Citomorfologia normal e patológica do sangue periférico

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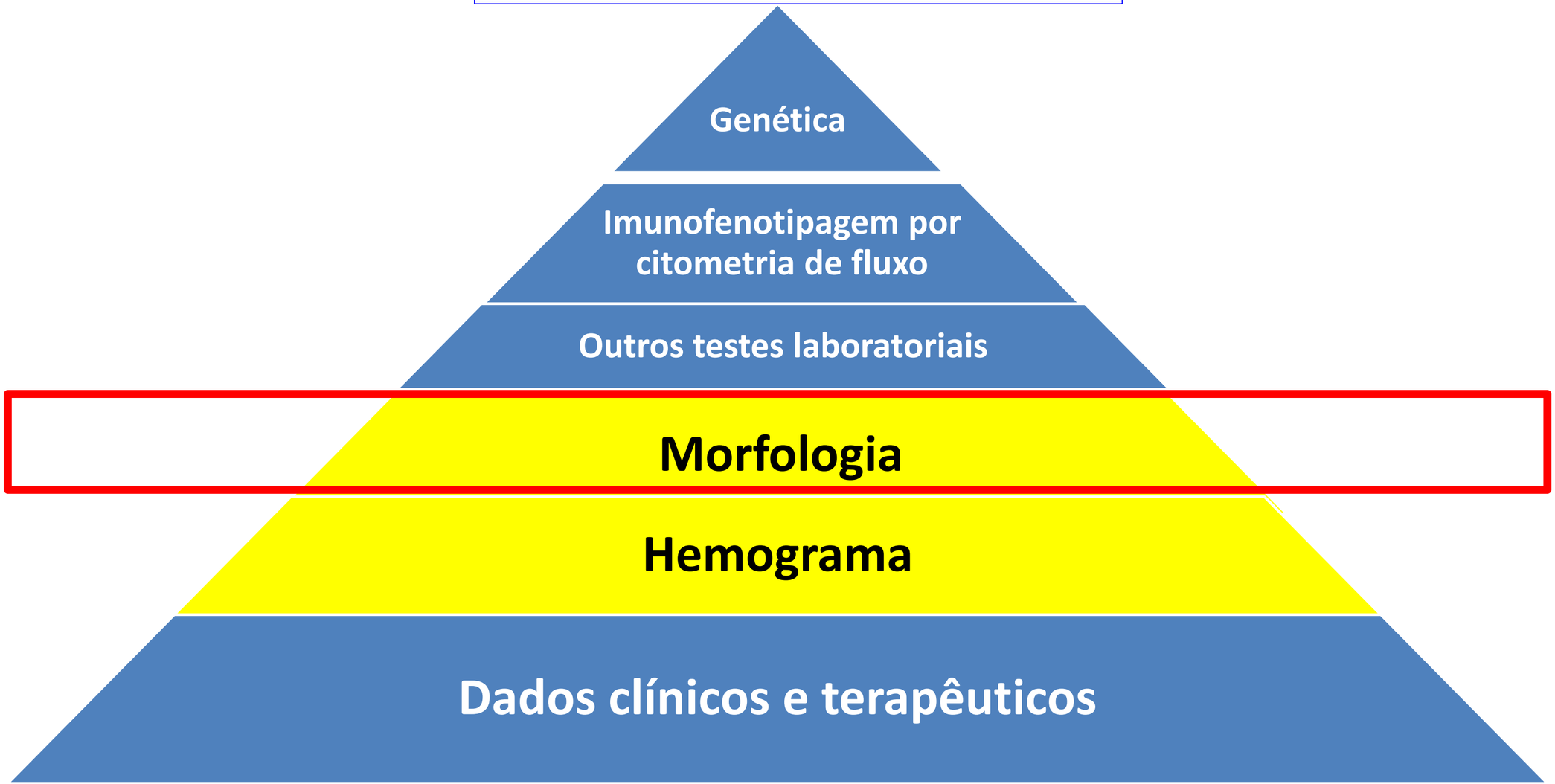
PNAEQ 2025 - Formação
ProMeQuaLab

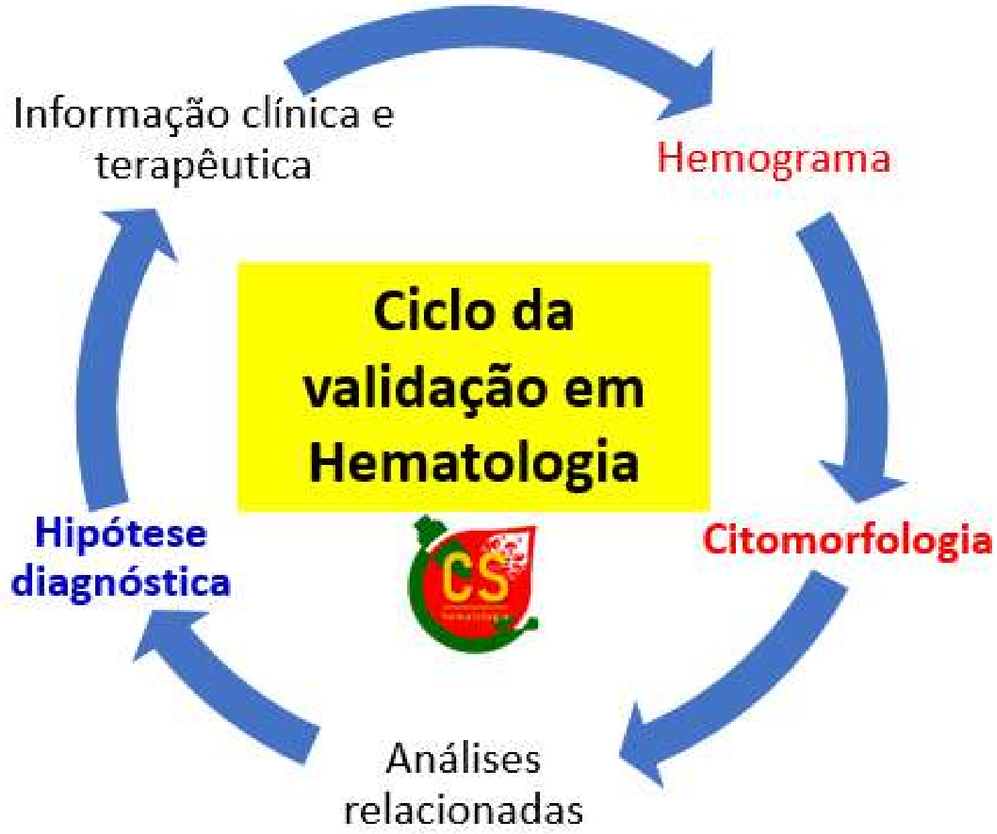
O diagnóstico integrado em hematologia




Sinais gerais
(astenia, anorexia, emagrecimento, sudação profusa nocturna, febre)
Icterícia, dores ósseas
Síndrome tumoral
(poliadenopatias, adenopatias isoladas, esplenomegália, hepatomegália, outras massas)
Complicações das citopénias /citoses
(anemia, infeções, hemorragias e tromboses)
Alterações do hemograma:
Citopénias ou citoses
Gráficos celulares anormais
Alarmes automáticos
Alterações morfológicas celulares (SP/MO)
Perturbações analíticas (síndrome inflamatória inexplicada, aumento da LDH, síndrome de activação macrofágica e síndrome de lise tumoral)
Como se apresenta um doente hematológico?

Validação em Hematologia

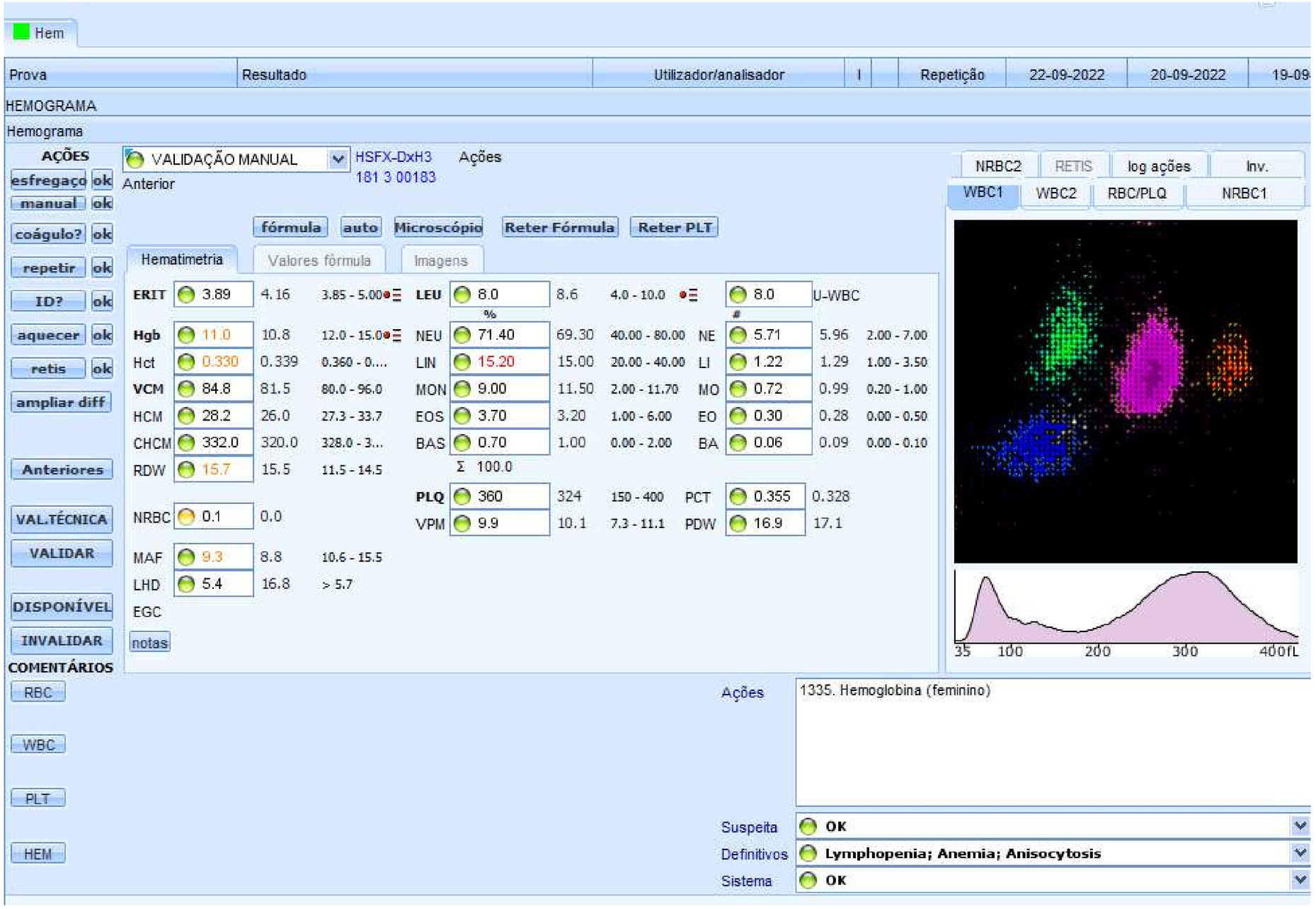
- **Interpretar** o hemograma, em função dos dados clínicos e terapêuticos (doença base, comorbilidades e situação actual) e dos valores anteriores
- **Observar** cuidadosamente a morfologia, com particular atenção às alterações suspeitadas e valorizando o **contexto celular**
- **Reconhecer** as alterações observadas
- **Relacioná-las**, **interpretando-as** nos diferentes **contextos**, de forma a atribuir-lhes um significado clínico e estruturar uma hipótese diagnóstica
- Chegados a este ponto devemos encerrar o ciclo e verificar se essa hipótese é coerente e ajustada aos dados clínicos e terapêuticos
- Por último **relatar** correctamente o observado e, caso seja necessário, **sugerir ou orientar o diagnóstico**



