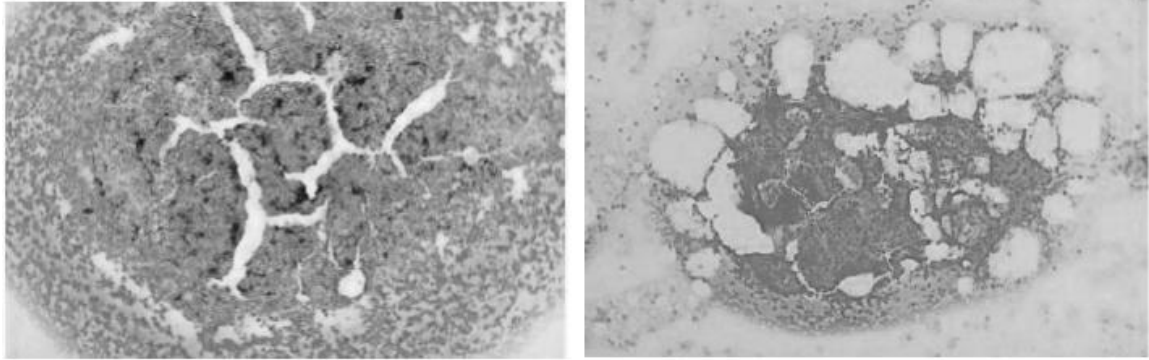
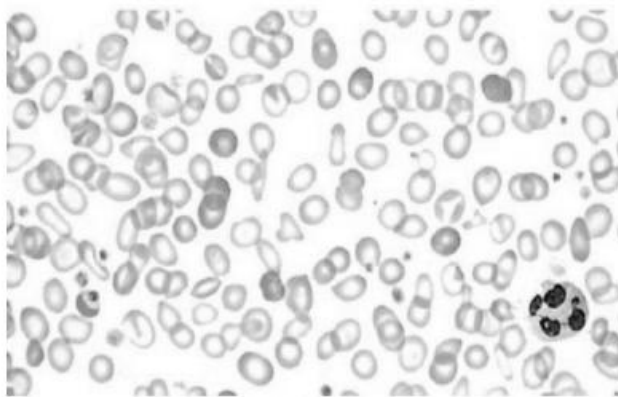


We are gonna travel back to the early 1800s, the black and white era. Buckle up it's gonna be a long exhausting trip

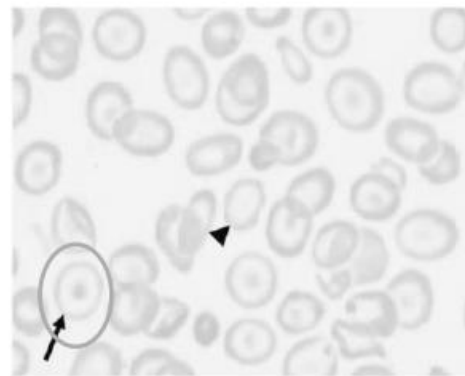
The first stop will be in the bone marrow as you can see to the left is a normal BM with iron stored as hemosiderin, to the right there is no iron which means we have this beautiful view; **iron deficiency anemia**



And if we took a look at the peripheral blood in IDA we would find target cells + different shapes of RBCs (poikilocytosis)

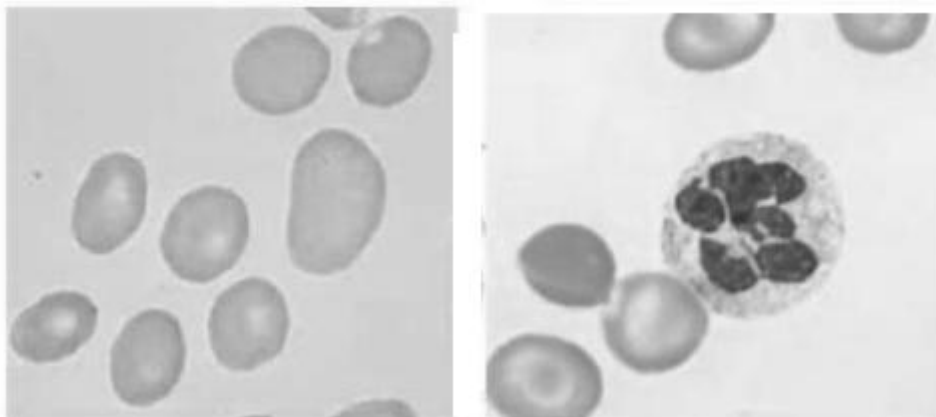


Note the poikilocytosis and hypochromia

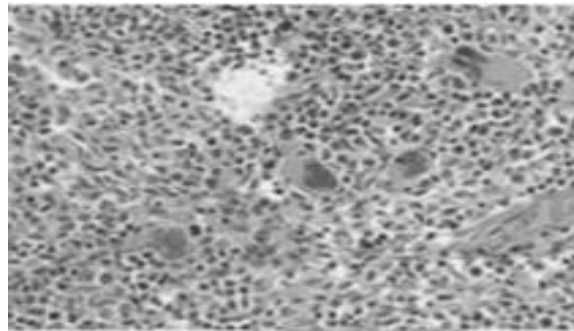


Target cell appearance (green circle)

The next view is **megaloblastic anemia** where you can see large oval RBCs and over nucleated neutrophils



Now look through the windows to see the spleen it is crowded because of the **extramedullary hematopoiesis**

