Celiac Disease Case Study

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?

The villi, which are normally upright, are now smaller and flattened. The intestinal crypt is now more elongated due to increased growth and due to continually having to regenerate itself as a result of excess inflammation. White blood cells are now present in the lower layer of the mucosa, which is evidence of inflammation and an active immune response. Because the enterocytes have changed their anatomical structure, normal functioning, namely digestion/absorption, will be lost. (Farrell and Kelly, 2001)

Understanding the Disease and Pathophysiology

2) What is the etiology of celiac disease? Is anything in Mrs. Gaines’ history typical of patients with celiac disease?

Celiac disease causes an inflammatory response in the intestine when the enterocytes come into contact with gliaden and other high-proline proteins found in gluten. This inflammatory, autoimmune response causes significant damage to the cells of the intestine and causes it to lose its normal digestive/absorptive functions. Furthermore, if a person is exposed to gluten at an early age, the likelihood of developing celiac disease is increased. Also, if a person is not breastfed a sufficient amount of time or if he/she suffered from a viral infection early in life, the risk of developing celiac disease increases. Lastly, the disease has a genetic component and is therefore heritable from the parents. Mrs. Gaines most likely is genetically predisposed to the disease since both her mother and grandmother had “funny stomachs,” which may have been undiagnosed celiac disease. (Nelms, Suchner, Lacey, & Roth, 2011)

3) How is celiac disease related to the damage to the small intestine that the endoscopy and biopsy results indicate?

The cells within the intestine of a person with celiac disease mount an immune response when exposed to gluten. An enzyme located in the mucosal layer alters the gluten molecule, making it more recognizable to lymphocytes (white blood cells). These cells release signal molecules and other defense compounds that damage the surrounding cells. Additionally, T-cells, another cell active during an immune response, become active and cause damage to the enterocytes during the inflammatory response. It is this damage that causes the villi to flatten and causes maldigestion/malabsorption. (Nelms, et al, 2011; Wakim-Fleming, 2012)
4) What are AGA and EMA antibodies? Explain the connection between the presence of antibodies and the etiology of celiac disease.

IGA and EMA are antibodies that are synthesized and secreted during the enterocytes’ autoimmune/inflammatory response to gluten. By testing for these antibodies, medical professionals can determine if a patient’s GI dysfunction is or is not due to celiac disease. (Nelms, et al, 2011)

5) What is a 72-hour fecal fat test? What are the normal results for this test?

The 72-hour fecal fat test involves the patient eating a normal diet that contains 100 grams of fat each day. All stools are collected within this time period, and the amount of fat in the stool is determined. If the amount of fat in the stool exceeds 7 grams per 24 hours, the person is diagnosed with fat malabsorption (steatorrhea). (Dugdale, 2012)

6) Mrs. Gaines’ laboratory report shows that her fecal fat was 11.5 g/24 hours. What does this mean?

Because Mrs. Gaines’ fecal fat test showed her excretion of fat was 11.5 g per 24 hours, it is clear she has fat malabsorption (steatorrhea).

7) Why was the patient placed on a 100-g fat diet when her diet history indicates that her symptoms are much worse with fried foods?

The diet was part of the diagnostic fecal fat test. If the patient had continued to eat a low fat diet, the test would not have been sensitive enough to diagnose her with 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?

Gluten is a protein composed of glutenin and gliaden subunits and is naturally found in wheat, rye, barley, malt, and any products that contain them. Only a minimal amount is found in oats, and many people with celiac disease can consume oats without any ill effects. Gluten can also be found in non-food items (discussed in #10). (Nelms, et al, 2011)

9) Can patients on a gluten-free diet tolerate oats?

Oats naturally contain only a small prolamin fraction, and therefore some people with celiac disease may tolerate oats. However, oats can easily be contaminated during either the growing process or during the manufacturing process. Since many facilities that process oats also process other gluten-containing grains, cross-contamination is a possibility. (Fenster & Case)

10) What sources other than food might introduce gluten to the patient?
Gluten can be found in many non-food items such as paints, cosmetics, medications, toothpaste, lotions, and mouthwash. They exist in these items as thickening agents, binders, or to keep products, such as latex gloves, from adhering to surfaces. Any item or food can become contaminated with gluten if the object/food comes into contact with the protein. (Celiac Solution)

11) Can patients with celiac disease also be lactose intolerant?

When a person has been first diagnosed with celiac disease, he may initially be put on a lactose-free diet since the damage done to the enterocytes may decrease the amount of lactase available for digestion. If the patient does have low production of this enzyme, he will experience lactose intolerance (gas/bloating/diarrhea). After being gluten free for a sufficient amount of time, the villi/microvilli should sufficiently regenerate and lactose can slowly be reintroduced into the diet. (Nelms, et al, 2011)

Evaluation of Weight/Body Composition
12) Calculate the patient’s percent UBW and BMI, and explain the nutritional risk associated with each value.

\[
\%\text{UBW} = \left(\frac{92}{112}\right) \times 100 = 82\% \text{ (moderate weight loss)} \\
\text{BMI} = \left(\frac{92}{(63^2)}\right) \times 703 = 16.3 \text{ (underweight)}
\]

Both assessments indicate the patient is at risk for overall protein-energy and micronutrient malnutrition. Such malnutrition can cause depressed immunity, poor wound healing, weakened musculoskeletal structure, anemia, or metabolic dysfunction.

