

Celiac Disease Symptoms in a Female Collegiate Tennis Player: A Case Report

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Objective: To present the case of a collegiate tennis player with celiac disease symptoms.

Background: Celiac disease is a common intestinal disorder that is often confused with other conditions. It causes severe intestinal damage manifested by several uncomfortable signs and symptoms. Failure by the sports medicine staff to recognize symptoms consistent with celiac disease and treat them appropriately can have deleterious consequences for the athlete.

Differential Diagnosis: Irritable bowel syndrome, Crohn disease, Addison disease, lupus erythematosus, juvenile rheumatoid arthritis, lactose intolerance, herpes zoster, psychogenic disorder (depression), fibromyalgia, complex regional pain syndrome, hyperthyroidism, anemia, type I diabetes.

Treatment: The athlete underwent a series of blood and allergen tests to confirm or refute a diagnosis of celiac disease. When celiac disease was suspected, dietary modifications were

made to eliminate all wheat-based and gluten-based products from the athlete's diet.

Uniqueness: The athlete was able to fully compete in a competitive National Collegiate Athletic Association Division I tennis program while experiencing the debilitating effects associated with celiac disease. The immediacy of symptom onset was notable because the athlete had no history of similar complaints.

Conclusions: Celiac disease is a potentially life-threatening condition that affects more people than reported. A properly educated sports medicine staff can help to identify symptoms consistent with celiac disease early, so damage to the intestine is minimized. Prompt recognition and appropriate management allow the athlete to adjust the diet accordingly, compete at a high-caliber level, and enjoy a healthier quality of life.

Key Words: nutrition, diet, gastrointestinal tract, arthralgia, autoimmune disease, gluten, villi

Our purpose in developing this communication on celiac disease is fourfold: (1) to present the physical manifestations experienced by our patient, (2) to discuss celiac disease in general, (3) to explain why the disease is important to athletic trainers, and (4) to alert athletic trainers about the diagnosis and prognosis of celiac disease and prepare them to help the athlete once he or she is diagnosed.

Celiac disease is a hereditary hypersensitivity disorder causing malabsorption within the gastrointestinal tract,¹ which some experts believe is triggered by a virus. A hereditary hypersensitivity disorder results in the body's overreacting to a foreign substance. In celiac disease, this substance is an antigen ingested as gluten or gliadin-containing foods. The immune system of a susceptible person responds to the ingestion of gluten or gliadin by damaging the small intestinal mucosa, resulting in a reduced ability to absorb nutrients.¹ The disease itself has many interchangeable and descriptive names, including celiac sprue, nontropical sprue, gluten-sensitive enteropathy, celiac syndrome, and simply gluten intolerance.¹ The clinical presentation of the disease is vague at best because of the wide variety of symptoms with which it may be associated. These symptoms are numerous, varied, and potentially debilitating, ranging from physical ailments such as arthralgia, myalgia, chronic diarrhea, abdominal pain, and cramping to cognitive and behavioral changes.²

Two schools of thought exist regarding the origin of the

disease: genetic and viral.³ Celiac disease is on the rise globally and particularly in the United States.⁴ Whatever the origin, the incidence and failure to diagnose the condition can result in harmful consequences for the affected individual. Celiac disease is not a disease athletic trainers commonly deal with, and so we hope that presenting this case will increase awareness among athletic trainers and other health care professionals. By being familiar with this disease and considering the diagnosis in patients with suspicious symptoms, the athletic trainer can be of great benefit to both undiagnosed and established celiac disease patients.

