ANAEMIAS

Introduction
Iron deficiency Anaemia
Anaemia of chronic disease

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anaemia refer to a state in which the level of haemoglobin in the blood below the reference range appropriate for age and sex.

The clinical features of anaemia reflect diminished oxygen supply to the tissues .

Symptoms and signs help to indicate the clinical severity of anaemia. A full history and examination is needed to identify the underlying cause

A rapid onset of anaemia (e.g. due to blood loss) causes more profound symptoms than a gradually developing anaemia.

Individuals with cardiorespiratory disease are more susceptible to symptoms of anaemia.

ANAEMIA

Non-specific symptoms

- Tiredness
- Lightheadedness
- Breathlessness
- Development/worsening of ischaemic symptoms, e.g. angina or claudication

Non-specific signs

- Mucous membrane pallor
- Tachypnoea
- Raised jugular venous pressure
- Tachycardia
- Flow murmurs
- Ankle oedema
- Postural hypotension

SYMPTOMS OF ANEMIA

Causes of anaemia

Decreased or ineffective marrow production

- *Lack of iron, vitamin B12 or folate*
- *Hypoplasia/myelodysplasia*
- *Invasion by malignant cells*
- *Renal failure*
- *Anaemia of chronic disease*

Normal marrow production but increased removal of cells

- *Blood loss*
- *Haemolysis*
- *Hypersplenism*

The clinical assessment and investigation of anaemia should gauge its severity and define the underlying cause

Clinical assessment

• Iron deficiency anaemia is the most common type of anaemia worldwide. A thorough gastrointestinal history is important, looking in particular for symptoms of blood loss.
Menorrhagia is a common cause of anaemia in pre-menopausal females, so women should always beasked about their periods.

A dietary history should assess the intake of iron and folate, which may become deficient in comparison to needs (e.g. in pregnancy or during periods of rapid growth.

- Past medical history may reveal a disease that is known to be associated with anaemia, such as rheumatoid arthritis (anaemia of chronic disease), or previous surgery (e.g. resection of the stomach or small bowel, which may lead to malabsorption of iron and/or vitamin B12).

Family history and ethnic background may raise suspicion of haemolytic anaemias, such as the haemoglobinopathies and hereditary spherocytosis. Pernicious anaemia may also run in families but is not associated with a clear Mendelian pattern of inheritance.

• A drug history may reveal the ingestion of drugs that cause blood loss (e.g. aspirin and anti-inflammatory drugs), haemolysis (e.g. sulphonamides) or aplasia (e.g. chloramphenicol).

On examination

there may be specific findings related to the aetiology of the anaemia; for example, a patient may be found to have a right iliac fossa mass due to an underlying caecal carcinoma.

Haemolytic anaemias can cause jaundice.

Vitamin B12 deficiency may be associated with neurological signs, including peripheral neuropathy, dementia and signs of subacute combined degeneration of the cord .

Sickle-cell anaemia may result in leg ulcers, stroke or features of pulmonary hypertension. Anaemia may be multifactorial and the lack of specific symptoms and signs does not rule out silent pathology

Investigations

Schemes for the investigation of anaemias are often based on the size of the red cells, which is most accurately indicated by the MCV in the FBC.

Commonly, in the presence of anaemia:

-A normal MCV (normocytic anaemia) suggests either acute blood loss or the anaemia of chronic disease, also known as the anaemiaof infammation (ACD/AI) .

- A low MCV (microcytic anaemia) suggests iron defciency or thalassaemia or sometimes ACD/AI .

-A high MCV (macrocytic anaemia) suggests vitamin B12 or folate defciency or myelodysplasia

ANAEMIAS

Around 30% of the total world population is anaemic and half of these, some 600 million people, have iron deficiency.

The classification of anaemia
by the size of the red cells (MCV) indicates the likely cause


IRON DEFICIENCY ANEMIA

Iron deficiency anaemia

This occurs when iron losses or physiological requirements exceed absorption.

causes

1-Blood loss

The most common explanation in men and post-menopausal women is gastrointestinal blood loss . This may result from :

1-occult gastric or colorectal malignancy, gastritis, peptic ulceration, inflammatory bowel disease, diverticulitis, polyps and angiodysplastic lesions.