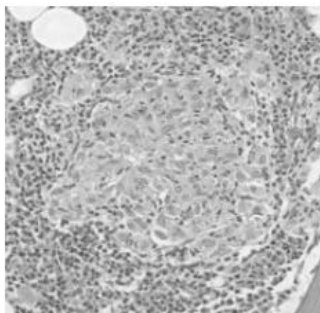


Now we'll see the BM in different occasions (diseases)

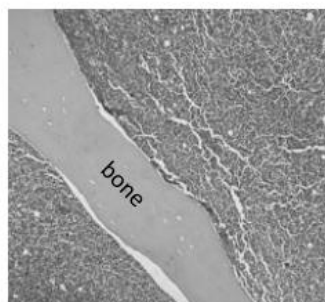
Aplastic anemia: depleted of hematopoietic cells, with only residual fat and some lymphocytes



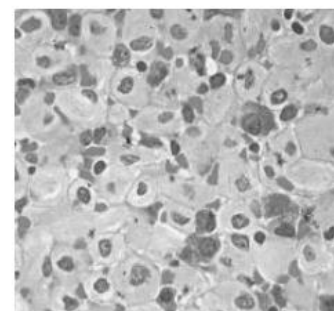
Myelophthisic anemia: here it is like a group of people kicking the residents out of their homes (BM)



Granuloma infiltration of the bone



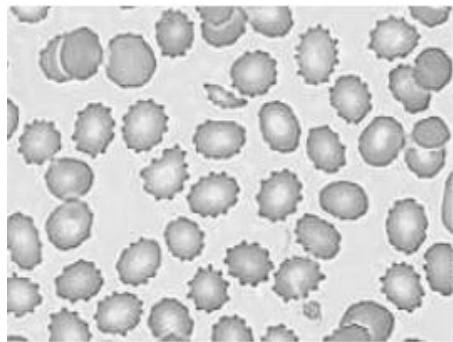
Hypercellular bone marrow (but NOT erythropoietic cells)



Bone marrow full of infiltrative cells

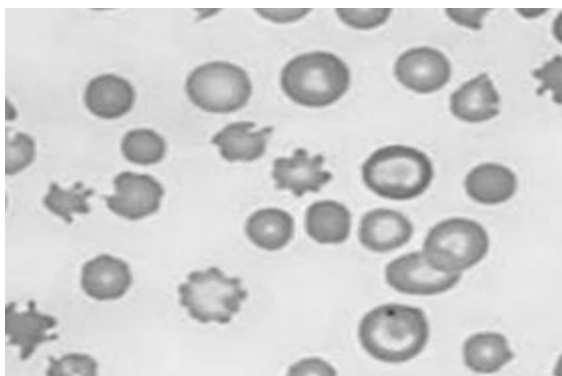
Aren't you bored already? The BM isn't that interesting lets go and see the sea (blood) and its components

The sea will have a lot of echinocytes in **anemia of renal diseases**

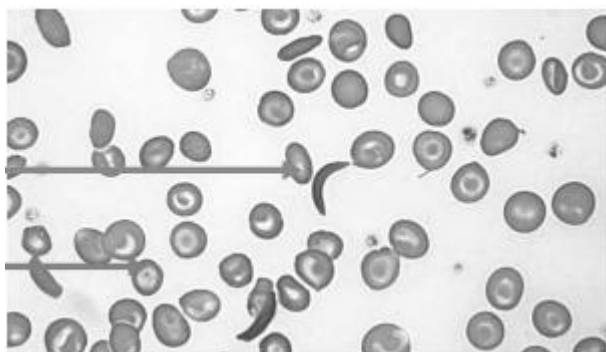


And similar to it but with less projections called acanthocytes

Appears with **anemia of liver diseases**

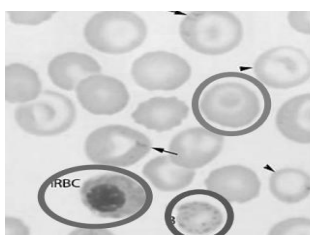


And we can find in the sea some fish hooks and target cells (**sickle cell anemia**)

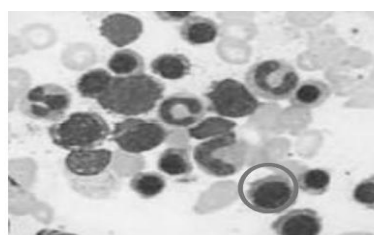


Remember that sickle cell anemia happens due to point mutation in beta chain from Glu to Val

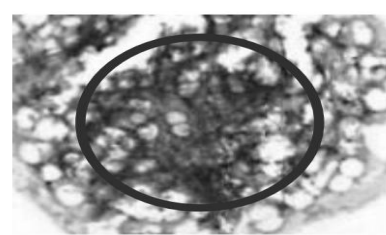
There is also **thalassemia** where you can find target cells and hypochromic microcytic RBCs



Peripheral blood film: Target cells, basophilic stippling (blue dots), and nRBC.



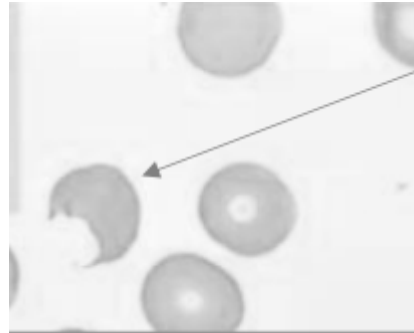
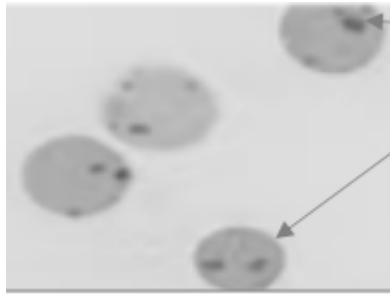
Bone marrow: most cells are normoblasts (secondary to erythropoietin). The normal bone marrow contains myeloid cells 3-4 times the number of normoblasts.



