Celiac Disease

Description/Etiology
Celiac disease (CD; also known as celiac sprue and gluten-sensitive enteropathy) is a chronic autoimmune disease induced by ingestion of food products containing gluten, a protein found in wheat, rye, and barley. The major auto-antigen in CD is tissue transglutaminase (tTG), an enzyme that modifies gluten. The tTG reacts with gliadin, a protein within gluten. This change causes a release of natural killer cells and lymphocytes that result in inflammatory changes in the small intestine. This inflammation results in atrophy of the small intestinal villi, resulting in diarrhea and malabsorption of nutrients; the CNS, skin, joints, and reproductive system can also be affected. CD can manifest at any age, and patients who have a family member with CD are at higher risk for CD.

CD can be classified as classic (i.e., characterized by the presence of gastrointestinal [GI] signs and symptoms), atypical (i.e., characterized by few or absent GI signs/symptoms but the presence of non-GI symptoms), silent (i.e., asymptomatic) or latent (i.e., causing positive serology but no villous atrophy). Classic GI signs (e.g., failure to thrive, diarrhea, abdominal distention, and vomiting) are typically seen in infants 2–24 months of age (when cereals are introduced into the diet) and in children. Symptomatic adults tend to experience atypical or mixed signs/symptoms, including anemia, fatigue, change in bowel habits, and low-impact bone fracture. Serology tests with the highest accuracy for diagnosing CD are immunoglobin A endomysial antibody (IgA-EMA), and immunoglobulin A tissue transglutaminase antibody (IgA-tTG). Abnormal histology of biopsied small bowel tissue obtained through endoscopy is the standard method of confirming the diagnosis in patients with positive serologic tests for CD.

Prognosis is excellent if patients are treated with a strict gluten-free diet (GFD) (i.e., complete exclusion of all foods and beverages containing gluten), and levels of IgA-tTG and IgA-EMA become undetectable after following a gluten-free diet for 6–12 months. Gluten-free foods must be prepared separately from foods containing gluten to prevent cross-contamination. This makes meal preparation challenging and dining at restaurants very restrictive. Because gluten is present in the ingredients of many processed foods (e.g., malt flavoring, dextrin, hydrolyzed plant proteins), extensive knowledge of food products is necessary to avoid unintentional exposure to gluten. Risk for nutrient deficiency is increased if the sources of food in the GFD are not well planned to contain balanced nutrition. The most common nutrient deficiencies associated with CD and following a GFD are iron, folate, and calcium deficiency. Low intake of fiber and B vitamins is also common in persons following a GFD. Patients should be encouraged to consume folate- and iron-rich foods, such as liver, legumes, enriched rice, flax, quinoa, fish, red meat, and blackstrap molasses. Including a vitamin C source with the meal can enhance iron absorption. Patients who have nutritional deficiencies might also require treatment with a multivitamin and calcium and iron supplementation. Treatment requires multidisciplinary collaboration, with the primary health care provider and nutritionist working as a team with the patient and family. Treatment includes patient and family education about necessary diet restrictions, emotional support for stress that can be experienced related to diagnosis of CD and dietary restrictions, and continued medical surveillance. Unrelieved CD signs and symptoms are usually related to lack of strict patient adherence to the prescribed dietary regimen. Poor adherence to the GFD is usually due to inadequate education.
Facts and Figures
The prevalence of CD in the United States is 1 in 133 persons or 1% of the population. CD occurs in 1 in 266 persons worldwide. CD is commonly undiagnosed; just 10–15% of people with CD in the U.S. have been diagnosed. The mean age at diagnosis is 8.4. The female-to-male ratio of clinically diagnosed cases of CD is 3:1, but this female predominance is less pronounced in cases of CD diagnosed by screening. First-degree relatives of patients with CD have a 5% chance of being diagnosed with CD. The prevalence of CD is higher (7–12%) in persons with diabetes mellitus, type 1 (DM1). Without treatment, CD causes prolonged inflammation of the intestine and leads to cancer in about 10% of patients.

