

Physiology Lab 2

Tutorial Cases

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مرحبا

A decorative graphic on the right side of the slide. It features a large, light-colored, multi-pointed star shape (resembling a stylized 'M' or a traditional Islamic geometric pattern) in the center. Inside this star, the Arabic word 'مرحبا' (Marhaba) is written in a teal, modern font. The star is set against a background of intricate, repeating geometric patterns in shades of teal and white, characteristic of Islamic art. The overall design is layered and visually rich.

01. CASE



Introduction

A young Male adult; is admitted to the hospital. He complains that he feels Weak and Tires Easily (Typical sign of Anemia). On questioning, it becomes clear that he has been bleeding into his Gastrointestinal Tract (Chronic Bleeding), probably from a gastric ulcer. The patient is also found to have a mild fever (38.6°C).

The medical house officer sends a sample of the patient's blood: to the hematology laboratory in a bottle containing a Ca²⁺-Chelating agent (No Coagulation). The requested investigations include the measurement of the hemoglobin concentration and a blood cell count. The results are given in the Table below.

Table

Variable	Measured Value	Normal Value
Hemoglobin (Hb)	9.6 g/dl ¹ (Low Hb)	14 – 16 gdr ¹
Red Cell Count	3.3 x 10 ¹² L ⁻¹ (Anemic)	4 – 6 x 10 ¹² L ⁻¹
Reticulocytes	9% (High Not From BM)	0 – 2 %
White Cell Count	15.6 x 10 ⁹ L ⁻¹ (High Infection Suspected)	4 – 11 x 10 ⁹ L ⁻¹
Platelet Count	190 x 10 ⁹ L ⁻¹ (Normal)	150 – 400 x 10 ⁹ L ⁻¹



1. What is the purpose of the Ca^{2+} -Chelating agent in the sample bottle?
2. How might the patient's symptoms of weakness and tiredness be explained based on the haematology results?
3. Comment on the reticulocyte count in the light of the other blood results.
4. Which of the blood results is most consistent with the patient's fever and what may be the cause of both changes?

Answer

1. What is the purpose of the Ca^{2+} -Chelating agent in the sample bottle?

The Ca^{2+} -chelating agent in the blood sample bottle serves the purpose of preventing blood clotting by binding calcium ions. This ensures the preservation of the blood sample in an anticoagulated state, facilitating accurate hematological analyses without clot formation.

2. How might the patient's symptoms of weakness and tiredness be explained based on the hematology results?

The patient's symptoms of weakness and fatigue can be explained considering the hematological results. The hemoglobin concentration of 9.6 g/dl is indicative of anemia, likely resulting from chronic gastrointestinal bleeding. This anemia reduces the oxygen-carrying capacity of the blood, leading to fatigue and weakness.

3. Comment on the reticulocyte count in the light of the other blood results.

The reticulocyte count of 9% indicates an appropriate response to the anemia, as reticulocytes are immature red blood cells released by the Bone Marrow in response to low hemoglobin levels. However, it is crucial to interpret this count in conjunction with other blood results. The absolute reticulocyte count may provide a more comprehensive understanding of the bone marrow's compensatory response.

Answer

4. Which of the blood results is most consistent with the patient's fever and what may be the cause of both changes?

The elevated White Cell Count of $15.6 \times 10^9\text{L}^{-1}$ is most consistent with the patient's fever. This increase suggests an inflammatory or infectious process. Gastrointestinal bleeding, possibly from a gastric ulcer, could lead to localized infection and systemic inflammation, contributing to both the elevated white cell count and the patient's fever.

- The hematological results shed light on the patient's anemia, potential underlying causes, and the body's compensatory responses. The correlation of these findings with the clinical presentation allows for a more comprehensive understanding of the patient's condition.

02.

CASE



Introduction

A 34-year-old Man with Schizophrenia has had: Chronic fatigue for 6 months. He has a good appetite but has refused to eat vegetables for 1 year because he hears voices that tell him the vegetables are poisoned. His physical and neurological examinations are normal



- His hemoglobin level is 9.1 g/dl (Reference: 14-16 g/dl)
- Leukocyte count is 10,000/mm³ (Reference: 6000-11000/mm³)
- Mean corpuscular volume is 122 fL (Reference: 85-92 fL).

What is the most likely diagnosis? Explain your answer

Answer

What is the most likely diagnosis? Explain your answer

The most likely diagnosis for the presented case is iron deficiency Anemia.

Iron deficiency anemia is a condition characterized by a decrease in the number of red blood cells or a decrease in the amount of hemoglobin in the blood due to insufficient iron. In this case, the key indicators pointing towards Iron deficiency anemia include:

- 1. Hemoglobin Level:** The hemoglobin level of 9.1 g/dl is below the normal reference range (14-16 g/dl), indicating anemia.
- 2. Mean Corpuscular Volume (MCV):** The mean corpuscular volume is elevated at 122 fL (normal range: 85-92 fL). This is a crucial finding as an elevated MCV is often associated with macrocytic anemias, and in the context of the presented case, it suggests that the red blood cells are larger than normal.
- 3. Leukocyte Count:** The leukocyte count is within the normal reference range, which is expected in iron deficiency anemia.

Answer

The patient's chronic fatigue is a common symptom of anemia, as the decreased hemoglobin levels impair the oxygen-carrying capacity of the blood, leading to reduced oxygen delivery to tissues and organs.

The unusual dietary restriction of not eating vegetables for a year due to paranoid delusions is indicative of the patient's underlying schizophrenia. However, this psychiatric condition is not directly related to the anemia but may contribute to the patient's overall health and nutritional status.

The combination of chronic fatigue, low hemoglobin, elevated MCV, and a normal leukocyte count strongly suggests iron deficiency anemia in this 34-year-old man with schizophrenia. Addressing the iron deficiency through appropriate supplementation and treatment is essential for managing the anemia in this case.

03.

CASE



Introduction

A 65-year-old man complains of dizziness & visual disturbances. His laboratory values are as follows:

- Red Blood Cell Count = $8.5 \times 10^6/\text{mm}^3$ (Elevated)
- Hemoglobin = 21 g/dl (Elevated)
- Hematocrit = 60% (Elevated)
- Plasma Osmolality = 295 mOsm/L (Normal)

What is the most likely explanation for this -presentation?

Answer

The clinical presentation along with the provided laboratory values, suggests a condition known as **Polycythemia**. Polycythemia is characterized by an increase in the number of Red Blood Cells (RBCs), leading to elevated Hemoglobin and Hematocrit levels.

These elevated values indicate an excessive concentration of red blood cells in the blood, a condition referred to as polycythemia vera. Polycythemia vera is a **Myeloproliferative Disorder** characterized by the overproduction of red blood cells in the bone marrow. This excess of red blood cells can lead to increased blood viscosity, reduced blood flow, and impaired circulation, resulting in symptoms such as dizziness and visual disturbances.

The normal plasma osmolality of 295 mOsm/L indicates that the increased red blood cell count is not due to Dehydration, as the plasma osmolality is within the normal range.

Thanks!

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