2-Worldwide, hookworm and schistosomiasis are the most common causes of gut blood loss

Gastrointestinal blood loss may be exacerbated by the chronic use of aspirin or non-steroidal anti-inflammatory drugs (NSAIDs), which cause intestinal erosions and impair platelet function.

In women of child-bearing age, menstrual blood loss, pregnancy and breast feeding contribute to iron deficiency by depleting iron stores.

Very rarely, chronic haemoptysis or haematuria may cause iron deficiency.

2-Malabsorption

Gastric acid is required to release iron from food and helps to keep iron in the soluble ferrous state

Achlorhydria in the elderly or that due to drugs such as proton pump inhibitors may contribute to the lack of iron availability from the diet, as may previous gastric surgery.

Iron is absorbed actively in the upper small intestine and hence can be affected by coeliac disease

3-Physiological demands

At times of rapid growth, such as infancy and puberty, iron requirements increase and may outstrip absorption. In pregnancy,
iron is diverted to the fetus, the placenta and the increased maternal red cell mass, and is lost with bleeding at parturition

Daily requirement:

-infants, children = 1-2mg/day
-adult male = 1mg/day
-premenopausal female = 2mg/day
-pregnant woman = 3mg/day, increased in the last two trimesters to 5-6mg/day.

Iron absorption : by the proximal small intestine, foods contain certain compounds as phosphates and phagtates inhibit absorption while ascorbic acid can promote iron absorption.

Clinical features:

1.clinical features of anemia(fatigue.pallor and reduce exercise capacity).

2.clinical features of iron deficiency:

*spoon shaped nails (koilonychias)

*angular chilitis (painful hacks at the corner of the mouth)

*atrophic glossitis (pale, smooth tongue)