Risk Factors
CD has a strong genetic component; carrying either the HLA-DQ2 or HLA-DQ8 allele is a risk factor for CD. CD onset can be triggered by surgery, pregnancy, childbirth, viral infection, or severe emotional stress. CD is more common in persons with certain genetic disorders, including Down syndrome and Turner syndrome. Persons with CD also have higher rates of other immune disorders (e.g., rheumatoid arthritis, systemic lupus erythematosus), thyroid disease, and DM1. Introducing gluten-containing foods before the age of 3 months might be associated with an increased incidence of CD in children, and breastfeeding might reduce risk by up to 52%.

Signs and Symptoms/Clinical Presentation
More than 200 signs and symptoms can be associated with CD, making the presentation variable. Infants with CD have signs of malabsorption (e.g., diarrhea, weight loss, muscle wasting, and/or slowed growth). Children and adults with CD show signs of serious malabsorption less often, instead experiencing diarrhea, constipation, dyspepsia, abdominal pain, and flatulence. Older children and adults might also have fatigue, anemia, motor weakness, paresthesias, ataxia, seizures, delayed puberty, amenorrhea, and/or osteoporosis. Children with CD can have delayed puberty, iron-and folate-deficiency anemia, rickets, and defects in dental enamel. Adults might have diarrhea, flatulence, and weight loss. Iron deficiency anemia is a common presenting manifestation of CD in adults who have minimal CD-related GI symptoms. Adults with CD typically have extraintestinal signs and symptoms such as chronic fatigue, iron deficiency anemia, dental enamel hypoplasia, infertility, neurologic disorders, dermatitis herpetiformis (DH; i.e., a pruritic, blistering, chronic skin rash that primarily affects the knees, elbows, buttocks, and back), peripheral neuropathy, skeletal disorders (e.g., osteoporosis), and/or generalized pain. When intestinal signs do occur, adults with CD are often misdiagnosed with irritable bowel syndrome and typically have signs and symptoms for up to 10 years before the correct diagnosis is made. Approximately 40% of older children and adults with positive serologic test results for CD are asymptomatic. Women with CD have a higher risk of infertility, miscarriages, and intrauterine growth restriction compared to women without CD. CD is associated with increased risk of retinopathy and neuropathy in patients with DM1.

Assessment
› Patient History
  • Take a complete medical history and ask about family history of CD
  • Inquire about dietary intake and GI signs and symptoms (e.g., weight loss, diarrhea, dyspepsia, flatulence)
› Physical Findings of Particular Interest
  • Patients can show signs of malabsorption (e.g., pallor, muscle wasting, easy bruising)
  • Abdominal distention and hyperactive bowel sounds can be present
  • Skin examination can reveal DH (present in 10–20% of patients with CD)
› Laboratory Tests That May Be Ordered
  • Positive serologic antibody tests for IgA-tTG and IgA-EMA have an 84–94% sensitivity and 98% specificity for diagnosing CD
    – tTG is the single most accurate test for diagnosing CD
  • Blood tests can be ordered to evaluate for malabsorption
    – Low levels of iron, folate, calcium, ferritin, and fat-soluble vitamins (e.g., A, D, E, and K) can indicate CD
    – PT can be prolonged secondary to vitamin K malabsorption
  • Histologic examination of biopsied small bowel (e.g., duodenum) tissue will identify flattening of the mucosa and atrophy of the villi in patients with CD. A normal test result excludes the diagnosis
    – To provide accurate results, this test must be performed before the patient is placed on a GFD
Other Diagnostic Tests/Studies
• X-ray scan of the small intestine after barium ingestion will identify dilatation, a coarsening or obliteration of the mucosal pattern and fragmentation or flocculation of the barium in the gut lumen, if present
• Stool testing can show fat malabsorption

