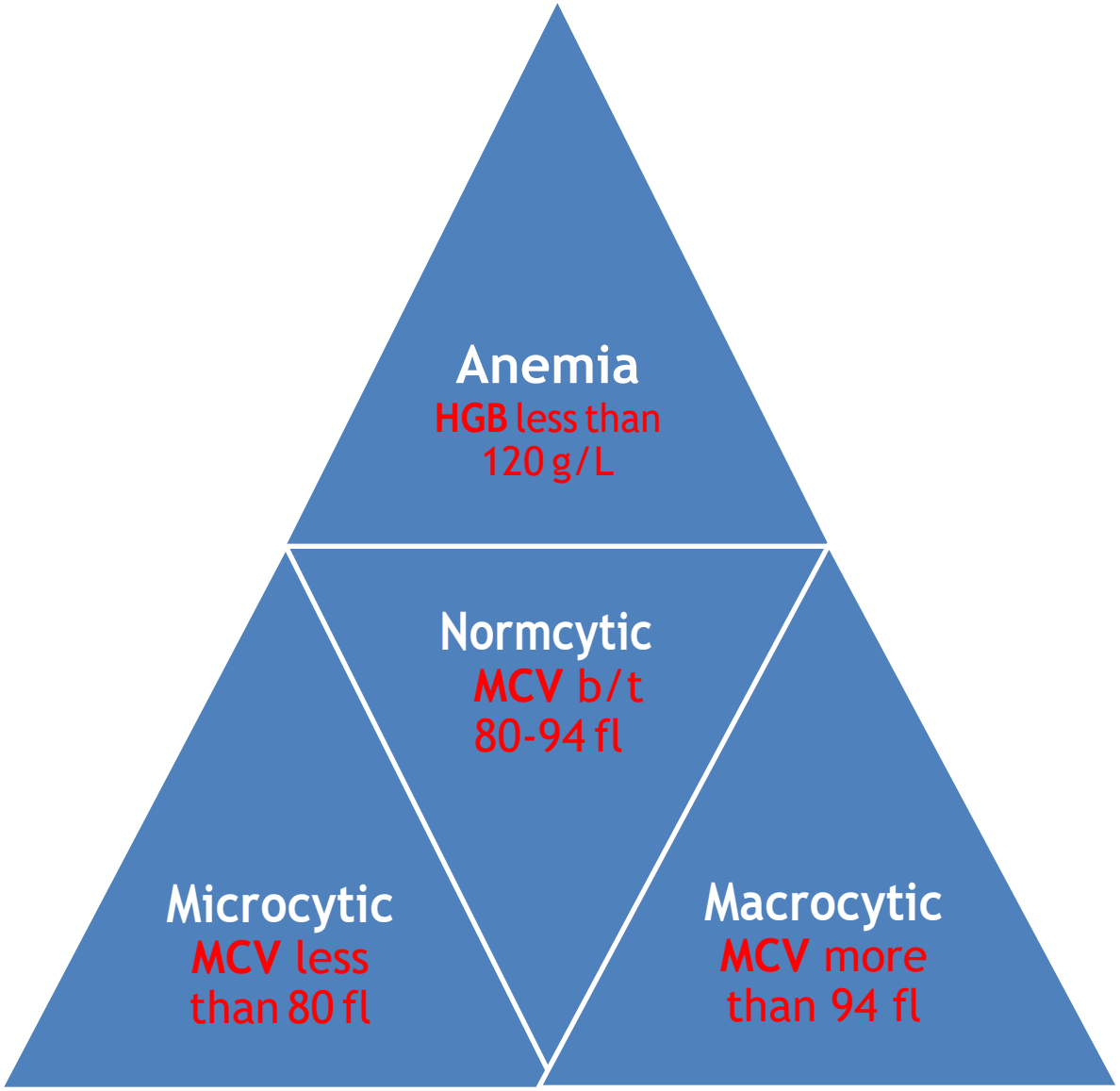
Done by : Abdullah Alghizzi
Revised by:

[Color index : Important | Notes | Extra]

References: 433 team, slides



- ☐ Microcytic e.g. Iron Deficiency Anemia (IDA) and Thalassemia.
- ☐ Normocytic e.g. Anemia of Chronic Diseases and Aplastic Anemia (pancytopenia).
- ☐ Macrocytic e.g.Vit B12 Deficiency.

Other type of Anemia:

- Hemolytic Anemia e.g. Sickle Cell Anemia SCA and Glucose-6- phosphate Dehydrogenase Deficiency (G6PD deficiency).

- **Microcytosis:** low MCV

	Serum Iron	Ferritin
◘ IDA "Iron Deficiency Anemia"	**Low**	**Low**
◘ Thalassemia Minor	**Normal**	**Normal**
◘ Sideroplastic Anemia	**High**	**High**

✓ Sideroplastic Anemia is Uncommon, defect in heme synthesis and ringed sideroplasts in bone marrow. Very rare disease. May not see one in your life!

◘ RDW: Red Cell Distribution Width, when increased reflect heterogeneity in cell Size or indicating low serum iron level.

✓ Iron Deficiency Anemia

- Oral iron therapy, characterized by a modest reticulocytosis beginning in about five to seven days, followed by an increase in hemoglobin at a rate of about 2 to 4 g/dL every three weeks until the hemoglobin concentration returns to normal.

- The serum or plasma ferritin concentration is an excellent indicator of iron stores. Very important.

- Patient with Iron deficiency anemia not response to treatment mean: - Don't take the medication
  - Malabsorption (give I.V.)

❖ Thalassemia Minor:

Microcytosis is much more profound, and the anemia much milder, than that seen in iron deficiency anemia.

Patients with beta thalassemia minor/trait also tend to have **total red blood cell counts higher than normal**, often into the "polycythaemic" range.

The **RDW** in patients with thalassemia trait tends to be normal, since virtually all cells are hypochromic and microcytic**.**

- ✓ When increased reflect heterogeneity in cell size or indicating low serum iron level.

MCV usually< 70fL

- The decrease in MCV is disproportionate to the HB level.
  - ✓ y3ni MCV is very low and HB is mild low.
- Mentzer Index: MCV / RBC is < 13
- If RDW is high, Correct Iron level first before proceeding to HB electrophoresis, otherwise giving a false negative result.
- Hemoglobin electrophoresis:
  - ✓ If HB A2> 3.5 → B-thalassemia Minor.
  - ✓ If HB A2 < 1.5 → alpha thalassemia Minor.

- **First case:**

A 37- year- old lady, presents with 3 months H/O dizziness and easy fatigue. The following CBC is shown below:

WBC	7. 0	4 – 11		x10.e9/L
RBC	3. 68	4.2 – 5.5		x10.e12/ L
HGB	87	120 – 160		g/L
HCT	27.1	42 – 52		%
MCV	73.6	80 – 94		fl
MCH	23.6	27 – 32		pg
MCHC	321	320 – 360		g/L
RDW	15.5	11.5 – 14.5		%
PLT	445	140 – 450		x10.e9/L

- Interpretation the CBC :
  - ✓ RBC Low
  - ✓ HGB Low
  - ✓ HCT Low
  - ✓ MCV Low
  - ✓ MCH Low
  - ✓ RDW High

- RBC, HGB and HCT are low **Anemia.**
- MCV is low **Microcytic.**
- MCH is low **Hypochromic.**
- RDW is high **Serum Iron is low**

- The **Diagnosis** through the CBC is Hypochromic Microcytic Anemia the most common is **iron deficiency anemia (IDA).**
  - ✓ On systemic enquiry (y3ni through systemic review Hx), she added that she has **menorrhagia** for the last 4 months.
  - ✓ **DDX:** Diet, GI bleeding, medication e.g. aspirin, and malabsorption.

- Mention one investigation of importance to reach the diagnosis:
  The Most Common cause of Menorrhagia is **Hypothyroidism**

TSH : 89	mIU/L	(0.25 – 5)
FT4: 8.6	pmol/l	(10.3—25.8)

Primary Hypothyroidism

- **Treatment:** thyroxine, iron supplement (ferrous sulfate or ferrous fumarat) and folic acid. We treat usually at least 4 to 6 months. Stop the treatment when the Ferritin become in normal range.

- **second case:**
  A 17-year-old lady presents with dizziness and bouts of fall. The following CBC is showing below:

WBC: 7.4	4 -11	x10.e9/L
RBC: 3.57	4.2 - 5.5	x10.e12/L
HGB: 57	120 -160	g/L
HCT: 20.1	37 - 47	%
MCV: 56.2	80 - 94	fl
MCH: 15.9	27 - 32	pg
MCHC: 282	320 - 360	g/L
RDW: 25.0	11.5 - 14.5	%
PLT: 578	140 - 450	x10.e9/L
Iron: 1.0	9 - 30	umol/L
Total Iron-Binding cap: 89.6	44.8 - 80.6 umol/L	

- Interpretation of the CBC:
  - ✓ RBC Low
  - ✓ HGB Low
  - ✓ HCT Low
  - ✓ MCV Low
  - ✓ MCH Low
  - ✓ MCHC Low
  - ✓ RDW High
  - ✓ PLT High
  - ✓ IRON Low
  - ✓ TIBC High

Commonly, the platelet count (PLT) is slightly above the high limit of normal in IDA (mild thrombocytosis). This effect was classically postulated to be due to high erythropoietin levels in the body because of anemia, cross-reacting to activate thrombopoietin receptors in the precursor cells that make platelets

☐ **Diagnosis :** Microcytic Hypochromic Anemia -Iron Deficiency Anemia

☐ **Treatment :** Transfused (one pint of blood) and Put on :ferrous sulphate and folic acid

☐ Third case: (2 Cont.)