(Perls stain) The iron fills the entire bone marrow. Patient has hemosiderosis in bone marrow.

(G6PD deficiency): it is a bakery in front of the sea where it bakes delicious cookies (RBC) with chocolate chips (Heinz bodies)

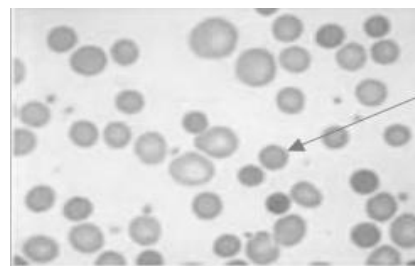
And guess who love these cookies?? Spleen macrophages, they take a bite to taste it leaving the cookies as (bitten cells)



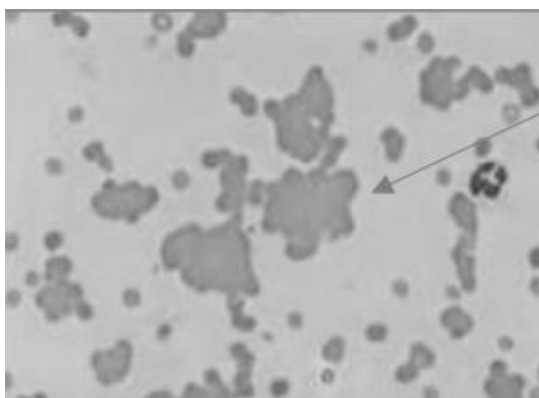
القصة وما فيها بهاد المرض البروتينات ومنها الهيموغلوبين ببلش يتفتت ويتجمع على شكل قطع شوكليت (Heinz bodies) و لما تشوفهم الماكروفيج يتاخذ لقمة منهم عشان هيك اسمهم bitten cells

People sometimes used to fight their own families in winter **(cold immune hemolytic anemia)** and summer **(warm immune hemolytic anemia)**

In the warm type: we will have spherocytes

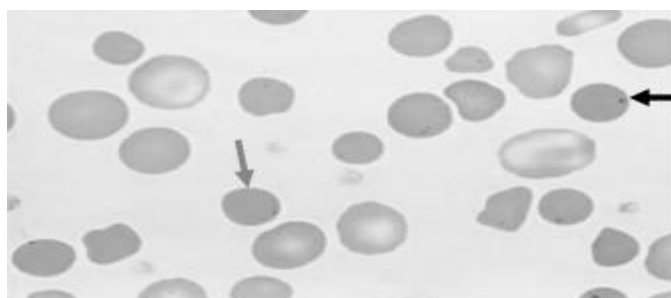


In cold type: we will have spherocytes and agglutination of RBC

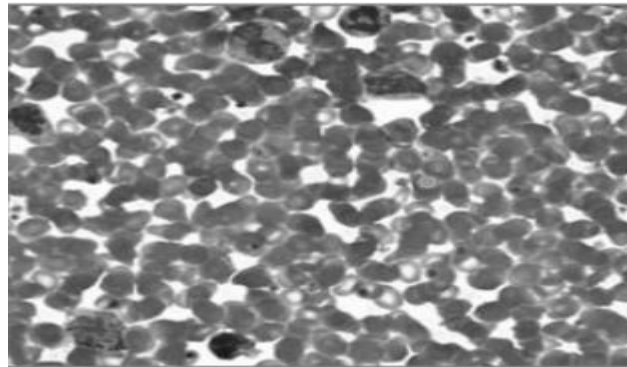


اربطوها انه بالبرد الناس كانت تتجمع حوالين بعض لتندفى ف بيعملوا agglutination و بالنسبة للشكل الكروي بالحالتين ف هي بسبب الماكروفيج اكلت الانتبودي اللي مسك على سطح خلايا الدم ف شكلها تغير

On the other hand there are cells who inherit the spherocyte shape and not like the disease above (get their shape changed because of the macrophages) these are called **hereditary spherocytosis**



Last thing we will find in this sea is when we have a lot of fishes (RBCs) we call this case **polycythemia** (remember we're talking about mass not number)

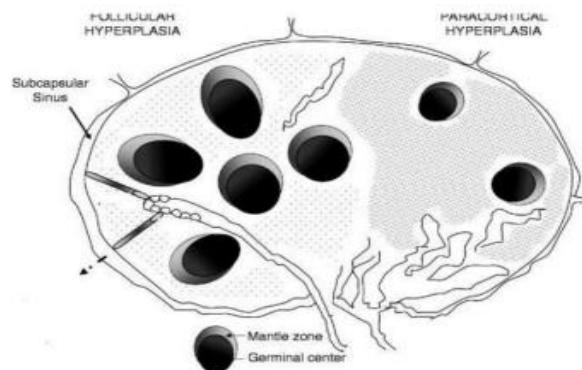


One last stop before we go to lymphomas and leukemias

When there is increase demand in one type of cells what do you think will happen? Of course it will proliferate and call her family (which means hyperplasia)