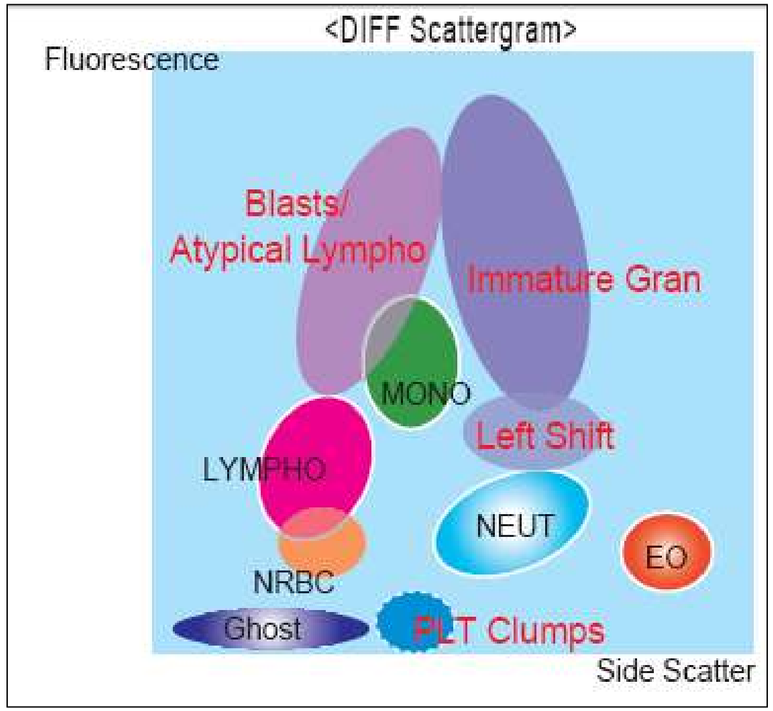
Competência em citomorfologia

- Contextualizar e interpretar os achados citomorfológicos
- Valorizar (o que é relevante, evitando o supérfluo)
- Relatar (forma clara e objectiva)
- Diagnosticar e/ou orientar a marcha diagnóstica

Dados relevantes de um hemograma



Interpretação – Morfologia e gráficos celulares



Conjugar a morfologia com as alterações dos gráficos celulares

Recomendações para observação do esfregaço de sangue periférico

Revue microscopique du frottis sanguin : *propositions du Groupe Francophone d'Hématologie Cellulaire (GFHC)*

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pour le Groupe Francophone d'Hématologie Cellulaire

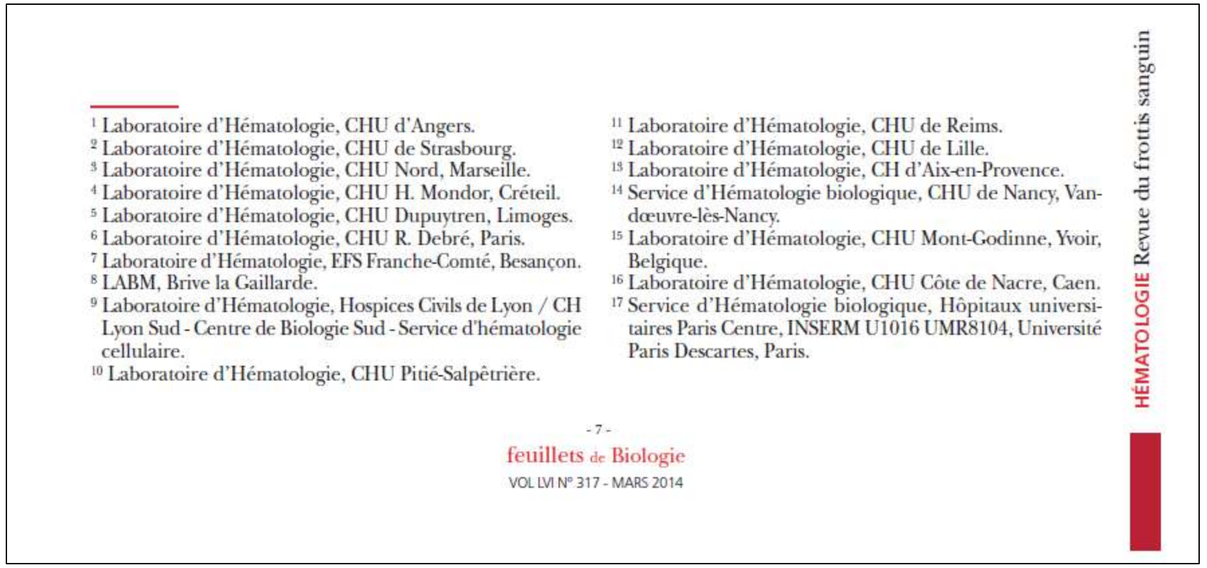

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Tableau II - Indications d'examen du frottis sanguin relatives aux résultats de la numération globulaire.

Leucocytes (G/l)	Adulte/Enfant	Patients atteints d'hémopathie maligne, en sortie d'aplasie (leucocytes ≥ 1,0 G/l sur le résultat actuel et < 1,0 sur le résultat précédent)
Plaquettes (G/l)	Adulte	< 100, en situation initiale > 450, en situation initiale
	Enfant	< 150, en situation initiale
Volume plaquettaire moyen (fl)	Adulte/Enfant	< 7, en situation initiale avec plaquettes < 150 G/l > valeur limite supérieure (fournisseur), en situation initiale avec plaquettes < 150 G/l
Hémoglobine (g/dl)	Adulte	< 8, en situation initiale < 10, en situation initiale avec réticulocytes > 120 G/l
	Enfant	< 9, en situation initiale
Volume globulaire moyen (fl)	Adulte	> 105, en situation initiale < 75, en situation initiale
	Enfant	> 85 (6 mois à 2 ans), > 95 (2 à 15 ans), en situation initiale < 70 (6 mois à 2 ans), < 72 (2 à 6 ans), < 75 (au-delà de 6 ans), en situation initiale
Concentration corpusculaire moyenne en hémoglobine (g/dl)	Adulte/Enfant	> limite normale supérieure, en absence d'interférence
Index de distribution volumétrique des globules rouges (CV %)	Adulte/Enfant	> 22 %, en situation initiale, hors contexte connu de transfusion de globules rouges
Réticulocytes (G/l)	Adulte/Enfant	> 120, en situation initiale

A contagem total de glóbulos brancos não é um bom critério para decidir se é necessário observar o esfregaço de SP.
Os alarmes qualitativos ou quantitativos exibidos pelo analisador são mais úteis.
Nos casos de leucopénia ou leucocitose, recomenda-se basearmo-nos na contagem diferencial leucocitária para decidir a necessidade de observar o ESP.

Tableau III - Indications d'examen du frottis sanguin relatives aux résultats de la formule leucocytaire.

Résultat précédent	Adulte/Enfant	Présence de cellules malignes sur le résultat précédent Présence d'érythroblastes sur le résultat précédent (si non énumérés automatiquement par l'analyseur)
Érythroblastes	Adulte/Enfant	Présence d'érythroblastes détectée par l'analyseur, en situation initiale ou à chaque fois si non énumérés automatiquement par l'analyseur
Polynucléaires neutrophiles	Adulte/Enfant	< 1,5 G/l, en situation initiale
Polynucléaires éosinophiles	Adulte/Enfant	> 1,5 G/l, en situation initiale
Polynucléaires basophiles	Adulte/Enfant	> 0,3 G/l et/ou > 3 %, en situation initiale
Lymphocytes	Adulte	> 5 G/l, en situation initiale
	Enfant	> 9 G/l (2 à 6 ans), > 6 G/l (6 à 12 ans), > 4 G/l (> 12 ans), en situation initiale
Monocytes	Adulte/Enfant	> 1,5 G/l, en situation initiale > 1,5 G/l, persistant plus de 30 jours > seuil à définir par chaque laboratoire en cas de monocytose survenant en cours d'hospitalisation

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Anexo III: Razões para Prescrição de Estudo Morfológico do Sangue Periférico

Clínica

Clínica sugestiva de anemia, icterícia inexplicável, drepanocitose, trombocitopenia, neutropenia, de doença mielo ou linfoproliferativa, bem como presença de esplenomegalia, dor óssea ou sintomas sistémicos inesperados como febre, sudorese, prurido emagrecimento e palidez.

Laboratorial

- Alarmes ou mensagens do hemograma
- Anormalidades dos gráficos

	Valores Mínimos de Consenso	Valores Máximos de Consenso
HGB (g/dL; Mulher)	< 7	2 g/dL acima VR
HGB (g/dL; Homem)	< 7	2 g/dL acima VR
MCV (fL)	< 75	> 105
PLT (x 10^9/L)	< 100	> 1000
WBC (x 10^9/L)	< 4	> 30
NEU (x 10^9/L)	< 1	> 20
LYM (x 10^9/L)	---	> 7
MONO (x 10^9/L)	---	> 1.5
EOS (x 10^9/L)	---	> 2.0
BASO (x 10^9/L)	---	> 0.05

Qual a importância da citomorfologia?