CASE REPORT

History

A 20-year-old female collegiate tennis player presented in the athletic medicine facility on October 14, 2001, complaining of diffuse myalgia centered in her midback. Her height was 162.5 cm and her mass was 58.2 kg. Her father's height was 182.9 cm; her mother's, 172.2 cm; and her sister's, 175.3 cm. Vital signs were temperature of 98.2°F, respirations of 13 per minute, and blood pressure of 118/76 mm Hg. The subject had severe eczema in 1996 and mononucleosis in 2000. In April 2001, she developed arthralgia, myalgia, chronic diarrhea, and profound fatigue. She saw her pediatrician in May

2001 and was referred to an allergist, who found negative reactions to a multitude of substances. Because of her symptom severity and persistence, the athlete was referred for further, more specific testing. An enzyme-linked immunosorbent assay test was conducted in July 2001. This assay tests the patient's blood for antibodies to specific substances (antigens). The patient showed positive reactions to gluten, spelt (a member of the same grain family as wheat and oats but an entirely different species), albumin, lactose, barley, and rye, as well as other wheat-based substances (Figure 1).

Celiac disease was considered at this point, but a firm diagnosis was not made. The athlete and her mother both experienced symptoms of celiac disease; therefore, an effort to find a diagnosis for their joint symptoms was undertaken. The athlete's symptoms may have been caused by leaving home for college, where she was subjected to a "regular" diet. The diet she followed at home may have evolved to minimize the foods that tended to bring on the symptoms.

The athlete reported typical gastrointestinal distress (nausea, diarrhea, black and tarry stools, and intestinal cramping), arthralgia, lack of attentional focus, back spasms, and general feelings of malaise. She also had a history of lactose intolerance and suspicious skin rashes and family history of a "wheat allergy" diagnosed in her maternal grandfather at age 90. The athlete's symptoms started in August 2000, when she began college. Her outward physical appearances were judged normal by the athletic trainers in the athletic medicine facility, aside from a slight painful rash on her back that consisted of reddened papules without drainage.

Interestingly, the athlete was able to fully participate in a competitive National Collegiate Athletic Association Division I women's tennis program and lost virtually no time from competition or practice because of her condition. After the tentative diagnosis, the athlete was allowed to continue competing fully as tolerated.

The differential diagnosis included irritable bowel syndrome, Crohn disease, Addison disease, lupus erythematosus, juvenile rheumatoid arthritis, lactose intolerance, herpes zoster, psychogenic disorder (depression), fibromyalgia, complex regional pain syndrome, hyperthyroidism, anemia, type I diabetes, and celiac disease. The athlete was tested for diabetes and lupus with negative results.

Treatment

During the course of testing, we treated the spasms of her back muscles with physical modalities, (ice, massage, and electric stimulation) and nonsteroidal anti-inflammatory drugs. Treatment was continued for approximately 3 weeks, yielding minimal improvement of her back spasms. We initiated an aggressive stretching and strengthening program because of the lack of response to other treatments. The focus was on improving scapular stability and postural control. Two weeks of treatment produced short-term reduction of her back pain and spasms. However, because of her persistent gastrointestinal, cognitive, and systemic complaints, further consultation with the athlete's physicians and the school physician was deemed necessary. The physicians disagreed about the possible diagnosis of celiac disease and, therefore, the insurance company declined to cover a jejunal mucosal biopsy. The patient was advised to follow a gluten-free and wheat-free diet to see whether her symptoms improved.

The athlete and her mother chose to try a wheat-free diet

to eliminate most sources of wheat and gluten after learning the results of the enzyme-linked immunosorbent assay. The diet resulted in a marked decrease in symptoms such as myalgia, arthralgia, flatulence, and fatigue in both, reinforcing the likelihood that the symptoms were celiac in nature.

DISCUSSION

The Gastrointestinal Tract: Absorption and Celiac Disease

General Overview. The digestive tract includes the mouth, teeth, pharynx, esophagus, stomach, and intestines, as well as exocrine glands such as the liver, pancreas, and salivary glands. The primary function of the gastrointestinal tract is to aid in the digestion and absorption of nutrients. Nutrients within this canal are not considered to be within the body until they are absorbed via the intestines. This absorption and secretion occurs at the inner layers of the gastrointestinal tract, the gastrointestinal mucosa. The mechanical process of breaking food down into its constituents is digestion. As the smaller food molecules pass through the mucosal cells of the small intestine into the blood and lymphatic system, absorption occurs.⁵⁻⁸