Treatment Goals
Promote Optimal Physiologic Function and Reduce Risk of Complications
• Monitor vital signs, all physiologic systems (especially GI, endocrine, and immune systems), and laboratory/other diagnostic study results; report abnormalities and treat, as ordered
  – Administer a multivitamin, and calcium and iron supplementation, as ordered; assess for side effects and treat, as ordered
  – Administer corticosteroids, which may be prescribed in refractory cases due to their anti-inflammatory properties
• Monitor weight and encourage maintenance of a healthy body weight
  – Request referral to registered dietitian for patient evaluation and nutritional education on following a GFD, including shopping for food, meal planning, and eating a diet high in nutritional value and dietary supplementation

Support Emotional Well-Being and Educate
• Assess anxiety level and coping ability of patient and family; provide emotional support and promote a positive self-image for patients who have experienced a change in lifestyle due to CD-related functional limitations
• Educate and encourage discussion regarding CD benefits of treatment, changes in body image and function and what to expect during recovery from treatment
• Social worker for identification of local resources for support groups, transportation, and Internet resources

Food for Thought
• Oats might be safe for a patient with CD to eat but should be avoided until the patient’s condition stabilizes after the CD diagnosis in order to determine whether or not the patient is reactive to the oats. Oats also carry a risk for cross-contamination with wheat or barley; care should be taken to ensure the oats are gluten-free. (For more information, see Evidence-Based Care Sheet: Oats)
  
  In a 2014 study publication, researchers concluded that new computer algorithms in video capsule endoscopy may allow mapping of the entire small intestine for the presence of abnormality in real-time, which would be useful to determine progress in patients with CD on a GFD, and to better understand the properties of the healing process in this population (Ciaccio et al., 2014)
  
  In a study investigating the effects of CD on cardiac functions using tissue Doppler echocardiography, researchers concluded that patients with CD have increased risk for impaired diastolic function and myocardial systolic function and recommend using tissue Doppler echocardiography in addition to conventional echocardiography for the cardiovascular risk assessment of patients with CD (Akin et al., 2016)

  In December 2017 the FDA released a statement regarding the presence of gluten in medications. It stated that they are unaware of any medications that contain significant levels of gluten. They did publish a list of inactive ingredients that can contain gluten in insignificant quantities. They suggested the following statement for drug companies, if appropriate, “Contains no ingredient made from a gluten-containing grain (wheat, barley, or rye)”

Red Flags
• Persistent weight loss and signs of nutrient deficiency could indicate non-compliance with the GFD, inadequate dietary intake, or refractory CD
  • CD that is refractory with strict adherence to the prescribed diet might be indicative of enteropathy-associated T-cell lymphoma
  • CD can impact drug absorption, requiring cautious selection of medications and dosage and close monitoring for effectiveness and potential adverse reactions
  • Monitor for signs and symptoms of other autoimmune diseases that frequently occur in patients with CD (e.g., DM1, thyroiditis, dermatitis herpetiformis)

What Do I Need to Tell the Patient/Patient’s Family?
• Emphasize the importance of strict, lifelong adherence to a GFD and/or supplementing vitamins, iron, and calcium and continued medical surveillance
Educate the patients and family members to read labels and lists of ingredients in processed foods, food additives, beer products, and medications because all may contain gluten.

Explain that gluten-free labeling is voluntary, that manufacturers often use wheat derivatives (e.g., malt) in foods, and that inactive wheat-based ingredients can be found in vitamins, supplements, and prescription and over-the-counter medications.

Encourage the patient/patient’s family to attend a support group for contact with others who face similar health challenges.

Provide written information on any scheduled follow-up appointments to monitor enzyme levels, assess for other autoimmune diseases, monitor nutritional status, and/or test bone density.

Online GFD guidelines and support can be found at the Celiac Disease Foundation at https://celiac.org, the Celiac Support Association at http://www.csaceliacs.org, the American Dietetic Association (ADA) at http://www.eatright.org, and Gluten-Free Diet at http://www.glutenfreediet.ca.

Note

Recent review of the literature has found no updated research evidence on this topic since previous publication on July 15, 2016.

References


