College of Medicine
Department of Medical Education

"... Trying To Loose Bodyweight"

Tutorial One

ENDOCRINE BLOCK- YEAR 2

Curriculum Development & Research Unit

Problem-Based Learning

STUDENT'S CASE

Case 3, 2015

Copyright Statement

The Template of the PBL Cases is designed by Professor Samy A. Azer.

The Student Case and Tutor Guide are written by:
Dr. Maha Iqbal
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Dr. Amer Shafie
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Trigger (35 Minutes)

Mohamed Ali a 50-year-old teacher, who has been successfully accepted for a job as a principal in a private high school in Riyadh, comes in for a medical check-up. This is part of the requirements for the new job. During the medical examination he is found to have a BMI of 33, a blood pressure in the range of 170/95- 175/93 mmHg measured over three separate occasions. During the medical consultation, Mohamed tells Dr. Khalid Al Sulayman, "About two years ago a blood test showed that I have high blood cholesterol but I was so busy and never worked on the medical advice recommended by my doctor."

Discussion Questions:

- Are there any difficult words you do not understand?
- List the key information about Mohamed.
- Identify Mohamed's presenting problems.
- For each problem, generate a list of possible causes (hypotheses).
- What further information would you like to know from history to refine your hypotheses?

History (30 Minutes)

Mohamed has been overweight since childhood. Over the years, he tried several regimens to loose weight but with little benefit. About two years ago, his GP found Mohamed to have a high blood pressure. This has been confirmed on three occasions. Finally the GP commenced him on Enalapril (an ACE inhibitor) which he took for only five months. At that time his laboratory tests showed that his blood cholesterol was high and the liver function tests were a little raised. Further laboratory assessments for viral hepatitis were all negative. The doctor, at that time told him that the increases in the liver function tests are due to accumulation of fat in the liver cells. Mohamed was asked by his GP to start exercising and eat less calories, and low fatty food to control his bodyweight and the increased blood cholesterol. He did join a gym near his home and went for exercising regularly. However, this routine lasted only for a few weeks then he was back to eating fatty foods and stopped exercising. He prefers sitting at home and watching TV in the evenings.

Past medical history

No history of angina, surgery or hospital admissions. No past history of renal trouble.

Allergy and Medication

Nil.

Family history

No family history of hypercholestorolaemia or collagen-related disorders. His father was diagnosed with diabetes mellitus and he suffered a heart attack 5 years ago. He is still alive and on medication. His mother, two brothers and three sisters are all over-weight.

Alcohol and smoking

Mohamed smokes 20 cigarretes a day for the last 25 years. No history of alcohol consumption.

Social history

Mohamed has been married for the last 20 years. He has two grown up children. He has no hobbies and does very little exercise. He tried to reduce his body weight and even joined the local Body Masters gym but did not continue.

Discussion Questions:

- Are there words that you do not understand?
- Summarize key information that you have obtained from this progress.
- Identify Mohamed's new problems. Provide hypotheses for each problem.
- What further information would you like to know through clinical examination?

Clinical Examination (20 Minutes)

The index and the middle fingers of his right hand have nicotine stains. Mohamed is 1.70 meters tall and his body weight is 96 kg. His BMI is 33 and his waist circumference is 105 cm. No evidence of central obesity or hypothyroidism.
His vital signs are summarized in the table below:

Vital signs	Mohamed	Normal range
Pulse rate	100 regular	60-100/min
Blood pressure	170/95 mmHg	100/60-120/80 mmHg
Temperature	37.0	36.6-37.2 °C
Respiratory rate	17	12-16/min

Cardiovascular and Respiratory Systems:
- Normal, apart from his high blood pressure.

Abdominal Examination:
- No abdominal tenderness or regidity.
- Liver is palpably enlarged with a liver span of 16 cm (normally less than 13 cm).
- No abdominal swellings.
- Auscultation of the abdomen is normal.

Discussion Questions:

- Are there words that you do not understand?
- Summarize key information that you have obtained from this progress.
- Identify patient's new problems. Provide hypotheses for each problem.
- What further information would you like to know through investigations?