The Small Intestine. The intestine is a series of convoluted tubes with 3 distinct subdivisions: the duodenum, the jejunum, and the ileum.^{5,6,8} The duodenum receives partially digested food from the stomach and begins the absorption of nutrients, whereas the jejunum and ileum move the food further along while absorbing nutrients. The coils of the small intestine dominate the abdominal cavity, averaging 6 to 7 m in length.^{7,8} The small intestine absorbs digested molecules of food into the bloodstream and lymphatic system via the gastrointestinal mucosa.⁵ Typically, all products of carbohydrate, lipid, and protein digestion, as well as most ingested electrolytes and vitamins, are absorbed by the small intestine, with little absorption occurring in the duodenum and jejunum.⁵

Villi. Finger-like projections, villi are present in the small intestinal mucosa to increase the absorptive surface area. The movement of the villi during the digestive process is made possible by a slip of smooth muscle that extends into the core of each villus. These muscular motions enhance absorption.^{6,7} The surface area is further increased by the infolding of epithelium between the bases of the villi, forming tubular intestinal glands, or crypts of Lieberkühn.⁵⁻⁷ Villi are considered very effective structures in that they increase absorption by 600 times.⁵

Diagnosing Celiac Disease. The "gold standard" for diagnosing celiac disease is through a jejunal mucosal biopsy sample to measure the extent of the damage.^{2,4,9,11} However, subjective findings with minimal objective evidence often lead to an inconclusive diagnosis, as was the case with this athlete. Another method is the enzyme-linked immunosorbent assay (ELISA). Both procedures are costly,^{4,9} but the potential for harm exists if the proper diagnosis is not made. Therefore, the cost and discomfort of more invasive procedures need to be weighed against the possible harm caused by not diagnosing celiac disease. If the definitive test is not possible, either because of cost or patient reluctance, dietary modifications with significant improvement may suggest a celiac diagnosis, even without definitive proof.

Celiac disease is very damaging to the small intestine and can create many other problems, such as electrolyte imbalance-

Basic Food Panel







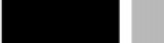


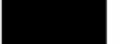









Result	Value (mcg/dL)	Allergen	Clinical Significance			Reference Range		
			Insignificant	Moderate	Significant	Insignificant	Moderate	Significant
Dairy								
Equivocal	344	Cow's milk				<117	117-358	>358
Equivocal	167	Casein				<105	105-324	>324
Equivocal	211	Lactalbumin				<140	140-438	>438
Negative	0	Goat's milk				<125	125-391	>391
Negative	177	American Cheese				<186	186-580	>581
Negative	161	Cheddar cheese				<162	162-502	>502
Equivocal	183	Cottage cheese				<133	133-408	>409
Negative	128	Mozzarella cheese				<138	138-430	>430
Negative	107	Swiss cheese				<115	115-358	>358
Grains								
Negative	0	Barley				<117	117-351	>351
Negative	0	Buckwheat				<122	122-374	>374
Negative	0	Corn				<113	113-337	>337
Significant	975	Gliadin				<192	192-594	>594
Significant	956	Gluten				<115	115-363	>363
Negative	0	Malt				<101	101-500	>500
Negative	0	Oat				<143	143-447	>447
Negative	0	Rice				<67	67-201	>201
Significant	546	Rye				<136	136-421	>421
Significant	689	Wheat				<171	171-528	>528

Figure 1. Results of athlete's allergen exposure testing. Note the significant response to cow's milk, gliadin, gluten, rye, and wheat.