A 17-year-old lady with low Hb, **after 6 weeks.** (means 6 weeks after treatment)

WBC: **8.4**	4 -11	x10.e9/L
RBC: **4.71**	4.2 - 5.5	x10.e12/L
HGB: **105**	120 -160	g/L
HCT: **32.5**	37 –47	%
MCV: **68.9**	80 –94	fl
MCH: **22.3**	27 –32	pg
MCHC: **324**	320 - 360	g/L
RDW: **35.7**	11.5 -14.5	%
PLT: **296**	140 - 450	x10.e9/L
Ferritin:**6.77**	13 -150	ug/L

After 6 month of treatment, the parameters are increase except the Ferritin still low, so we must continue on the treatment until the parameters (particularly ferritin) become in normal values.

☐ We ordered **hemoglobin electrophoresis** because we have high normal RBCs(4.7) in comparison to low HGB(105)

Hemoglobin A2 :	2.3%	2.0 - 3.5
Hemoglobin F:	0.0 %	0 - 2.0
Hemoglobin A:	97.7 %	95 - 99
Hemoglobin S:	0.0 %	NORMAL

✓ All normal.

❖ Fourth Case:

A 55-year-old man, who is a known case of hypertension controlled on 25 mg hydrochlorothiazide. He is a smoker of 20 cig. per day for >20 years.
He came for routine follow up:

WBC: 6.5	4—11	x 10.e9/L
RBC: 7.1	4.7—6.1	x 10.e12/L
HB: 197	130—180	g/L
HCT: 56.3	42—52	%
MCV: 88	80 - 94	fl
MCH: 30.3	27 - 32	pg
PLT: 305	140 - 450	x 10.e9/L
ESR: 4	0 – 10	mm/hr

❖ Interpret this data:

- ✓ **RBC** High
- ✓ **HB** High
- ✓ **HCT** High

❖ What is the differential diagnosis?

- 2nd Polycythemia (mostly 2nd Polycythaemia due to smoking)
- Polythycaemia rubra vera (primary)

❖ The diagnosis is
Secondary polycythemia (WBC and PLT are normal!)

❖ How are you going to manage this patient?

- U/S abdomen to R/O other causes.
- Blood Donation e.g. every two weeks till **HCT** reaches **45 .**
- Stop smoking.
- Aspirin.
- Shift to another anti-HTN (calcium channel blocker) (because hydrochlorothiazide is diuretic, which cause decrease in plasma volume, in consequence the polycythemia will increase).

❖ Polycythaemia:

- **Absolute** Polycythaemia: (Red Cell mass ↑)
- **Relative** Polycythaemia: (GaisBock's):
  - Normal Red Cell Mass
  - Decrease in plasma volume
  - Obese, middle aged men with
  - Anxiety and hypertension.

- Absolute: very imp

  ◘ Primary Polycythaemia Rubra Vera (↑ RBC WBC and Platelets) OR (Increase in RBCs with ↑in WBCs, ↑Platelets or both).

  ◘ Secondary Polycythaemia Causes :

- Smoking	- COPD
- High altitude	- Cyanotic Cong. H.D
- Renal Cysts	- Uterine Fibromyoma
- Hypernephroma	- Adrenal adenoma
- Hepatoma	- Phaeochromocytoma

  ✓ One investigation to role most causes of 2nd polycythemia is US abdomen in maleand US abdomen and pelvic in female. Very imp.

❖ What is the role of erythropoietin?

- If the erythropoietin level is **high**: secondary polycythaemia.
- If the erythropoietin level is **low**: polycythaemia rubra vera

❖ Lap. Features of Polycythaemia Rubra Vera:

- Increased in HB
- Increased in WBC (>12.000)
- Increased platelets (> 400.000) could be within normal level
- Increased uric acid
- Increased LAP (Leukocyte Alkaline Phosphatase) Score
- Increased serum Vit B12
- Bone Marrow Examin: Hypercelularity

❖ **Polycythaemia vera** (Diagnostic criteria)

- Major Criteria:
  - ✓ Elevated cell mass
  - ✓ Normal arterial oxygen concent. (≥ 92%)
  - ✓ Splenomegaly

- Minor Criteria:
  - ✓ Platelet count > 400.000
  - ✓ WBC count >12.000
  - ✓ ↑ LAP Score
  - ✓ ↑ B12 level

To differentiate Beta-thalassemia from S-beta thalassemia, we focus on HbA2:

- ✓ If its percentage >3.7% it is S-Beta thalassemia.
- ✓ If its percentage >3.5% and <3.7% it is sickle cell anemia.
- ✓ If its percentage < 3.5% or < 1.5% it is S-alfa thalassemia

❖

❖ Fifth case:

A 25-year-old man came for pre-marital checkup(means healthy)
The following CBC is shown below:

WBC	6.6	4 -11	x10.e9/L
RBC	5.87	4.2 - 5.5	x10.e12/L
HGB	121	120 -160	g/L
HCT	38.1	37 – 47	%
MCV	64.0	80 –94	fl
MCH	20.6	27 – 32	pg
MCHC	318	320 - 36	g/L
RDW	14.3	11.5- 14.5	%
PLT	271	140 - 450	x10.e9/L

- Interpret this data:
  - ✓ RBC High
  - ✓ HGB Low
  - ✓ HCT Low
  - ✓ MCV Low
  - ✓ MCH Low
  - ✓ MCHC Low
  - ✓ The decrease in MCV is more and is disproportionate to the HB level

When RBC not matching with HGB (RBC is high and HGB is low , vice versa) we order the Haemoglobin Electrophoresis.

- Haemoglobin Electrophoresis:
  - ✓ Hemoglobin A 94.5 95 -99 %
  - ✓ Hemoglobin F 0.6 0 – 2.0 %
  - ✓ HemoglobinA2 4.9 H 2.0 - 3.5 %
  - ✓ Hemoglobin S 0.0
  - ✓ Hemoglobin E 0.0
  - ✓ Hemoglobin C 0.0

- DDX :
  - ✓ Beta-thalassemia minor

- Treatment:
  - ✓ Patient with Beta-thalassemia minor don't need to treatment.

❖ Sixth case:

A 34-year-old man came to check some of results because of being have IBS. The following CBC is shown below:

#	Test	Result	Unit	Range
				EDTA Whole Blood - SAMPLE: 1
١	WBC	٧,٧٥	x10.e9/L	٤ - ١١
٢	RBC	٦,٨٣	x10.e12/L	٤,٧ - ٦,١
٣	HGB	١٣٥,٠	g/L	١٣٠ - ١٨٠
٤	HCT	٤٣,٠	%	٤٢ - ٥٢
٥	MCV	٦٣,٠	fl	٨٠ - ٩٤
٦	MCH	١٩,٨	pg	٢٧ - ٣٢
٧	MCHC	٣١٤,٠	g/L	٣٢٠ - ٣٦٠
٨	RDW	١٦,٢٠	%	١١,٥ - ١٤,٥
٩	PLT	١٧٥	x10.e9/L	١٤٠ - ٤٥٠

- ✓ RBC High, MCV & MCH are Low, RDW is High.
- ✓ not matching with HGB so, we order Haemoglobin Electrophoresis.

#	Test	Result	Unit	Range
				Venous Blood - SAMPLE: 1
١	Hemoglobin A2	٢,٥	%	٢,٠ - ٣,٥
٢	Hemoglobin F	٠,٥٠	%	٠ - ٢,٠
٣	Hemoglobin A	٩٧,٠	%	٩٥ - ٩٩
٤	Hemoglobin S	٠		-
٥	Hemoglobin C	٠		-
٦	Hemoglobin E	٠		-
٧	Hemoglobin O	٠	%	-

- ✓ HB A2 normal !

