Case Study

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?

The mucosa usually has villi projecting out all over the surface but in those with celiac disease, villi become damaged and flattened. If the crypts are hyperplastic they are much more rigid than normal. Smooth abnormal muscle called muscularis mucosa separates the lamina propria from the submucosa so an inflammatory infiltrate fills the area (Derm101.com, 2008).

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

Celiac disease (or gluten-sensitive enteropathy) is an autoimmune disease characterized by the body’s negative immune system response to gluten in the diet. It has been found to run in families and carry risk of the condition to family members, occurring in 5-15% of the siblings or offspring (Celiac Disease Foundation, 2012). Some gene mutations may increase celiac disease risk not by directly increasing the risk for the disease itself but by altering factors that may increase the risk of this disease (MayoClinic, 2012).

Mrs. Gaines’ history is somewhat typical of a patient with celiac disease. Some patients show several symptoms, others show fewer or mild symptoms, while some show no symptoms at all. The range to which symptoms show is related to the patient’s degree of malabsorption (WebMD, 2012). Mrs. Gaines’s symptoms included “foul smelling” diarrhea off and on for most of her adult life, a family history of “stomach” problems, weakness, weight loss, and fatigue. These are typical symptoms for a patient with celiac disease along with abdominal cramping, gas, bloating or distention of the stomach, constipation, and weight loss with big appetite or weight gain. Mrs. Gaines’ diagnosis also included malabsorption and anemia which are classic symptoms for the disease as well (Celiac Disease Foundation, 2012).

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

When gluten is consumed by a person with celiac disease, the villi on intestinal cells are damaged (U.S. Department of Health and Human Services, 2012) so nutrient absorption is impaired, leading to malnutrition (Mayo Clinic, 2012).

4. What are AGA and EMA antibodies? Explain the connection between the presence of antibodies and the etiology of the celiac disease.

AGA antibodies are anti-gliadin antibodies which are released as a response to gliadin and can therefore detect celiac disease. EMA antibodies are endomysial antibodies which are highly specific for celiac disease assessments (U.S. Department of Health and Human Services). When both of these antibodies are taken together they are a strong indicator of risk. “Taken together, a positive panel of IgG AGA, IgA AGA and EMA can predict the presence of celiac disease in 99.3% of patients (Celiac.com)”. When following a gluten-free diet, these antibodies tend to disappear.
5. What is a 72-hour fecal fat test? What are the normal results for this test?

Fecal fat tests are used to measure the amount of fat excreted in stools over a short period of time. Patient ingests 100g/day for three days and samples are assessed to determine the degree of fat absorption and whether or not there is a lack of absorption. Normal results are less than 7 grams of fat per 24 hours. This test further determines whether a patient needs pancreatic enzyme therapy (The University of Mississippi Medical Center).

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

Mrs. Gaines’ lab report indicates that she has more fat in her stools than normal. This indicates fat malabsorption.

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 test was ordered to assess whether Mrs. Gaines has a fat malabsorption disorder such as steatorrhea (Stanford Hospital and Clinics, 2012). If fried foods are affecting her more than other foods it is a sign that fat absorption might be a problem. The test will see how her body responds to three days of a high-fat diet.

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 found in bread products including wheat, barley and rye, as well as “in many whole grain foods related to wheat, including bulgur, faro, kamut, spelt, triticale (WebMD, 2012).”

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

Some celiac experts advise avoiding oats (WebMD). Researchers have found that some people with problems eating oats showed intestinal inflammation due to celiac-disease-associated HLA molecules. Two particular peptides in oat avenin were found to be very similar to gluten peptides (PLOS Medicine, 2004). This indicates that oats may not be ideal for consumption among some people who may have an adverse reaction similar to that of consuming gluten.

10. What sources other than foods might introduce gluten to the patient?

Gluten can be found in a variety of other sources aside from wheat and related products. Anywhere that foods are prepared that have come in contact with gluten is a risk for celiac disease patients. Foods must be prepared in areas that are free of gluten entirely. The glue on envelopes that require a lick to seal often have some gluten in the material. Latex and rubber cleaning gloves are sometimes brushed with wheat/oat flour and can pose a risk. Other household products like detergents and bar soap can include gluten. Art supplies including dough, paint or glue may contain gluten as well. It can even be found in makeup products such as lotions, lip balms and mouthwash. Medication pills may be dusted with wheat/oat flour or may contain gluten in the oil contained in some pills (Celiac Solution). It is important to read labels on nearly everything.