Table 1. Identifying Celiac Disease¹⁰

Subjective Findings
<ol style="list-style-type: none"> 1. History of digestive disturbances (ie, cramping, bloating, and diarrhea) 2. History of vague and diffuse myalgia and arthralgia 3. Behavioral and mood disturbances 4. Inability to concentrate and other cognitive problems 5. General malaise 6. Pubertal delay
Objective Findings
<ol style="list-style-type: none"> 1. Failure to grow and thrive (children) 2. Enlarged abdomen and vomiting (children) 3. Short stature in physically mature adults 4. Weight loss, anorexia, and lack of sufficient body fat 5. Muscle atrophy and wasting
Clinical Findings
<ol style="list-style-type: none"> 1. Anemia and abnormal blood tests 2. Rickets (from vitamin D deficiency) and other vitamin deficiencies 3. Dermatitis herpetiformis 4. Extreme sensitivity to allergen exposure testing and ELISA* testing 5. Chronic history of miscarriages (females) 6. Higher mortality rates

*ELISA indicates enzyme-linked immunosorbent assay.

es, cardiac arrhythmias, villus atrophy, and short stature because of the diminished ability to properly absorb nutrients (Table 1).^{11,13–15} Celiac disease also causes many problems for the body, and healing the damage requires a great deal of time.

Many signs and symptoms associated with celiac disease are characteristic of other conditions (Table 2). As a result, diagnosing this condition can be very challenging for the sports medicine team and frustrating for the athlete.

Celiac disease can be an incapacitating condition if it goes undiagnosed or is mismanaged. The condition usually manifests in childhood, but it can present at any time during adulthood. Our patient's presentation was unusual in that no single traumatic life event appeared to trigger the disease.

Management. The signs and symptoms of celiac disease are usually easily addressed. For example, if wheat or gluten has been ingested, the athlete may develop a rash (hives). This reaction, dermatitis herpetiformis, is typical of celiac disease and can be effectively managed with oral Dapsone (Jacobus Pharmaceutical Co, Inc, Princeton, NJ).^{2,3,9–11} Other treatments include supportive nutrition such as supplemental iron, vitamin B₁₂, and folic acid. Dehydration can be managed with electrolyte drinks or, in more severe cases, intravenous fluids.^{4,10,12–15}

Celiac disease patients cannot tolerate gluten, a protein found in the grains wheat, rye, and barley. In order to preserve their gastrointestinal integrity, people with celiac disease need to take extra precaution when selecting foods.^{13,15–18} It is challenging to avoid all forms of food that may contain the gluten or gliadin offending agents. Table 3 lists some common and less obvious foods that contain gluten or gliadin and should be eliminated from the diet for more successful treatment of celiac disease. Today, the only known treatment is to eliminate these agents from the diet and to carefully monitor progress.^{1–4,11,14,15,19} Therefore, a gliadin-free and gluten-free diet must be a lifelong commitment for the patient with this condition.

The sports medicine team can play a crucial role in helping

Table 2. Differential Diagnosis of Celiac Disease

Illness/Disease	Signs and Symptoms
Addison disease	Weakness Fatigue Weight loss Nausea, vomiting Anorexia Chronic diarrhea Bronze discoloration of the skin Adrenal dysfunction
Pernicious anemia	Weakness Sore tongue Paresthesia in extremities Paleness of lips, gums, and tongue Pale to bright yellow-colored skin Nausea, vomiting Fatigue Weight loss Diarrhea and flatulence
Celiac disease	Arthralgia Myalgia Cognitive and attentional disturbances Diarrhea Gastrointestinal discomfort Painful skin rashes Slowed growth patterns Significant weight loss Vitamin deficiencies
Crohn disease	Right lower quadrant pain Cramping and tenderness Flatulence Nausea Fever Diarrhea Marked weight loss Weakness Lack of ambition
Diverticular disease	Recurrent left lower abdominal quadrant pain Alternating constipation and diarrhea Difficult defecation Gas Irritable bowel habits Low-grade fever Leukocytosis
Fibromyalgia	Complex pain patterns Hypersensitivity to normal stimuli Diffuse to specific myalgias Mood disturbances and irritability
Lactose intolerance	Mild to severe intolerance to milk products Gas and accompanying flatulence Cramping Diarrhea Sunken appearance of eyes

a person with celiac disease deal with dietary restrictions. Athletic trainers, other health care professionals, and coaches all contribute to the athlete's choices. The athletic trainer can help by referring the patient to the most appropriate health care professional.²⁰ This could be the institution's physician, his or her own family physician when the initial symptoms occur, or a specialist. If psychological issues from the frustrations of dealing with the disease are affecting performance, a sport