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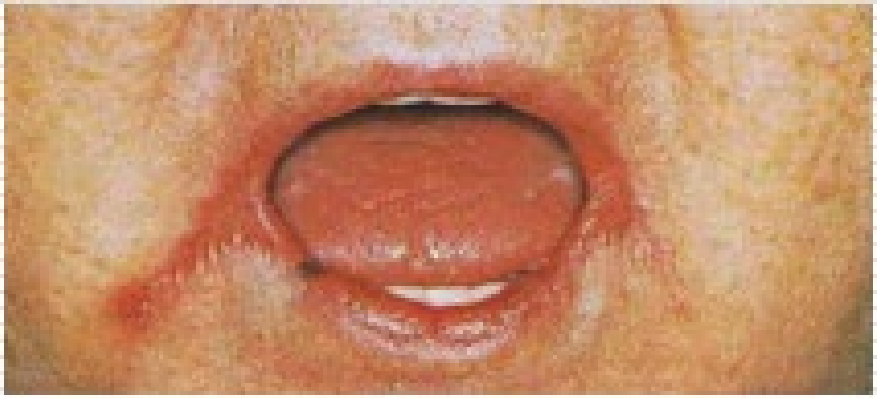
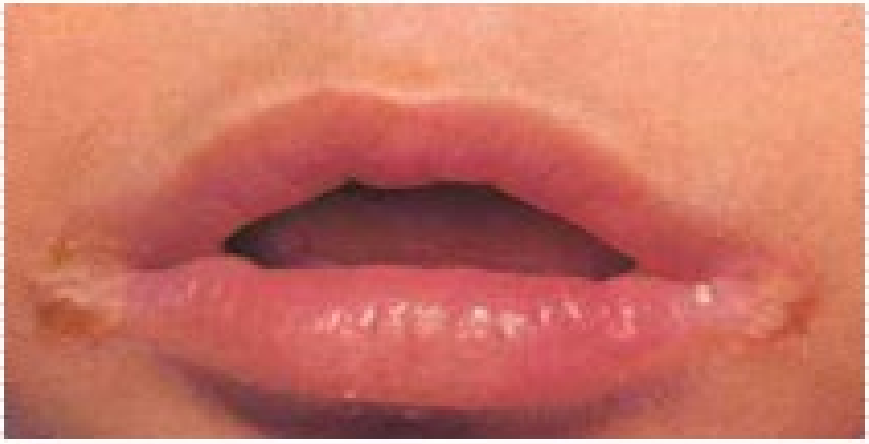
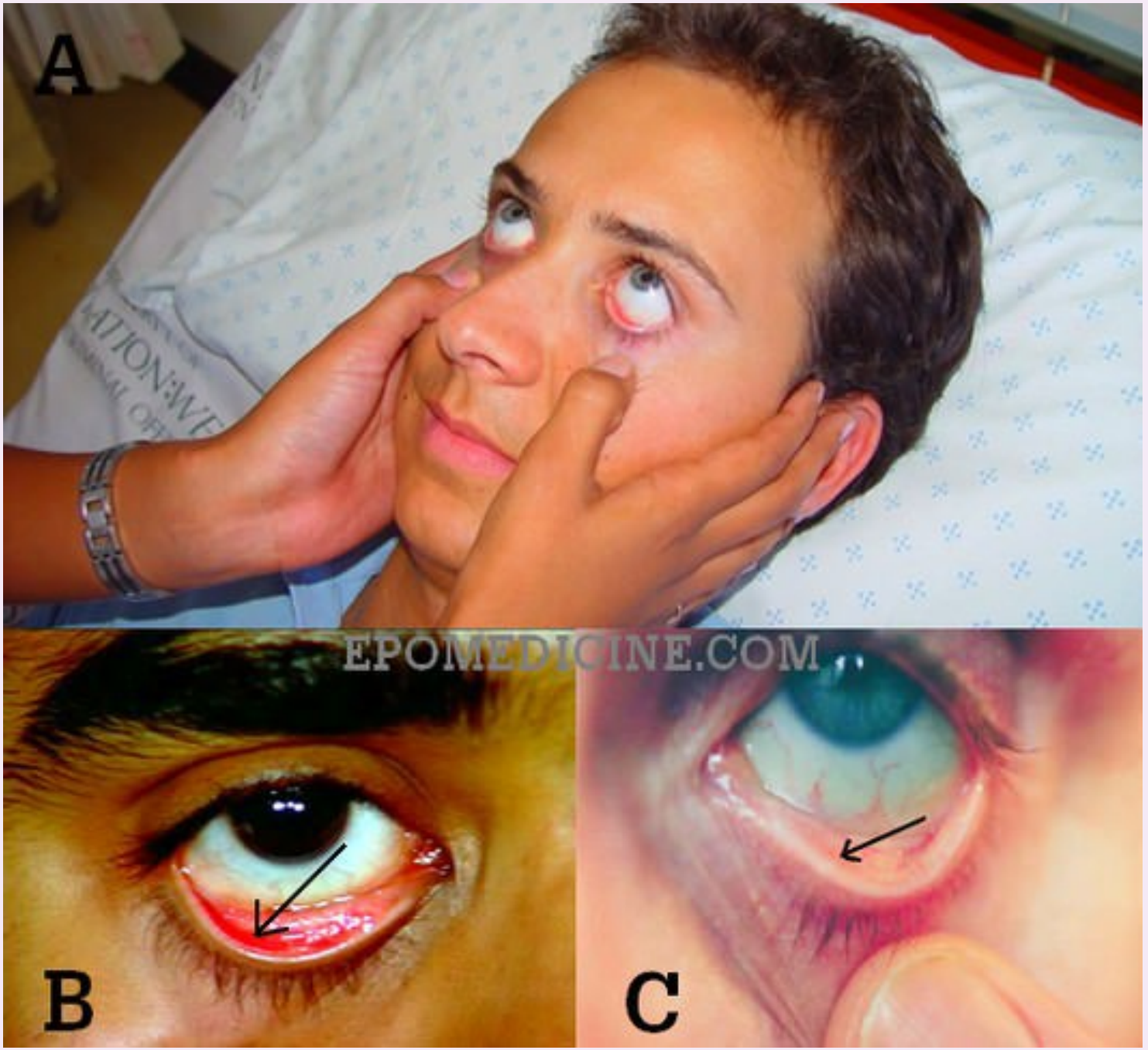
angular chilitis (painful hacks at the corner of the mouth)

Angulular stomatitis &cheilosis





glossitis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I -Investigation :

Laboratory Tests in Anemia Diagnosis

I. Complete blood count (CBC)

A. Red blood cell count

1. Hemoglobin 2. Hematocrit 3. Reticulocyte count

B. Red blood cell indices

1. Mean cell volume (MCV) 2. Mean cell hemoglobin (MCH)

3. Mean cell hemoglobin concentration 4. Red cell distribution width (RDW)

C. White blood cell count

1. Cell differential 2. Nuclear segmentation of neutrophils

D. Platelet count

E. Cell morphology

1. Cell size 2. Hemoglobin content 3. Anisocytosis

4. Poikilocytosis 5. Polychromasia

Investigations

Confirmation of iron deficiency

1-Serum ferritin is a measure of iron stores in tissues and is the best single test to confirm iron deficiency A subnormal level is most often due to iron deficiency or, very rarely, hypothyroidism or vitamin C deficiency. Ferritin levels can be raised in liver disease and in the acute phase response; in these conditions, a ferritin level of up to 100 µg/L may still be compatible with low bone marrow iron stores.