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

Those with celiac disease have a malfunctioning small intestine so production of lactase may become less efficient. This can lead to secondary lactose intolerance in some people. It is advised that those affected by lactose reduce their lactose consumption or remove dairy products from the diet completely until the gastrointestinal tract has healed. At this point it is okay to reintroduce lactose-containing foods into the diet slowly to see how they are tolerated (Gluten Free Dietitian, 2012).
Nutrition Assessment

12. Calculate the patient’s percent UBW and BMI, and explain the nutrition risk associated with each value.

UBW = 112lbs, ABW = 92lbs

%UBW = ABW/UBW = 92/112 x 100 = 82%

BMI = \[\text{wt/ ht (in)}^2\] x 703 = \[\frac{92}{(63)}^2\] x 703 = 16.3

Mrs. Gaines’ actual body weight (92 pounds) is 82% of her usual body weight (112 pounds) which indicates moderate malnutrition. Malnutrition may result in slower wound healing, impaired immune system performance, and a greater risk of illness and/or death. Her body mass index is 16.3 which indicates that she is underweight. Being underweight may cause a decrease in bone mass and have a decreased ability to turn over/heal enterocytes which could be detrimental to her health.

13. Calculate this patient’s total energy and protein needs using the Harris-Benedict equation or Mifflin-St. Jeor equation.

RMR (females) = \((9.99 \times \text{wt (kg)}) + (6.25 \times \text{ht (cm)}) - (4.92 \times \text{age (yrs)} - 161)\)

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= (9.99 \times 41.8 \text{ kg}) + (6.25 \times 160 \text{ cm}) - (4.92 \times 36 - 161) = 418 + 1000 - 16 = 1400 \text{ kcal}
\]

TEE = RMR x SF x AF AF = 1.3, SF = 1.2

TEE = 1400 x 1.2 x 1.3 = \(-2185\) kcal

Protein needs = 1.0 g/kg body weight/day = \((1.0 \times 41.8 \text{ kg}) = 42 \text{ g/day}\)

Her activity factor was estimated to be 1.3 because she isn’t on bed rest. Her stress factor was estimated to be 1.2 because she is experiencing stress due to the moderate amount of pain she feels daily along with her malabsorption problems and anemia. Her energy needs are about 2185 kcals per day. Her protein needs were based off of an increased need of protein due to her condition. The protein DRI is 0.8 grams per kilogram of body weight for a healthy person with no condition or metabolic stress. Since Mrs. Gaines’ body needs to repair her intestines and steatorrhea her protein needs were increased to 1.0 grams per kilogram. Therefore her protein needs are 42 grams per day. However, she may want to increase her protein intake if possible for her anabolic and healing needs.

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

Mrs. Gaines’ caloric needs were calculated to be about 2000 kcals per day while Super Tracker (2012) estimated her needs to be 1639 kcals per day. That is more of a number for healthy people. She is not consuming nearly enough calories and is not meeting her body’s needs for energy, micro- and macronutrients.

Other nutrients Mrs. Gaines is not getting enough of in her diet are protein, iron, calcium and fat. According to her 24 hour recall she only consumed 8 grams of protein (needs 46 grams), 3 mg of iron (needs 18 grams), 72 mg of calcium (needs 1000 mg) and 8 grams of fat (needs 13.3-23.3 grams) (Super Tracker, 2012). She is not even meeting half of her needs for any of the major food groups. She is lacking in many areas due to her overall lack of vegetables and dairy and minimal amount of fruit. She seemed to be avoiding meat, stating that meats including beef were possibly worsening her condition, although this avoidance has led her to anemia, making her body’s needs for iron greater than a typical person’s needs. Of the grains she consumed, she had less than half of what she should be eating but the grains she was consuming- whole wheat toast and noodles in soup- are the primary harmful culprit to those with celiac disease, unbeknownst to Mrs. Gaines. All of these factors contribute to her weight loss and are impairing homeostasis in her body.
15. From the information gathered within the intake domain, list possible nutrition problems using the diagnostic term

N.I.-1.4 Inadequate energy intake
N.I.-2.1 Inadequate oral food/beverage intake
N.I.-5.2 Malnutrition
N.I.-5.3 Inadequate protein-energy intake
N.I.-5.6.1 Inadequate fat intake
N.I.-5.7.1 Inadequate protein intake
(American Dietetic Association, Nutrition Diagnostic Terminology, 2006)

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

Overall, very many of Mrs. Gaines’ lab values were low. Her albumin and prealbumin levels were very low (2.9 g/dL, 13 mg/dL) which indicate malnutrition and according to her other lab values, diet and weight she is indeed malnourished. Her protein is low, at 5.5 g/dL, which is out of the healthy range of 6-8 g/dL. Due to Mrs. Gaines’ celiac condition, her body isn’t digesting or absorbing protein correctly but she was also avoiding meat which caused these lacking areas. Tests for AGA/EMA together were positive which points to gluten intolerance and therefore celiac disease. Her fecal fat test showed 11.5 g/24 hrs which indicates that she is having issues with fat malabsorption, a side effect of celiac disease. Her hemoglobin and hematocrit levels were low which indicate iron-deficiency anemia. Her ferritin level was low as well as her mean cell hemoglobin concentration. All of these factors led her to iron-deficient anemia. Her folate levels (3 μg/dL) and her vitamin B12 levels (21.2 ng/dL) were low, and indicated deficiency (Mediline Plus, 2012) (PubMed Health, 2012).