Follicular hyperplasia is when there is increased demand on B-cells in rheumatologic diseases, toxoplasmosis and HIV infection

Parafollicular hyperplasia when there is increased demand on T-cells in n viral infections (For example EBV), after vaccination and drug reaction



Final material and our final destination for today's trip

Hodgkin lymphomas are of 2 types

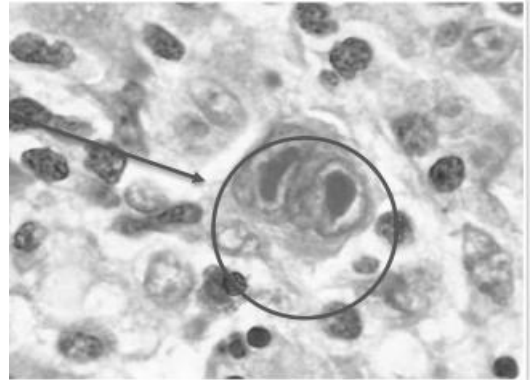
Classic HL 95%

Four subtypes and the best features are RS cells

Which are multinucleated and Hodgkin cells

Remember the classic type is +ve for cd30, cd15 while -ve for cd3, cd20 and cd45

The opposite is in the non-classic type: -ve for cd30, cd15 and +ve for cd20, cd45



1- Nodular sclerosis

Most common classic HL

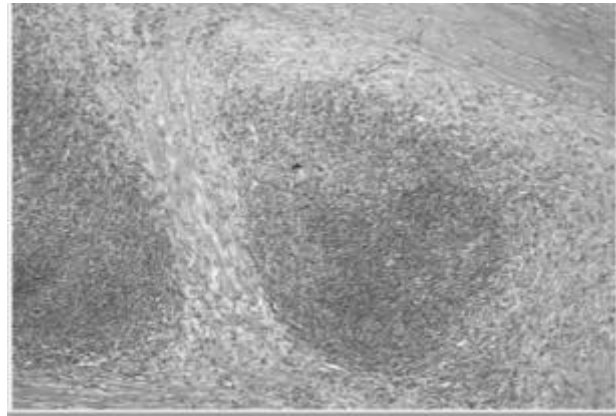
Children+ young adults

From its name it forms nodules with

Fibrous band surrounding it

When we fix the slides in vitro

We will get whitish area around RS cells and we call it lacunar cells



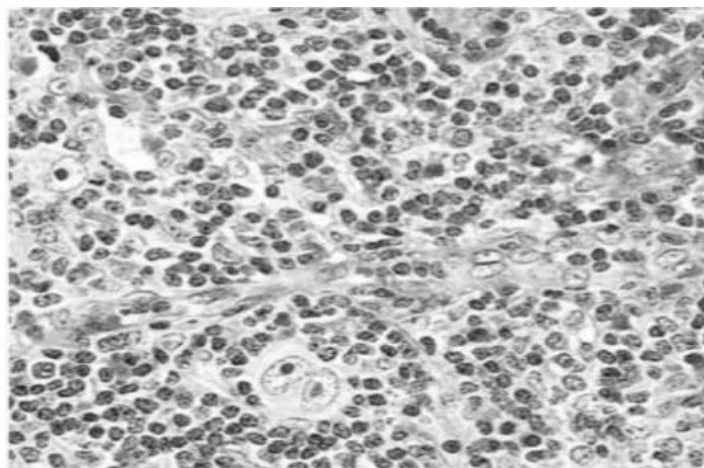
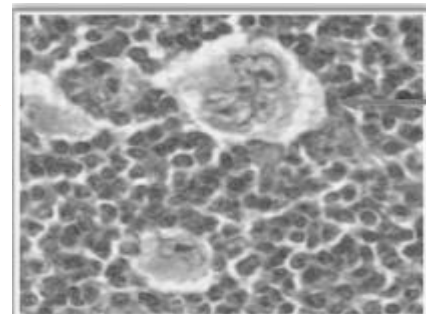
2- Mixed cellularity HL

Common in old people

Lacks fibrous bands ∅ diffuse area with numerous

RS cells with a background of inflammatory cells

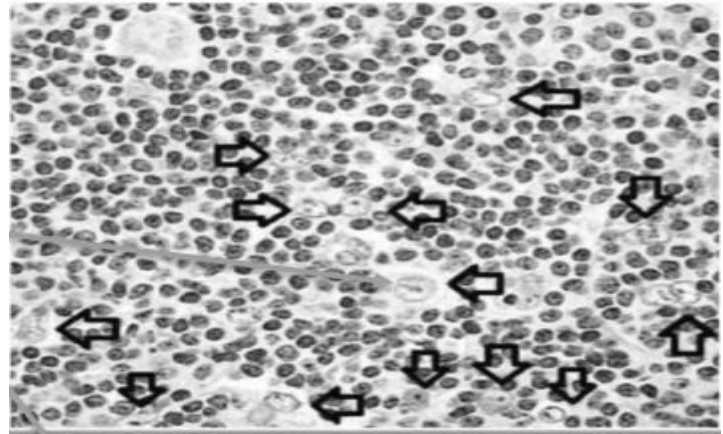
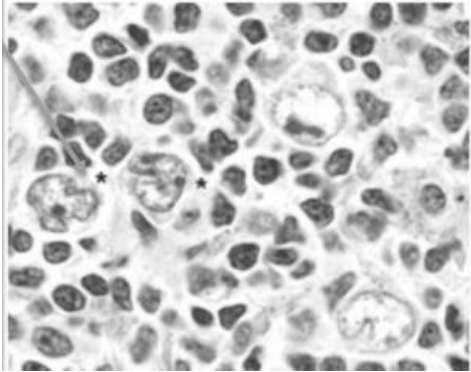
[Mixed neutrophils, eosinophil, lymphocytes, plasma cells and histiocytes]



