Female Collegiate Volleyball Player with Celiac Disease: A Case Report

Lindsey E. Eberman, Michelle A. Cleary, Ron E. Zuri, and Gary Salvador
Florida International University, USA

Abstract: Estimates of one in every 200 to 400 individuals, including the athletic population, suffer from celiac disease. Elite athletes present a unique complication when implementing a gluten-free diet because of the need for a high energy fuel. Dietetic adjustments such as increasing the caloric content and frequency are necessary to meet energy needs of highly physically active individuals.

A National Collegiate Athletics Association (NCAA) Division I female volleyball player (height = 183 cm, weight = 81.0 kg) presented a unique case which initially mimicked the early stages of an eating disorder exacerbated by a significant increase in physical activity (preseason conditioning consisted of 11 days of three exercise sessions per day with one day of rest). The athlete was observed before, during, and after volleyball practice and competition and before, during and after meals. Under this superficial surveillance, her behavior supported the presumption of an eating disorder. The athlete was removed from volleyball activity once her condition began to affect her performance and her activities of daily living. The athlete had lost a considerable amount of body mass during the first 20 days of the season (-8.1 kg). This finding prompted the sports medicine staff to refer the athlete to the University Health Center for diagnostic testing. All initial blood tests were within normal limits; however, her weight at this time was 72.9 kg and she was 14.5% body fat, prompting referral to a gastroenterologist. After extensive gastroenterological testing, this female athlete was diagnosed with celiac disease, a condition primarily characterized by diarrhea and malabsorption (Pugh, 2000). This case report describes a differential diagnosis for athletes presenting with loss of body mass or decrease in body fat percentage. Increasing diagnoses of celiac disease appears to be occurring in the general population including the athletic population.

Background and Significance

Celiac disease, also known as gluten-sensitive enteropathy and celiac sprue, is a gastrointestinal condition affecting the small intestine. The disease causes chronic inflammation of the villi on the mucosal lining of the jejunum in the small intestine (Pugh, 2000). Characteristics specific to celiac disease include a mosaic pattern and scalloped folds in the lining of the small intestine, best identified with an endoscope. These mucosal characteristics as well as pallor and erythema with obviously visible blood vessels within the lumen of the small intestine are the best indicators to diagnosing celiac disease. The cause of histological changes in the small intestine is attributed to a hyper-sensitivity to gluten, an insoluble protein found in wheat, barley, and rye grains (Branski, 1998; Wardlaw, 1999). The disease is labeled “silent” or sub-clinical as cases often differ greatly between individuals and may go undiagnosed for years because the patient does not exhibit any outward signs or symptoms of the disease (Branski, 1998). Celiac disease may be exhibited by signs and symptoms of diarrhea, bloating, abdominal pain, weight loss, menstrual irregularities, fatigue, and weakness (Inman-Felton, 1999).

Celiac disease is fairly common and various etiological factors appear to contribute to its development. In North American and European populations, celiac disease is prevalent in one in 200 to 400 individuals (Branski, 1998; Inman-Felton, 1999); however, many individuals with subclinical celiac disease may not have been diagnosed. Celiac disease is often triggered by a
life altering event or extreme stress (Nelson, 2002). Undiagnosed celiac disease can lead to a variety of subsequent conditions (Branski, 1998; Edwards, 2003; Nelson, 2002; Storsrud, Hulten, & Lenner, 2003). Calcium and vitamin D deficiencies are related to the malabsorption of nutrients. Osteoporosis can develop if a patient or a physician does not recognize the signs of celiac disease. In cases with concomitant dermatitis herpetiformis (a skin condition sometimes associated with the disease), chances of developing cancers, such as lymphoma and bowel adenocarcinoma may increase. Problematic conditions can occur when implementation of a gluten-free diet (GFD) is delayed and when celiac disease is either unidentified or untreated, it can be fatal.

Cultural and environmental factors may play a role in the prevalence and the course of celiac disease. The onset of the disease has been linked to geographic location because of varying diets among continents and cultures (Branski, 1998). Family history, thyroid disease, type I diabetes, irritable bowel syndrome, anemia, chronic diarrhea, chronic fatigue, unexplained weight loss, shorter stature, epilepsy, infertility, dermatitis herpetiformis, and Downs syndrome are risk factors of familial conditions indicative of celiac disease (Branski, 1998; Edwards, 2003; Inman-Felton, 1999; Nelson, 2002). Heredity is a strong risk factor in celiac disease; 10% of first-degree family members tend to pass celiac disease to their offspring (Branski, 1998). Anemia occurs in 50% of celiac disease patients (Nelson, 2002). A variety of indicators can assist in diagnosis of celiac disease, and identifying these indicators within the individual as a whole may assist clinicians in implementing serologic testing and endoscopic biopsies.