- Na era actual, apesar de todos os avanços tecnológicos na análise celular, a **morfologia celular** do sangue periférico e da medula óssea continua a ser uma **pedra angular para o diagnóstico de neoplasias hematológicas, mas deve ser integrada** com a clínica, terapêutica, hemograma, imunofenotipagem, genética molecular e histopatologia

- Representa a **primeira triagem diagnóstica na maioria dos distúrbios hematológicos** e pode evitar um grande número de erros e muitos exames diagnósticos desnecessários

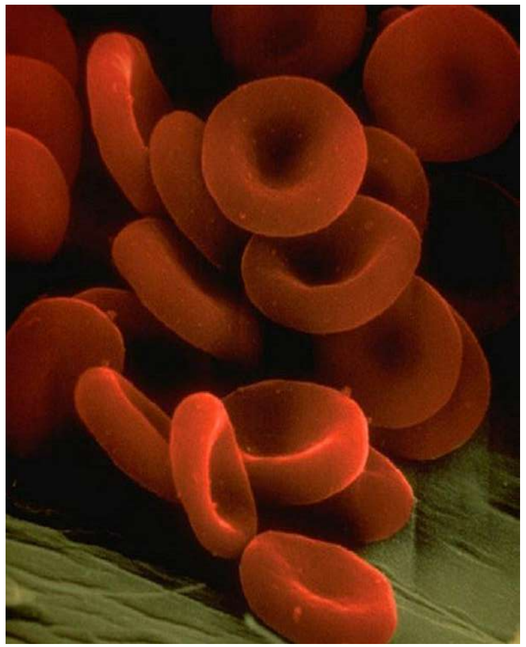
- O **rendimento esperado** da observação morfológica do sangue periférico **depende muito da competência e experiência do observador** (treino citológico)
- As principais causas da **alta variabilidade interobservador** em citomorfologia são:
  - diferenças biológicas em amostras de pacientes
  - diferenças individuais na habilidade morfológica dos observadores
  - **falta de harmonização terminológica e de falta de uniformização na preparação e coloração de esfregaços**

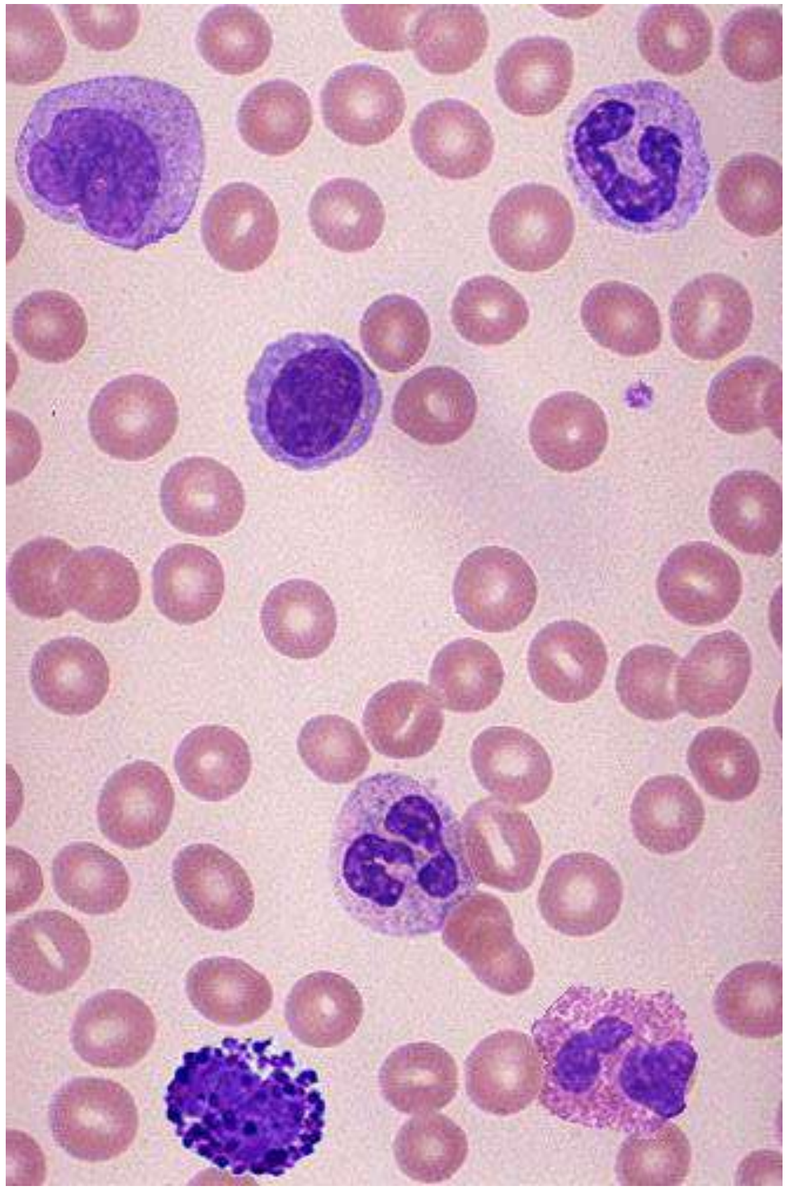
- A **citomorfologia permanece de importância crucial** porque pode:
  - Sugerir um diagnóstico urgente de neoplasias hematológicas que requerem tratamento urgente (ex. LPA, MATs, linfoma de Burkitt)
  - Fornecer um contexto para interpretação de outros testes (ex. blastos, bastonetes de Auer e sinais displásicos)
  - Indicar um diagnóstico provável

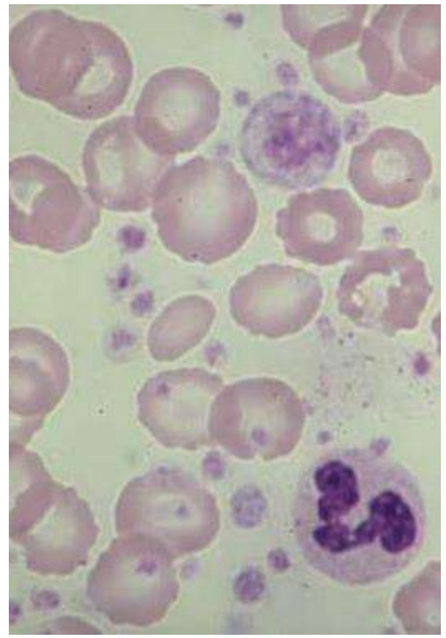
- A **% de blastos** mantém-se crucial para o diagnóstico, subclassificação, prognóstico e avaliação de progressão da doença (LMA, SMD e SMD/NMP)
- A **% de células displásicas** é um critério quantitativo adicional para a definição da displasia das diferentes linhagens celulares