❖ DDX:

Thalassemia Trait mostly “alpha Thalassemia”

❖ Seventh Case:

A 31-year-old man presents with heart burn and known to have IBS. The following CBC is shown below:

#	Test	Result		Unit	Range
EDTA Whole Blood - SAMPLE: 1					
1	WBC	13.6	H	x10.e9/L	4 - 11
2	RBC	4.94		x10.e12/L	4.7 - 6.1
3	HGB	106	L	g/L	130 - 180
4	HCT	33.1	L	%	42 - 52
5	MCV	67.1	L	fl	80 - 94
6	MCH	21.4	L	pg	27 - 32
7	MCHC	319	L	g/L	320 - 360
8	RDW	19.7	H	%	11.5 - 14.5
9	HDW	0.0		g/L	0 - 0
10	PLT	375		x10.e9/L	140 - 450

✓ RBC not matching with HGB so, we order Haemoglobin Electrophoresis:

#	Test	Result		Unit	Range
Venous Blood - SAMPLE: 1					
1	Hemoglobin A2	7.3	H	%	2.0 - 3.5
2	Hemoglobin F	5.2	H	%	0 - 2.0
3	Hemoglobin A	0.0	L	%	95 - 99
4	Hemoglobin S	87.5	H		-
5	Hemoglobin C	0.0			-
6	Hemoglobin E	0.0			-
7	Hemoglobin O	0.0		%	-

❖ What is your diagnosis?

✓ sickle cell anemia SCA and Beta Thalassemia Trait

❖ Treatment:

✓ Patient with SCA treat by hydroxyurea, which is increase HBF.

HBF is very high affinity for oxygen, that way patient live with less symptoms!

Coexistent of beta-thalassemia with SCA, made it less severe. However, if he had a pure SCA, HBA2 will be less than 7.

❖ Eighth Case:

A 49-year-old woman presents with weakness and easy tiredness. The following investigations are shown:

WBC: 7.8	4 - 11	x10.e9/L
RBC: 4.16	4.2 – 5.5	x10.e12/ L
HGB: 76	120 – 160	g/L
HCT: 25.2	37 – 47	%
MCV: 60.6	80 – 94	fl
MCH: 18.3	27 – 32	pg
MCHC: 303	320– 360	g/L
RDW: 19.2	11.5 – 14.5	%
PLT: 383	140 – 450	x10.e9/L

Iron: 2.0	9 – 30	umol/L
Ferritin: 4.57	13 - 150	ug/L

Total Iron-Binding cap: 89.3 44.8 - 80.6 umol/L

❖ Interpret this data:

- ✓ **RBC** Normal
- ✓ **HGB** Low
- ✓ **HCT** Low
- ✓ **MCV** Low
- ✓ **MCH** Low
- ✓ **MCHC** Low
- ✓ **RDW** High
- ✓ **Iron** Low
- ✓ **Ferritin** Low
- ✓ **TIBC** High

- RBC low normal,
- HB very low = no matching = thalassemia trait.
- Very low serum iron, low ferritin, high TIBC = typical picture of iron deficiency anemia.
- In case of pure IDA , RBC must be very low.

❖ What is your diagnosis?

- ✓ Iron def. anaemia and Thalassemia trait

- **Three cases!**

	41yo SF pre-op screening	45 yo Indian male pre-employment	52 yo Filipino male HTN	Normal
Anemia	Microcytic	Microcytic	Microcytic	
RBC	3. 40	5.87	4.98	4.7 -6.1x 10.e 12/L
Hb	89	126	119	130 - 180 g/L
MCV	70.9	63.3	70.8	80-94 fl
S. Iron	2.6	13	34	9-30µmol/L
Ferritin	3.39 ↓	266.7	691 ↑	30-400µg/L
Hemogl.A2	2.1	5.4 "because high"	2.2 "because normal"	2.0-3.5
Hemogl F	0	<0.5	0	0-2.0
Hemogl A	97.9	>94	97.8	95-99
Hemogl S	0	0	0	-
Hemogl C	0	0	0	-
	IDA	Beta-Th. Trait	Alfa-Th. Trait	

The Filipino guy took a lot of iron supplements → secondary hemosedrosis. Stop and educate and the levels will go back to normal. (no serious risk)

- **Normocytic Normochromic Anaemia:**
  - Anaemia of chronic diseases characterized by:
    - Serum Iron Low
    - Ferritin Normal or High
    - RDW Normal or High
  - Causes:

    Acute blood loss
    Hypothyroidism (most common)
    Chronic Diseases (Rheumatoid Arthritis, Renal failure)
    Malignancy

- **Macrocytic Hyperchromic:** MCV > 94 fl
  - **Causes:**
    - ✓ **Megaloblastic :** B12 deficiency/ Folate deficiency (**MCV** mostly > 120 fl)
    - ✓ **Non Megaloblastic:** Myelodysplastic Syndrome
      Liver Disease
      Alcohol
      Hypothyroidism
    - ✓ Cytotoxic Drug

❖ Ninth Case:

A 44-year-old man, who is a known case of HCV positive. The following investigations are shown below:

WBC: 2.0	4—11	x 10.e9/L
RBC: 2.95	4.7—6.1	x 10.e12/L
HB: 110	130—180	g/L
HCT: 31.9	42—52	%
MCV: 108.1	80 - 94	fl
MCH: 37.3	27 - 32	pg
RDW: 19.5	11.5 – 14.5	
PLT: 92	140 - 450	x 10.e9/L

HEPATITIS C RNA QUALITATIVE (detect the RNA or DNA): Positive
HEPATITIS C RNA QUANTITATIVE (unit of virus in ML): 389744 IU/ML H

❖ Interpret this data:

- ✓ WBC, RBC, HB, HCT and PLT are Low
- ✓ RDW, MCV and MCH are High

❖ What is your diagnosis?

- Pancytopenia 2nd to therapy like interferon. (drug-induce bone marrow depression).

❖ What is the management?

- Only Stop the treatment and follow up.

WBC, RBC, platelet count are all low, its pancytopenia (bone morrow depression). Then we ordered PCR to know whether the virus is there or not (RNA or DNA and present or not "qualitative and quantitative = viral load") in this case 389744 is high. He was on interferon (to treat hep. C) One of side effect is bone morrow depression. Stop medication and give a chance for the bone morrow to recover. It will take approximately 2 weeks but the hepatologist should consider other medications to treat the patient.

❖ Tenth Case:

A 70-year-old man, presents with 2-month H/O easy fatigue and tiredness. PMH (Past Medical History): unremarkable,
The following CBC is shown below:

WBC: 7.8	4 –	11	x10.e9/L
RBC: 2.26	4.2 –	5.5	x10.e12/ L
HGB: 69	120 –	160	g/L
HCT: 20.2	37 –	47	%
MCV: 89.3	80 –	94	fl
MCH: 30.6	27 –	32	pg
MCHC: 343	320–	360	g/L
RDW:15.8	11.5 –	14.5	%
PLT : 179	140 –	450	x10.e9/L

❖ Interpret this data:

- ✓ **RBC** Low
- ✓ **HGB** Low
- ✓ **HCT** Low
- ✓ **RDW** High

- ❖ RBC, HGB and HCT are low Anemia.
- ❖ MCV is normal Normocytic.
- ❖ MCH is low Normochromic.
- ❖ RDW is high Serum Iron is low

❖ What is your diagnosis?

- ✓ Normocytic Normochromic Anaemia

❖ What is the possible causes?

- ✓ Hypothyroidism, Chronic Diseases (rheumatoid arthritis , renal failure) , Malignancy

❖ Tenth Case: (1)

A 70-year-old man, known diabetic, admitted because of abdominal pain. The following investigations are shown below:

# Test	Result		Unit	Range
EDTA Whole Blood - SAMPLE: 1				
1 WBC	7.0		10.e9/L	4 - 11
2 RBC	3.38	L	10.e12/L	4.7 - 6.1
3 HGB	101	L	g/L	130 - 180
4 HCT	30.0	L	%	42 - 52
5 MCV	88.8		fl	80 - 94
6 MCH	29.9		pg	27 - 32
7 MCHC	336		g/L	320 - 360
8 RDW	17.8		%	11.5 - 14.5

# Test	Result		Unit	Range
Serum - SAMPLE: 1				
1 Ferritin	1583.000	H	ug/L	30 - 400
2 Vitamin B12	630.600		PM/L	145 - 637

# Test	Result		Unit	Range
Serum - SAMPLE: 1				
1 Iron	9.4	L	umol/L	11 - 31

❖ What is your diagnosis?

- ✓ Normocytic normochromic anaemia, due to chronic disease, malignancy or hypothyroidism.

Why the ferritin is very high in this patient?
Because the ferritin is are actant for the inflammation-means once we have inflammation (acute or chronic), the ferritin level will increase "this will give you also impression about ferritin stores".

❖ Tenth Case (Cont. 2):

A 70-year-old man, known diabetic, admitted because of abdominal pain.

