Case 4: Metabolic Syndrome

PBL Team
Endocrine block

Leaders:

Mamdouh Al-Enezi   Tarfah Al-Obaidan

Members:

Abdullah Altowim   Khaled Almohaimede   Samiha Aljetaily

Summary of the case:

* Mohammed Ali, 50-years old, accepted as school principle.

* His father has diabetes mellitus

* suffered from heart attack 5 years ago (still alive and on medication)

* A smoker (20 cigarettes a day for 25 years)

Presenting problems	Clinical examination	Investigation
• High BMI=33 (obese) • Hypertension • High cholesterol • Enlarged liver	• Nicotine stains on fingers (due to smoking) • Vital signs (elevated blood pressure) • Abdominal examination: enlarged liver	• FPG: high • Lipid profile: High cholesterol High triglycerides High LDL, Low HDL • Liver function test: elevated ALT & AST • Blood urea and serum creatinine • Ultrasound for abdomen (fatty liver) • Chest Xray: hyperinflation of the lungs • ECG (left ventricular hypertrophy) • Viral hepatitis screening

* Final diagnosis: Metabolic Syndrome

* Treated by: Lifestyle modifications, enalapril (anti-hypertensive)

Definition of Graves Disease:

Metabolic syndrome is a name for a group of risk factors that occur together and increase the risk for coronary artery disease, stroke, and type 2 diabetes.

Causes and risk factors:

Researchers are not sure whether the syndrome is due to one single cause, but all of the risks for the syndrome are related to obesity.

The two most important risk factors:

- Extra weight around the middle and upper parts of the body (central obesity) = "Apple-shaped" body
- Insulin resistance. The body uses insulin less effectively than normal.

Other risk factors include:

- Aging
- Genes that make you more likely to develop this condition
- Hormone changes
- Lack of exercise

People who have metabolic syndrome often have two other problems that **can either cause** the condition **or make it worse**:

- Excess blood clotting
- Increased levels of blood substances that are a sign of inflammation throughout the body

Signs & Symptoms (cont.):

- Hypertension
- Dyslipidemia
- Increased hunger, thirst, urination (indicate hyperglycemia)
- Chest pain (if cardiac complication)
- Shortness of breath (if cardiac complication)

Further questions to ask:

- Describe daily activities and any exercises?
- Describe your diet? What do you it in meals and between meals?
- Any history of obesity in childhood?
- Do you have any chronic diseases?
- Any renal diseases?
- Do you have any family history?
- Do you smoke or drink alcohol?
- History of medications?
- Do you have any medical history?

Differential Diagnosis:

1) Obesity:

- Metabolic:
    - Increase intake
    - Lack of exercise
- Genetic: Family obesity
- Metabolic syndrome
- Metabolic disorder
- Hormonal: Hypothyroidism, Cushing's, DM type 2, Acromegaly
- Drugs
- Psychological disorders (such as depression)
- Edema

Differential Diagnosis (cont.):

2) Hypertension:

- Primary:
    - Idiopathic
    - Genetic
    - Environmental
- Secondary
    - Renal: renin-producing tumor, Chronic renal failure, Polycystic kidney disease, urinary tract obstruction, renal artery stenosis
    - Endocrine: pheochromocytoma, Cushing's, Acromegaly, Hyperthyroidism, Metabolic syndrome
    - CNS: stressful condition, caffeine consumption, alcohol, smoking
    - Post menopause
    - Liver cirrhosis
    - Drugs: antidiuretics, glucocorticoids, NSAIDS, Anticholinergic, sympathomimetics, oral contraceptives

3) High Cholesterol:

- Familial (genetic)
- Diabetes mellitus
- Nephritic syndrome
- High-fat diet
- Alcohol
- Smoking
- Medications: oral contraceptives, thiazides,
- Hyperinsulinemia
- High cortisol (Cushing's)
- Liver disease
- Constipation

Differential Diagnosis (cont.):

4) Enlarged Liver:

- Early stages of liver cirrhosis
- Hepatocellular carcinoma
- Non-alcoholic steatohepatitis (fatty liver) (NASH)
- Viral hepatitis
- Parasitic infections (leishmeniasis, Schistosomiasis)
- Drugs
- Autoimmune
- Heart failure
- Liver failure
- Liver tumor
- Liver nodule

Clinical Examination:

- BMI (obese)
- Vital signs (increased blood pressure)
- Large waist circumference (length around the waist):
  - Men: 40 inches or more
  - Women 35 inches or more
- Abdominal examination
- Cardiovascular and respiratory examination: to check if there are any complications
- Eye exam and peripheral nerve examination: to check for retinopathy and neuropathy in case of hyperglycemia

Investigation:

- Full blood count
- Fasting blood glucose
- Lipid profile (LDL, HDL, total cholesterol, serum triglycerides)
- Blood urea and serum creatinin
- LFT (AST, ALT, ALP)
- ECG
- Radiology: chest xray, abdominal ultrasound

Treatment:

The goal of treatment is to reduce the risk of heart disease and diabetes. The doctor will recommend **lifestyle changes** or **medicines** to help **reduce patient's blood pressure**, **LDL cholesterol**, and **blood sugar**.

- **Lose weight**. The goal is to lose between 7% and 10% of the current weight. The patient will probably need to eat 500 - 1,000 fewer calories per day.

- Get 30 minutes of moderate intensity **exercise**, such as walking, 5 - 7 days per week.

- **Lower cholesterol level** using weight loss, exercise, and cholesterol lowering medicines, if needed.

- **Lower your blood pressure** using weight loss, exercise, and medicine, if needed.

- Some people may benefit from daily **low-dose aspirin**.

- People who **smoke** should **quit**.

Prevention:

Since physical inactivity and excess weight are the main underlying contributors to the development metabolic syndrome, getting **more exercise** and **losing weight** can help reduce or prevent the complications.

Complications (if not treated):

Increased long-term risk for developing:
- heart disease
- type 2 diabetes
- stroke
- kidney disease
- poor blood supply to the legs

Revision Questions:

1- What is metabolic syndrome?
(was defined earlier)

2- Discuss the biochemical, physiological and pathological changes in metabolic syndrome:

Biochemical:

High: FBG- total cholesterol- blood triglycerides- LDL cholesterol- ALT- AST

Low: HDL cholesterol

Physiological and pathological:

Insulin resistance

Hypertension

Obesity

Dyslipidemia

3- Discuss the pathophysiology of developing insulin resistance in patients with metabolic syndrome:

Obesity leads to imbalance of "adipocytokines" which play an important role in regulating metabolism in cells. When the imbalance occurs, cells do not respond to insulin as they used to before, so normal levels of insulin do not have the same effect on muscle and adipose cells. As a result, glucose levels stay higher than normal. To compensate for this, the pancreas in an insulin-resistant individual is stimulated to release more insulin. The elevated insulin levels have additional effects which cause further biological effects throughout the body. Insulin resistance can progress to full Type 2 diabetes mellitus (T2DM).

4- Discuss management goals and plan for a patient with metabolic syndrome:

(Was mentioned earlier)

Learning Objectives:

- Discuss the hormones involved in the metabolism of CHO and fats and the mechanism responsible for maintaining normal blood glucose level.

- Discuss the biochemical and physiological interactions between the different components of metabolic syndromes (such as obesity, Dyslipidemia, high BP and impaired blood glucose tolerance)

- Understand the role of obesity in insulin-resistance and the development of T2DM.

- Use basic sciences to interpret clinical manifestations and investigations obtained from a patient with metabolic syndrome.

- Understand the role of changing the life style (including weight loss, low calorie diet and stopping smoking) in management a patient with metabolic syndrome.