CITOMORFOLOGIA NORMAL
DO
SANGUE PERIFÉRICO

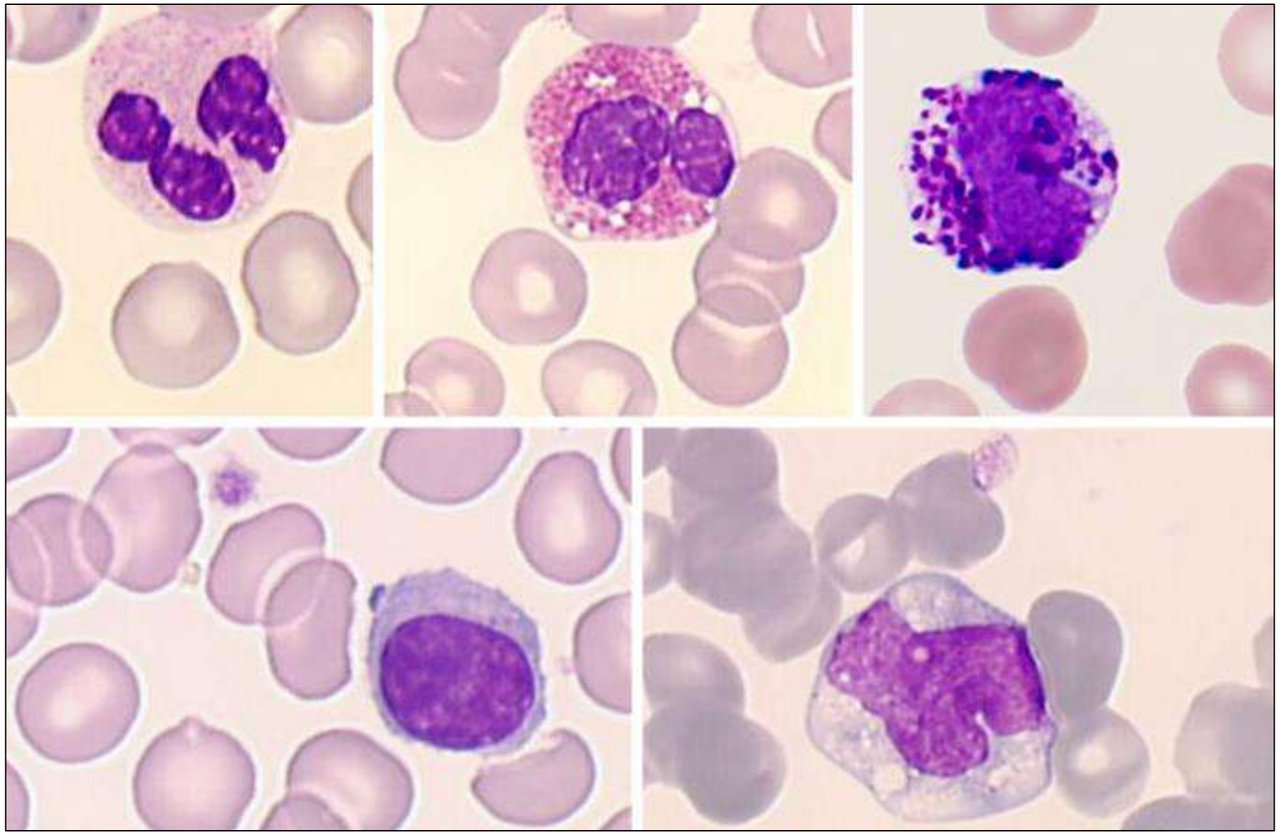
ESTUDO MORFOLÓGICO DO SANGUE PERIFÉRICO



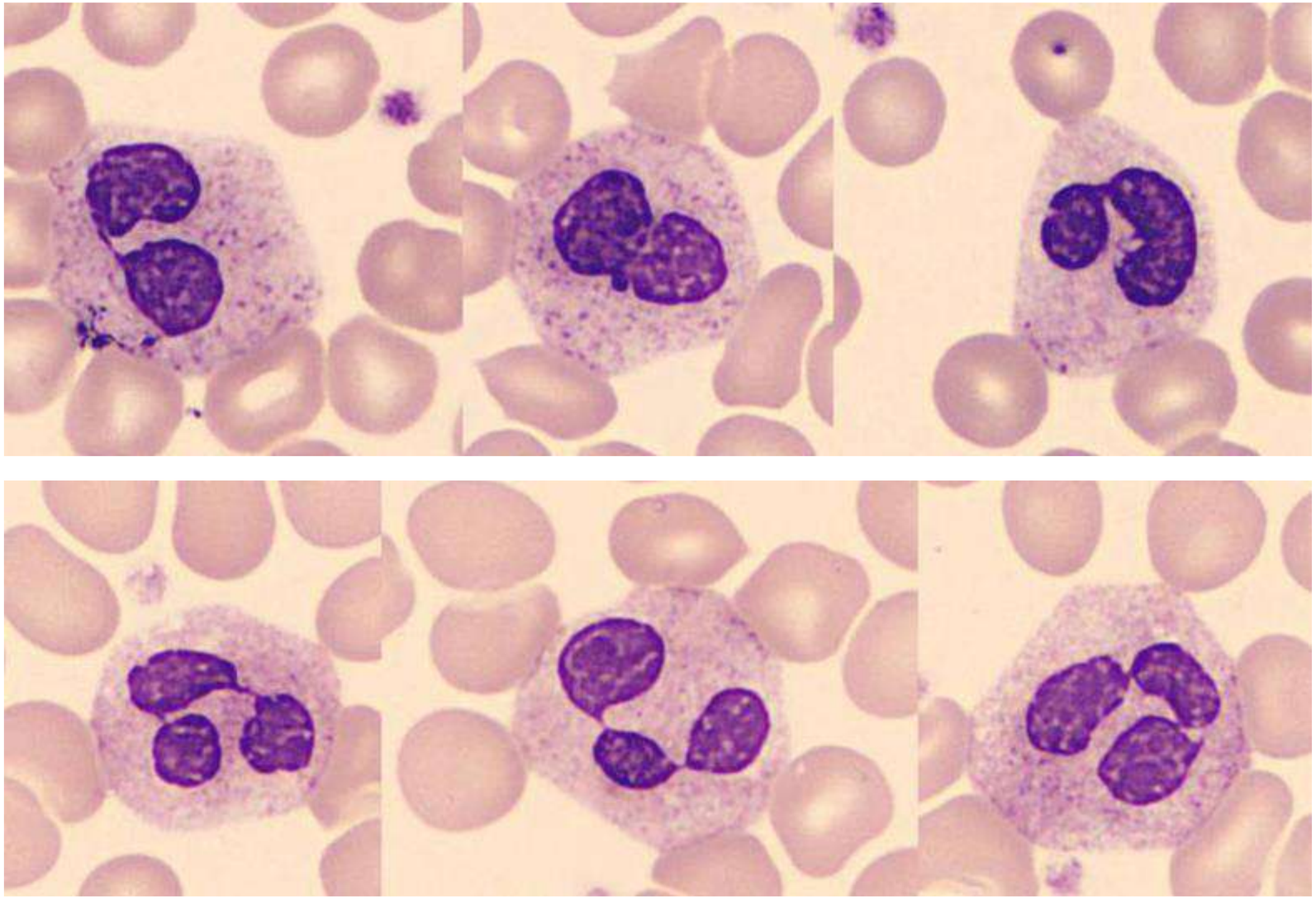




ESTUDO MORFOLÓGICO DO SANGUE PERIFÉRICO - Leucócitos



ESTUDO MORFOLÓGICO DO SANGUE PERIFÉRICO - Neutrófilos (PMNs)



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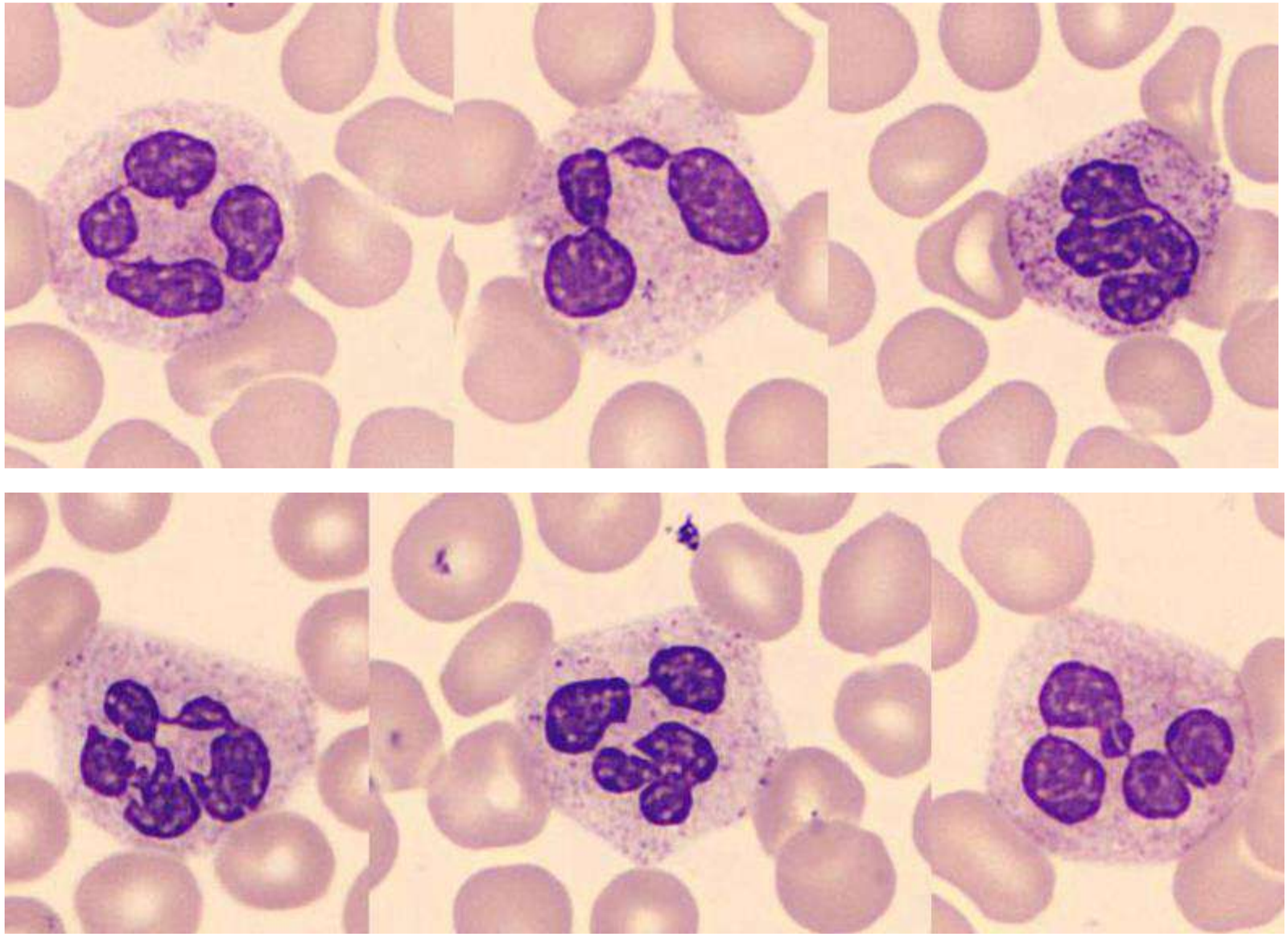

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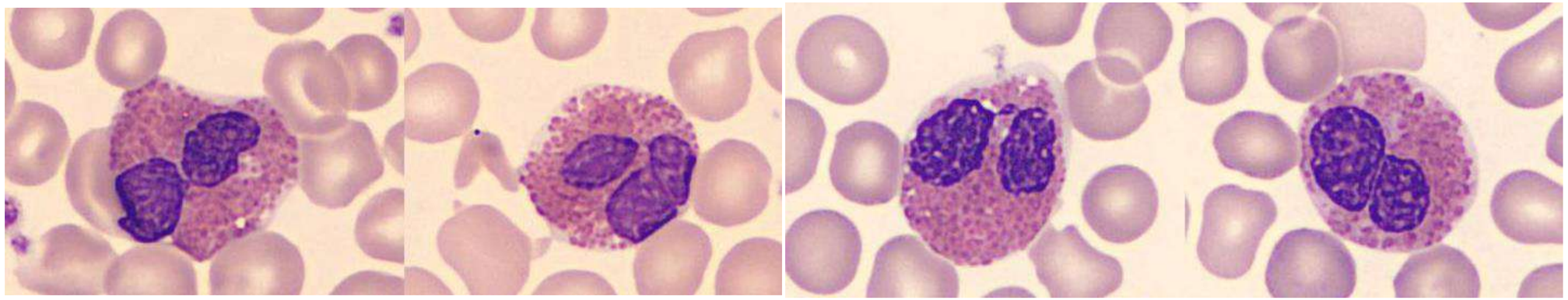