Test	Result	Unit		Range	
1	Urea	21.0	H	mmol/L	2.9 - 7.5
2	Serum Creatinine	330	H	umol/L	62 - 115
3	Sodium	128	L	mmol/L	135 - 145
4	Potassium	4.2		mmol/L	3.5 - 5.1
7	Random Blood Sugar	8.6		mmol/L	3.9 - 9
10	Albumin	37		g/L	30 - 50
11	Corrected Calcium	2.4		mml/L	2.1 - 2.55
12	Inorganic Phosphorus	1.68	H	mmol/L	0.74 - 1.3
13	Total Bilirubin	58	H	umol/L	3 - 17
14	Direct Bilirubin	42	H	umol/L	0 - 5
15	Total Proteins	84	H	g/L	60 - 80
16	Alkaline Phosphatase	189	H	U/L	50 - 136
17	Alanine Aminotransferase	72	H	U/L	20 - 65
18	Aspartate Aminotransfer.	62	H	U/L	12 - 37
19	Gamma G T	142		U/L	15 - 85
21	Globulins	47.0		g/L	20 - 40
23	Creatine Kinase	6	L	U/L	39 - 308
24	Magnesium	0.8		mmol/L	0.7 - 1.1
25	Amylase	168	H	U/L	25 - 125
26	Lipase	1414.0	H	U/L	0 - 200

This pt. also has pancreatitis

❖ What is the kind of chronic disease cause Normocytic Normochromic Anaemia in this patient?

- ✓ Chronic Renal Failure.

❖ Eleventh Case:

A 57-year-old man presents with 5 weeks H/O numbness and weakness of the lower limbs. He was looked pale with signs of peripheral neuropathy.
The following CBC is shown below:

WBC: 3.20	4 – 11	x10.e9/L
RBC: 1.90	4.2 – 5.5	x10.e12/ L
HGB: 53	120 – 160	g/L
HCT: 15	37 – 47	%
MCV: 118	80 – 94	fl
MCH: 40	27 – 32	pg
MCHC: 134	320– 360	g/L
RDW:24.6	11.5 – 14.5	%
PLT :39	140 – 450	x10.e9/L

Blood film: Hypersegmentation of neutrophils.

❖ Interpret this data:

- ✓ **WBC Low**
- ✓ **RBC Low**
- ✓ **HGB Low**
- ✓ **HCT Low**
- ✓ **MCV High**
- ✓ **MCH High**
- ✓ **RDW High**
- ✓ **PLT Low**

- ❖ RBC, HGB and HCT are low Anemia.
- ❖ MCV is High Macrocytic.
- ❖ MCH is low Hyperchromic.
- ❖ RDW is high Serum Iron is low

❖ What is the most likely Diagnosis?

- ✓ Vitamin B12 Deficiency / Pernicious Anaemia.

❖ Mention three investigation necessary for this patient:

- ✓ Vitamin B12 level
- ✓ Bone Marrow Aspiration
- ✓ Gastroscopy " never do it when the HB less than 10 g "

❖ 12th Case:

A 64-year-old man presents with 3 month H/ODizziness and headache. His PMH: unremarkable O/E: plethoric and tip of the spleen is palpable.
The following CBC is shown below.

WBC: 21.8	4 – 11	x10.e9/L
RBC: 8.59	4.7 – 6.1	x10.e12/L
HGB: 213	130 – 180	g/L
HCT: 66.6	42 – 52	%
MCV: 81	80 – 94	fl
MCH: 28.3	27 – 32	pg
MCHC: 324	320 – 360	g/L
RDW: 14.3	11.5 – 14.5	%
PLT: 350	140 – 450	x10.e9/L
LAP SCORE: 237	20 – 80 (Leukocyte Alkaline Phosphate support the DX)	

❖ What is your diagnosis and action taken?

- ✓ Polycythaemia Rubra Vera
- ✓ Admission Referral to Haematology and Bone marrow aspiration.

The patient has high RBC (means polycythemia) , high either WBC, PLT, or both- here we have WBC (means rubra vera)- Also, based on the symptoms palpable spleen "diagnostic" , headache & dizziness " due to high viscosity of blood , leading to slow and increase of pressure in circulation"

❖ Therteenth Case:

A 53-year-old man booked for control of high blood pressure.He used to smoke 20 – 40 cig. per day and cheesha.
The following CBC is shown below:

#	Test	Result	Unit	Range
EDTA Whole Blood - SAMPLE: 1				
1	WBC	3.9 L	10.e9/L	4 - 11
2	RBC	7.18 H	10.e12/L	4.7 - 6.1
3	HGB	224 H	g/L	130 - 180
4	HCT	66.6 H	%	42 - 52
5	MCV	92.7	fl	80 - 94
6	MCH	31.3	pg	27 - 32
7	MCHC	337	g/L	320 - 360
8	RDW	13.7	%	11.5 - 14.5
9	HDW	0	g/L	-
10	PLT	163.0	10.e9/L	140 - 450

❖ What is your diagnosis?

- ✓ 2nd Polycythemia

❖ Think in caused by

- ✓ Smoking
- ✓ COPD

- **We have to do ultrasound "to rule out other causes of 2nd polycythemia, even if I am 100% sure that is caused by smoking".**
- **Treated by antihypertensive"e.g. CCBs or ACEIs, but never used thiazide", aspirin & frequent blood donation.**

❖ Fourteenth Case:

A 63-year-old woman presents with a 2 months' H/O tiredness and easy bruising. O/E cervical lymph nodes are felt and her spleen is palpable 4 cm below the costal margin.
The following investigations are shown below:

WBC	42.7	4 – 11	x10.e9/L
RBC	2. 6	4.7 – 6.1	x10.e12/L
HGB	83	130 – 180	g/L
HCT	30.2	42 – 52	%
MCV	102	80 – 94	fl
MCH	36.4	27 – 32	pg
PLT	52	140 – 450	x10.e9/L

Differential

NEUT	8.5	40 – 75	%
LYMP	89	20 – 45	% (most WBC are lymphocyte)
RETIC	5.3	0.2 - 2	% (RETIC High = Hemolytic anaemia)

Immunoglobulins

IGG:	3.5	8 - 18	g/L
IGM:	0.1	0.6- 2.5	g/L
IGA:	0.1	0.9- 4.5	g/L

❖ Interpret the results and what complications are seen?

- ✓ High WBCs with mainly lymphocytes predominant
- ✓ Lymphadenopathy and splenomegaly

❖ Complication:

- ✓ Autoimmune Haemolytic Anaemia Low Hb and high reticulocytes.
- ✓ Thrombocytopenia (bone marrow filtration)
- ✓ Hypogammaglobulinaemia (Low Immunoglobulins, because they are synthesized by the lymphocytes that are damaged and not functioning)

❖ What is your diagnosis?

- ✓ Chronic Lymphocytic Leukaemia.

❖ Fifteenth Case:

A 12-year-old boy presented with two days H/O of lethargy. His mother has noted him to be jaundiced. He was usually well. His PMH is unremarkable.
O/E, he was pale and obviously jaundiced, no hepatomegaly. The following investigations are shown below:

HB	76	130 – 180		g/L
WBC	6.90	4 – 11		x10.e9/L
PLT	413	140 – 450		xlo .e9/L
Retic.	5.4	0.2 - 2.0		
Total bilirubin:	94	3- 17		umol/L
Direct bilirubin: 5				
Urine urobilinogen: +ve				
Alanine amino transferase: 35			20-65	u/L

❖ What is most likely diagnosis ?

- ✓ G6PD deficiency / Hemolytic anaemia.

❖ What additional details in history and further investigations?

- ✓ H/O exposure to Fava Beans / Drugs
- ✓ Screening test for G6PD, when haemolysis is not present.

❖ Management:

- ✓ Iron and folic acid supplement
- ✓ Referral to Hematologist and nutritionist
- ✓ Wait to 6 weeks or to 2 months then check the G6PD, if the patient had the disease will be low.

❖ Sixteenth Case:

A 15-year-old girl presents with 6 months H/O hair fall. The following investigations are shown:

Hb:	111	(120 – 160)	g/L
Ferritin :	4.7	(13 – 150)	ng/ml
Vit D:	11.2	(75 – 250)	nmol/L
TSH:	3.2	(0.25 – 5)	mIU/L
Zinc:	10.2	(7.65 – 22.95)	umol/L

❖ What is your management?

- ✓ Ferrous fumarate and folic acid to restore Ferritin level
- ✓ Vitamin D3

❖ What are the investigation will order for patient with hair fall?

- ✓ CBC
- ✓ Ferritin
- ✓ Vit D
- ✓ TSH to exclude Hypothyroidism
- ✓ Zinc

❖ Seventeenth Case:

A 62-year-old lady, known case of IHD presents with one week H/O black stools which is documented to be melena on PR. She was pale and abdomen is soft.
Investigations revealed:

HGB	96	120 – 160 g/L
PLT	26 0	140 – 450 x10.e9/L

❖ What is the most common cause could be responsible for this condition?

- ✓ Aspirin

❖ Q:The most appropriate next step to do is:

A- Start her on ferrous sulphate
B- Start her on H2 blocker
C- Start her on proton pump inhibitor
D- Refer her for gastroscopy

- Answer: D

❖ Eighteenth Case:

A 24-year-old man presents with 2 days H/O loose motions, 3 – 5 times per day with blood and mucous. He gave H/O URTI and a course of antibiotic.
Stool analysis is shown:

Mucous ++
RBCs 30 – 40 /HPF
WBCs 10 – 20 /HPF
C/S: No growth

- RBCs and WBCs in stool analysis mean Infection.
- Culture and sensitivity not growth means not bacterial infection.