Treatment options for individuals diagnosed with celiac disease primarily include dietary changes with adjunctive pharmacological intervention. Corticosteroid drugs are not commonly used unless the situation is life-threatening (Branski, 1998). GFD, the most common prescription treatment, eliminates wheat, barley, and rye in the diet and substitutes potatoes, rice, and corn to compensate for energy losses. The key to a healthy GFD is identification of all gluten rich foods; however, dining out can complicate the process (Inman-Felton, 1999). Since effective treatment depends on maintenance of the GFD, dietitians suggest a visit with a nutritionist to gain knowledge about diet alterations. Consumption of any gluten can cause relapse to symptomatic status (Branski, 1998). Eliminating gluten from the diet can be beneficial within 3 to 6 days, but full histological restoration of the small intestine will not occur for about 6 months (Inman-Felton, 1999).

Methods

The participant was identified as a patient of the principal investigator while working as an athletic training clinical education student. A signed medical information release was obtained from the participant in accordance with Florida International University Institutional Review Board policies. Data were collected by searching the internet databases MEDLINE, PUBMed, and FirstSearch with the following keywords: celiac disease, wheat allergy, sport nutrition, celiac sprue, and gluten-sensitive enteropathy. The patient’s medical files, physician notes, and diagnostic testing reports were gathered from the gastroenterologist and the University Health Center. After gathering all the related data, the publications were analyzed and synthesized in relation to the patient’s case.

Results

Initially, this athlete’s condition was presented as an eating disorder and treated as such until further evidence was found to the contrary. Upon interview, the athlete’s teammates reported a history of performance-enhancing drug use, specifically ephedrine (banned by the NCAA) while the volleyball coaches observed a decline in her athletic performance. To identify
eating disordered behavior, the coaching and sports medicine staffs strictly observed her behaviors before, during, and after practices, competitions, team meals, and during travel. The athlete was observed to be falling asleep at meals, in the team van or bus and prior to and during practices for which she was not participating.

The athlete was removed from volleyball practice for her own safety. She was confronted about her behavior by the staff Certified Athletic Trainer and the eating disorder liaison who was also a Certified Athletic Trainer with a specialization in health education and a research background in sports nutrition. After an intensive interview process, the staff members determined that the athlete was not presenting clinically relevant psychological symptoms of an eating disorder and the athlete was referred to the University Health Center for a physical evaluation. The University Health Center performed routine blood testing procedures and identified clinical abnormalities within her complete blood cell count. The low hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, and red blood cell distribution all indicated the possibility of anemia. In this athlete’s case, no drastic change in blood count was observed; however, the increased platelet count observed during the second blood test indicated the possibility of cancer or blood disease and required further testing.

The referral to the gastroenterologist revealed that the diarrhea, weight loss, and laboratory findings were indicative of active celiac disease. The gastroenterologist finalized his diagnosis using the results of the diagnostic testing procedures. The duodenal biopsy revealed diffuse loss of villi, crypt hyperplasia, increased inflammatory cells in the lamina propria, and intraepithelial lymphocytes (Diagnostic Notes, 2002). The loss of villi decreases the surface area for absorption of nutrients. The crypt hyperplasia was representative of unidentifiable or insidious increases in cellular formation, but not an indication of a cancerous tumor. The presence of inflammatory cells and lymphocytes indicated an active immune system response in the mucosal membrane (Nelson, 2002; Pugh, 2000). The serologic testing revealed elevated anti-gliadin and endomysial antibodies. In addition, malabsorption had led to noticeable Vitamin K and B12 deficiencies in our athlete, all leading to the confirmation of the celiac disease diagnosis.