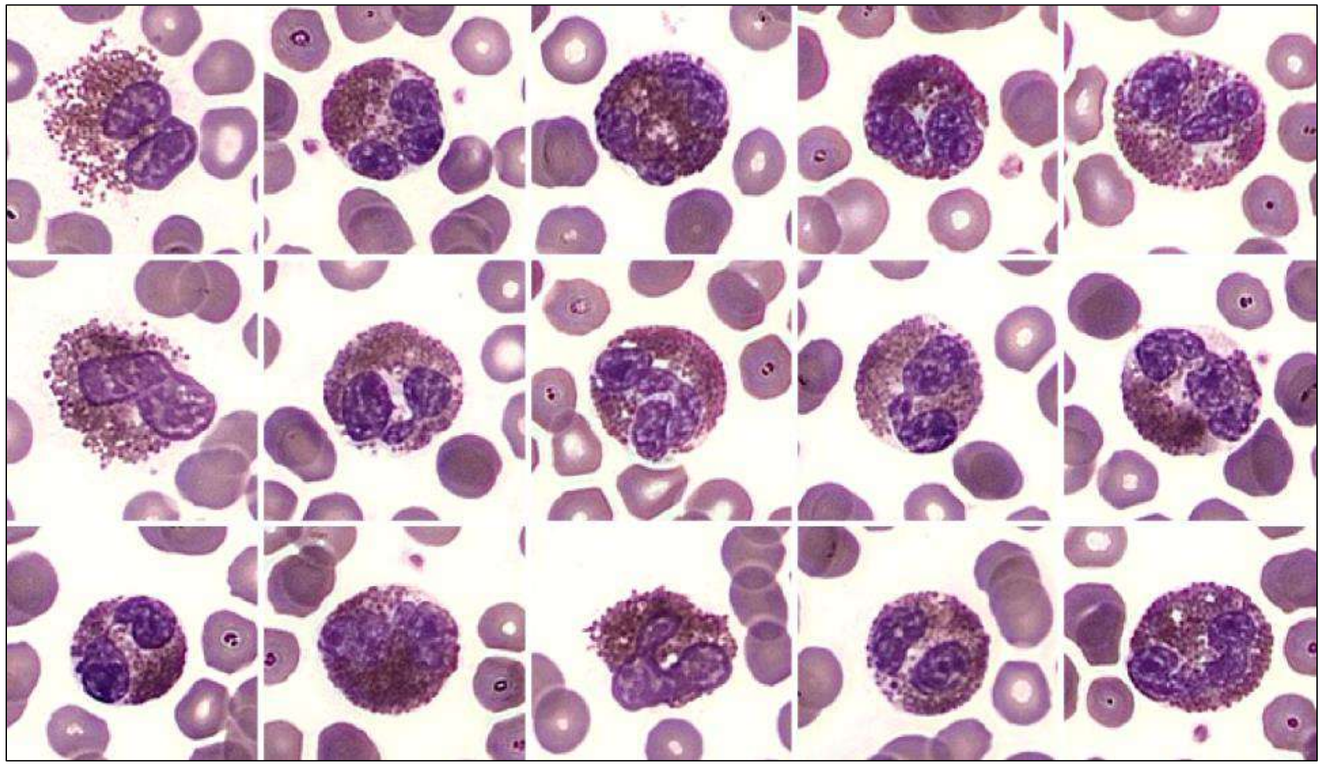

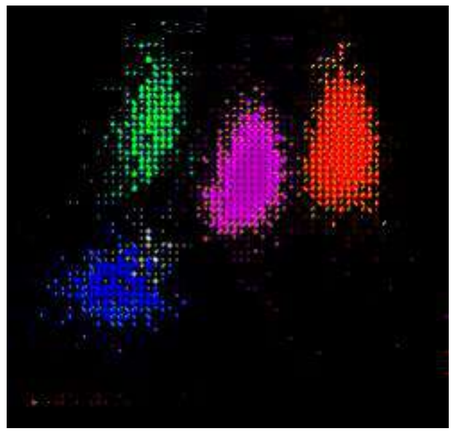

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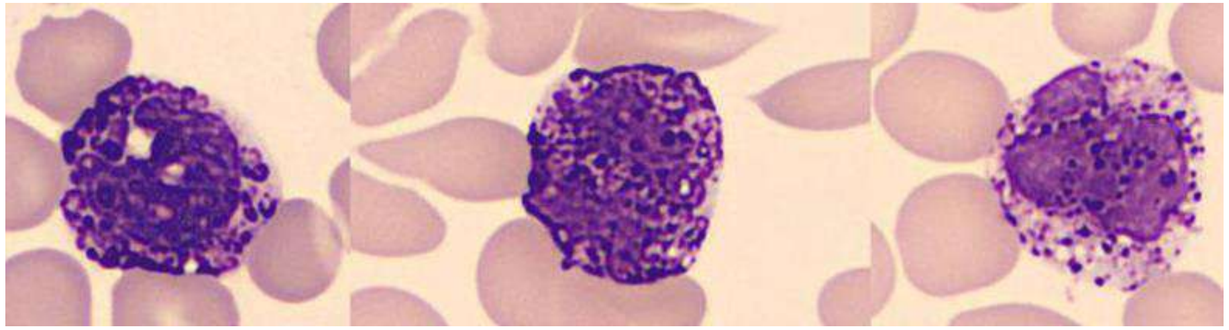

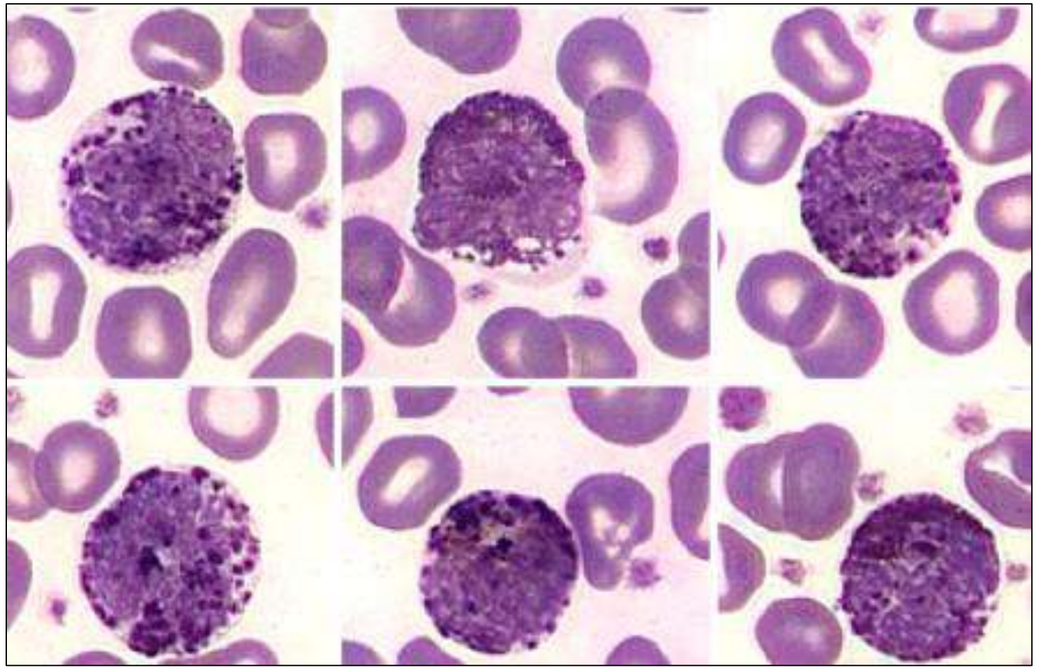

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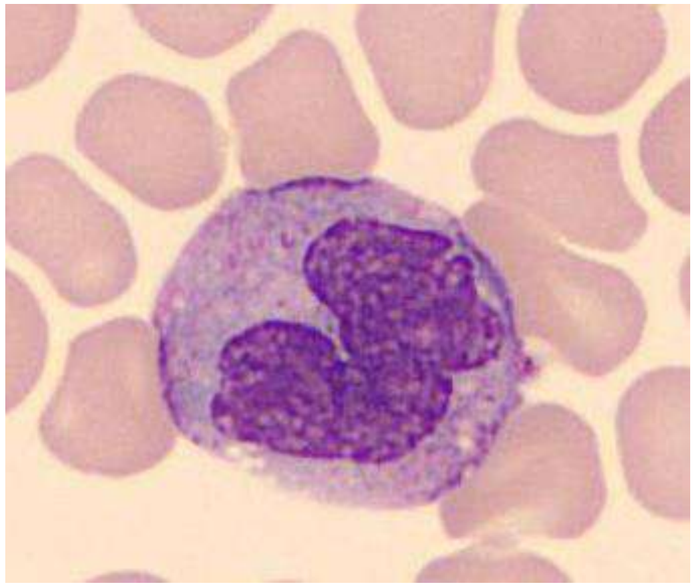

