CASE ONE

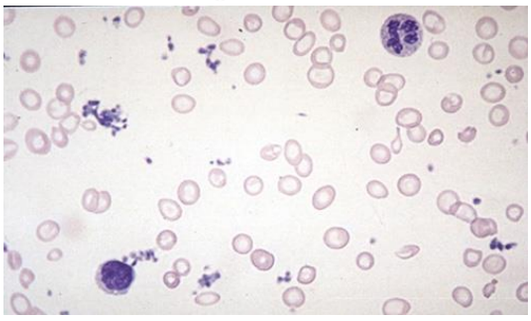
Short case number: 3_30_1
Category: Immune and haemopoietic systems
Discipline: Medicine
Setting: General Practice
Topic: Anaemia_Microcytic

Case

Gabriella Pesce is 24 years old and a regular patient of the practice. She presents complaining of worsening fatigue. Gabriella has often discussed her weight and diet with you and you know that over the last few years she adopted a vegetarian diet to try and keep her weight under control. You comment that she looks paler that normal and she concurs that her family also expressed concerns about how pale she looks.
You are concerned that Gabriella may have developed anaemia as a result of her diet.

Questions

1. What are the key features of history and examination in your assessment of Gabriella and why?
2. What is anaemia?
3. You explain to Gabriella that you think that lack of iron in her diet has caused anaemia. Gabriella asks why does lack of iron cause anaemia. What would you explain to her?
4. Gabriella's investigations demonstrate a Hb 80 g/L and microcytic red cells on the blood film. [similar to the picture shown]. What are the possible causes of this clinical picture? How would the results of iron study tests assist in distinguishing between these causes?



5. Outline your plans to investigate Gabriella's anaemia.
6. Your management of Gabriella includes increasing iron content of her diet. Explain the process iron absorption and metabolism.

Suggested reading:

- Kumar P, Clark ML, editors. Kumar & Clark's Clinical Medicine. 9th edition. Edinburgh: Saunders Elsevier; 2016.
- Colledge NR, Walker BR, Ralston SH, Penman ID, editors. Davidson's Principles and Practice of Medicine. 22nd edition. Edinburgh: Churchill Livingstone; 2014.

ANSWERS

Question 1
What are the key features of history and examination in your assessment of Gabriella and why?

History and examination:

1. Features of Anaemia
    - SOB, fatigue, pallor
2. Features of iron deficiency
    - glossitis
    - angular stomatitis
    - spoon-nails - koilonychia; brittle longitudinal ridges occur in 10% of patients
    - dysphagia due to pharyngeal webs - Plummer-Vinson syndrome
    - thin, fragile scalp hair
    - unusual dietary cravings - pica
    - achlorhydria

Question 2
What is anaemia?

Anaemia can be described as a reduction in the haemoglobin concentration to below 135g/L per decilitre in an adult male and below 115g/L per decilitre in an adult female.

Anaemia is not a disease in itself, but may reflect an underlying disease process. It may also result from an increase in plasma volume and a dilatational effect - for example, as occurs during pregnancy.

It can be classified according to the blood film; thus red cells with a low mean cell volume (MCV) appear small and pale - microcytic; those with a large MCV appear large and oval shaped - macrocytic. Alternatively, the red blood cells may be normal in size and shape but may be reduced in number - normocytic.

An alternative classification is with respect to the underlying mechanism

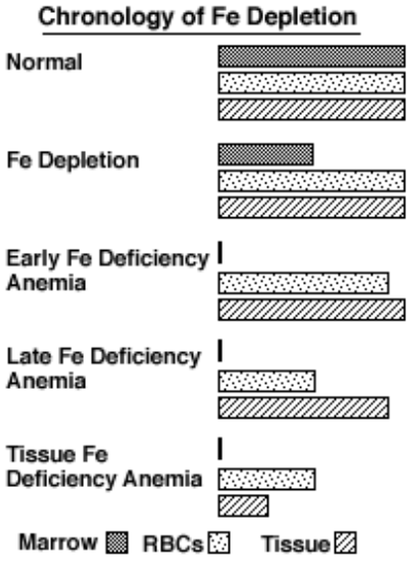
Question 3
You explain to Gabriella that you think that lack of iron in her diet has caused anaemia. Gabriella asks why does lack of iron cause anaemia. What would you explain to her?

Iron deficiency causes anaemia gradually. Storage iron in the bone marrow is the first to become depleted. Serum ferritin levels decrease (corresponding to the marrow stores), while the Hct, Hgb and MCV remain normal, thus a latent state.

In time, serum iron decreases and iron-binding capacity increases, but there may be little or no evidence of anemia (small D in the Hct, Hgb, and MCV).

Later, synthesis of hemoglobin becomes impaired by the lack of iron and readily recognizable anemia results.

Eventually iron is lost from tissues other than blood including the liver, skin and skeletal muscle.



Question 4
Gabriella's investigations demonstrate an Hb 110 g/l and microcytic red cells on the blood film. What are the possible causes of this clinical picture? How would the results of iron study tests assist in distinguishing between these causes?

Microcytic anaemia is where the mean cell volume (MCV) is less than 76 femtolitres (normal range = 76-96).

Causes of Microcytic anaemia include

- iron deficiency anaemia - the commonest cause
- sideroblastic anaemia
- thalassaemia
- anaemia of chronic disease
- lead poisoning

The blood film is a useful part of the initial laboratory assessment for microcytic anaemia. Iron deficiency has a typical hypochromic microcytic appearance. On blood film examination, target cells and basophilic stripling are more prominent in haemoglobinopathy than in iron deficiency. However, the film appearances may be indistinguishable from a haemoglobinopathy - like thalassaemia trait. Useful parameters to make the distinction include:

- ethnic background
- red cell count, haemoglobin level for the degree of microcytosis
- red cell distribution width (RDW)

The RDW is the standard deviation of red cell size and indicates variation in red cell size. In iron deficiency the RDW is typically increased, whereas in thalassaemia it is usually within the normal range.

Question 5

Outline your plans to investigate Gabriella's anaemia.

Initial investigations would include

- Iron Studies

Further testing is not required to diagnose iron deficiency anaemia in a patient with low serum ferritin. However, if there is concomitant inflammatory state and borderline or elevated ferritin, a soluble transferrin receptor assay may be helpful in the differential diagnosis. The soluble transferrin receptor is increased in patients with iron deficiency anaemia, so normal or low levels may be more suggestive of an alternative diagnosis. If the results are indeterminate you could either request a bone marrow examination for assessment of tissue iron stores or give the patient a therapeutic trial of iron.

Question 6

Your management of Gabriella includes increasing iron content of her diet. Explain the process iron absorption and metabolism.

Normally, the total body iron content is in the range of 2gm in women and up to 6 gm in men. It is divided into functional and storage compartments. Approx 8-% of the functional iron is found in haemoglobin, myoglobin and iron containing enzymes such as catalase. The storage pool represented by haemosiderin and ferritin contains approx 20% of total body iron.

The absorption of iron and its regulation are complex and poorly understood. The most active step of iron absorption is the duodenum, but the stomach, ileum and the colon may also participate to a small degree.