KRESSER INSTITUTE FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Blood Chem Hypoglycemia Review

DIAGNOSIS OF HYPOGLYCEMIA IN PATIENTS WITHOUT DIABETES: WHIPPLE'S TRIAD.

1. Patient must have symptoms consistent with hypoglycemia;
2. Low plasma glucose is measured with a precise method, meaning not a glucometer, when symptoms are present; and
3. Patient has relief of those symptoms if plasma glucose is raised.

Often, symptoms of hypoglycemia are diverse and nonspecific.

NEUROGENIC AND NEUROGLYCOPENIC SYMPTOMS

Neurogenic (Autonomic)	**Neuroglycopenic**
Tremor	Cognitive impairment
Palpitations	Behavioral changes
Anxiety/Arousal (catecholamine-mediated, adrenergic)	Psychomotor abnormalities
Sweating	Seizure and coma (at lower plasma glucose concentrations)
Hunger	
Paresthesias (acetylcholine-mediated, cholinergic)	

MOST COMMON CAUSES OF HYPOGLYCEMIA

- Drugs are the most common cause; for example quinolones, pentamidine, quinine, beta-blockers, angiotensin-converting enzyme inhibitor, and IgF-1.
- Alcohol, often after a several-day alcohol binge with limited ingestion of food
- Critical illness
- Malnourishment
- Cortisol deficiency
- Non-Islet cell tumors

- Endogenous hyperinsulinism; also caused by a beta cell tumor, a functional beta cell disorder, or insulin autoimmune hypoglycemia

FOLLOW-UP TESTING

- Another fasting glucose
- Fasting insulin
- C-peptide
- Beta-hydroxybutyrate
- Proinsulin

Please see the interpretation of hypoglycemia follow-up tests handout for guidance in interpreting these follow-up test results.

Evaluation of low fasting glucose and hypoglycemia in children is a little different. One of the primary possible causes in kids is mitochondrial dysfunction or mitochondrial disease.

IS IT TRUE HYPOGLYCEMIA OR POSTPRANDIAL SYNDROME?

- The diagnostic workup includes documenting Whipple's triad and low glucose below 50 mg/dL at the time symptoms are occurring within four hours after a meal.
- These patients should be evaluated in the postprandial state after a mixed meal.
- While glucometers are not considered to be accurate—10 to 15% variation per reading—they are a practical way of doing this kind of testing.
- Postprandial hypoglycemia most often occurs in the context of diabetes and other blood sugar disorders, so the causes are similar to the causes of hypoglycemia.
- Consider drug-induced hypoglycemia in patients with diabetes taking medication.

HYPOGLYCEMIA CAUSES: FUNCTIONAL MEDICINE PERSPECTIVE

- Industrialized diet
- Nutrient imbalance
- Physical inactivity
- Sleep deprivation
- Chronic stress
- Environmental toxins
- Disrupted gut microbiota

The functional medicine definition is less concerned with seeing a glucose level below the lab reference range. If I see a patient who has symptoms that are consistent with hypoglycemia, and those symptoms are resolved by eating, what do we do if their fasting blood sugar is 70?

- Start by ruling out other conditions that can cause these symptoms.
- Then possibly treat, especially since functional medicine treatment primarily involves dietary, lifestyle, and behavioral tweaks and possibly supplements and botanicals that are not likely to have significant side effects.

The most common presentation of functional hypoglycemia I see in practice is postprandial. These patients typically have normal or low-normal fasting glucose, but they exhibit telltale signs of hypoglycemia between meals. These include fatigue, lightheadedness, shakiness, blurred vision, palpitations, anxiety, brain fog, spaciness, extreme hunger where they feel like they are going to die if they don't eat, and intense sugar cravings.

HYPOGLYCEMIA TREATMENT

1. Paleo template diet with a high-protein
    a. A high-protein breakfast is important. We suggest patients eat at least 30 g of protein at breakfast. This usually involves animal protein or fish along with eggs or instead of eggs.
        i. Protein powder doesn't have the same stabilizing effect on blood sugar.
    b. Snacking. Have patients eat something every two to three hours. This could be eating three normal meals and then snacking between meals, or five or six small meals throughout the day. Snacks and meals should always contain some protein and fat and never be carbohydrates alone.
    c. Moderate carbohydrate intake, 20 to 30 percent of calories from Paleo-friendly carbs such as sweet potatoes, taro, yuca, or plantains, particularly green plantains.
        i. Hypoglycemic patients do poorly with refined carbohydrates and sugar.
2. Physical activity
    a. Focus on gentle activity and light weightlifting, with outdoor activity being particularly beneficial.
3. Address any HPA axis dysfunction. Often these patients have low-cortisol.
4. Nutrients and botanicals for blood sugar regulation are the same as they are for hyperglycemia:
    a. Nutrients include chromium (100 to 300 mg per day), alpha-lipoic acid (200 to 400 mg per day), magnesium (300 to 500 mg per day), biotin (200 to 500 mcg per day), and green tea extract (200 to 300 mcg per day).
        i. These nutrients really have more of a regulatory than a suppressive effect, so they can be used in both conditions.

   b. The same is true for the botanicals such as berberine (400 to 600 mg per day), gymnema (200 to 400 mg per day), banaba (40 to 60 mg per day), and fenugreek (200 to 300 mg per day). You can use the same combination of Metabolic Synergy and GlucoSupreme from Designs for Health in patients with hypoglycemia.

5. Fiber. Use the same recommendations as in the hyperglycemia unit.
6. Glucomannan and resistant starch can cause favorable changes in the gut microbiota that may improve blood sugar regulation.

HYPOGLYCEMIA TREATMENT SUMMARY

Intervention	Comments
Diet	Paleo w/high protein, moderate or low-carb
Lifestyle	Physical activity (gentle), sleep, stress management
Address pathologies	Primarily gut and HPA axis; low cortisol more common
Rebalance nutrients	Vitamin D, iron, magnesium
Therapeutic supplementation	Metabolic Synergy, GlucoSupreme
Fiber	Glucomannan, resistant starch