

Case Study

Celiac Disease

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Understanding the Disease and Pathophysiology

1. The small bowel biopsy results state, “flat mucosa with villus atrophy and hyperplastic crypts—inflammatory infiltrate in lamina propria.” What do these results tell you about the change in the anatomy of the small intestine?
 - a. These results indicate that the villi in the small intestine have been flattened and damaged due to an inflammatory response. (2).

2. What is the etiology of celiac disease? Is anything in Mrs. Gaines’s history typical of patients with celiac disease? Explain?
 - a. The inflammatory response of the mucosa in the small intestines is caused by the exposure to alpha-gliadin, a protein that is a part of a larger protein called gluten. Gliadin is found with other proteins that compose gluten and the structure as a whole is known as a prolamins fraction. Foods such as wheat, malt, barley, rye, and contaminated oats contain the protein gluten. In healthy individuals, the intestinal mucosa would not have a response to gluten. However, when people with celiac disease are exposed to gluten this triggers an inflammatory response that releases several compounds: IgA anti-tissue transglutaminase, antiendomysial, antigliadin antibodies, and white blood cells. All of these contribute to the destruction and damage to the intestinal mucosa (2).

 - b. It is reported that the patient, Mrs. Gaines’s, has a history of diarrhea throughout her life. Diarrhea is one of the clinical symptoms of celiac disease. She also reports extreme fatigue and severe weight loss which are also signs and symptoms of celiac disease.

- c. The patient reports that her diarrhea is foul smelling, which may be an indicator of steatorrhea. Steatorrhea is caused by fat malabsorption. In celiac disease fat malabsorption occurs when the damaged villi are unable to properly absorb dietary fats (3).
3. How is celiac disease related to the damage to the small intestine that the endoscopy and biopsy indicate?
 - a. Celiac disease is related to the intestinal damage that the biopsy indicated because atrophy of intestinal villi, hyperplasia of crypts, and the presence of lymphocytes are all confirming factors for the diagnosis (2).
4. What are AGA and EMA antibodies? Explain the connection between the presence of anti-bodies and the etiology of celiac disease.
 - a. AGA, antigliadin, and EMA, antiendomysial, are antibodies that are triggered by gluten, which is the body considers to be a foreign and dangerous substance. Antibodies are present as a result of the autoimmune response in celiac disease. The purpose of these antibodies is to destroy the proteins in gluten but as a result also damages the mucosa in the small intestine (2).
5. What is a 72-hour fecal fat test? What are the normal results for this test?
 - a. A 72-hour fecal fat test is done to determine whether a person has steatorrhea, which is fat malabsorption. In this test a person is given 100 grams of fat every day for three days. Their fecal matter is tested to determine the amount of fat present. Normal values are less than six grams of fat within a 24-hour period. More than that indicates fat malabsorption (2).

6. Mrs. Gaines's laboratory report shows that her fecal fat was 11.5 g fat/24 hours. What does this mean?
 - a. A fecal fat test result of 11.5 grams of fat within a 24-hour period indicates steatorrhea (2).
7. Why was the patient placed on a 100-g fat diet when her diet history indicated that her symptoms are much worse with fried foods?
 - a. The patient only had to have an intake of 100 grams of fat per day for three days. This intake was necessary for the diagnosis of steatorrhea.

Understanding the Nutrition Therapy

8. Gluten restriction is the major component of the medical nutrition therapy for celiac disease. What is gluten? Where is it found?
 - a. Gluten is composed of many proteins, including gliadin, that are found in wheat, cereal grains, barley, and rye. Gluten can also be found in many other sources such as: contaminated oats, energy bars, flour, beer, lagers, ale, imitation bacon, pasta, sauces, stuffing, thickeners, lunch meat, and soy sauce (1).
9. Can patients on a gluten-free diet tolerate oats?
 - a. Those on a gluten-free diet have been reported to tolerate pure oats, up to a 1/2 cup per day, that are not contaminated (1).
10. What sources other than foods might introduce gluten to the patient?
 - a. Sources other than food that might contain gluten are: play-dough, vitamin/mineral supplements, herbal/nutritional supplements, and some

medications. Gluten-free food can become easily contaminated by gluten. People with celiac disease must avoid sharing utensils, toasters, flour sifters, and spreadable condiment containers. It is also advised that they do not consume food that has been deep fried in breaded products. Also, wheat flour particles in the air can contaminate uncovered gluten-free food and utensils (1).

11. Can patients with celiac disease also be lactose intolerant?
 - a. Patients with celiac disease may also have a temporary lactose intolerance due to a lack of proper lactase excretion secondary to damaged intestinal villi (2).