Non classic HL

Instead of RS we have LP cells which are popcorn cells

Multi-lobulated (not multi nucleated like RS) vesicular (white nucleus and small blue nucleoli)



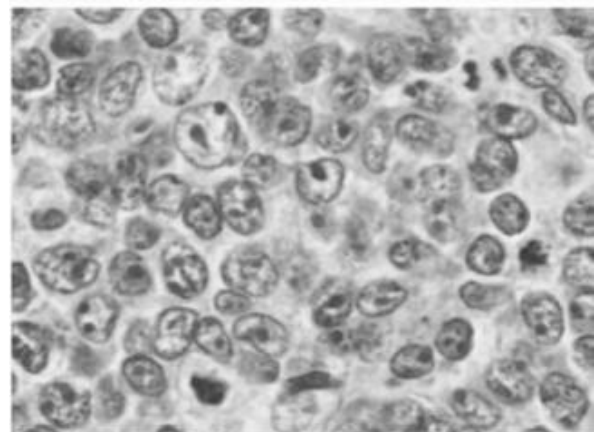
Non Hodgkin lymphoma

DLBCL

Most common NHL extra nodal lymphoma

From its name diffuse cells no follicles

And large cells 3* normal lymphocyte

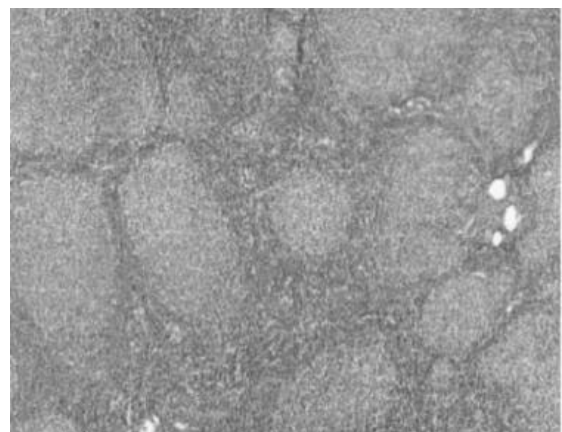


Follicular lymphoma

2nd most common NHL

Here we have nodular proliferation

The difference between this and follicular hyperplasia is that follicular lymphoma crowded follicles hitting each other and fusing, with variant follicle sizes



Higher magnification

It has centrocytes and centroblast

We can use immunohistochemistry

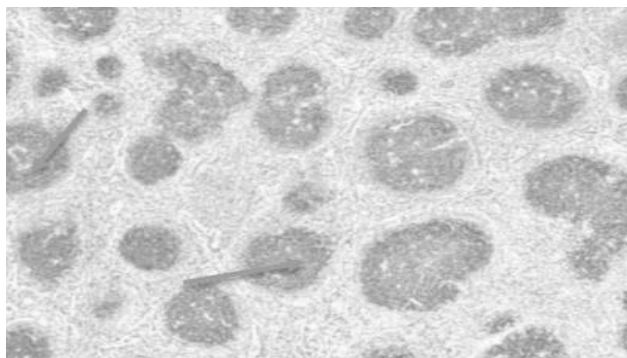
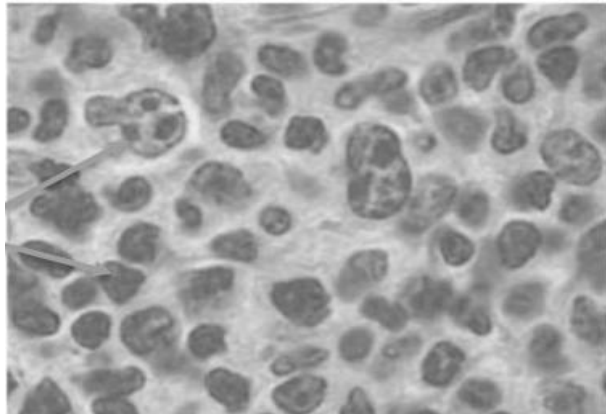
To differentiate between benign and

The malignant follicular lymphoma

(*BCL2*) if it stains +ve then its

A lymphoma if not then it's a

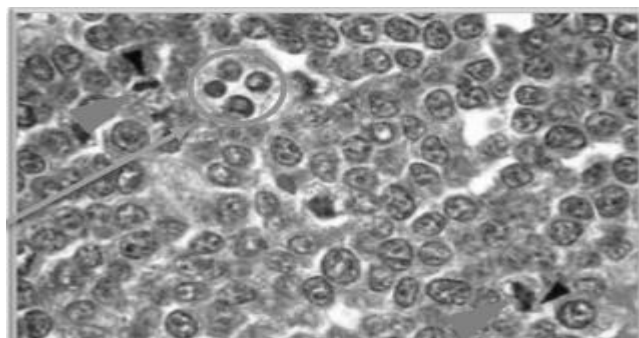
Hyperplasia



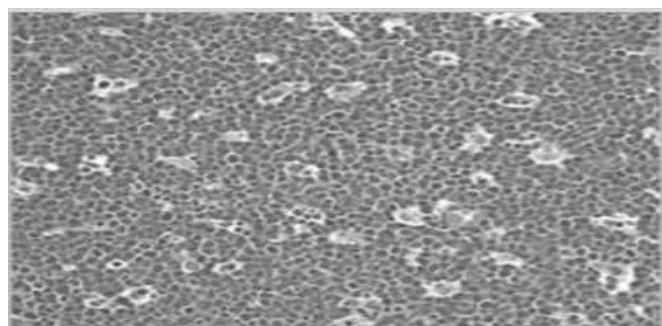
Burkitt lymphoma

Most common NHL in children

Intermediate size cells • monomorphic • Round or oval nuclei [unlike DLBCL and FL] with multiple small nucleoli • Very high mitosis, and a lot of apoptosis; so we see tinged body macrophages engulfing nuclear debris