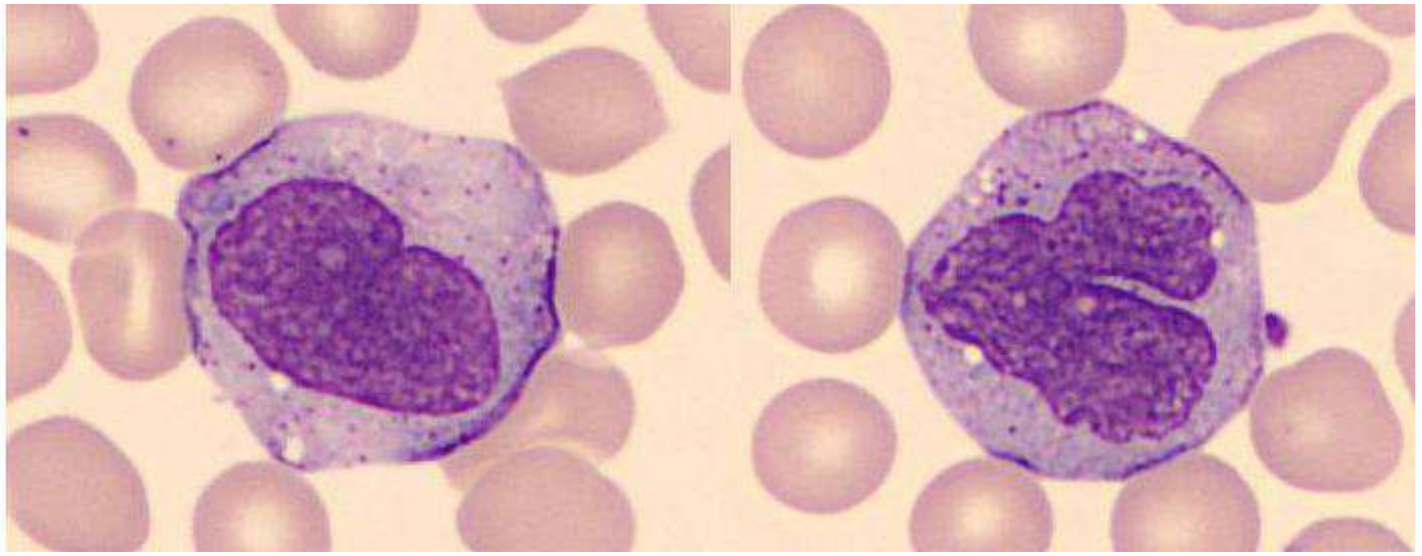

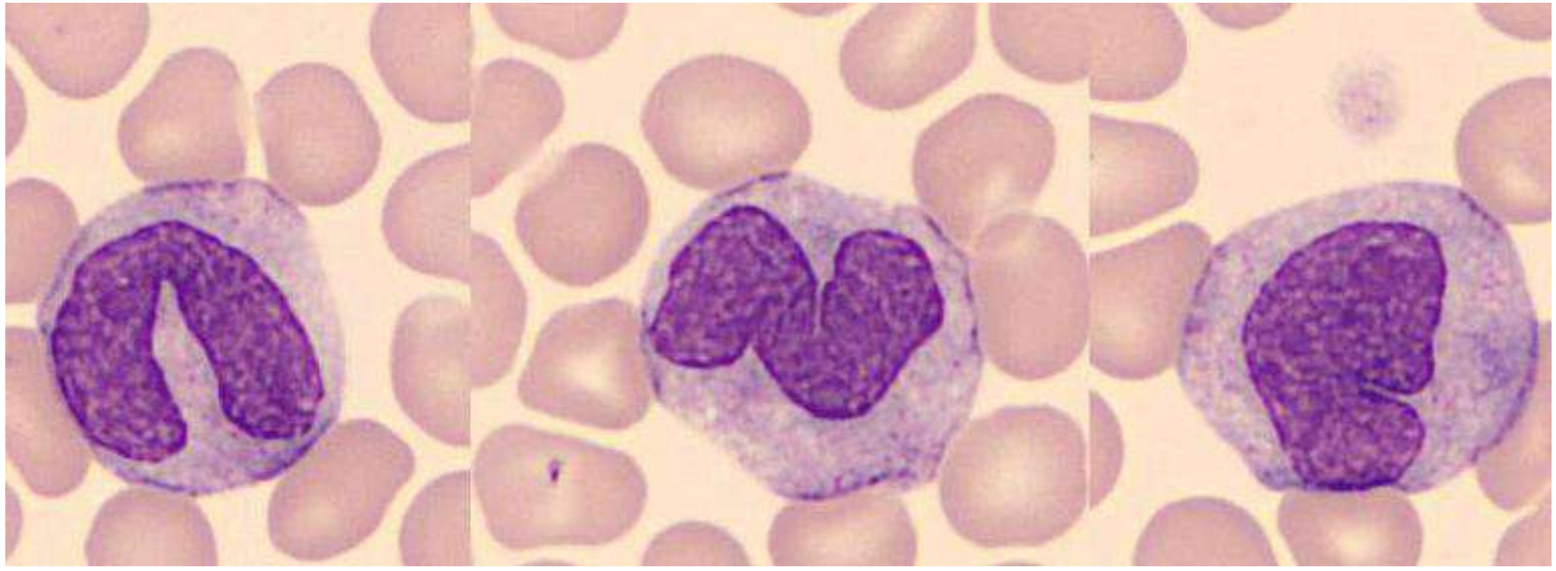

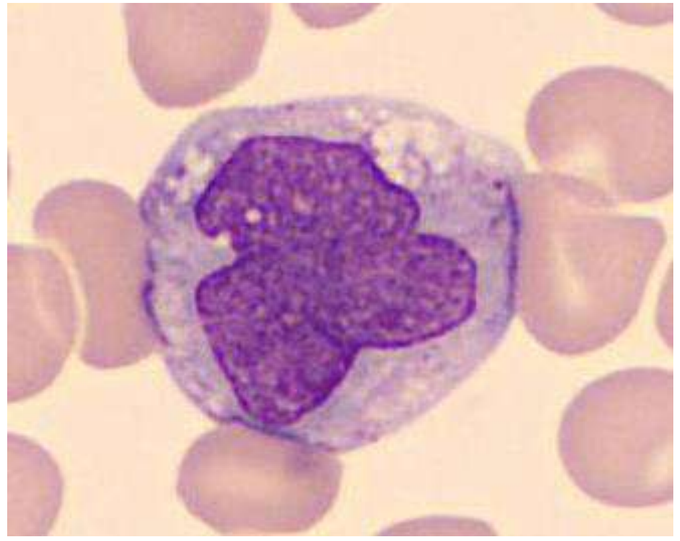

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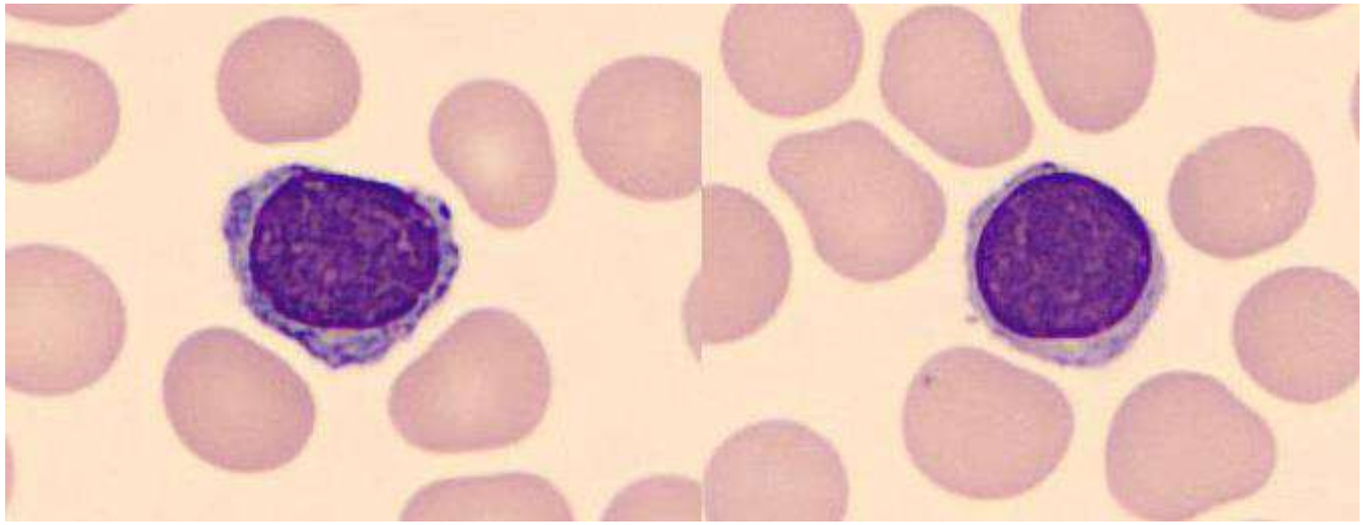