❖ Mention two differential diagnosis.

- ✓ Acute dysentery e.g. Shigella / Amoebic
- ✓ Pseudo Membranous Colitis

❖ What is the most appropriate diagnosis based on the scenario?

- ✓ Pseudo Membranous Colitis

❖ Mention three drugs responsible for that picture:

- ✓ 1. Clindamycin 2. Ciprofloxacin 3. Amoxicillin

❖ What is the causative agent?

- ✓ Clostridium Difficile

❖ Management:

- ✓ Discontinue Antibiotic
- ✓ Oral fluids
- ✓ Metronidazole " Vancomycin in severe or resistant cases "

❖ Ninteenth Case:

A 42-year-old lady presented with 2 days H/O lower abdominal pain and vomiting. Result Unit Range URINE - SAMPLE: 1

NITRITE: POSITIVE
PH: 8.5
PROTEIN 1+
GLUCOSE NIL
KETONE TRACE
BLOOD 3+
HG 3+
WBCs 467 cmm
RBCs 968 cmm
CAST NIL
CRYSTAL NIL
OTHERS BACTERIA ++
SPECIFIC GRAVITY: 1.025

- ✓ When nitrite is positive = **infection**
- ✓ high WBC = infection
- ✓ **So, it s a clear case of infection** upper or low? Pyelonephritis or Cystitis?
- ✓ If **pyelonephritis** vomiting, fever, .etc.
- ✓ She needs admission.
- ✓ Choice of antibiotic? **Ciprofloxacin** and follow.

❖ What is your diagnosis?

- ✓ UTI – Caused by most likely, E.coli.

❖ 20th case:

A 14-year-old boy presents with one-month H/O puffiness of eyelids mainly by morning. The following urine analysis is shown below.

NITRITE -ve
PH 5.8
PROTEIN 4+
WBC 10 /CMM
RBC 10 / CMM
CASTS NIL
ANTIBACTERIAL ACTIVITY: NIL
HG: NIL
CULTURE: NO GROWTH

- All normal except the protein .

❖ INTERPRET THE RESULTS:

- ✓ Proteinuria and mostly Nephrotic syndrome.

❖ Twenty First Case:

A 32-year-old man who is a known case of IBS for the last 3 years. The stool analysis shown below.

OCCULT BLOOD:	NEGATIVE
OVA, CYST & PARASITE:	NO OVA CYST or PARASITE
SEEN CULTURE:	SALMONELLA SEROGROUP C1

❖ How are you going to manage this patient?

- ✓ Self-limiting, no need for antibiotic and follow up.

This patient was exposed **to food poisoning**, salmonella causes food poisoning.

Should we give antibiotic?
No, if non-typhi don't give, it's self-limiting. Repeat culture after one month and it will be negative.

Summary

From 433 team

- Anaemia has different types:
  - Microcytic Hypochromic (MCV < 80 fl) e.g.
    - ✓ IDA "serum iron and ferritin are low ".
    - ✓ Thalassemia "serum iron and ferritin are normal".

RDW: Red Cell Distribution Width, when increased reflect heterogeneity in cell size or indicating low serum iron level.

  - Normocytic Normochromic (MCV = 80-94 fl)(serum iron low , ferritin normal or high and RDW normal or high) e.g.
    - ✓ Chronic disease e.g. RA and RF
    - ✓ Acute blood loss
    - ✓ Malignancies
    - ✓ Hypothyroidism
  - Macrocytic Hyperchromic (MCV > 94 fl)e.g.
    - ✓ Megaloblastic; Vit B12 deficiency.

☐ **Primary Polycythemia** Rubra vera criteria are
  - RBC, WBC and Platelets are High
  - RBC WBC are High
  - RBC and Platelets are High

☐ **Secondary Polycythemia** caused by either natural or artificial increases in the production of erythropoietin, hence an increased production of erythrocytes. E.g.
    - ✓ High altitude, Smoking, COPD, Adrenal Adenoma Phaeochromocytoma, etc.
  - Abdominal US used to exclude the most of caused secondary Polycythemia.

❖ Components of Liver Chemistry Tests:

1- Indicate Hepatocyte Integrity:

- Alanine amino Transferase **ALT** (Pure liver and the most important one).
- Aspartate amino Transferase **AST** (not specific could rise in muscle damage).

2- Indicate Obstructive Cholestasis:

- Alkaline phosphatase (not specific could rise in bone damage), if the ALT high also, it is more suggestive of liver disease.
- γ-Glutamyl-transpeptidase (could be affected in hepatocyte injury also).
- Bilirubin (Mainly direct indicate obstruction while indirect indicate hemolysis).

3- Indicate Liver Function:

- Serum albumin (indicate decompensation and chronic liver disease).
- Prothrombin time / INR.

Example:

Patient with high ALT indicating hepatocyte injury by inflammation;
- If the serum albumin is normal, means the liver still function well (compensated)
- If the serum albumin is low, means the liver not

❖ First case:

A 40 year old man, came for routine medical check up. The

following LFT is shown below:

Total bilirubin 10	(3-17 umol/L)	
Total protein..... 73	(60-80 g/L)	
Albumin 38	(35-50 g/L)	
Alkaline phosphatase 116	(50-136u/L)	
Alanine aminotransferase ... 55	(20-65 u/L)	
Aspartate aminotransferase..27	(10-31 u/L)	
G.G. Transferase..... 198	(5-55 u/L)	high

Mention two causes for rise of G.G.Transferase Alone?

- Drugs like anti-epileptics e.g. Carbamazepine, phenytoin most common in KSA
- Alcohol
- Fatty liver e.g. Obese patient

- No need to do anything for this patent – unless there is change in other parameters (e.g. albumin, ...) .
- Treat the underlying cause.

❖ Second case:

A 32 year old man referred from PHC center because of Jaundice, LFT done for him as shown:

Total Bilirubin (Mainly indirect)..... 57	3 – 17mmol/L	High
Direct Bilirubin..... 6	0 – 5 umol/L	almost normal
Total Protein..... 78	60 – 80 g/L	
Albumin 47	30 – 50 g/L	
Alkaline phosphatase 69	50 – 136 u/L	
Alanine Aminotransferase..... 63	20 – 65 u/L	
Asparate Aminotransferase 31	12 – 37 u/L	
Gamma Glutamyltransferase 25	15 – 85 u/L	

How are you going to deal with this gentleman?

- Request CBC and Reticulocytes to roll out haemolytic anaemia due torise indirect bilirubin (Reticulocytes will behigh).
- If normal so it is mostly due to Gilbert Syndrome.

❖ Third case:

A 25 year old man on 4 drug anti-tuberculous treatment. On 2 months follow up visit, he presents with mildly elevated transaminases. Physical examination is unremarkable.

Total bilirubin 10		(3- 17 umol/L)	
Total protein 71		(60-80 g/L)	
Albumin 37		(35-50 g/L)	
Alkaline phosphatase 126		(50-136u/L)	
Alanine aminotransferase 99		(20-65 u/L)	High (imp)
increase1.5 fold which is mild (below 3 fold → no risk)			
Aspartate aminotransferase 65		(10-31 u/L)	High
G.G. Transferase..... 98		(5-55 u/L)	High

What is the most likely diagnosis?

- Drug induced Hepatitis, mostly due to Isoniazide.

High ALT and AST and G.G Transferase indicate hepatocytes injury (hepatitis in this case due to anti- tuberculous drug).

- In this case, as long as his LFT is mildly increase, we consider it normal until he finishes his treatment .

❖ Forth case: (very common presentation)

A 58 year old asymptomatic woman presents with elevated liver enzymes on routine screening. Her past medical history is significant for HTN, DM 2 and dyslipidaemia. On examination, her BMI is 38 and there is significant acanthosis nigricans on her neck.

CBC ..... Normal			
U&E ..... Normal			
Total bilirubin 10		(3- 17 umol/L)	
Total protein 69		(60-80 g/L)	
Albumin 38		(35-50 g/L)	(the liver compensated)
Alkaline phosphatase 146	High	(50-136u/L)	(mild=liver injury)
Alanine aminotransferase 112	High	(20-65 u/L)	(mild=more specific)
Aspartate aminotransferase..... 61	High	(10-31 u/L)	
G.G. Transferase.....126	High	(5-55 u/L)	
Total cholesterol.....6.1			
Triglycerides..... .. 3.2			
INR 1.2			

Mention two investigations of significance?

1- Viral serology B & C (Negative)
2- U/S liver (increased echogenicity(fatty liver))

- Tell the patient to change life style and reduce her weight
- Give Metformin (for DM + fatty liver)

What is the most likely diagnosis?