Adult males have serum ferritin values averaging 100 micro.g./L , while adult females have levels averaging 30 micro.gram/L.

2-Plasma iron and total iron binding capacity (TIBC) are measures of iron availability;. Plasma iron has a marked diurnal and day-to-day variation and becomes very low during an acute phase response but is raised in liver disease and haemolysis

normal range for serum irons (50-150micro.g/dl)

Normal TIBC (300-360micro.g/dl).

2-Levels of transferrin:

The binding protein for iron, are lowered by malnutrition, liver disease, the acute phase response and nephrotic syndrome, but raised by pregnancy and the oral contraceptive pill.

A transferrin saturation (i.e. iron/TIBC × 100) of less than 16% is consistent with iron deficiency but is less specific than a ferritin measurement

4- membrane transferrin receptors

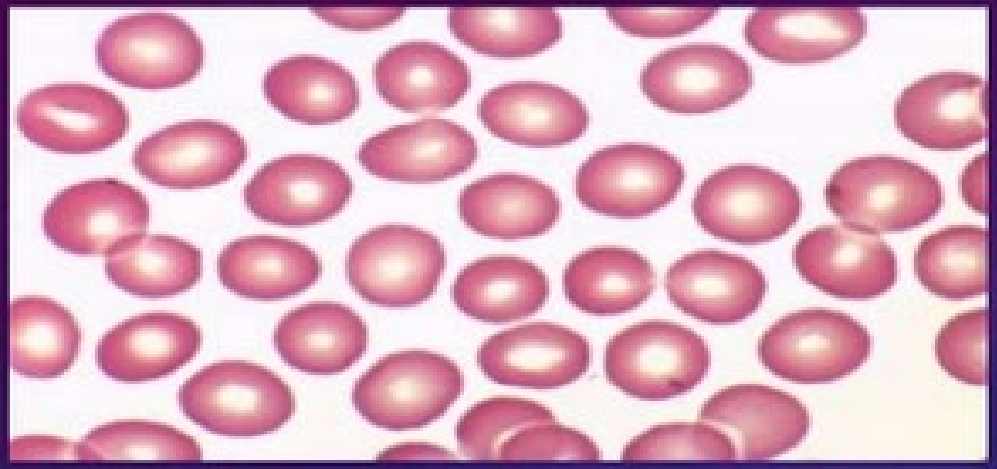
All proliferating cells express membrane transferrin receptors to acquire iron; a small amount of this receptor is shed into blood, where it can be detected in a free soluble form.

At times of poor iron stores, cells up-regulate transferrin receptor expression and the level of soluble transferin receptors increase.

This can now be measured by immunoassay when a raised level indicates iron deficiency.

In difficult cases, it may still be necessary to examine a bone marrow aspirate for iron stores.

