“Bad Breath”: An integrated case study of alcoholic liver disease for first year medical students.

“Bad Breath”: An integrated case study of alcoholic liver disease for first year medical students.

University of Houston College of Medicine

OMAR MATUK-VILLAZON, MD, MBA AND KEVIN ROWLAND, PHD

Contents

“Bad Breath”: An integrated case study of alcoholic liver disease for first year medical students.

by Omar Matuk-Villazon MD, MBA & Kevin Rowland*, PhD University of Houston College of Medicine*

*both authors contributed equally to the work.

Edits and Contributions by:

Brian Reed, MD, Winston Liaw MD, Donald Briscoe MD, Raj Kumar, PhD, Richard Brown MD, Kenya Steele MD, Suresh Rajendran, MD

Author Information

Dr. Omar Matuk-Villazon, MD, MBA, Clinical Assistant Professor, Department of Clinical Sciences, University of Houston College of Medicine, 4800 Calhoun Rd, Houston, TX 77004

Dr. Kevin Rowland, PhD[1], Clinical Professor of Physiology, Department of Biomedical Sciences, University of Houston College of Medicine, 4800 Calhoun Rd, Houston, TX 77004

* – both authors contributed equally to the work

[1] – to whom correspondence should be addressed

Introduction

"Bad Breath"

Albert Pate (fictional patient name), a 52-year old Caucasian male, returns to your office to receive results from tests that you have ordered. He originally presented to your office with his wife Lady Pate because they were concerned about his bad breath. After a thorough examination, you decide to send Al for some lab work. Today is the follow up visit.

PART I

THE CASE

Al Pate is a 52-year-old Caucasian male who is employed in a sales department of a major software company. He first presented to you 10 days ago at the urging of his wife, who said that he often is confused and that she thinks that his eyes look yellow. She also noted that he "has terrible breath". Al admits that he drinks often, because "I have to show my clients a good time at lunch, dinner, and golfing". He states that he thinks he "should be okay" because he never feels heartburn nor gets a hangover from his drinking, he brags that he is his company's top salesman every year.

His wife complains that he "actually drinks every single day." Upon questioning he admits to drinking in the morning on occasion, "just to help me get going". He has also complained about fatigue and a couple of weeks of watery diarrhea. He feels tired and weak. His wife says that he has gained some weight and that he has no interest in his children or her. "He barely touches me doctor" and she starts crying in your office while pointing at Al, "Doctor, I cannot live with him anymore." Upon questioning further, you decide to consult a social worker and refer him to a local support group. You order some blood tests and decide to follow up in a couple of weeks.

Laboratory Studies:

BLOOD, PLASMA, SERUM	Patient Lab Results	NBME Lab Reference Values	Remark
Alanine aminotransferase (ALT), serum	78	8 – 20 U/L	
Amylase, serum	50	25 – 125 U/L	
Aspartate aminotransferase (AST), serum	256	8 – 20 U/L	
Bilirubin, serum (adult) Total // Direct	4	0.1 – 1.0 mg/dL // 0.0 – 0.3 mg/dL	
Calcium, serum (Ca2+)	7.8	8.4 – 10.2 mg/dL	
Alkaline Phosphate	215		
Cholesterol, serum	100	Rec:<200 mg/dL	
Cortisol, serum	14	0800 h: 5 – 23 ug/dL 1600 h: 3 – 15 ug/dL 2000 h: ≤50% of 0800h	
Creatine kinase, serum	65	Male: 25 – 90 U/L Female: 10 – 70 U/L	
Creatinine, serum	1.4	0.6 – 1.2 mg/dL	
Electrolytes, serum			
Sodium (Na+)	130	136 – 145 mEq/L	
Potassium (K+)	3.0	3.5 – 5.0 mEq/L	
Chloride (Cl-)	98	95 – 105 mEq/L	
Bicarbonate (HCO3-)	21	22 – 28 mEq/L	
Magnesium (Mg2+)	1.4	1.5 – 2.0 mEq/L	
Glucose, serum	200	Fasting: 70 – 110 mg/dL 2-h postprandial: <120 mg/dL	
Lactate dehydrogenase, serum	100	45 – 90 U/L	
Phosphorus (inorganic), serum	2.8	3.0 – 4.5 mg/dL	
Proteins, serum			
Total (recumbent)	5.0	6.0 – 7.8 g/dL	
Albumin	2.0	3.5 – 5.5 g/dL	
Globulin	3.0	2.3 – 3.5 g/dL	
Thyroid-stimulating hormone, serum or plasma	0.8	0.5 – 5.0 ?U/mL	
Triglycerides, serum	300	35 – 160 mg/dL	
Urea nitrogen, serum	40	7 – 18 mg/dL	
Uric acid, serum	7.8	3.0 – 8.2 mg/dL	
HEMATOLOGIC			
Erythrocyte count	5.0	Male: 4.3 – 5.9 million/mm3 Female: 3.5 – 5.5 million/mm3	
Erythrocyte sedimentation rate (Westergren)	12	Male: 0 – 15 mm/h Female: 0 – 20 mm/h	
Hematocrit	35	Male: 41% – 53% Female: 36% – 46%	
Hemoglobin A1C	7.6	≤ 6%	