Table 3. Sources of Gluten

Common Sources	Less Obvious Sources
Bread	Couscous
Pasta	Ice cream cones
Cereal	Waffles
Baked goods	Ice cream (eg, cookie-dough flavor)
	Processed meats
	Frozen vegetables (flour used to prevent “sticking”)
	Soy sauce
	Most canned soups
	Beer and ale
	Adhesives (envelopes)
	Hair products

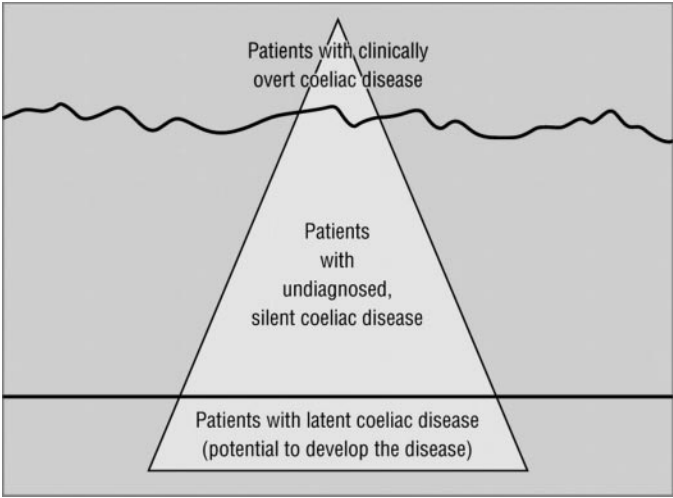


Figure 2. Iceberg model of celiac disease. Reproduced with permission.³

psychologist can be consulted. Finally, the athletic trainer can refer the athlete to a nutritionist or dietitian to help manage the diet. Coaches can stay involved by learning more about the disease in order to make better choices of restaurants with gliadin-free and gluten-free options during team traveling.

Currently, there is no cure for celiac disease. Therefore, it is important for athletic trainers to be aware of the symptoms (see Table 2) and the adverse effects of celiac disease. Ideally, science, through research and alternative therapies, will allow the celiac patient to achieve a better quality of life. Until then, heightening the public’s awareness of the condition will allow for the person with celiac disease to be more appropriately accommodated. For now, the athlete needs to take precautionary measures to maintain a healthy body and lifestyle.

Statistically, celiac disease is on the rise in the United States.⁴ It is estimated that 1 in every 200 to 500 people have celiac disease. Of this number, only 1 in every 4700 is accurately diagnosed.^{3,4,11} The “iceberg” model proposed by Feighery³ (Figure 2) provides a pictorial representation of this point, reflecting the fact that celiac disease is more prevalent than people think. The damage that can occur because symptoms associated with this condition are not recognized can lead to negative consequences for the athlete and even death in some instances.

Athletic populations are just as susceptible to celiac disease as other populations. Sports medicine professionals interact

with a variety of populations from clinical settings, including physical therapy clinics and traditional athletic venues such as colleges and universities. This places the “team” in a critical role in helping the diagnosed athlete receive proper treatment. The misdiagnosis and mismanagement of celiac disease can lead to severe consequences for the athlete. Quality of life can be achieved by following a strict gliadin-free and gluten-free diet, but the commitment has to be present on the part of both the athlete and the clinician. Depending on the severity and stage of the disease, symptoms can usually be managed quite effectively, and the athlete can continue to participate and remain active and competitive with minimal complications. Because athletes place enormous physical and psychological stresses on their bodies on a regular basis, celiac disease in this population may produce more profound effects than in the general population.

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