boyfriends’ pockets, diaper bags, lockers, next to exercise machines – anywhere hypoglycemia is bound to hit. People around you should be able to spot one of your reactions as well, in the event you are mentally unable to help yourself. Instruct them to feed your face when you get flaky.

Preventing hypoglycemic episodes may possibly involve fudge.

The unaware diabetic is the one with the most problems. This person may passively take medication and never understand the subtle clues that can help him sidestep the long-term complications as well as the more immediate problem of hypoglycemia. Education is key. A German study showed how patients who were in a five-day teaching program for intensive insulin therapy had better controlled blood glucose levels and fewer incidence of severe hypoglycemia than those who did not. [5] People in the program were better informed about their condition and knew the signs and symptoms of low blood sugar and could treat themselves before their condition exacerbated. As pharmacists, you can counsel diabetic patients to make sure they understand how to recognize and treat the problem of hypoglycemia.

“The sad part of hypoglycemia,” says Perrott, “is that it is so scary to the diabetic that he will do anything not to have another attack. That often means cutting back on his insulin dose or eating more and not caring that there are long-term consequences for keeping his blood glucose purposely high.”

For the diabetic hell-bent on intensive therapy to forego future complications, such as loss of limbs and/or eyesight, maintaining just the right sugar level can be tricky. Stressful days at work, weekend touch football games, and social drinking at parties all can push blood glucose into the red. Recognizing symptoms early and knowing what and when to eat can short-circuit a full-blown attack.

“‘Any change in the diabetic’s life can lead to hypoglycemia,’” adds Perrott. “Change of medications,
lifestyle, exercise, or diet can all make things go out of whack. The bottom line is that the diabetic himself has to recognize his own symptoms so he can short-circuit a severe episode that can endanger his life.”

Preventing a nighttime hypoglycemic attack has recently been studied in type 1 diabetics using uncooked cornstarch exerted a lower and delayed nocturnal blood glucose peak compared with a conventional snack. [6] Uncooked cornstarch, ingested at bedtime, mimicked the nocturnal glucose utilization profile following insulin replacement, with a peak in blood glucose after four hours. Researchers reported that uncooked cornstarch, as opposed to plain sucrose or protein, kept blood glucose levels more steady over the eight-hour sleep period, without the highs and lows that the other foods may cause. In the type 1 patients studied, the uncooked cornstarch supplement diminished the number of hypoglycemic episodes, without adversely affecting lipid levels. If uncooked cornstarch sounds yucky, know that Medical Foods, Inc., of Cambridge, Massachusetts manufactures a timed-release glucose bar made from the starch called NiteBite. While NiteBite is not intended to treat a hypoglycemic event, the bar can help those with the problem of nocturnal hypoglycemia. Plusses: it comes in chocolate fudge and peanut butter flavors. Downside: 30 percent of their calories come from fat. But, the company maintains that its souped-up Snickers will “delay gastric emptying thereby slowing the rate at which nutrients turn into glucose and enter the bloodstream.” Who knows? They may even come in handy during those long, boring staff meetings.

References


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