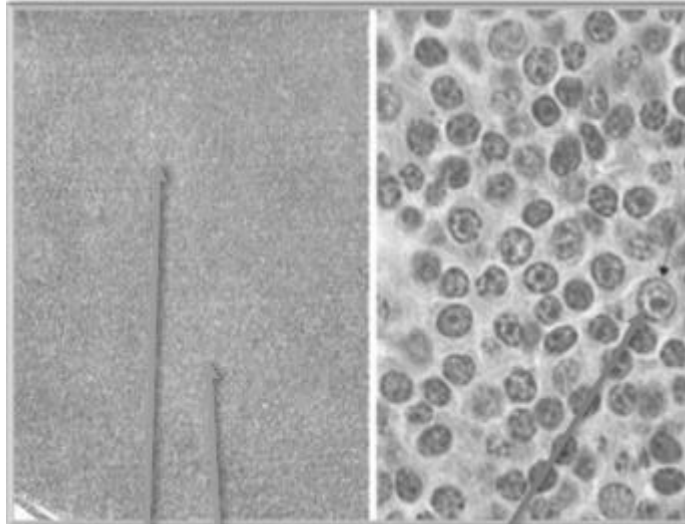
And when we lower the magnification it has a starry sky appearance



Small lymphocytic lymphoma

[Diffuse] ▪ Focal pale areas [cells with a lot of cytoplasm] containing large number of prolymphocytes and increased mitosis.

▪ Most of neoplastic cells are small in size, round, dark chromatin, along with few large cells with central prominent nucleolus [prolymphocytes] which increase in number as the disease progress.



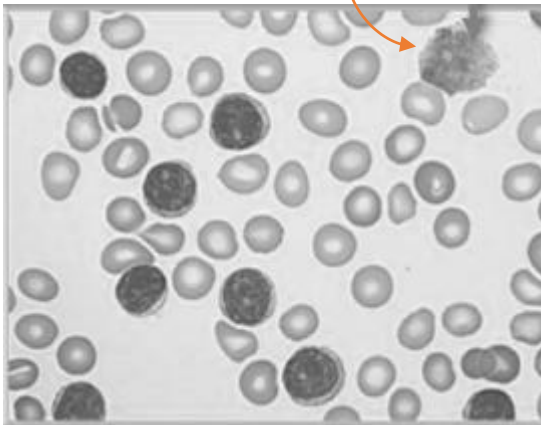
And we have another type

Chronic lymphocytic

Lymphoma

This one has smudged cells

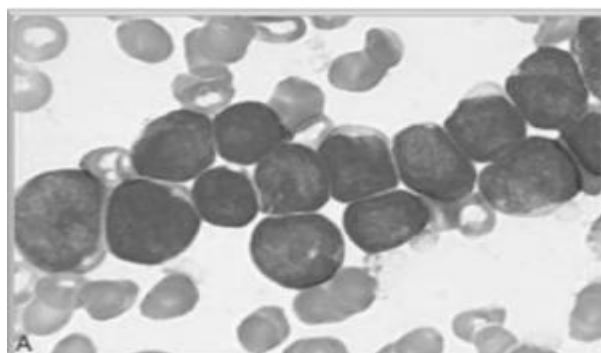
And occasional prolymphocytes



Acute lymphoblastic leukemia

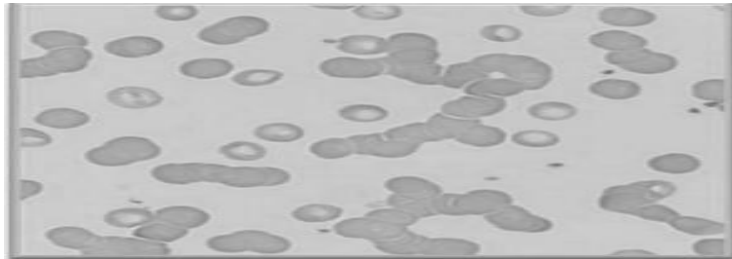
Blasts are large compared to lymphocytes, with a high Nucleus/Cytoplasm ratio

▪ Chromatin is open [pale] because this cell isn't very active [immature] ▪ Nucleolus sometimes is present ▪ Cytoplasm doesn't have granules

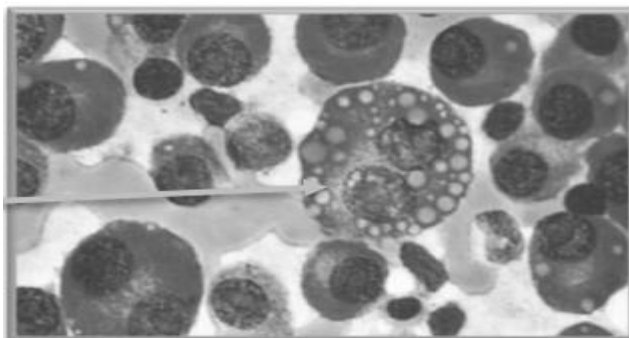


Plasma cell myeloma (multiple myeloma)