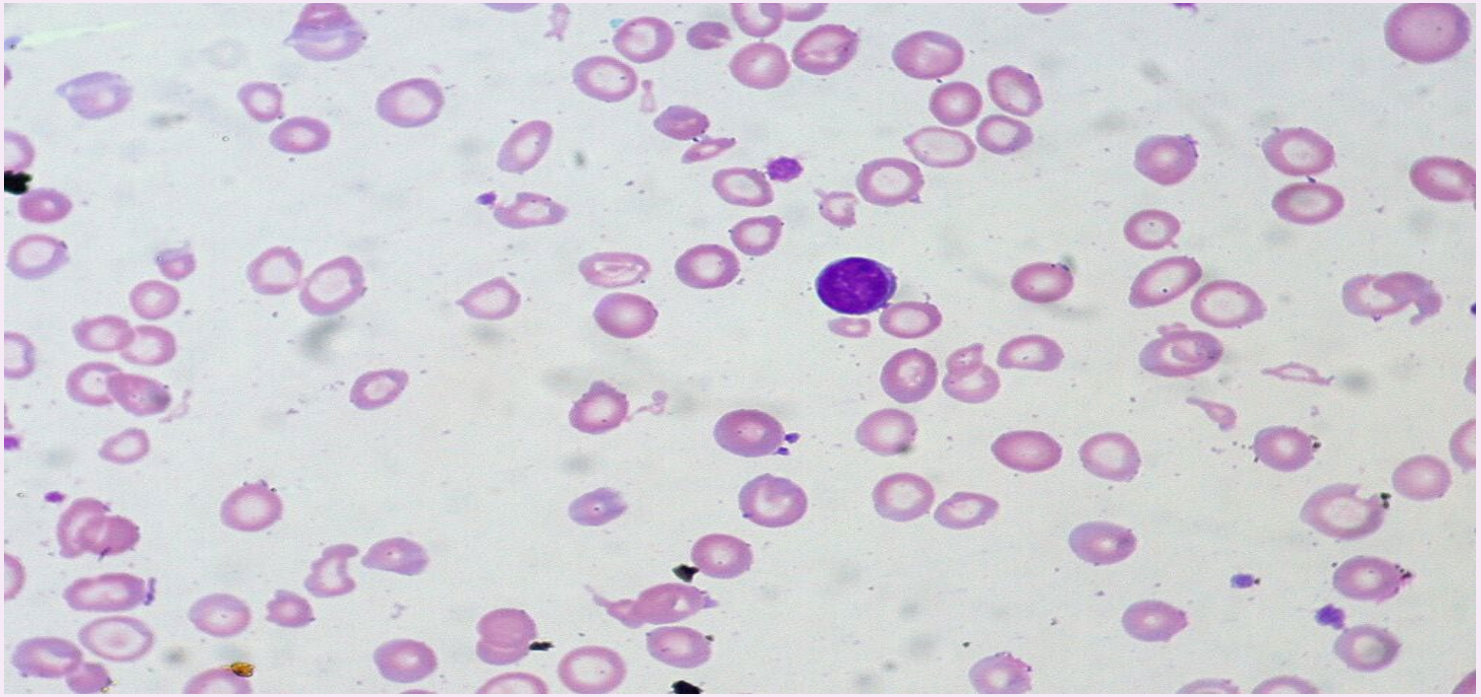
Morphology of normal RBC



- Biconcave disc
- Diameter : 7 ~ 8 µm
- Average volume : 90 fl.
- Central pallor occupy 1/3 rd of total size
- Approx same as nucleus of mature lymphocyte