Investigations (35 Minutes)

The doctor arranges for Mohamed some blood tests to check for his blood count, blood glucose level, lipid profile, blood biochemstry and a viral screening for hepatitis. He also arranges for an abdominal ultrasoiund to assess the enlarged liver. Because Mohamed has been smooking for 25 years and has high blood pressure for a number of years, the doctor decides to do a chest X-ray and an ECG. A summary of the investigation results are shown below:

Complete Blood Count (CBC)

Blood Test	Mohamed	Normal range
Blood haemoglobin	14	11.5-15.5 g/100ml
White blood cell count	8×10^9	$4\text{-}11 \times 10^9$/L
Platelet count	242,000	160,000-500,000 mm^3

Blood Biochemistry

Blood Test	Mohamed	Normal range
Fasting blood glucose	6.5	3.8-5.8 mmol/L
Total Cholesterol	6.1	<5.2 mmol/L
Blood Triglycerides	3.1	<1.7 mmol/L
HDL Cholesterol	0.89	>1.03 mmol/L
LDL Cholesterol	4.21	<2.84 mmol/L
Blood urea	2.9	2.5-6.7 mmol/L
Serum creatinine	101	79-118 µmol/L

Liver Function Tests

Test	Mohamed	Normal range
Serum bilirubin	5	0 - 19 µmol/L
Serum aspartate aminotransferase (AST)	40	0 - 34 IU/L
Serum alanine aminotransferase (ALT)	87	0 - 50 IU/L
Serum alkaline phosphatase (ALP)	120	0 -120 IU/L
Serum albumin	39	35 - 50 g/L

Viral screening for hepatitis: Negative

Ultrasound Abdomen

There is an increased echogenecity of the liver tissue. No masses are found. The gallbladder and biliary tract are normal. Both kidneys are normal.

Chest X-Ray

Shows bilateral hyperinflation of the lungs and a flat diaghragm.

Electro-cardiogram
Evidence of left ventricular hypertrophy

Discussion Questions:

- Are there any terms that you do not understand?
- Summarize the key information that you have obtained from this progress.
- Identify if there are any new problems. Use the new information obtained to refine and rank your hypotheses.
- Do you know a Nobel prize laureate whose work has contributed to the advancement of our knowledge in physiology and/or pharmacology related to this case? What was exactly his/her work about?
- Work out with your group your "learning issues".

Resources

A note to students: You are not required to read all these textbooks and resources to prepare for your learning issues. You could use one textbook or one resource for each discipline. For example, for this case you will need to use a resource covering issues related to the case from four disciplines: Physiology, Histology, Pathology and Medicine. Once you have identified your learning resources, research them for your learning issues and the questions raised in the group discussion. You might choose to use alternative resources other than those listed below:

Textbooks:

- Rhoades R, and Pflanzer R. Human Physiology, 4th ed. London: Brooks/Cole, 2003.
- Fox SI. Human Physiology, 9th Ed. McGraw Hill, 2005.
- Guyton AC and Hall JE. Textbook of Medical Physiology. 10th ed. Philadelphia: WB Saunders & Co, 2000.
- Gartner LP and Hiatt JL. Color Textbook of Histology. 2nd ed. Philadelphia: WB Saunders & Co, 2001.
- Kumar P and Clark M. Clinical Medicine. 5th ed. Edinburgh: WB Saunders, 2002.
- Kumar V and Cotran RS (2007). Robbins Basic Pathology. 8th ed. Philadelphia: Saunders WB

Educational websites:

1. **eMedicine: Metabolic Syndrome**

http://www.emedicinehealth.com/metabolic_syndrome-health/article_em.htm
This website provides information about the metabolic syndrome. You can click on the camera items to see how to measure the waist and the different body fat distributions.

2. **Metabolic Syndrome**

http://emedicine.medscape.com/article/165124-overview
This website provides information about metabolic syndrome. Focus on areas related to etiology, clinical picture, pathology and pathogenesis, of metabolic syndrome.

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Tutorial 2:
Discussion of Learning Issues (70 minutes)

Students: You should start by discussing your "learning issues" that you have identified at the end of tutorial one. You might spend about **60 minutes** on this task. A scribe on the whiteboard is needed to help in this process.

Once you have completed the discussion of your "learning issues", you might progress to these questions. Spend about **10 minutes** on discussing them in your group. A scribe on the whiteboard will help in this process.

Discussion Questions:

- On the basis of the information provided, what is your final hypothesis? Justify your views.
- How would you explain to Mohamed the examination findings and the investigation results?
- What are your management goals and your management plans for Mohamed?