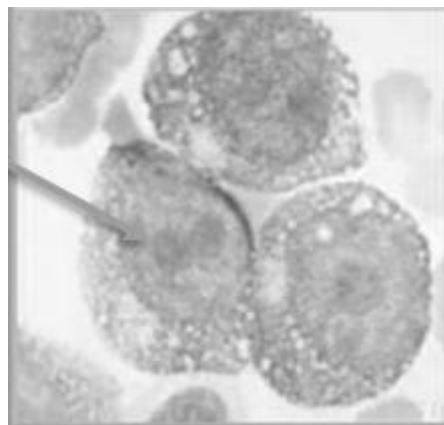
RBCs show rouleaux formation ⊗ Immunoglobulin bind multiple RBCs together



Increased number of plasma cells in BM (>10% of bone marrow cells need to be seen for diagnosis) Abnormal figures with multinuclei and cytoplasmic vacuoles containing Igs can also be observed



Sometimes we can observe prominent nucleoli instead of the normal cartwheel chromatin



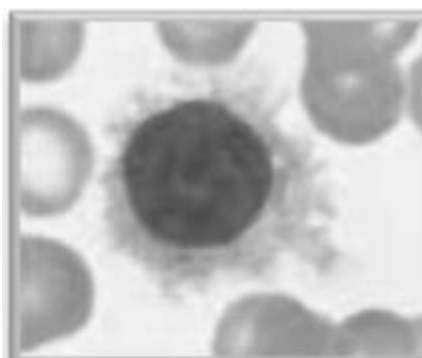
Hairy cell leukemia

Uncommon low-grade B-cell leukemia

Has hair like projections

More common in older MEN

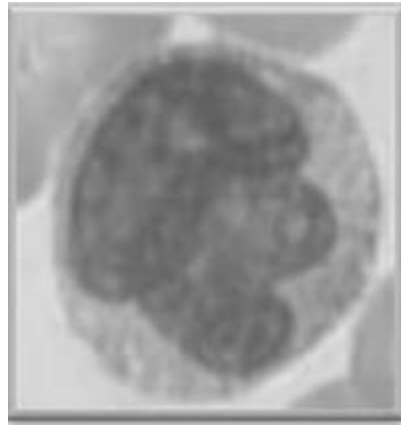
اربطوها انه الشباب يكون عندهم لحية
يعني HAIKY اكثر من البنات



Cutaneous lymphoma

Most common cutaneous lymphoma

It has an irregular nucleus **C**erebrum shape



Aml=adult male

It's common in elderly (especially men)

Acute myeloid leukemia AML

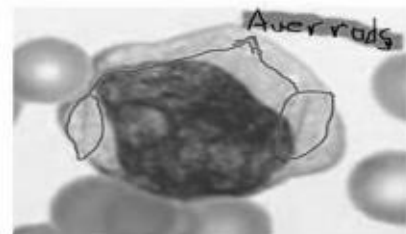
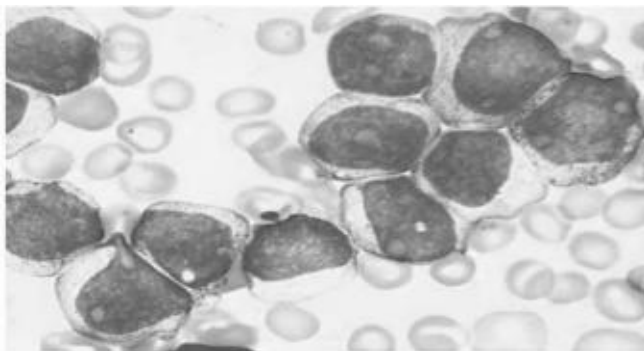
Diagnosis of AML: 20% of blasts in peripheral blood OR bone marrow

Myeloblasts are similar to lymphoblasts but they are larger and have more amount of cytoplasm,

High N/C ratio, fine granules in cytoplasm in contrast to lymphoblasts

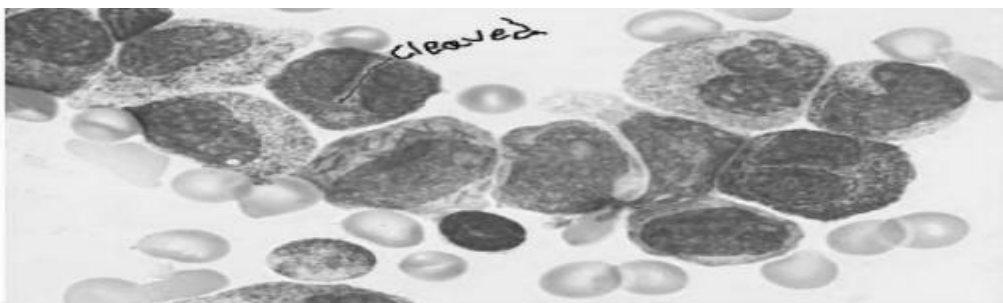
Which don't have granules, fine chromatin (pale), prominent nucleoli

Auer rods: small pink rods present in cytoplasm, represent peroxidase enzyme



Acute promyelocytic leukemia

Numerous cytoplasmic granules and Auer rods. The nuclei are commonly cleaved (we call it "figure of eight")