Hemoglobin, blood	8.4	Male: 13.5 – 17.5 g/dL Female: 12.0 -16.0 g/dL
Leukocyte count and differential		
Leukocyte count	8500	4500 – 11,000/mm3
Segmented neutrophils	60	54% – 62%
Bands	3	3% – 5%
Eosinophils	1	1% – 3%
Basophils	0	0% – 0.75%
Lymphocytes	30	25% – 33%
Monocytes	8	3% – 7%
Mean corpuscular hemoglobin	24	25.4 – 34.6 pg/cell
Mean corpuscular hemoglobin concentration	29	31% – 36% Hb/cell
Mean corpuscle volume	77	80 – 100 mm3
Partial thromboplastin time (activated)	55	25 – 40 seconds
Platelet count	75,000	150,000 – 400,000/mm3
Prothrombin time	18	11 – 15 seconds
Reticulocyte count	0	0.5% – 1.5%
Ammonia Level	94	
INR	1.8	
GGT	86	

ABDOMINAL ULTRASOUND: shows a diffusely enlarged fatty liver with a nodular contour, splenomegaly and moderate ascites. The portal vessels are prominent.

Surgical History: Inguinal hernia repair at 43 years old.

Medical History: History of diabetes mellitus and alcohol abuse.

Social History: Married to wife for almost 15 years. Has 5 kids. Ages 14, 12, 8, 6, and 2 months. He has been working at the same company for almost 4 years. Wife does not work, stays at home with the kids.

Family History: His father died when he was 3 years old and says his mother never indicated why his father died.

Allergies: Penicillin

Medications: None

Review of Systems: Positive for diarrhea, weakness and impotence.

His vital signs are: Height 5'7"ft (175cm), Weight 233 lbs (106kg), Temp; 97.5 F, Pulse: 110 bpm; RR: 22, BP 120/80, O2 95%.

HEENT: PEERL, EOMI, yellow discoloration of sclera, acanthosis nigricans on neck.

EARS: Normal TM and light reflex.

MOUTH: Strong alcohol odor, caries, otherwise mouth and pharynx normal.

NECK: No carotid bruits or jugular venous distention while sitting upright. No cervical adenopathy noted. Thyroid not palpated.

CHEST: Lungs with fine crackles on both bases, good air movement, no wheezing on inspiration/expiration. Heart regular rate and rhythm, no murmurs heard. Gynecomastia present bilaterally.

ABDOMEN: Obese and enlarged abdomen, reduced hair growth, varicocele umbilical vein present, telangiectasias, positive for shifting dullness, unable to palpate any visceromegaly's due to distention.

GENITAL: Uncircumcised male, both testes descended bilaterally atrophy noticed.

EXTREMITIES: Thin appearance, poor muscle tone. Lower extremity 2+ edema to the knees bilaterally; Strength 5/5, pulses present bilaterally, no other abnormalities. Palmar erythema noted.

NEURO: Slurred speech, cranial nerves 2-12 normal; asterixis present.

Ten Days Later:

Today is the follow up visit. Upon entering the room, you notice alcoholic odor and a large hematoma on his left arm which he indicates is the blood draw location from a couple of weeks ago. He remarks that "sometimes I feel confused doc", and says, "my energy is low, you gotta fix me." He mentions "my wife left with the kids to her mom's house" and later, "I lost this year's sales bonus at my company and I have started drinking more than usual."

You decide to ask Al more details about his drinking. He admits that he has gotten several DUIs over the past year. Sometimes he forgets where he is at and when he tries to stop drinking, he feels bad, one time he had a seizure. He has not tried to stop drinking because of that.