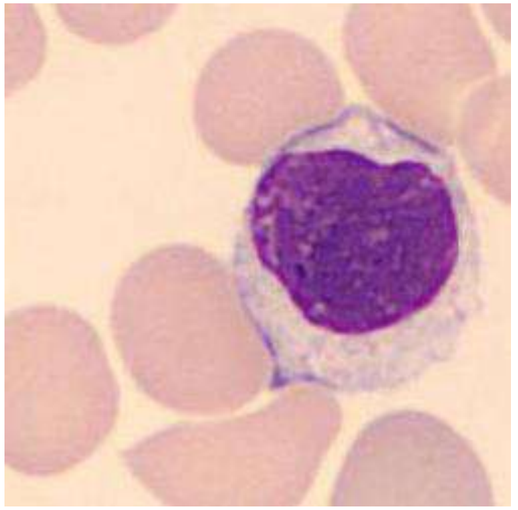

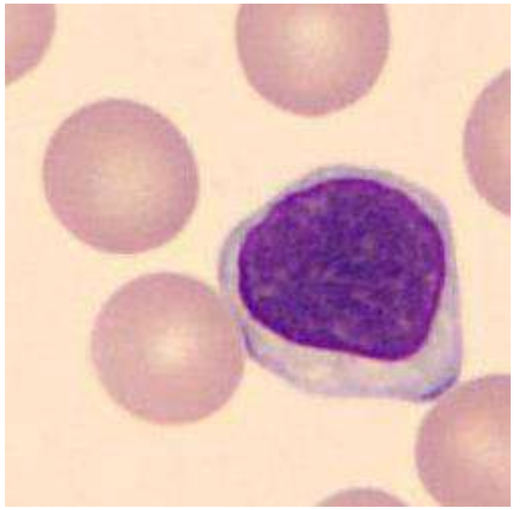

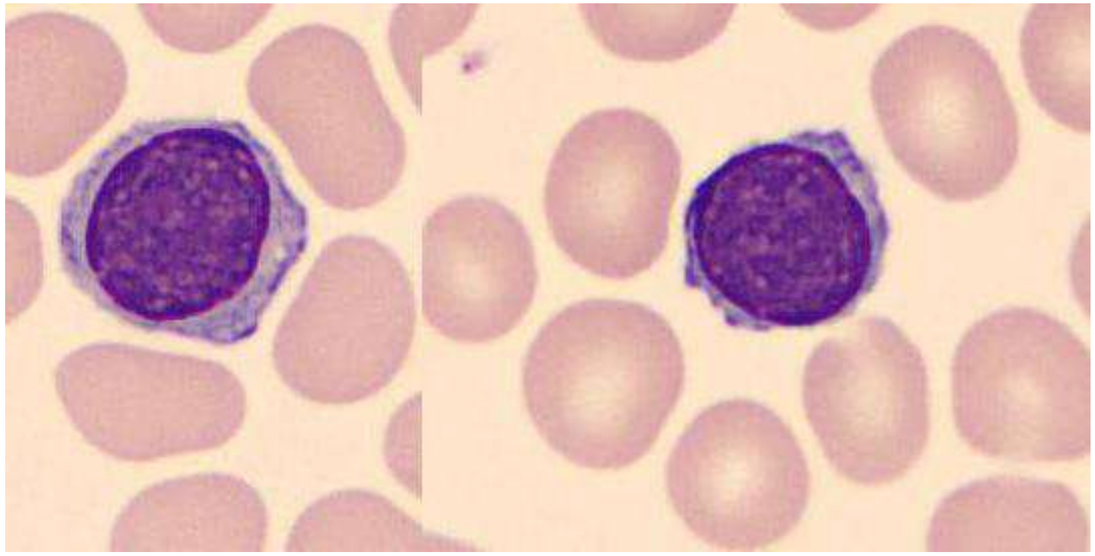

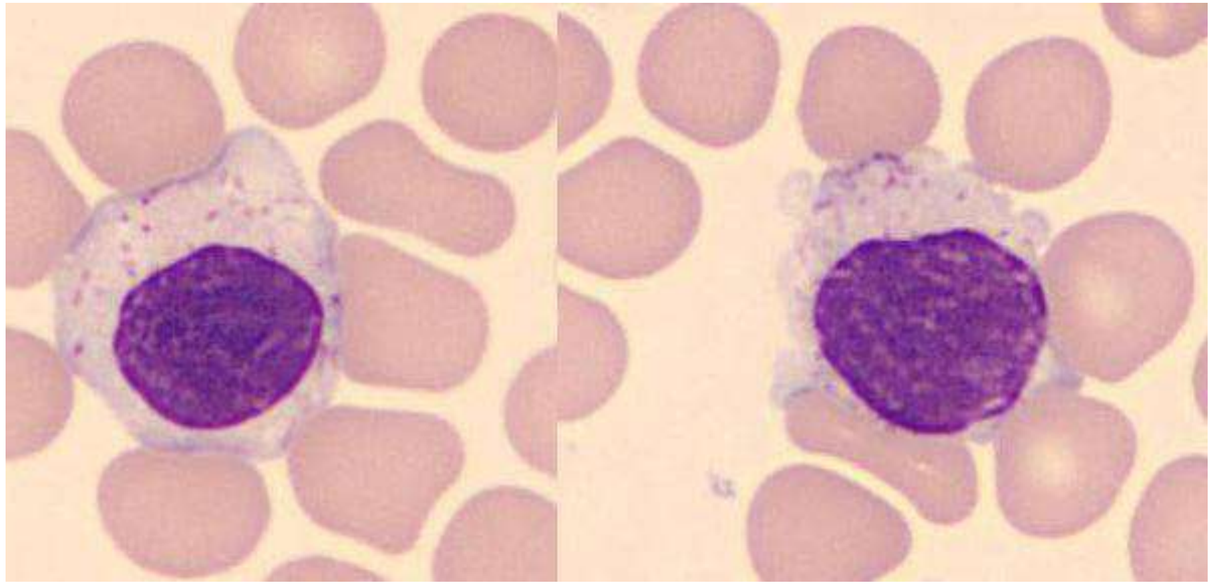

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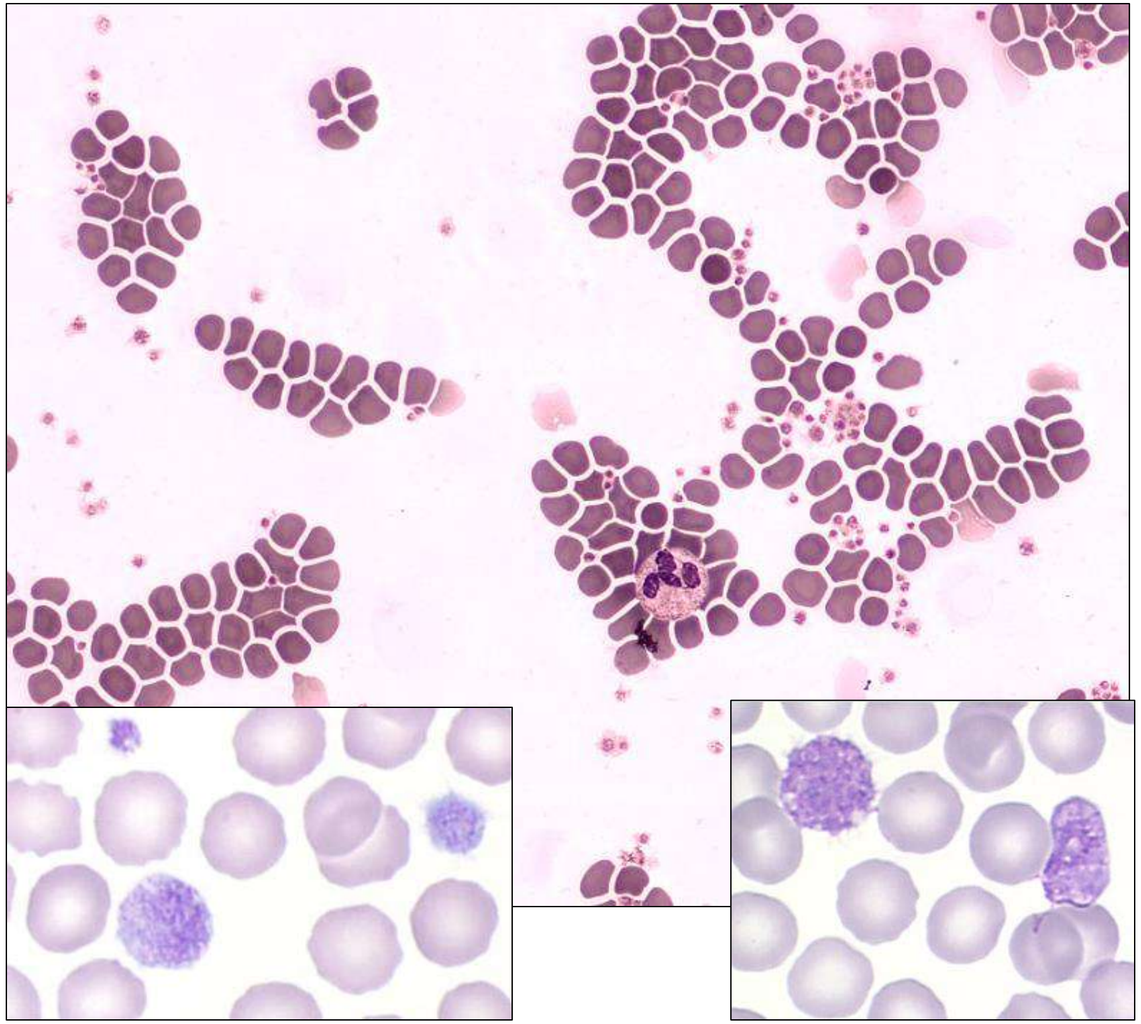

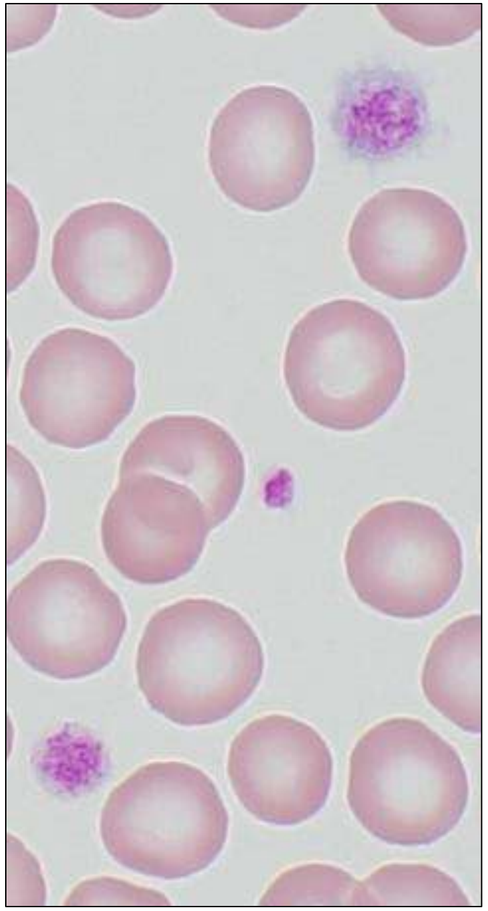

CITOMORFOLOGIA PATOLÓGICA DO SANGUE PERIFÉRICO

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ICSH recommendations for the standardization of nomenclature and grading of peripheral blood cell morphological features

L. PALMER*, C. BRIGGS†, S. MCFADDEN‡, G. ZINI§, J. BURTHEM¶, G. ROZENBERG**, M. PROYTCHEVA††, S. J. MACHIN†

 Int. Jnl. Lab. Hem. 2015, **37**, 287–303

ESTUDO MORFOLÓGICO DO SP

Table 1. Morphology Grading Table

	Grading System		
Cell Name	Few/1+	Mod/2+, %	Many/3+, %
RBC			
Anisocytosis	N/A	11–20	>20
Macrocytes	N/A	11–20	>20
Oval macrocytes	N/A	2–5	>5
Microcytes	N/A	11–20	>20
Hypochromic cells	N/A	11–20	>20
Polychromasia	N/A	5–20	>20
Acanthocytes	N/A	5–20	>20
Bite cells	N/A	1–2	>2
Blister cells	N/A	1–2	>2
Echinocytes	N/A	5–20	>20
Elliptocytes	N/A	5–20	>20
Irregularly contracted cells	N/A	1–2	>2
Ovalocytes	N/A	5–20	>20
Schistocytes	<1%	1–2	>2
Sickle cells	N/A	1–2	>2
Spherocytes	N/A	5–20	>20
Stomatocytes	N/A	5–20	>20
Target cells	N/A	5–20	>20
Teardrop cells	N/A	5–20	>20
Basophilic stippling	N/A	5–20	>20
Howell-Jolly bodies	N/A	2–3	>3
Pappenheimer bodies	N/A	2–3	>3

Table 1. Morphology Grading Table

	Grading System		
Cell Name	Few/1+	Mod/2+, %	Many/3+, %
WBC			
Döhle bodies	N/A	2–4	>4
Vacuolation (neutrophil)	N/A	4–8	>8
Hypogranulation (neutrophil)	N/A	4–8	>8
Hypergranulation (neutrophil)	N/A	4–8	>8
Platelets			
Giant Platelets	N/A	11–20	>20

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ISLH
Official Publication

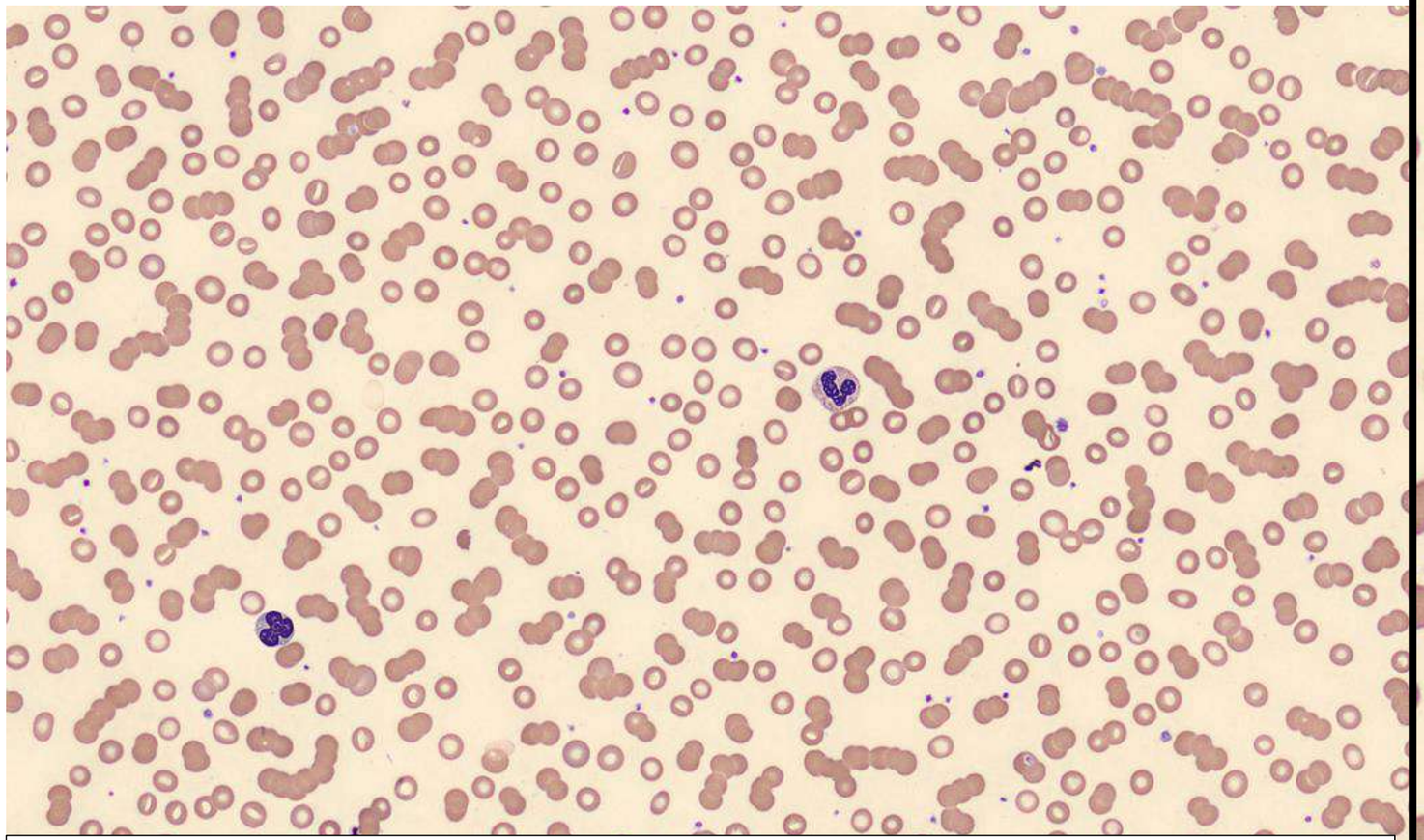
The International Consensus Group for Hematology Review: Suggested Criteria for Action Following Automated CBC and WBC Differential Analysis