Calculation of Nutrient Requirements
13) Calculate this patient’s total energy and protein needs using the Harris-Benedict or Mifflin- St. Jeore equations.

Harris-Benedict:
\[
655 + (9.6 \times 41.8) + (1.8 \times 160) - (4.7 \times 36)](1.3) + 125 = 1603 \text{ kcals}
\]

• +125 kcals for weight gain
• 1603 kcals = ~38 kcals/kg

Protein Needs:
\[
41.8 \text{ kg} \times (1.5 \text{ g. PRO/kg}) = 63 \text{ g PRO}
\]

• 1.5 g/kg due to low serum protein levels (protein-energy malnutrition)

Intake Domain
14) Evaluate Mrs. Gaines’ 24-hour recall for adequacy

Mrs. Gaines’ recall is inadequate. When analyzed, it was found she consumed only about 450 kcals, 7 g protein, 87 g carbohydrate, and 8.6 g of fat, all of which are well under her
required amounts. Furthermore, she consumed less than 25% of the RDA for most of her micronutrients, such as vitamins A/D/E, iron, zinc, magnesium, and all the B vitamins.

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

- NI-1.4 Inadequate energy intake
- NI-2.1 Inadequate oral intake
- NI-5.3 Inadequate protein-energy intake
- NI-5.6.1 Inadequate fat intake
- NI-5.7.1 Inadequate protein intake
- NI-5.8.1 Inadequate carbohydrate intake
- NI-5.11.1 Predicted suboptimal nutrient intake
- NI-5.2 Malnutrition

**Clinical Domain**

16) Evaluate Mrs. Gaines’ laboratory measures for nutritional significance. Identify all laboratory values that support a nutrition problem.

**Nutritional deficiency:** albumin 2.9 g/dL (low), total protein 5.5 g/dL (low), prealbumin 13 mg/dL (low), Hgb 9.5 g/dL (low), Hct 34% (low), MCHC 30 g/dL (low), Ferritin 12 mg/mL (low)

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

Yes, given the fact her villi have atrophied and the amount of diarrhea she is experiencing, it can be assumed she is experiencing malabsorption of key nutrients, such as protein and iron (both of which are indicated as low in her lab values). In addition to deficiency due to malabsorption, the amount of diarrhea she is experiencing has caused her to drastically decrease her food intake, thereby increasing the level of deficiency.

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

Yes, her thin, pale appearance, fatigue, and weakness would be indicative of protein and iron deficiencies, though her normal vital signs show it has not yet altered normal functioning of vital organs.

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

**Corrected Arm Muscle Area (AMA):**

\[
\frac{\{18.0-(.75\pi)\}^2}{(4\pi)} - 6.5 = 13.0 \text{ cm}^2
\]
20) From the information gathered within the clinical domain, list possible nutrition problems using the diagnostic terms.

- **NC-1.4** Altered GI function
- **NC-2.1** Impaired nutrient utilization
- **NC-2.2** Altered nutrition-related laboratory values: albumin, prealbumin, total protein, Hgb, Hct, MCHC, ferritin
- **NC-3.1** Underweight
- **NC-3.2** Unintended weight loss

**Nutrition Diagnosis**

21) Using the VA Nutrition Screening Form, what is this patient’s nutrition status level?

Moderately compromised nutritional status (see attached screening form)

Yes, given Mrs. Gaines low serum protein levels, muscle deficit, low intake, and unintended weight loss, she can be diagnosed with protein-energy malnutrition.

22) Select two high-priority nutrition problems and complete the PES statement for each.

**A. Food- and nutrition-related knowledge deficit (NB-1.1), related to no previous nutrition counseling, as evidenced by recently being diagnosed with celiac disease.**

**Intervention:**
Nutrition counseling: Health Belief Model (C-1.2) using self-monitoring (C2.3).

**B. Altered GI function (NC-1.4), related to diarrhea and GI distress, as evidence by moderate weight loss and low serum protein levels (albumin 2.9 g/dL, total protein 5.5 g/dL, prealbumin 13 mg/dL, Hgb 9.5 g/dL, Hct 34%, MCHC 30 g/dL, Ferritin 12 mg/mL).**

**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 etiology).

**A. Goal (NB-1.1):** For the patient to become aware of sources of gluten and to become aware of healthy, alternative foods.