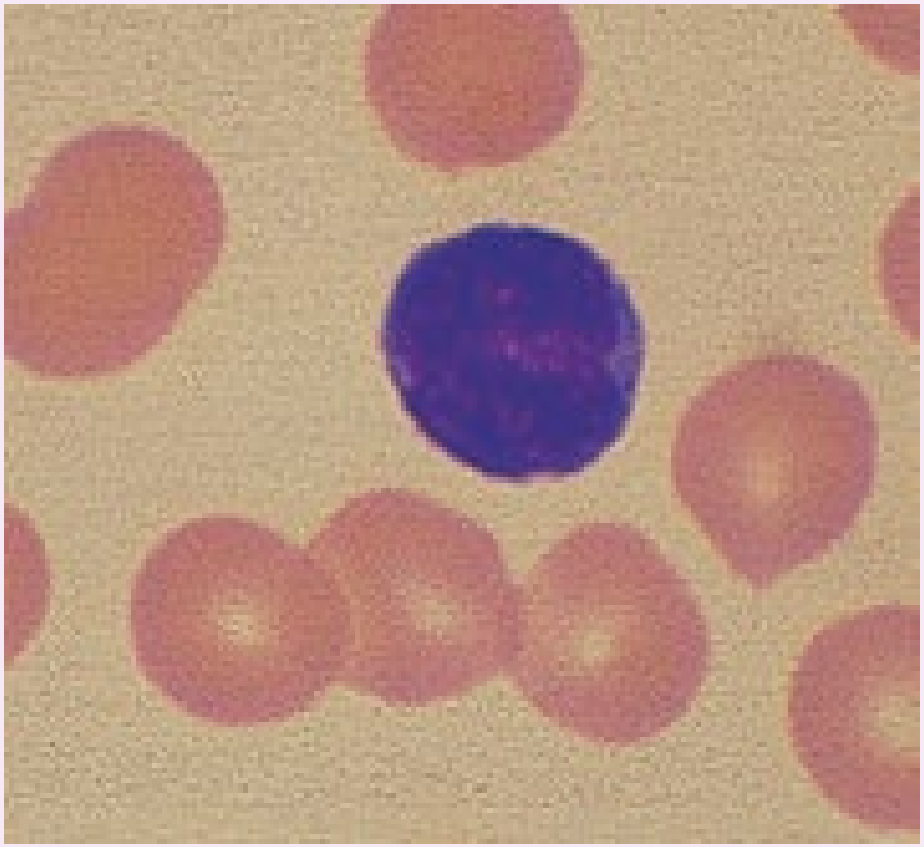
HYPOCHROMIA

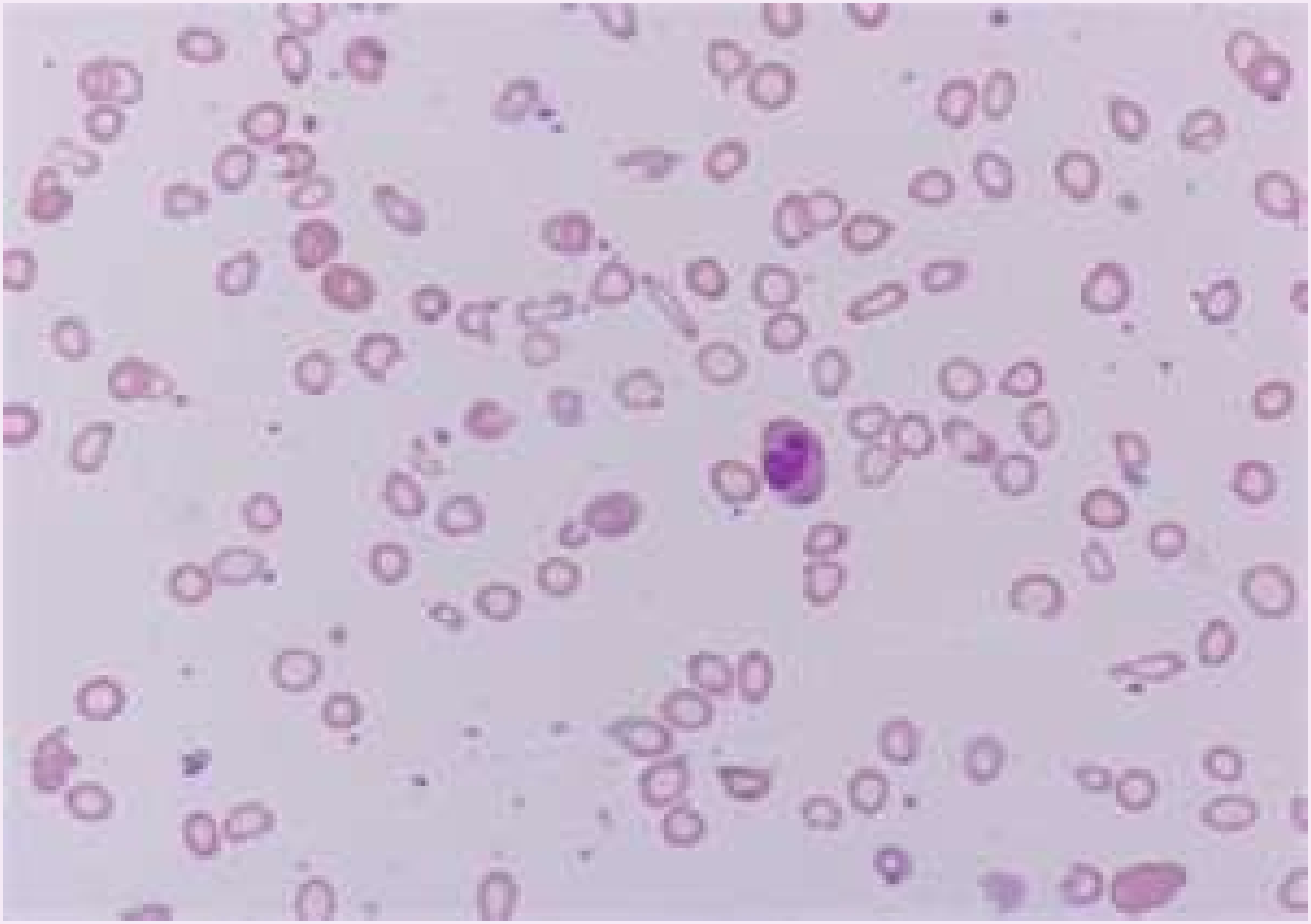
- Any RBC having a central area of pallor of greater than 3µm is said to be hypochromic



Hypochromic Microytic Red Blood Cells

The cell size can easily be calibrated using the nucleus of a small lymphocyte. A normal red blood cell is usually the same size as the nucleus of a small lymphocyte.