Myelodysplastic Syndrome

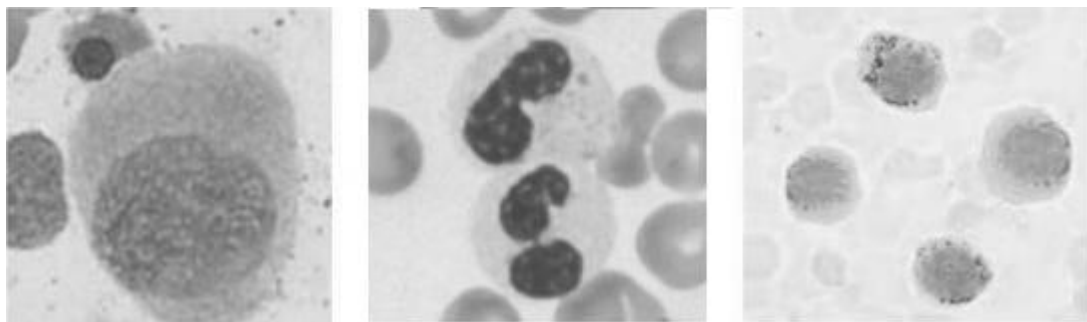
Erythroid: macrocytic anemia, megaloblastoid nuclei (the chromatin is immature, and the cells are large)

Ring sideroblasts (iron accumulation inside the mitochondria of nucleated erythroid cells in the BM).

Myeloid: decreased granulation, hypo segmented nuclei of neutrophils.

Megakaryocytes: small, hypolobated nuclei (it become monolobated nucleus).

Myeloblasts: can be increased, but they keep below 20% of nucleated cells either in the BM or in the peripheral blood. **REMEMBER**: If they reach 20%, we call it AML



Chronic Myeloid Leukemia

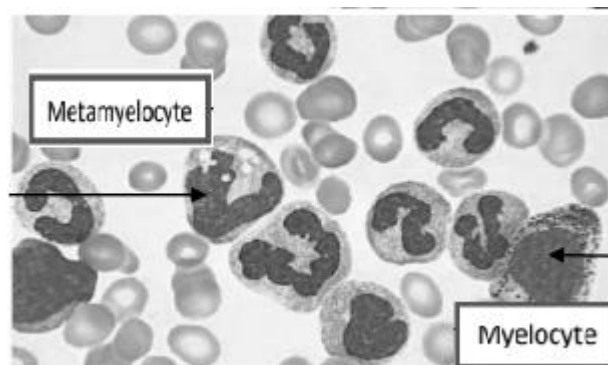
Leukocytosis, shift to the left, blast less than 20%, basophilia, eosinophilia

Thrombocytosis

If we took a BM biopsy

We would see hyper-

Cellularity in it



Primary Myelofibrosis

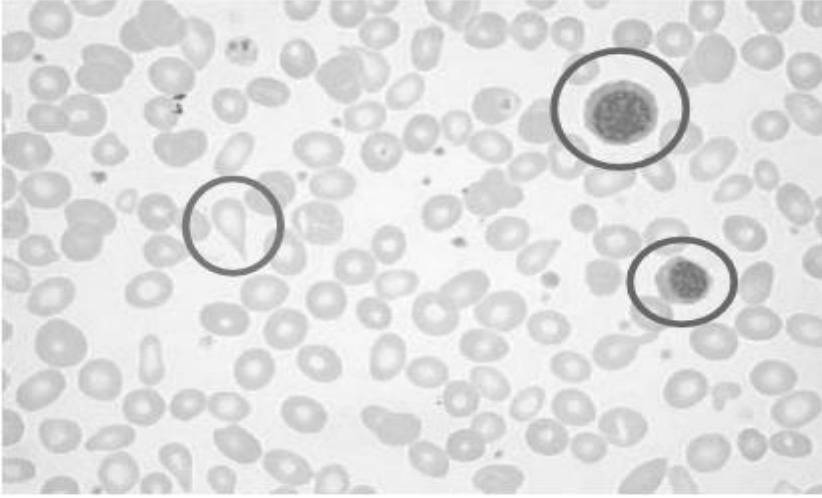
Peripheral blood \diamond tear-drop cells, nucleated RBCs, shift to left \diamond together, we call it leucoerythroblastic anemia which is characteristic of Myelofibrosis.

WBC \diamond can be normal OR increased

Platelets \diamond High, but with time it becomes low due to fibrosis.

BM \diamond (1) EARLY: hyper cellular (MPN) and focal fibrosis (2) LATE: hypo cellular and extensive fibrosis. DOMINANT CELLS

◇Megakaryocytes: they are increased and will form clusters, these cells are individual cells but when they form clusters, this is abnormal and a sign of Myelofibrosis.



تفسيري المتواضع الهبيدي :

خلايا الدم وهي بتطلع من البونمرو بما انه صارله fibrosis
رح تنفصص (تنحشر) ف بصير شكلها زي الدمعة

و لا ننسى البطل بهاد المرض هو ال megakaryocytes

بصيروا يتجمعوا مع بعض و يطلعوا TGF-B هاد بحفز

الفايبروبلاست تطلع كولاجين ف بصير عنا BM fibrosis

This is the end of our 1800s trip let's go back to 2021 and study for our HLS final

وانا بدور عالمعلومة اللي حفظتها قبل 0.0001 ثانية بالباتو



Done by:

Carmen Sahawneh