- NAFLD (non-alcoholic fatty liver disease)

❖ Fifth case:

A 19 year old girl presents with new onset fatigue, jaundice and mild pruritus. Her past medical history is significant for acne, which is being treated with minocycline for the past 2 months. There is no history of travel or contact with patients with viral hepatitis. On examination there is mild icterus, no organomegaly.

Total bilirubin 58	High	(3- 17 umol/L) (mild)(obstruction)
Indirect bilirubin.....5		
Albumin..... 38		(35-50 g/L)
Alkaline phosphatase 346	High	(50-136u/L) (significant high, obstruction)
Alanine aminotransferase 116	High	(20-65 u/L) (mild 1.5 folds)
Aspartate aminotransferase.....91	High	(10-31 u/L)

- Viral serology for B and C (hepatitis) is Negative

- U/S is within normal

What is the most likely diagnosis?

- Drug induced cholestasis- secondary to minocycline. Symptoms resolve within 2 weeks of drug discontinuation Liver profile normalize within 8 weeks.

- We just reassure the patient and stop the medication.
- The patient asks you, when is the jaundice going away? 2 week but repeat investigations after 6-8 week
- Do you know other drugs that can causes cholestasis? OCP, phenothiazenes (antipsychotics), androgens.

❖ Sixth case:

A 38-year-old lady presented with 2 weeks H/O yellowish discoloration of sclera together with weakness.The following investigations are shown below:

Total bilirubin 98	High	(3- 17 umol/L)
Indirect bilirubin.....43		
Albumin 36		(35-50 g/L)
Alkaline phosphatase 356	High	(50-136u/L) (significant high)
Alanine aminotransferase 316	High	(20-65 u/L) (significant high)
Aspartate aminotransferase.....291	High	(10-31 u/L) (significant high)
G.G. Transferase 286	High	(5-55 u/L) (significant high)
INR ..... Normal		

So the liver is compensating but there is (hepatocytes injury by inflammation+ obstruction)

What are the possible differential diagnosis?

- Viral Hepatitis
- Autoimmune Hepatitis (the diagnosis of this case)
- Primary biliary cirrhosis. most likely in 45 years old patient or older
- Alcoholic hepatitis
- Drug induced

What are essential investigations needed to help to reach diagnosis?

- Viral markers (screening) for B, C and A.
- Ultrasound liver.
- Autoimmune antibodies (ANA, Anti mitoch. Ab and Anti smooth musc. Ab) .
- Liver biopsy.

We have to admit this patient

❖ Seventh case:

A 62-year-old man is a known case of HCV +ve.
The following investigations are shown below:

Total bilirubin 6		(3- 17 umol/L)
Indirect bilirubin..... 3		
Albumin.....23	Low	(35-50 g/L)
uncompensated(impaired function)		
Alkaline phosphatase 180	High	(50-136u/L)
Alanine aminotransferase 71	High	(20-65 u/L)
Aspartate aminotransferase ..77	High	(10-31 u/L)
G.G. Transferase.....111	High	(5-55 u/L)
INR.....1.36	High	(0.8 – 1.2)
RBC.....3.08	Low	4.2 - 5.5 X10e12/L
HGB.....88	Low	120 - 160 g/L
HCT.....26.7	Low	42 - 52%
MCV 86.7		80 - 94 fl
MCH..... 28.5		27 - 32 pg

➢ **What is your diagnosis?**

- Chronic liver disease (CLD), uncompensated, post HC virus.
- Normocytic Normochromic Anaemia due to Chronic Liver Disease.

Diagnosis of Diabetes:

(If Fasting Plasma Glucose Test is requested)

FPG ≤ 5.5 mmol/L = normal.
FPG ≥ 5.6 mmol/L to 6.9 mmol/L= Impaired Fasting Glucose.
FPG ≥ 7 mmol/L = DM.

(If Oral Glucose Tolerance Test is requested)

2-h post 75 gm glucose < 7.8 mmol/L = normal GTT
2-h post 75 gm glucose ≥ 7.8 mmol/L and < 11.1 mmol/L = impaired GTT
2-h post 75 gm glucose ≥ 11.1 mmol/L = DM

❖ Case:

A 53-year-old man known case of dyslipidemia. As a routine investigation:

FPG: 6.2 mmol/L
5.9 mmol/L

If impaired:
Diet, exercise
and Metformin.

What is your diagnosis?

- ❖ Impaired FPG.

OGTT is requested (FPG and 2 hr post 75 gm glucose)
FPG: 6.9 mmol/L
2 hr: 13.4 mmol/l

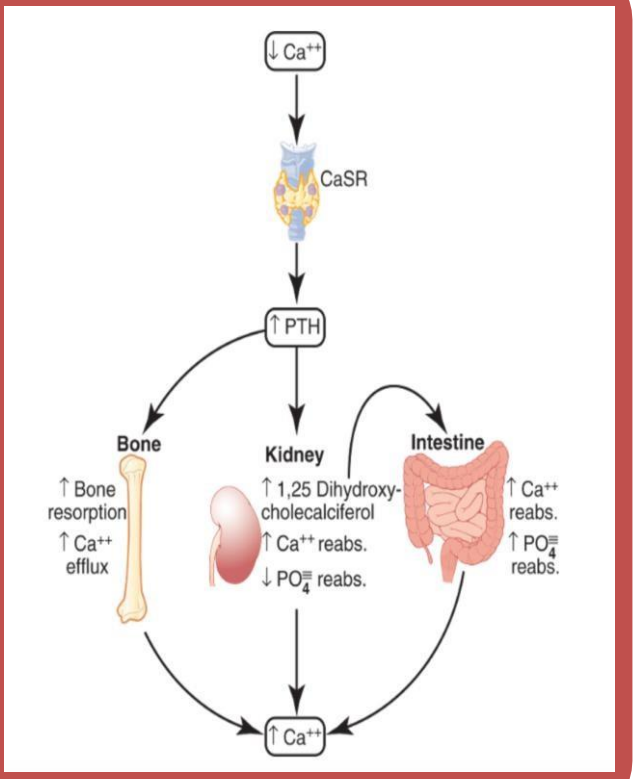
Now HB1c = 6.5 and above is diagnostic

What is your diagnosis?

- Diabetes.

❖ Comparison between hypo-parathyroidism and Rickets:

PTH secretion in response to decreased extracellular fluid calcium ion concentration: (1) PTH stimulates bone resorption, causing release of calcium into the extracellular fluid; (2) PTH increases reabsorption of calcium and decreases phosphate reabsorption by the renal tubules, leading to decreased excretion of calcium and increased excretion of phosphate; and (3) PTH is necessary for conversion of 25-hydroxycholecalciferol to 1,25-dihydroxycholecalciferol, which, in turn, increases calcium absorption by the intestines.



Rickets / Osteomalacia	Hypoparathyroidism
Low calcium	Low calcium
Low or Normal phosphate	High phosphate
High alkaline phosphatase	Normal alkaline phosphatase

❖ First case:

A 70-year-old blind man known case of hypothyroidism + vitiligo (= autoimmune) and left ventricular dysfunction (this is the most serious and I should care about it first) presents with 2 month H/O SOB, bouts of dry and irritating cough, loss of appetite, hoarseness of voice and low mood.

TSH:	0.288 miu/L		(0.25 – 5)
T4:	20.5 pmol/L		(10.3 – 25.8)
Ca.	1.4 mmol/L	Low	(2.10 – 2.55) (very low)
Ph.	1.67 mmol/L	High	(0.74 – 1.30)
Alb.	35 gm/L		(30 – 50)
Alkaline phosphatase	86 u/l		(50 – 136)

What is your diagnosis?

- ❖ Primary hypoparathyroidism. (most likely in this case Autoimmune)

What is the next investigation of choice?

- ❖ Parathyroid hormone 0.353pmol/L Low (1.65 – 6.9) (very low)

What is your management?

- ❖ Vitamin D
- ❖ Oral Calcium

What other organs or diseases you may screen for?

- ❖ Diabetes (FPG)
- ❖ Adrenal gland (Cortisol level)

❖ Second case:

A 14-year-old girl presents with 1 year H/O pain in lower limbs.
O/E: unremarkable. The following results are shown:

Calcium 1.62	Low	2.10 –2.55 mmol/L
Corrected calcium...1.6 (we relay on this)	Low	2.10 –2.55 mmol/L
Inorganic Phosphorus 1.13		0.87 – 1.45 mmol/L
Albumin.....39		35 – 50 g/L
Alkaline phosphatase..1191	High	195 – 476u/L (very high)
Vit D ..... 4.0 nmol/L	Low	

[vit D Defeciency: < 25 Insuffeciency: 25 – 75
Suffecient: 75 – 250 Toxicity: > 250]

Widened growth plate with fraying, splaying and cupping of the metaphysis Involving both distal both femurs and proximal tibias and fibulas suggestive of Rickets.

What is your diagnosis and management?

- **Rickets**, we have to give her calcium and Vit D supplements.