Discussion

Uniqueness of the Case

Clinical course. The signs and symptoms of celiac disease are often and easily confused, and a differential diagnosis without appropriate diagnostic tests is difficult. From an internal medicine perspective, celiac disease may appear similar to the course of anemia, Crohn’s disease, and other food allergies. For the Certified Athletic Trainer, the outward signs of celiac disease, especially in an elite female athlete, can imitate those of an eating disorder. Initially, an eating disorder was suspected based upon the signs and symptoms in this case including rapid decrease in body mass, loss of appetite, diarrhea, vomiting, and malabsorption after meals. Sundgot-Borgen (2002) found that athletes were 10% more likely than the average population (3.2%) to participate in disordered eating and 20% of women were even more likely to have disordered eating than the 8% of men in the athletic population with disordered eating.

This student athlete began pre-season with high potential and was pressured by her coach and her teammates to improve her volleyball skills. Rumors of ergogenic aid use existed prior to the athlete reporting for her sophomore season with the team. The rumors were never validated as the athlete was not supplementing at the time of the blood tests. The athlete denied allegations of an eating disorder when approached by her teammates. With the increased incidence and risk of an elite female athlete developing an eating disorder, the early signs of her disease, and the
early psychosocial pattern of behavior, the differential diagnosis included anorexia athletica, bulimia, anorexia nervosa, and gastrointestinal dysfunction. It was the stress to perform at an elite level that was believed to trigger the adult-onset of celiac disease.

**Dietary challenges.** Many demands are placed on today’s collegiate athlete. Stresses imposed by full or partial scholarships, academics, athletic and social demands, physical demands of the sport, and the challenges of living away from home affect every aspect of the daily life of the collegiate athlete. Daily stresses place an even greater emphasis on nutrition and diet concerns with 32% of young athletic adults between the ages of 22 and 29 reported to be selective in their diet choices (Clark, 1998). According to the American Academy of Sports Medicine, the American Dietetics Association, and the Dieticians of Canada, at times of high intensity exercise energy intake must meet or exceed energy output (Joint Position Statement, 2000). A low-energy diet can cause fatigue, muscle mass loss, menstrual irregularities, bone density loss, and increased risk of injury or illness (Joint Position Statement, 2000). Female athletes, compared to non-athletes, tend to intake energy primarily from carbohydrates and less from lipid sources (Cupisti, D’Alessandro, Castrogiovanni, Barale, & Morelli, 2002). Carbohydrates are an important source of energy especially during exercise. The recommended intake of carbohydrates is 6 to 10 g/kg of body weight, but this recommendation can be affected by energy output, sport, gender, and climate (Joint Position Statement, 2000). Often, breads, pasta, cereal, rice, and fruit are the common foods linked to carbohydrates; in addition, vegetables, milk, and yogurt are also good sources of carbohydrates (Vinci, 1998).

Effective treatment of celiac disease in an elite female athlete depends greatly on the transition to a GFD while maintaining a high-carbohydrate diet. A GFD eliminates the ingestion of wheat, barley, and rye, all of which are generally optimal carbohydrate sources. Typical carbohydrate sources on a GFD are rice, corn, maize, flax, quinoa, tapioca, potato, amaranth, nuts, and beans as dietary carbohydrate substitutions (Nelson, 2002). The challenge of a GFD for the average person is significant and most dietitians recommend a series of at least four nutritionist consultations (Inman-Felton, 1999). The most important consultation involves identifying all foods containing gluten. The literature is very clear about the need for an altered diet and that the patient must maintain the GFD for their entire life in order to avoid recurrence or exacerbating the disease.

The management of celiac disease for a 19 year-old female athlete presents additional challenges. Optimal performance is achieved by maintaining a good diet and providing enough carbohydrate fuel for energy. Following a GFD with an increased need for energy increases the difficulty of compliance for athletic patients. Dedication and self-control are very important in maintaining a lifelong GFD. The primary treatment for our athlete was prescription of a gluten-free diet and counseling concerning the implementation of a lifelong GFD. The athlete was unable to return to volleyball practice immediately, but as she learned to alter her diet to meet the demands of her daily activities and her athletic participation, she returned to play. To date, her athletic performance has improved and has even exceeded that of her pre-illness status.

**Conclusions**

The information gathered in this case report is important for athletic trainers who should be aware that the prevalence of celiac disease is higher than once thought. Clearly, a potential exists that athletes may be suffering from celiac disease and that its signs and symptoms are remarkably similar to those of eating disorders. It is imperative for Certified Athletic Trainers to be aware of the prevalence of celiac disease in order make an appropriate differential diagnosis.
and avoid misdiagnosis which can lead to death if this disease is not identified and properly treated.

References