Sever iron deficiency anaemia

B/Investigation of the cause:

Depend on (age, sex, history and clinical findings).

e.g.: men over 40, post-menopausal women with normal diet upper &lower GI tract should be investigated by endoscopy and barium studies.

If celiac disease is suspected serum anti-gliadin & anti-endomycin Ab and duodenal biopsy are indicated.

In tropics stool, urine ex: for parasites.

Non- pharmacological treatment

- **Iron-rich diet**
- Good sources of iron includes:
  - meats - beef, pork, lamb, liver, and other organ meats
  - poultry - chicken, duck, turkey, liver (especially dark meat)
  - fish - shellfish, including clams, mussels, and oysters, sardines, anchovies
  - leafy greens of the cabbage family, such as broccoli, kale, turnip greens, and collards
  - legumes, such as lima beans and green peas; dry beans and peas, such as pinto beans, black-eyed peas, and canned baked beans

Management:

-depend on:

1. Aetiology of IDA.
2. Severity.
3. The ability of the patient to tolerate oral preparations.
4. if the patient has angina, heart failure or evidence of cerebral hypoxia.

Treatment:

1. Treat the underlying cause (bleeding, malabsorption).
2. Blood transfusion: only for sever anemia, heart failure, angina or evidence of cerebral hypoxia.
3. Iron replacemen

***oral iron preparations:**

Ferrous sulphate 200mg 8 hourly (195mgof elemental iron per day) for 3-6 months to replete iron stores.

If the patient intolerant of ferrous sulphate with dyspepsia and altered bowel habit so either decrease the dose to 200mg 12 hourly or change to ferrous gluconate 300mg 12 hourly (70mg of elemental iron per day).

Hb should be increased lg/dl every 7-10 days and reticulocyte response will be evident by one week

TREATMENT

IRON SUPPLEMENT

failure to respond to treatment adequately:

***non-adherence.**

***continued blood loss.**

***malabsorption**

***incorrect diagnosis.**

S.E: GI distress is form of abdominal pain, nausea, vomiting, constipation or diarrhea.

parental iron therapy:

-indications:

1. Oral preparation intolerance.

2. Non-compliance.

3. Malabsorption and chronic gut disease.

4. Patient receiving recombinant erythropoietin to guarantee adequate iron delivery to support erythroid precursor proliferation

Previously, iron dextran or iron sucrose was used, but new preparations of iron isomaltose and iron carboxymaltose have fewer allergic effects and are preferred. Doses required can be calculated based on the patient's starting haemoglobin and body weight. Observation for anaphylaxis following an initial test dose is recommended.

ANAEMIA OF CHRONIC DISEASE

This is a common type of anaemia, particularly in hospital populations.

Characteristic features:

1. It occurs in the setting of chronic infections, chronic inflammation or neoplasia.
2. The anaemia is not related to bleeding, haemolysis or marrow infiltration,
3. mild, in the range of 85-115 g/l, and is usually associated with a normal MCV (normocytic, normochromic), but up to 25% may have reduced MCV
4. The serum iron is low but iron stores are normal or increased, as indicated by the ferritin or stainable marrow iron.

Clinical features

The clinical manifestations usually obscured by the clinical Features of the underlying disease.

Moderate anaemia(Hb lessThan 10 g/dl) can exacerbate the symptom of ischemic heart disease or respiratory disease or contribute to fatigue or exertional intolerance.