She was put on Vit.D3 and calcium carbonate for 2 months. Results were:

Calcium 2.27	(became normal)	2.10 – 2.55 mmol/L
Corrected calcium 2.30	(became normal)	2.10 –2.55 mmol/L
Inorganic Phosphorus 2.00	(High)	0.87 –1.45 mmol/L
Albumin 39		35 – 50 g/L Alkaline
phosphatase.....687	(still high but now mild)	195 – 476 u/L

❖ Third case:

A 15-year-old girl referred to obesity clinic. BMI 34.
The following investigations are shown below:

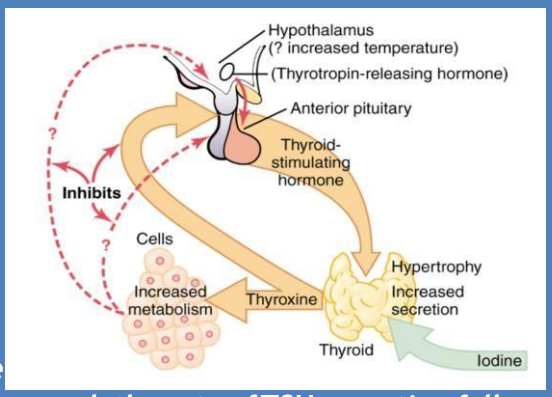
	Test	Result		Unit	Range
Serum - SAMPLE: 1					
1	Prolactin	165.900		MIU\L	102 - 496
2	Lutenizing Hormone	3.150		IU/L	-
3	Follicle Stimulating Horm	1.550		IU/L	-
4	Para Thyroid Hormone	**9.020**	H	PM/L	1.65 - 6.9
5	FT4	13.040		PM/L	10.3 - 25.8
6	Thyroid Stimulating Hormo	3.860		MIU/L	0.25 - 5
7	VITAMIN D - T	**27.870**	L	nmol/L	75 - 250
8	Insulin	**103.500**	H	MIU/L	2.6 - 24.9
9	Cortisol	194.000		NM/L	193 - 690
10	Vitamin B12	277.800		PM/L	145 - 637
11	Ferritin	97.350		ug/L	13 - 150
12	Folate	25.670	H	NM\L	4.5 - 20.7

#	Test		Result		Unit	Range		
Serum - SAMPLE: 1								
1	C-PEPTIDE		**3.560**	H	NM/L	0.37	-	1.47
2	Fasting Sugar		4.3		mmol/L	3.3		5.5

What is the diagnosis?

- ❖ Hyper-parathyroidism 2ndry to Vit.D deficiency (in this case there is high Ca and low phosphate not shown in the table).
- ❖ Insulin resistance (high insulin+c-peptide) (hyperinsulinemia) C-peptide is precursor of insulin.

Thyroid function test:



Increased thyroid hormone in the body fluids decreases secretion of TSH by the anterior pituitary. When the rate of thyroid hormone secretion rises to about 1.75 times normal, the rate of TSH secretion falls essentially to zero. Almost all this feedback depressant effect occurs even when the anterior pituitary has been separated from the hypothalamus. Therefore, as shown in, it is probable that increased thyroid hormone inhibits anterior pituitary secretion of TSH mainly by a direct effect on the anterior pituitary gland itself. Regardless of the mechanism of the feedback, its effect is to maintain an almost constant concentration of free thyroid hormones in the circulating body fluids.

❖ First case:

A 50 year- old man presents to your office with 6-month H/O of fatigue and weakness.
O/E: no objective positivefindings.

TSH: 12.2 miu/l	High	(0.25—5)
FT4: 11.6 pmol/l	normal	(10.3—25 .8)

What is your diagnosis?

a- Primary Hypothyroidism
b- Subclinical Hyperthyroidism
c- c-Subacute Thyroiditis
d- Subclinical Primary Hypothyroidism
e- Secondary Hypothyroidism

answer: D

If TSH < 10 and asymptomatic:

- Repeat TSH after 6 – 12 months
- Request thyroid antibodies, if high +ve then treat.

Indication of treatment:

- Clinical symptoms
- Presence ofgoiter
- TSH > 10 miu/l
- High positive antithyroid antibodies

In this case, TSH>10 And the patient is symptomatic. So treat and start with Thyroxin 25ugm OD

❖ Second case:

A 19-year-old lady presents with 3 weeks H/O a neck swelling discovered incidentally. The swelling move with deglutition and related to left lobe of thyroid and no LN swellings.
She is euthyroid (normal thyroid function).

What is the most appropriate first step in management?

A- Observation
B- Referral urgent to endocrine
C- Thyroglobulin antibodies
D- U/S thyroid.
E- Technetium thyroid scan

(Note: U/S is requested to see if there is one nodule or more and also to localize the nodule for biopsy)

answer: D

Technetium-99m pertechnetate thyroid scan is is ordered, what is the finding?

Cold nodule of left lobe of thyroid, we have to do fine needle aspiration with the US.

❖ Third case:

A 32-year-old lady, nurse, single presented with one-month H/O palpitation and loss of weight.

O/E: **pulse 116/ min** **Bp 140 /70**
Apart from fine tremors nothing was significant. The following investigations are shown:

WBC: ……8.4		ESR ……4	
TSH: < 0.01	miu/l	Primary Hyperthyroidism	(0.25—5)
FT4: 92.6	pmol/l		(10.3—25 .8)

Thyroid scan (we do it for all Hyperthyroidism cases): **Reduced iodine uptake**

Mention three causes of reduced iodine uptake.

Subacutethyroiditis.(notenderness)
Post-partum thyroiditis.
Factitious thyroiditis. (iatrogenic) most likely the diagnosis.

❖ Forth case:

A 42-year-old man booked recently in the clinic. Followed in a private psychiatry clinic because of depression mainly insomnia, weakness and fatigue, on 40 mg Paroxetine. Still not improving, so another antipsychotic drug was added. The patient has good insight and very cooperative.

Mention one investigation of importance for this patient:

- ❖ Thyroid function test

TSH: 329.0 mIU/L	High Primary	(0.25 – 5)
FT4: 2.87 pmol/L	Low Hypothyroidism	(10.3 - 25.8)
Cholesterol: 9.86 mmol/L	High	
Tri-g: 3.12 mmol/L		

❖ Fifth case:

A 27-year-old man presents with 3 months H/O weakness and tendency to sleep. The following investigation is shown.

#	Test	Result	Unit	Range
Serum - SAMPLE: 1				
1	**FT4**	0.87	PM/L L	10.3 - 25.8
2	**Thyroid Stimulating Hormo**	**1653.00**	MIU/L H	0.25 - 5
3	**FT3**	1.69	PM/L	3.96 - 6.8
4	**Lutenizing Hormone**	2.10	IU/L	-
5	**Follicle Stimulating Horm**	5.81	IU/L	-

After 1 month of treatment

#	Test	Result	Unit	Range
Serum - SAMPLE: 1				
1	**FT4**	14.69	PM/L	10.3 - 25.8
2	**Thyroid Stimulating Hormo**	**1549.00**	MIU/L H	0.25 - 5
3	**FT3**	1.75	PM/L	3.96 - 6.8
4	**Prolactin**	**549.20**	MIU\L H	86 - 324
5	**Cortisol**	476.40	NM/L	193 - 690
	ACTH	8.63	PM/L	

After about 4 months of treatment

#	Test	Result	Unit	Range
Serum - SAMPLE: 1				
1	**FT4**	13.63	PM/L	10.3 - 25.8
2	**Thyroid Stimulating Hormo**	0.59	MIU/L	0.25 - 5
3	**Prolactin**	**334.80**	MIU\L H	86 - 324

- In case of hypothyroidism High TSH stimulate prolactin secretion.

❖ Sixth case:

A 30-year-old lady with menstrual irregularities:

TSH: 44.58 miu/l	High Primary (autoimmune in this case)	(0.25 - 5)
FT4: 5.58 pmol/ l	Low Hypothyroidism	(10.3- 25.8)
Prolactin: 1499 miu/ l	High	(102 - 496)

3 months later: (after 100 micgm thyroxin)

TSH: 7.37 miu/l	Decreased but still high	(0.25 - 5)
FT4: 10.68 pmol/l	Normal	(10.3- 25.8)
Prolactin: 1161 miu/l	Decreased but still high	(102 - 496)

3 months later: (after 125 micgm thyroxin)

TSH: 2.59 miu/l	Normal	(0.25 - 5)
FT4: 12.58 pmol/l	Normal	(10.3- 25.8)
Prolactin: 1557 miu/l	increased	(102 - 496)

MRI sella turcica: No significant Macro or Microadenoma = idiopathic prolactinemia.

Cabergoline (dopamine agonist) was started 0.5 mg once weekly.

❖ Seventh case:

A 27-year-old woman presents with one month H/O weight loss, sweating and tremors. She has diffuse neck swelling.