You ask Albert the following **CAGE** questions:

1. *Have you ever felt you should **C**ut down on your drinking?*
2. *Have people **A**nnoyed you by criticizing your drinking?*
3. *Have you ever felt bad or **G**uilty about your drinking?*
4. *Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (**E**ye opener)?*

Al answers in the affirmative for each of the CAGE questions and on examination, you notice that he has yellow discoloration of the sclera, some parts of his skin have bruises especially on his back and trunk. You observe cherry red papules, lacy-looking patches and fragile skin. Al complains about generalized itching "Doc I cannot sleep with this". Upon examination of his abdomen, you realize that now he has markedly dilated abdominal wall veins, something that he did not have previously. Diligently, you decide to auscultate the abdomen to evaluate his peristalsis. To your surprise, you do not hear bowel sounds. You decide to do percussion and roll Al to his sides. You can demonstrate "shifting dullness" and you are unable to palpate the liver or any other organ due to distension. His extremities are thin and Al just tells you that he feels so tired and weak that, "I want to die doctor…"

Compassionately, you decide to take your time and listen to Al's story. Finalizing, you explain to him in plain terms that his liver is not functioning as it needs to. Al asks, "What is wrong with it?" You explain that the liver controls coagulation, protein synthesis to mention some. Al remembers to tell you that his diarrhea has a "black color doc" and points out that this has been going on for the last couple of months.

With this information you decide to send Al to the hospital for inpatient admission for further management of his condition. Your nurse just left since it is past 5pm and you had spent more than the allocated time with Al. You decide to start the referral process and call the local ED yourself to present your patient. When asking Al about his preferred hospital, he tells you that he forgot to pay his insurance premium almost 2 months ago and now he is uninsured. You send Al to the county hospital and you wonder if something else can be done.

1. Instructor's Guide

Instructions for Use:

1. Target audience: First-Year Medical Students
2. Purpose: The purpose of the case is for students to understand the etiology, anatomy, and pathophysiology and key clinical information of a patient with alcoholic liver disease progressing toward cirrhosis.

Implementation:

Pre-Work

Assign "*Case and Learning Objectives – Student Version*" assignment to students approximately 1 work week prior to the learning session. All pre-work and learning session instructions are provided in the student version.

Students will be asked to generate bullet point responses to the case learning objectives by using textbooks and current evidence-based resources in the literature and should be completed individually, not as a group. Suggested responses for faculty facilitators, as of August 2020, are found in the "Response" column below and are not provided to the students.

Learning Session

Students should be broken up into discussion groups of no more than eight students in a group. This could be done in an in-person setting or by using "breakout rooms" in an online format. The goal is for students to articulate the responses gathered individually and to generate a group response to be shared with the entire class.

2. Learning Objectives - Instructor's Version

Time	Learning Objective	Response
0:00 mins	**Welcome and formation of students into groups. Facilitator should assign students into groups and ask students to share the responses that were gathered individually and discuss the case discussion question.**	
	• **Explain the epidemiology of alcoholic liver disease in the United States.**	• Is a leading cause of mortality, nearly 250,000 deaths attributed to ALD; about 4% prevalence (JAMA, May 2019); • ALD leading indication for liver transplants (Clin Gastroenterol Hepatol. 2018;16(8):1356-1358.). • About half of the deaths from cirrhosis are alcohol-related
	• **List the risk factors for developing alcoholic liver disease.**	• Excessive alcohol use • More common in men • HCV • obesity • genetic
	• **Describe how alcohol is normally metabolized by the liver.** **Discuss with your group:** How did ethanol use lead to hepatitis in this patient?	• by alcohol dehydrogenase (ADH) • cytochrome P450
0:20 mins	**Facilitator: Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
	• **Describe how the liver participates in blood clotting.**	• Hemostasis is related to liver function. Coagulation factors are synthesized by liver parenchymal cells and the liver's reticuloendothelial system serves as important role in the clearance of activation products. • Vitamin K dependent factors: Prothrombin (which we usually measure in the lab), factor VII, IX, X, protein C and S
	• **Describe normal Starling pressures and changes that result in peripheral edema and ascites in a patient with alcoholic liver disease.**	Normal: • P_c = capillary pressure • P_i = interstitial fluid pressure • π_c = plasma colloid oncotic pressure • π_i = interstitial fluid colloid osmotic pressure Edema: • In this case, the peripheral edema is caused by decreased plasma proteins and increased interstitial fluid pressure. • Ascites in this case is from increased portal pressures and the "weeping" of fluids off the surface of the liver.
	• **List the normal progression of alcoholic liver disease.**	• Steatosis • Steatohepatitis • Cirrhosis • Hepatocellular carcinoma