- Do you know a Nobel prize laureate whose work has contributed to the advancement of our knowledge in physiology and/or pharmacology related to this case? What was exactly his/her work about?

Progress 1 (40 minutes)

Mohamed comes in to see Dr. Khalid with the lab results. Dr. Khalid explains the results to Mohamed and tells him that he has gained a lot of body weight and is not doing enough exercise. This has caused an accumulation of fats in several places in his body such the abdomen, thighs, and body organs. The fat also accumulated in the liver cells causing an enlargement in the size of the liver and changes in the liver function tests. Also eating high calorie food, containing high fat contents contributed to these problems and caused increases in the level of blood cholesterol and blood triglycerides above normal limits. This also resulted in decreases in the good cholesterol also known as HDL below normal limits and increases in the bad cholesterol also known as LDL above normal limits. The accumulation of fat in the body cells also interfered with the uptake of glucose by body cells resulting in an increased blood glucose level. So there are several problems happening at the same time and they are all related to increased body weight and lack of exercising. Usually such problems are associated with increases in blood pressure as it is the case with you. The high blood pressure if left untreated causes a load on the heart function and hence the changes in your ECG.

As you can see there are a number of changes happening in your body and they are all triggered by your increased body weight and lack of exercising. So to reverse these changes you need to change your life style by decreasing the amount of fats and calories in your food, exercising regularly with the aim to reach a BMI in the range of 23 to 25.

Dr. Khalid outlines a management plan with Mohamed. He advises him to stop smoking and guide him to a program for smoking cessation. He also plans with him a plan for reducing body weight, and referred him to a dietitian to manage his daily calorie requirements. He commences him on Enalapril tablets for high blood pressure and asks him to review in 6 weeks.

Discussion Questions:

- Write down a mechanism showing the pathogenesis of Mohamed's problems and heighlighting his symptoms, clinical signs, and laboratory investigations results. Use knowledge you learnt from physiology, biochemistry and pathology to build your mechanism.

- In another diagram discuss how loss of body weight and changes in daily intake of calories could help Mohamed in reversing his symptoms, clinical signs, and lab investigations results. Use knowledge you learnt from physiology, biochemistry and pathology to build your mechanism. .

Case closure (10 minutes)

Six weeks later, Mohamed reviews Dr. Khalid for a check-up. He has been following a rigid regime to loose body weight and eat only low calorie foods. He swims three days a week and for the other three days he does cardio exercise on a treadmill. In the first week Mohamed lost 3 kg of body weight and in the last week he lost 1kg. Going to the gym requires from Mohamed a lot of motivation and his family is supporting his decision of starting a healthier life style. He feels much better. His BMI is 28 and his blood pressure is in the range of 135/80 to 130/80 mmHg.

Eighteen months later, Mohamed continues exercising regularly and follows a strict dietary regime. His BMI is 25 and his blood pressure is in the range of 120/75 to 120/70 mmHg. His blood lipids are within normal range and his liver function tests are back to normal.

Tutor's note:
In the last 10 minutes of the tutorial, you might encourage your group to discuss how they could work better as a group. What are the things they need to change and what things they need to improve? This discussion is very useful and will help the group to function better as they work on the next PBL case.

Challenging and revision questions

Tutors: Students could think about these questions on their own as they review the case. They might discuss their answers with their friends.

- What does metabolic syndrome mean?
- Discuss the biochemical, physiological and pathological changes in metabolic syndrome.
- Discuss the pathophysiology of developing insulin resistance in patients with metabolic syndrome.
- Discuss the management goals and management plan for a patient with metabolic syndrome.

Learning Objectives:

On completion of this PBL package students should be able to:

1. Discuss the hormones involved in the metabolism of carbohydrates and fats and the mechanisms responsible for maintaining normal blood glucose level.
2. Discuss the biochemical and physiological interactions between the different components of metabolic symptoms (such as obesity, dyslipidaemia, high blood pressure and impaired blood glucose tolerance).
3. Understand the role of obesity in insulin-resistance and the development of type 2 diabetes.
4. Use basic sciences to interpret clinical manifestations and investigations obtained from a patient with metabolic syndrome.
5. Understand the role of changing the life style (including weight loss, low calorie diet and stopping smoking) in managing a patient with metabolic syndrome.