CBC: normal	Pulse: 124 bpm	ESR: 12 mm/h
TSH: <0.001 miu/l	Low Primary	(0.25 -5)
FT4: 139.2 pmol/l	High Hyperthyroidism	(10.3-25.8)

What are the differential diagnosis?

1- Graves' disease. Most common cause
2- Subacute thyroiditis
3- Multinodular toxic goiter
4- Toxic nodule /adenoma

Never say FNA unless you had a NODULE.

Mention 1 appropriate investigation to reach the diagnosis:

Thyroid Scan.

❖ Eight case:

A 28 year old woman presents to your office with 10 days H/O palpitation, sweating and neck discomfort. O/E: Wet hands and neck tenderness

Pulse: 116/m	Temp. 37.	CBC: normal	ESR: 82 mm/h High
TSH: <0.01 miu/l	Low Primary		(0.25 -5)
FT4: 89.2 pmol/l	High Hyperthyroidism		(10.3-25.8)

Q: What is the most likely diagnosis?

A- Graves' disease
B- Subacute thyroiditis
C- Hashimotos thyroiditis
D- Multinodular toxic goiter

Answer: B (there is neck tenderness AND high ESR)

Q: Select one investigation to confirm your diagnosis.

A- Ultrasound neck
B- Thyroid antibodies
C- Free T3 level
D- Radioactive Iodine thyroid uptake
E- Fine needle aspiration

Answer: D

Q: What is the treatment? Choose one or more.

A- L- Thyroxin
B- B Blockers
C- NSAID
D- Iodine therapy

Answer: C (for sympathomimetic and reduce pulse rate) & D (due to inflamed thyroid gland)

Previously we have mentioned that low calcium and high phosphate is a feature of hyporparathyroidism, on the other hand high calcium and low phosphate is a feature of hyperparathyroidism

❖ Case:

A 52- year- old woman presents to your office with 6 month H/O polyuria and lethargy.
O/E: looks dehydrated and has a neck swelling (she has the swelling for years and informed to be a simple goiter)

Ca: 3.4 mmol/L	High	(2.1 - 2.6)
Ph: 0.62 mmol/L	Low	(0.8 - 1.4)
Urea: 9.2 mmol/L	High	(2.6 - 6.6)
Chloride: 113 mmol/L	High	(95 - 105)

What is your diagnosis?

Hyperparathyroidism due to parathyroid adenoma (admit the patient, the Ca level is high and could lead to cardiac arrest).

❖ Practice:

A 48 year old woman presents with 5 month H/O difficulty in raising from sitting position. The following investigation is shown below:

Calcium	1.65 mmol/L	(2.1 – 2.6)
Phosph.	1.52 mmol/L	(0.8 – 1.4)
Alk. Phos.	134 mmol/L	(43 – 154)
Albumen	38 g/L	(35 – 50)

What is your diagnosis?

Hepatitis:

The 5 most important markers we care about here are:

1. Hepatitis B Surface antigen it means this patient is infected with HBV.
2. Anti-Hepa B Core IgG means there is a history of exposure at least 6 month or more.
3. Hep-B e Antigen Indicate (high activity), high replication of the virus.
4. Anti- Hepa B e Antigen is Anti body for e virus (indicate low infectivity).
5. Anti- Hepa B Surface means this patient is now immune.

❖ First case:

A 28 year old man, referred from Blood Bank because of being HBsAg positive.

The following HB markers are shown below:

- ❖ Hepatitis B Santigen.....Reactive (infected)
- ❖ Anti-Hepa B Core IgG .....Reactive (exposure)
- ❖ Hep-B e Antigen ..... Nonreactive
- ❖ Anti- Hepa B e Antigen ..... Reactive (lowinfectivity)
- ❖ Anti- Hepa B Surface ..... Nonreactive

Chronic history of hepatitis B exposure + viral infection

What is your next step?

LFT, U/S liver, PCR.

- ➢ HEPATITIS B DNA QUALITATIVE ..... Positive
- ➢ HEPATITIS B DNA QUANTITATIVE ..... 889796 IU/ML

How are you going to deal with patient?

- Measure for family contacts, screen and vaccinate the negative ones .
- NO blood donation.
- Referral to hepatologist.

❖ Second case:

A 35 year old man came to the clinic for screening, as one member in his family is HBV positive.
The following HB markers are shown below:

- ❖ Hepatitis B S antigen..... ....Nonreactive
- ❖ Anti-Hepa B Core IgG .....Reactive (exposure)
- ❖ Hep-B e Antigen .....Nonreactive
- ❖ Anti- Hepa B e Antigen .....Nonreactive
- ❖ Anti- Hepa B Surface ..... Reactive (Immune)

What is your diagnosis?

Immune post exposure to HB virus

How are you going to deal with patient?

Reassurance, No further actions could be taken, NO blood donation.

❖ Third case:

A 23-year-medical student came to the clinic for screening.
The following HB markers are shown below:

- ❖ Hepatitis B S antigen..... Nonreactive
- ❖ Anti-Hepa B Core IgG ..... Nonreactive
- ❖ Hep-B e Antigen ..... Nonreactive
- ❖ Anti- Hepa B e Antigen ..... Nonreactive
- ❖ Anti- Hepa B Surface ..... 1000.0 mIU/ml (> 10.0 Positive) (Immune)

What is your diagnosis?

Immune post Vaccination

❖ Forth case:

A 32-year old man presents to your clinic for routine check up.
The following viral markers are shown below:

- ❖ Hepatitis B Santigen..... Nonreactive
- ❖ Anti-Hepa B Core IgG .....Reactive (exposure)
- ❖ Hep-B e Antigen .....Nonreactive
- ❖ Anti- Hepa B e Antigen .....Nonreactive
- ❖ Anti- Hepa B Surface .....Nonreactive

Interpret the results.

H/O chronic exposure to HB virus

❖ What Explanations/options do we have in this case?

1- May be recovering from acute HBV infection (window period).between the acute infection and complete clearance (antibody no shown yet) ask him to came 6 month later.

2- May be distantly immune and test is not sensitive enough to detect very low level of anti-HBs in serum.

3- May be undetectable level of HBsAg present in the serum and the person is actually a carrier. Very low viral load, order PCR, if negative he is ok, if positive the virus active.

4- May be a false positive anti-HBc. Repeat the test after 6 month if same result it is not false +ve.

After ordering PCR:

- HEPATITIS B DNA QUALITATIVE Positive
- HEPATITIS B DNA QUANTITATIVE <20 IU/ML

Very low viral load, can not be detected in the screening.

❖ Actions:

- Measures to Contacts.
- No blood donation.
- Not candidate for treatment by e.g. Interferon.

Fifth case:

A 26-year-old female came for premarital check up.
The following hepatitis B markers are shown:

- Hepatitis B Santigen..... Reactive (Infected)
- Anti-Hepa B Core IgG .....Reactive (exposure)
- Hep-B e Antigen ..... Reactive (High infectivity)
- Anti- Hepa B e Antigen .....Nonreactive
- Anti- Hepa B Surface ..... Nonreactive

PCR:

- HEPATITIS B DNA QUALITATIVE Positive
- HEPATITIS B DNA QUANTITATIVE >110 million IU/ML

LFT:

Total bilirubin	15	(3- 17 umol/L)
Albumin	39	(35-50 g/L)
Alkaline phosphatase	225	(50-136u/L)
Alanine aminotransferase	960	(20-65 u/L)
Aspartate aminotransferase	296	(10-31 u/L)
G.G.Transferase	235	(5-55 u/L)

What is your diagnosis and what actions are you going to do?

Chronic viral Hepatitis with active replication and highly infectious (e antigen is positive).

<u>The patient came one and half year after treatment</u>

PCR:

- HEPATITIS B DNA QUALITATIVE Positive
- HEPATITIS B DNA QUANTITATIVE 31 IU/ML

LFT: Normal

Summary

from 433 team

- ALT is the most important and specific marker in LFT which indicate hepatocyte integrity.
- AST indicate hepatocyte integrity but not specific for liver.
- Alkaline phosphatase, G.G.Transferase and direct bilirubin indicate obstructive cholestasis.
- Indirect bilirubin indicate hemolysis.
- Serum albumin, prothrombin time and INR indicate liver function.
- The main difference between hypoparathyroidism and Rickets is that rickets with high Alkaline phosphatase while it is normal in hypoparathyriodism.
- In case of neck swelling with normal thyroid function test most appropriate first test to do is fine needle aspiration under US guide.
- We have to do thyroid scan for all cases of hyperthyroidism.
- Subacute thyroiditis came with neck tenderness and high ESR.
- High cholesterol level may due to hypothyroidism.
- Prolactenemia in hypothyroidism due to high TSH.
- Hepatitis B Surface antigen it means this patient is infected with HBV.
- Anti-Hepa B Core IgG means there is a history of exposure at least 6 month or more.
- Hep-B e Antigen Indicate (high activity), high replication of the virus.
- Anti- Hepa B e Antigen is Anti body for e virus (indicate low infectivity).
- Anti- Hepa B Surface means this patient is now immune.