Nutrition Assessment

12. Calculate the patient's percent UBW and BMI, and explain the nutritional risk associated with each value.
 - a. $BMI = (92/63/63)*703 = 16.3$: underweight
 - b. Percent usual body weight: $(92 \text{ lb}/112 \text{ lb})*100 = 82\%$ of her UBW; indicates moderate weight loss. However, the difference from her usual body weight is 18% within 1 year which indicates severe unintentional weight loss.
13. Calculate this patient's total energy and protein needs using the Harris-Benedict equation or Mifflin-St. Jeor equation.
 - a. Using the Harris-Benedict equation the BEE must first be calculated:
 $655 + (9.6 \times 42 \text{ kg}) + (1.8 \times 160 \text{ cm}) - (4.7 \times 36) = 1,177$
 - b. Then activity level, or activity factor, must be considered:
 $1,177 * 1.3(\text{ambulatory}) = 1,530 \text{ kcals}$

- i. Since the patient has experienced severe unintentional weight loss it may be necessary to increase her needs by 250-500 kcals/day for weight gain. This factor makes her total adjusted calorie needs **1,780-2,030 kcals/day**.

c. Protein needs: $42 \text{ kg} \times 1.5 \times 1.8\text{g} = \mathbf{63-76\text{grams/day}}$

14. Evaluate Mrs. Gaines's 24-hour recall for adequacy.

- a. The patient's 24-hour recall does not provide an adequate amount of nutrients to support her needs. Not only is the patient experiencing malabsorption but she is also restricting herself from eating in an attempt to avoid diarrhea. This also contributing to her malnutrition. Furthermore, the food that she is eating contains gluten (whole-wheat toast, crackers, and noodle soup).

15. From the information gathered within the intake domain, list possible nutrition problems using the diagnostic term.

- a. Inadequate oral intake NI-2.1
- b. Inadequate energy intake NI-1.4
- c. Inappropriate intake of fats NI-5.6.3
- d. Increased nutrient needs NI-5.1
- e. Malnutrition NI-5.2

16. Evaluate Mrs. Gaines's laboratory measures for nutritional significance. Identify all laboratory values that support a nutrition problem.
- a. Albumin: NL=3.5-5; her values= 2.9; indicates mildly depleted visceral protein stores.
 - b. Prealbumin: NL= 16-35; her values=13; indicates mildly depleted visceral protein stores.
 - c. Hemoglobin: NL= 12-15; her values= 9.5; indicates iron deficiency anemia
 - d. Hematocrit: NL=37-47; her values= 34; indicates iron deficiency anemia
 - e. Vitamin b12: NL= 24.4-100; her values= 21.2; may indicate macrocytic anemia
 - f. Positive for AGA and EMA antibodies; indicate allergy to gluten
 - g. Fecal fat test value is 11.5; indicates steatorrhea

17. Are the abnormalities identified in question 16 related to the consequence of celiac disease? Explain.

- a. Yes, having a positive value for AGA and EMA antibodies is an indication of celiac disease since these antibodies are released in the immune response to gluten. Also, due to malabsorption secondary to celiac disease the patient has a fecal fat test value of 11.5 which indicates steatorrhea. Furthermore, inadequate absorption of nutrients may be causing the patient to be anemic.

18. Are any symptoms from Mrs. Gaines's physical examination consistent with her laboratory values? Explain.

- a. The patient's laboratory values regarding her hemoglobin, hematocrit, vitamin b12, and her irons levels indicate that she has iron deficiency anemia. This would account for her pale complexion noted in her physical exam as

well as the patient's complaints of weakness and fatigue. Her mildly depleted visceral protein stores may also contribute to her weakness and fatigue.

19. Evaluate Mrs. Gaines's other anthropometric measurements. Using the available data, calculate her arm muscle area.

$$\text{AMA} = [\text{MAC}/4 \pi (\pi \times \text{TSF})]^2 =$$

$$[18\text{cm}/4 \pi (\pi \times .75 \text{ cm})]^2 = 11.34$$

An AMA of 11.34 indicates muscle wasting.

20. From the information gathered within the clinical domain, list possible nutrition problems using the diagnostic term.
- Altered GI function NC-1.4
 - Unintended weight loss NC-3.2

Nutrition Diagnosis

21. Using the VA Nutrition Screening Form, what is this patient's nutrition status level?
- The patient's nutrition status level is 3 which indicate that a full nutrition assessment is needed and that they have a moderately compromised nutrition status.
22. Select two high-priority nutrition problems and complete the PES statement for each.
- Food-and nutrition-related knowledge deficit NB-1.1 related to recent diagnosis of celiac disease as evidenced by patient's usual diet intake, 24-hour recall, positive lab values for AGA/EMA antibodies, and no prior education for gluten free diet.