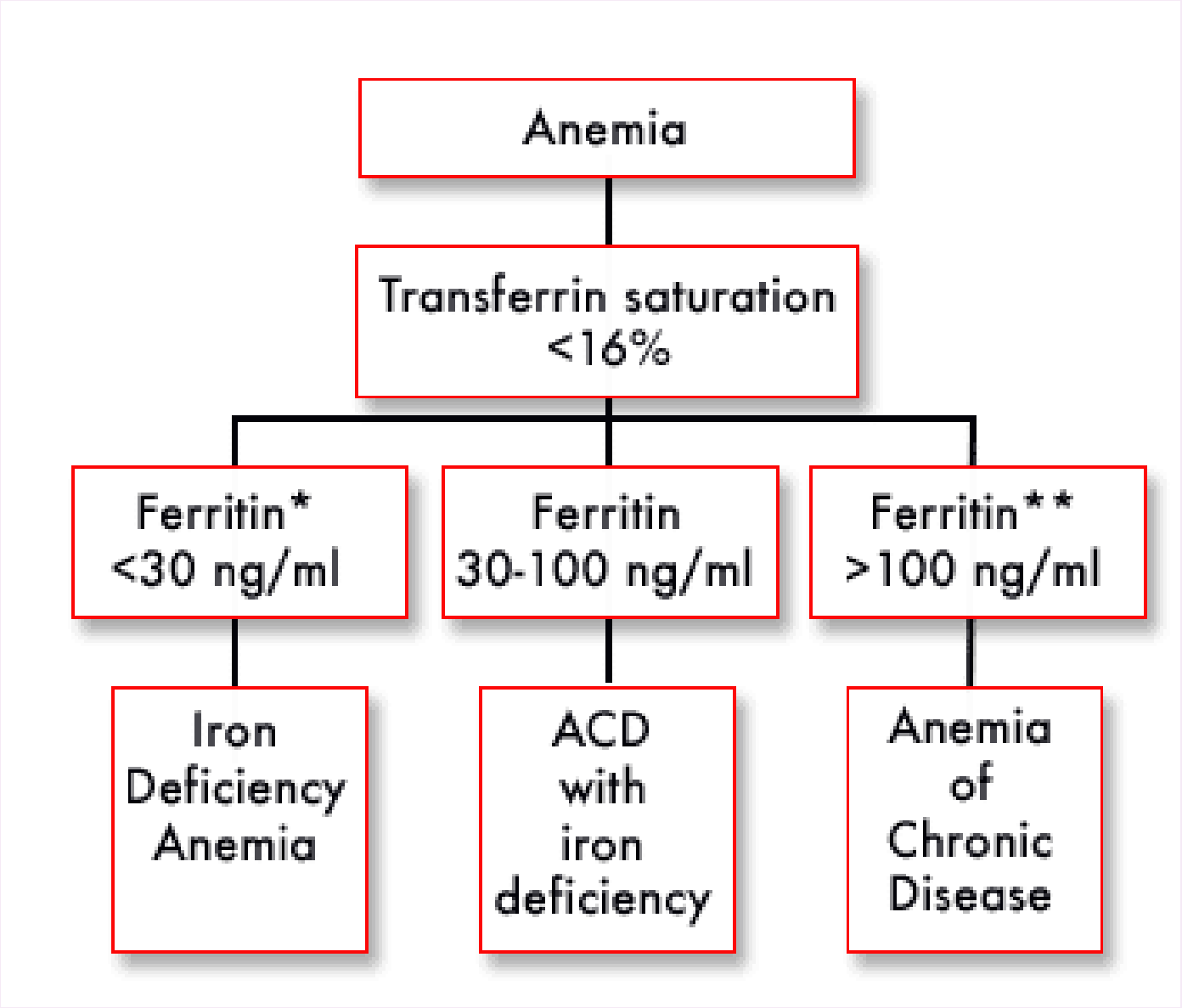
The diagnosis is based clinical features in conjugation with laboratory Results.

Diagnosis and management

It is often diffcult to distinguish ACD associated with a low MCV from iron deficiency.

Examination of the marrow may ultimately be required to assess iron stores directly. A trial of oral iron can be given in diffcult situations. A positive response occurs in true iron defciency, but not in ACD. Measures that reduce the severity of the underlying disorder generally help to improve the ACD.

Trials of higher-dose intravenous iron are under way to try to bypass the hepcidin-induced blockade.


Anemia
Transferrin saturation <16%
Ferritin* <30 ng/ml
Ferritin 30-100 ng/ml
Ferritin** >100 ng/ml
Iron Deficiency Anemia
ACD with iron deficiency
Anemia of Chronic Disease

THANK YOU