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

Yes, malabsorption occurs with celiac disease due to the damaging changes in the small intestine. Her diarrhea is disallowing her to absorb nutrients properly and instead they are excreted rather than being used. Her discomfort with eating and fear of having diarrhea led her to eat much less than normal, causing weight loss and low caloric intake as well. Fat in stool samples indicated fat malabsorption or steatorrhea and that is common with celiac disease. Low vitamin B12 and folate levels have resulted because of poor absorption and low intake (Albumin.org, 2012).

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

She claims to feel fatigue and weakness, stating that she doesn’t seem to have the energy to get off the couch. These symptoms are a result of low albumin and prealbumin and eating the wrong foods, causing intestinal upset and paleness.

19. Evaluate Mrs. Gaines’s other anthropometric measurements. Using the available data, calculate her arm muscle area. Interpret this information for nutritional significance.

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AMA = \left(\frac{MAC}{4\pi} \times \left(\pi \times TSF\right)\right)^2
\]
\[
AMA = \left(\frac{180mm}{4\pi} \times \left(\pi \times 7.5mm\right)\right)^2
\]
\[
AMA = \left(\frac{18cm}{4\pi} \times \left(\pi \times 0.75cm\right)\right)^2
\]
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AMA = (1.43 \times 2.36)^2 = (3.37)^2 = 11.36cm
\]

Melissa’s arm muscle area is 11.36cm meaning that her muscle mass is wasted (Nutrition Therapy and Pathophysiology, 2011).
20. From the information gathered within the clinical domain, list possible nutrition problems using the diagnostic term.

NC-3.1 Underweight
NC-3.2 Involuntary weight loss
(American Dietetic Association, Nutrition Diagnostic Terminology)

Nutrition Diagnosis

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

Mrs. Gaines’ nutrition status level is 3 which indicates moderate nutritional risk (VA Nutrition Screening Form).

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

1) Inadequate oral intake related to low intake/absorption and diarrhea as evidenced by severe weight loss, low PO intake, and low caloric intake.

2) Increased nutrient needs for iron related to malnutrition and anemia as evidenced by low albumin and prealbumin levels, HGB, MCHC, ferritin, magnesium, and vitamin B12.

Nutrition Intervention

23. For each of the PES statement that you have written, establish an ideal goal (based on signs and symptoms) and an appropriate intervention (based on the etiology).

1) Eliminate gluten and increase oral intake

2) Increase consumption of leaner meats (chicken and turkey) and overall increase in PO intake to improve nutrient levels

24. What type of diet would you initially begin when you consider the potential intestinal damage that Mrs. Gaines’s has?

I would advise Mrs. Gaines to consume a GI soft, gluten free, lactose free, low fat diet. She must eliminate all gluten from her diet to repair her intestinal damage on the villi and crypts. She should start a lower intake of caffeine and alcohol because they may not be tolerated well. I would also advise her to take a lactose intolerance test at a doctor’s office rather than on her own to get certainty rather than experimentation in the condition she is in. She may need to avoid dairy if lactase production is low or take a Lactaid pill. It would be beneficial for her to consume leaner meats like turkey for protein and iron rather than fatty beef to improve her fat absorption levels.

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

Ensure or Ensure Plus would be beneficial to Mrs. Gaines to raise her calorie and protein levels.
26. Would glutamine supplementation help Mrs. Gaines’s during the healing process? What form of glutamine supplementation would you recommend?

More consumption of glutamine would be beneficial to Mrs. Gaines. I would recommend that she obtain glutamine from foods rather than pill form. It can be found in chicken, milk, fish, beans, eggs and vegetable juices such as V8 Vegetable Juice (WebMD, 2012).

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

Mrs. Gaines will experience less diarrhea, better regulation of bowel movements and less discomfort. Her small intestine will be able to repair itself and her fat absorption should correct itself (PubMed Health, 2012). She needs to follow this diet for life for a long time but there are many gluten-free substitutions on the market currently for her to enjoy.

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: not tolerated, better to avoid due to presence of malt
Bologna slices: not tolerated well, substitute with chicken
Lean Cuisine – Ginger Garlic Stir Fry with Chicken: not tolerated, bake chicken and vegetables at home
Skim milk: tolerated, but if lactose intolerance develops, substitute with almond milk or soy milk for protein
Cheddar cheese spread: tolerated, substitute with real cheese, avoid if lactose intolerance develops
Green bean casserole: use gluten-free mushroom soup
Coffee: tolerated
Rice crackers: tolerated but check ingredients to insure that no gluten ingredients are added
Fruit cocktail: tolerated
Sugar: tolerated
Pudding: tolerated, substitute for gluten-free crackers
V8 juice: tolerated and encouraged for fruit/vegetable consumption
Banana: tolerated
Cola: tolerated but avoid, drink 100% fruit juice instead because it is low in sugar