- b. Malnutrition NI-5.2 related to steatorrhea, villus atrophy, and poor appetite as evidenced by severe unintentional weight loss, low Hgb/Hct, low albumin, low prealbumin, low vitamin b12, fecal fat of 11.5 grams, and patient's complaints of fatigue and low quality of life.

Nutrition Intervention

23. For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).
- a. Goals for the food-and nutrition-related knowledge deficit NB-1.1 includes implementation of a gluten-free diet by intervening with education on celiac disease and gluten free foods. This also includes eliminating the presence of AGA/EMA antibodies. Goal: patient demonstrates knowledge of gluten free diet. Intervention: comprehensive nutrition education.
 - b. Goals to improve nutrition status are: no further weight loss, improve labs (albumin, prealbumin, Hgb/Hct, fecal fat, vitamin b12). These goals can also be met by educating the patient on celiac disease and the importance of a gluten-free diet. Also, recommending an oral supplement high in calories and protein to promote healing and weight gain. Intervention: (ND 1.2) Change to a gluten free diet.
24. What type of diet would you initially begin when you consider the potential intestinal damage that Mrs. Gaines has?
- a. The first course of action would be an immediate implementation of a gluten-free diet and lactose-free diet. Once gluten is taken out of her diet her

intestinal villi will begin to heal. Lactose must be restricted because lactose intolerance may result due to the damaged intestinal villi. This restriction is not permanent and only implemented until the villi are healed and enzymes are excreted normally. Secondly, an oral supplement may be necessary to increase calories and protein for weight gain and to promote healing. Lastly, a low-fat diet may help relieve symptoms of steatorrhea along with MCT oil supplementation until the villi are healed (2).

25. Mrs. Gaines's nutritional status is so compromised that she might benefit from high-calorie, high-protein supplementation. What would you recommend?

- a. I would recommend that Mrs. Gaines supplement her diet with the oral supplement Ensure Plus. This formula has 335 kcals and 13 grams of protein in one serving (8oz). Having a high-calorie, high-protein supplementation will be beneficial for healing her intestinal villi and promote weight gain.

26. Would glutamine supplementation help Mrs. Gaines during the healing process?

What form of glutamine supplementation would you recommend?

- a. Yes, a glutamine supplementation would help this patient because it provides energy for the small intestine. I would recommend it in the pill form.

27. What result can Mrs. Gaines expect from restricting all foods with gluten? Will she have to follow this diet for very long?

- a. Celiac disease can only be treated by following a gluten-free diet. Once she eliminated gluten from her diet the damage done to her small intestine will

hopefully recede and healing can begin. If she follows a strict gluten-free diet for the rest of her life it is hopeful that the villi will return to normal and she will be able to have adequate nutrient absorption (2).

Nutrition Monitoring and Evaluation

28. Evaluate the following excerpt from Mrs. Gaines's food diary. Identify the foods that might not be tolerated on a gluten/gliadin-free diet. For each food identified, provide an appropriate substitute.

- Cornflakes
 - Allowable but check label for barley malt extract (malt contains gluten).
- Bologna slices
 - May contain gluten. Substitute with fresh or frozen meats such as lean chicken, turkey, beef, or fish.
- Lean Cuisine—Ginger Garlic Stir Fry w/ Chicken
 - The sauce may contain gluten. Substitute by cooking plain rice and mixing with fresh, cooked chicken, fresh garlic and ginger.
- Skim milk
 - allowable
- Cheddar cheese spread
 - May contain wheat based ingredients. Can substitute with fresh cheese or processed cheese.
- Green bean casserole (mushroom soup, onions, green beans)
 - Canned soups often contain thickeners with gluten. Check label to see if it contains wheat-based thickeners. A substitute may include a gluten free broth with fresh mushrooms.

- Coffee
 - Allowable when pure coffee; some flavored coffees or coffee substitutes may contain gluten.
- Rice crackers
 - Usually allowable; check to see if it contains other ingredients such as wheat, barley, or malt.
- Fruit cocktail
 - Check label to see if the cocktail contains any sauces which are a source of gluten. If so, substitute with fresh fruits which have no gluten.
- Sugar
 - allowable
- Pudding
 - May contain gluten; substitute with milk based pudding without wheat ingredients. Ice cream is allowable. Tapioca pudding is allowable.
- V8 juice
 - allowable
- Banana
 - allowable
- Cola
 - allowable

References

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