0:50 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
0:60 mins	**At 60 minutes: BREAK for 10 minutes**	
1:10 mins	**Facilitator should assign students into groups and ask students to share the responses that were gathered individually and discuss the case discussion question.**	
•	• **List the signs and symptoms of alcoholic liver disease.** **Discuss with your group:** *What causes this patient's peculiar breath (fetor hepaticus)?*	• Sometimes asymptomatic • with cirrhosis – jaundice, weakness, edema, swollen abdomen, GI bleed • evidence of hepatomegaly on physical exam • ascites • evidence of encephalopathy • skeletal muscle wasting/weakness • white discoloration of fingernails (leukonychia) • gynecomastia • testicular atrophy • palmar erythema • halitosis
	• **Contrast liver function laboratory results from a patient with alcoholic liver disease to normal lab findings and to patients with other forms of liver disease.** • • ***Discuss with your group:*** *Why is bilirubin elevated in this case?*	• The aspartate aminotransferase (AST) to alanine aminotransferase (ALT) ratio is >2 in ALD patients. • ALT is often higher than serum AST in patients with other forms of liver disease. • elevated transaminases in ALD patients • elevated gamma-glutamyl transpeptidase (GGT) in patients with ALD (not specific to ALD) • Blood findings in patients with ALD: • Elevated bilirubin • Thrombocytopenia • Anemia • Elevated MCV • Decreased lymphocyte count • Increased ESR • Increased INR • Radiographic image findings: • Signs of hepatic steatosis
•	• **Determine the correct evaluation and testing to make a diagnosis for the patient in this case.**	• Determine alcohol consumption • Physical exam – angiomata, ascites, gynecomastia, URQ tenderness • Lab tests – discussed above
1:30 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
•	• **Determine differential diagnoses for the patient in this case.**	• Hepatitis C, Hepatitis B • NAFLD • Wilson • Acute liver injury

•	• **Develop a management scheme for the patient.** ***Discuss with your group:*** *What interventions have been proven effective to address alcoholism?* *What social support is currently available in our community?*	• Counsel on alcohol intake • What meds to prescribe? • Counsel on diet and vitamin use • Counsel on acetaminophen
•	• **Describe when patients need a liver biopsy.**	• Patient with abnormal serum aminotransferase that persisted for more than six months without a clear explanation. • Patient with normal liver enzymes but BMI > 30
1:50 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	

3. Student's Guide

Pre-Work

Review the case learning objectives and generate bullet point responses using current evidence-based resources. Please complete the responses individually, not as a group.

Learning Session

1. You will be broken up into discussion groups of no more than eight students in a group. The goal is for you to articulate the responses gathered individually and to generate a group response that will be shared with the entire class.

4. Learning Objectives - Student's Version

Time	Learning Objective	Response
0:00 mins	**Welcome and formation of students into groups. Facilitator should assign students into groups and ask students to share the responses that were gathered individually and discuss the case discussion question.**	
	• **Explain the epidemiology of alcoholic liver disease in the United States.**	•
	• **List the risk factors for developing alcoholic liver disease.**	•
	• **Describe how alcohol is normally metabolized by the liver.** **Discuss with your group:** How did ethanol use lead to hepatitis in this patient?	•
0:20 mins	**Facilitator: Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
	• **Describe how the liver participates in blood clotting.**	•
	• **Describe normal Starling pressures and changes that result in peripheral edema and ascites in a patient with alcoholic liver disease.**	•
	• **List the normal progression of alcoholic liver disease.**	•
0:50 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
0:60 mins	**At 60 minutes: BREAK for 10 minutes**	
1:10 mins	**Facilitator should assign students into groups and ask students to share the responses that were gathered individually and discuss the case discussion question.**	
•	• **List the signs and symptoms of alcoholic liver disease.** **Discuss with your group:** *What causes this patient's peculiar breath (fetor hepaticus)?*	•

	• **Contrast liver function laboratory results from a patient with alcoholic liver disease to normal lab findings and to patients with other forms of liver disease.** ***Discuss with your group:*** *Why is bilirubin elevated in this case?*	•
•	• **Determine the correct evaluation and testing to make a diagnosis for the patient in this case.**	•
1:30 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	
•	• **Determine differential diagnoses for the patient in this case.**	•
•	• **Develop a management scheme for the patient.** ***Discuss with your group:*** *What interventions have been proven effective to address alcoholism?* *What social support is currently available in our community?*	•
•	• **Describe when patients need a liver biopsy.**	•
1:50 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	

Describe when patients need a liver biopsy.1:50 minsFacilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.

•	• **Describe when patients need a liver biopsy.**	•
1:50 mins	**Facilitate a debrief of the responses to the learning objectives and case discussion question with the entire class for 10 minutes.**	

This is where you can add appendices or other back matter.