**Intervention:**
Nutrition counseling: Health Belief Model (C-1.2) using self-monitoring (C2.3).

**B. Goal (NC-1.4):** To regain normal functioning of GI and thus stop any further weight loss and normalize serum protein levels (Hgb, Hct, albumin, total protein, prealbumin, MCHC, ferritin).

**Intervention:**
Meal and Snacks: Modify distribution, type, or amount of food and nutrients within meals or at specified time (ND-1.2) i.e. gluten-free diet.
24) What type of diet would you initially begin when you consider the potential intestinal damage that Mrs. Gaines’ has?

Because Mrs. Gaines is currently experiencing GI damage and distress and has been diagnosed with celiac disease, she should be placed on a GI soft diet that is gluten-free. The diet could include well-cooked rice or other gluten-free grains, cooked or soft fruits and vegetables (not raw) and no gas-producing vegetables (broccoli, cauliflower, cabbage, etc.). She should also initially eliminate lactose since the damage to the enterocytes likely decreased the amount of lactase available. Furthermore, since she stated that fried, high fat foods caused her diarrhea to get worse, she may have fat malabsorption. If she does, she would need to go on a steatorrhea diet (low fat, MCT oil, water-miscible fat-soluble vitamins, low oxalate).

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

I would recommend Ensure Plus, which is a high-calorie, high-protein commercial supplement drink. It is gluten-free and is therefore safe for her to consume. It would be recommended she start slowly with the extra protein since her intestinal villi have atrophied, and her digestive/absorptive capacity is impaired.

26) Would glutamine supplementation help Mrs. Gaines’ during the healing process? What form of glutamine supplementation would you recommend?

Glutamine is one of the preferred energy sources for intestinal cells and may help decrease gut permeability and villi atrophy. Because those with celiac suffer from both increased permeability and villi atrophy, supplementation may be beneficial for the healing process. Two forms of the supplement exist: L-glutamine and glutamine peptides. The glutamine peptides may be derived from wheat and therefore may cause adverse reactions in those with celiac disease. (Van der Hulst, et al, 1993; Lyon, 2010)

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

If Mrs. Gaines does completely eliminate gluten from her diet, her intestine will most likely become fully functioning again, and the symptoms should greatly decrease. She will have to stay on the diet her entire life. Any gluten consumed will again cause an autoimmune response against her enterocytes, and the GI symptoms will reappear.

**Nutritional Monitoring and Evaluation**

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

**Cornflakes**  Corn does not have gluten, but may become contaminated during processing
or may have compounds containing gluten (such as malt flavoring) added during the manufacturing process. Should look for a brand of cornflakes that explicitly states it is gluten free (ex. Nature’s Path Cornflakes, General Mills Corn Chex).

**Bologna Slices**  
Most deli meats do not contain gluten. You would be safe getting brands like Boar’s Head, Oscar Meyer, Hormel, or any other brand explicitly labeled as “gluten-free.” She should avoid getting bologna from the deli counter since the risk of cross-contamination is very high.

**Lean Cuisine—Ginger Garlic Stir-Fry with Chicken**  
Most ready-to-eat/microwaveable meals are not gluten free. There are microwaveable meals made gluten-free such as Goldbaum’s Chicken and Rice, My Own Meal’s Chicken and Blackbeans or Mediterranean Chicken Meal. She should avoid dishes made with soy sauce since many contain wheat.

**Skim Milk**  
Safe to consume.

**Cheddar Cheese Spread**  
Depending on how processed the spread is, it may or may not contain gluten. Philadelphia cream cheese dips are gluten-free as well as Kraft’s packaged cheese. Most cheeses that are minimally processed will be gluten-free. However, bleu cheese should be avoided since the mold used to make it is often taken from bread mold

**Green Bean Casserole**  
If the casserole is made with most canned soups, it will contain gluten. However, Health Valley makes gluten-free cream of mushroom and cream of chicken soups that can be used as safe substitutes.

**Coffee**  
Safe to consume.

**Rice crackers**  
Rice crackers and other similar rice-based products should be safe since rice does not contain gluten. You should check the label, though, to make sure no wheat or other gluten-containing additives are present and to see if the product has been made on machinery used to process wheat products. Other types of crackers are made gluten-free and are made by Glutino, Crunchmaster, and Mary’s Gone Crackers.

**Fruit Cocktail**  
Safe to consume.

**Sugar**  
Safe to consume.
**Pudding**

Should be safe to consume. Check ingredients to make sure wheat starch is not used as an ingredient. Jello brand pudding utilizes cornstarch and therefore is safe to consume.

**V8 Juice**

Safe to consume.

**Banana**

Safe to consume.

**Cola**

Safe to consume.

Note: Any gluten-free food can become contaminated if it touches a surface or utensil that came into contact with a gluten-containing food. Extra precautions, such as having a separate toaster for gluten-free breads and sanitizing dishes after they touch a gluten-containing food, to ensure no cross-contamination occurs.

Many gluten-free options and substitutes can be found at glutenfree.com

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