

### Anaemia

What is Anamia	A reduction the Hb concentration below normal ranges (M: <13g/dL / F: <12g/dL)
Aetiology	1. Decreased RCB production 2. Loss of RBCs 3. Increased RBC destruction

### Anaemia Main Categories

Microcytic / hypochromic	Low MCV / Low MCH
Normocytic / normochromic	Normal MCV / Normal MCH
Macrocytic / hyperchromic	High MCV / High MCH

### Clinical Presentation

fatigue
dyspnoea
chest pain
dizziness
palpitations
headaches
worsening of other conditions - intermittent claudication

### Normocytic Anaemia

Normal MCV, indicating normal sized RBCs	
DDx: Anaemia of chronic disease/inflammation	Haemolysis
	Bone marrow infiltration
	Acute blood loss

### Normocytic Anaemia

Investigations	
FBC	Low Hb, normal MCV
Blood Film	Normocytic, normochromic RBCs
Iron Studies	normal/low serum iron, low TIBC, normal/high serum ferritin
+/- other Ix	Serum erythropoietin (EPO) level is decreased in CKD
Management	
Manage underlying cause	consult haem/medical team
EPO replacement	

### Normocytic Anaemia (cont)

RCC transfusion if severe or symptomatic
Iron supplementation may or may not be needed

### Normocytic Anaemia Causes

Anaemia of Chronic Diseases	Chronic renal disease, rheumatic disease, congestive heart failure
Mechanism	depends on underlying pathology
	decrease in release of stored iron
	shortened red cell survival
	impaired marrow response in red cell replacement

### Macrocytic Anaemia

Macrocytic Anaemia	Large RBCs and increased MCV
Aetiology	
Megaloblastic	B12 or folate deficiency
Normoblastic	alcohol excess, reticulocytosis, liver disease
Mechanism	
Megaloblastic	Impaired DNA synthesis
Normoblastic	Unkown
Signs and symptoms	General symptoms of anaemia
	Pallor +/- glossitis, angular stomatitis
	B12 deficiency can lead to neurologic syndrome

### Megaloblastic Anaemia

Vit B12	Found in animal sources
Causes of deficiency	Pernicious anaemia (autoimmune disorder)
	Veganism
	Gastrectomy/gastric absorptive disease
	Chron's disease/coeliac



### Megaloblastic Anaemia (cont)

Folate	green veg., organ meat, fortified cereals
Causes of deficiency	Poor dietary intake
	Alcohol
	Anti-epileptic drugs (phenytoin)
	Methotrexate
	Coeliac disease

### Management Macrocytic Anaemia

Treat underlying cause	consult haem/medical team
B12 deficiency	IM hydroxocobalamin (B12): replenish levels with frequent administration then gradually reduce frequency
Folate deficiency	Oral folate replacement: folic acid 5mg OD

### Signs - on CE

Jaundice	can occur in haemolysis
Koilonychia	spoon shaped nails in IDA
conjunctive pallor	ensure looking at palpebral conjunctiva
sclera icterus	jaundice (haemolysis)
angular stomatitis	B12/folate/iron deficiency
systolic flow murmur	mid-systolic ejection murmur due to increased semi-lunar blood flow

### Anaemia Differential Diagnosis

Microcytic Anaemia	Normocytic Anaemia	Macrocytic Anaemia
Iron deficiency anaemia (50% of cases)	Anaemia of chronic disease	Vitamin B12
Thalassaemia	Inflammation:	
Chronic diseases	Chronic infection	

### Iron Deficiency Anaemia

4 main causes	Decreased intake (infant/vegan)
	Decreased absorption (gastrectomy, IBD, coeliac disease)
	Increased demand (childhood, pregnancy)
	Increased loss (chronic slow bleed)
Potential Symptoms	GI blood loss, heavy menstrual bleeding, Pica

### IDA Investigations and Management

Investigations	
FBC	decreased Hb and MCV. Check WCC & platelets (expect normal in IDA)
Iron Studies	decreased serum iron, serum ferritin, transferrin sat., increased TIBC
Blood Film	microcytic and hypochromic RBCs, Poikilocytosis / Anisocytosis
+/- other Ix	Faecal occult blood (FOB), OGD, colonoscopy

### Management

Manage underlying cause	consult haem/medical team
Start supplemental iron	Aim 1-2g raise in Hb every week
1st line:	oral iron replacement eg. Ferrous fumarate
2nd line:	IV iron replacement (Ferrinject)
3rd line:	RCC transfusion (if severe)

Don't forget to type and screen if giving a blood transfusion

### Microcytic Anaemia

Low Hb & MCV, indication RBCs	Causes of microcytic anaemia; mnemonic TAILS
Mechanism:	Defect in synthesis of haem
	Thalassaemia - defect in synthesis of globin chain

### DDX:

- T - Thalassemia
- A - Anaemia of chronic disease
- I - Iron deficiency anaemia
- L - lead poisoning
- S - sideroblastic anaemia



### Macrocytic Anaemia

#### Investigations

FBC	Low Hb, MCV is elevated
B12/Folate Deficiency	check levels
Anti-parietal cell anti-body & intrinsic factor antibody	screening for pernicious anaemia
Anti-tTG & IgA	screening for coeliac disease
LFTs	GGT may be elevated in alcohol excess
Peripheral blood smear	anisocytosis, poikilocytosis, hypersegmented neutrophils

Don't forget to ask about diet (vegan), alcohol intake, medications

### IDA Iron Studies

Serum iron levels	LOW	measures amount of iron in transit in blood
Serum ferritin	LOW	total iron stored in the body
Total iron binding capacity	HIGH	TIBC increases in order to try and maximise use of the little iron available
Transferrin saturation	LOW	level of saturation of transferring with iron: normal is 30%. Reduced in iron deficiency states

### Autoimmune Haemolytic Anaemia (Haemolysis)

Warm AIHA	Antibody active at body temp
	Aetiologies include: rheumatic disease and lymphoproliferative disorders
	IgG antibodies +/- complement
Cold AIHA	Antibody active only at lower temps
	Aetiologies include: infections (eg. mono) and lymphoma
	IgM antibodies

### Haemolytic Anaemia

#### Investigations

FBC	Low Hb, normal MCV
Reticulocytes	elevated
LDH	elevated
Haptoglobin	low
LFT's	unconjugated Bilirubin - elevated
Direct Antiglobulin (Coombs) Test	if + then autoimmune haemolysis likely
Blood Film	look for specific abnormalities

#### Management

Treat underlying cause	consult haem/medical team
Stabilize pt	consult haem re. need for transfusion
Warm AIHA	1st line: corticosteroids, 2nd line: Rituximab, Azathioprine, Cyclosporin, 3rd line: splenectomy
Cold AIHA	Avoid cold temps & treat underlying cause +/- immunosuppressant (rituximab)

### Haemolytic Anaemia

Haemolytic Anaemia      Haemolysis: destruction of red blood cells

#### Aetiologies

Autoimmune	Warm, cold, transfusion reaction, drug induces
Haemoglobinopathies	sickle cell, hereditary spherocytosis, thalassaemia
Infections	malaria
Enzyme defects	G6PD
Microangiopathic haemolytic anaemia (MAHA)	haemolytic uremic syndrome, TTP, DIC, eclampsia/HELLP
Mechanical haemolysis	heart valve prosthesis
Rare	Paroxysmal nocturnal, haemoglobinuria (PNH)