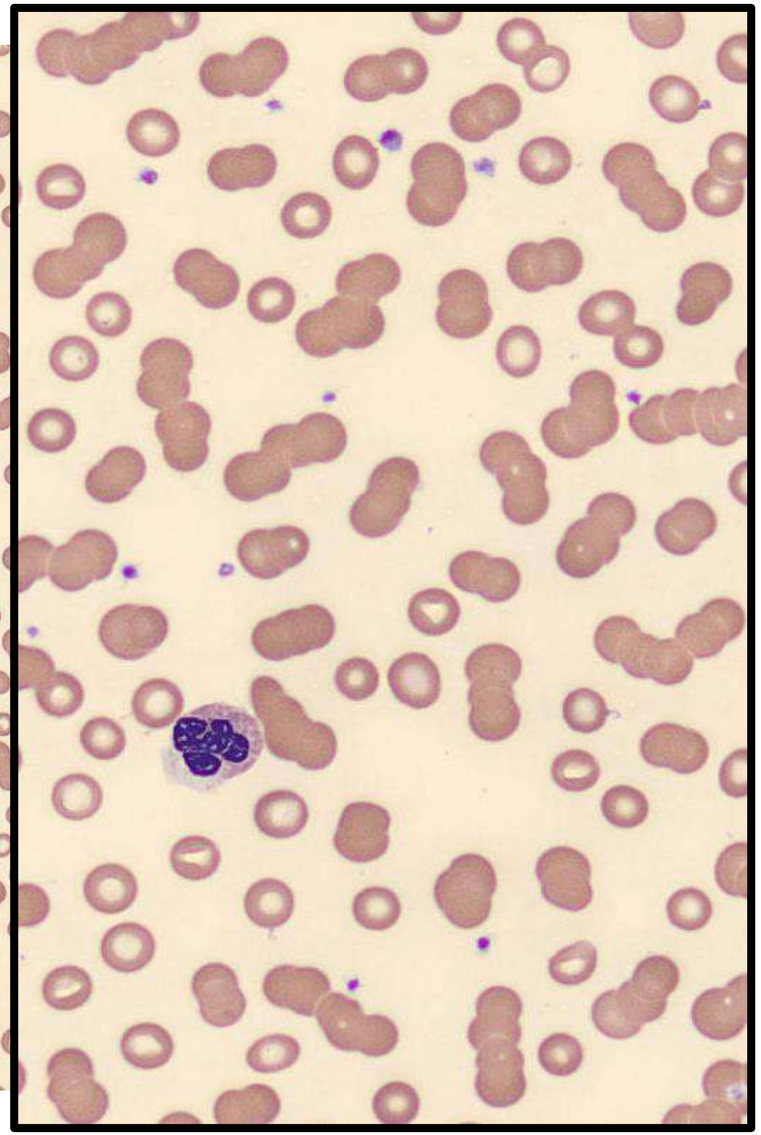
P. W. Barnes,[1] S. L. McFadden,[2] S. J. Machin,[3] E. Simson[4]

TABLE 1. Criteria for a Positive Smear

1. Morphology
   a. RBC morphology at either 2+/moderate or greater. The only exception is malaria, where any finding will be considered a positive finding.
   b. PLT morphology (giant platelets) at either 2+/moderate or greater.
   c. Platelet clumps at > rare/occasional.
   d. Dohle bodies at either 2+/moderate or greater.
   e. Toxic granulation at either 2+/moderate or greater.
   f. Vacuoles at either 2+/moderate or greater.
2. Abnormal cell types
   a. Blast ≥1
   b. Meta >2
   c. Myelo/promyelocyte ≥1
   d. Atypical lymphs >5
   e. NRBC ≥1
   f. Plasma cells ≥1

“Rouleaux” eritrocitários

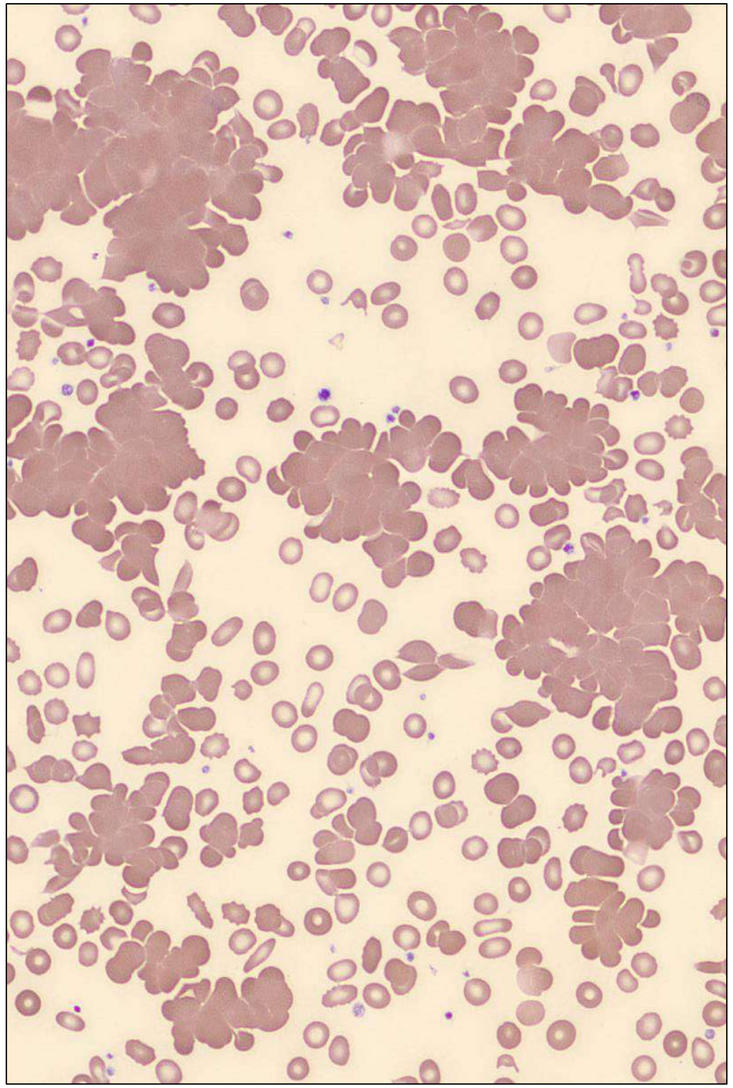


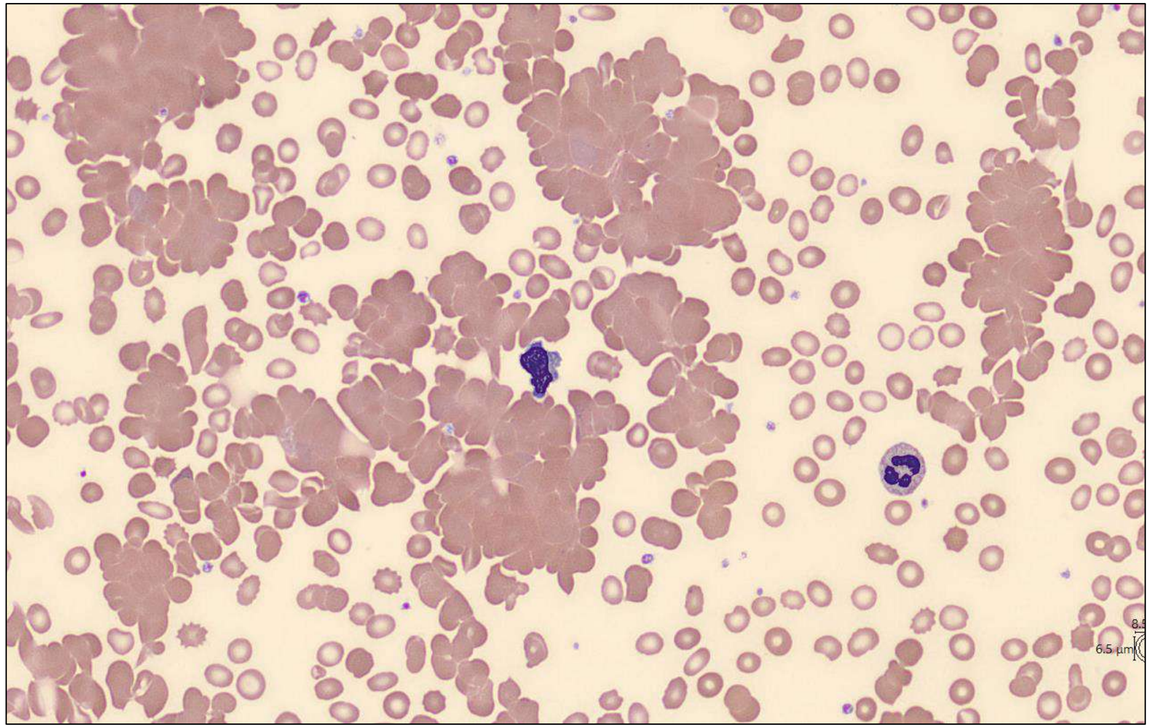


- **Hierfibrinogenémia ou hipergamaglobulinémia policlonal** associada a doenças inflamatórias e infecciosas
- **Gamapatias monoclonais** (MGUS, MM, linfoma linfoplasmocítico/MW e outras neoplasias linfóides de células B maduras)

Aglutinação eritrocitária

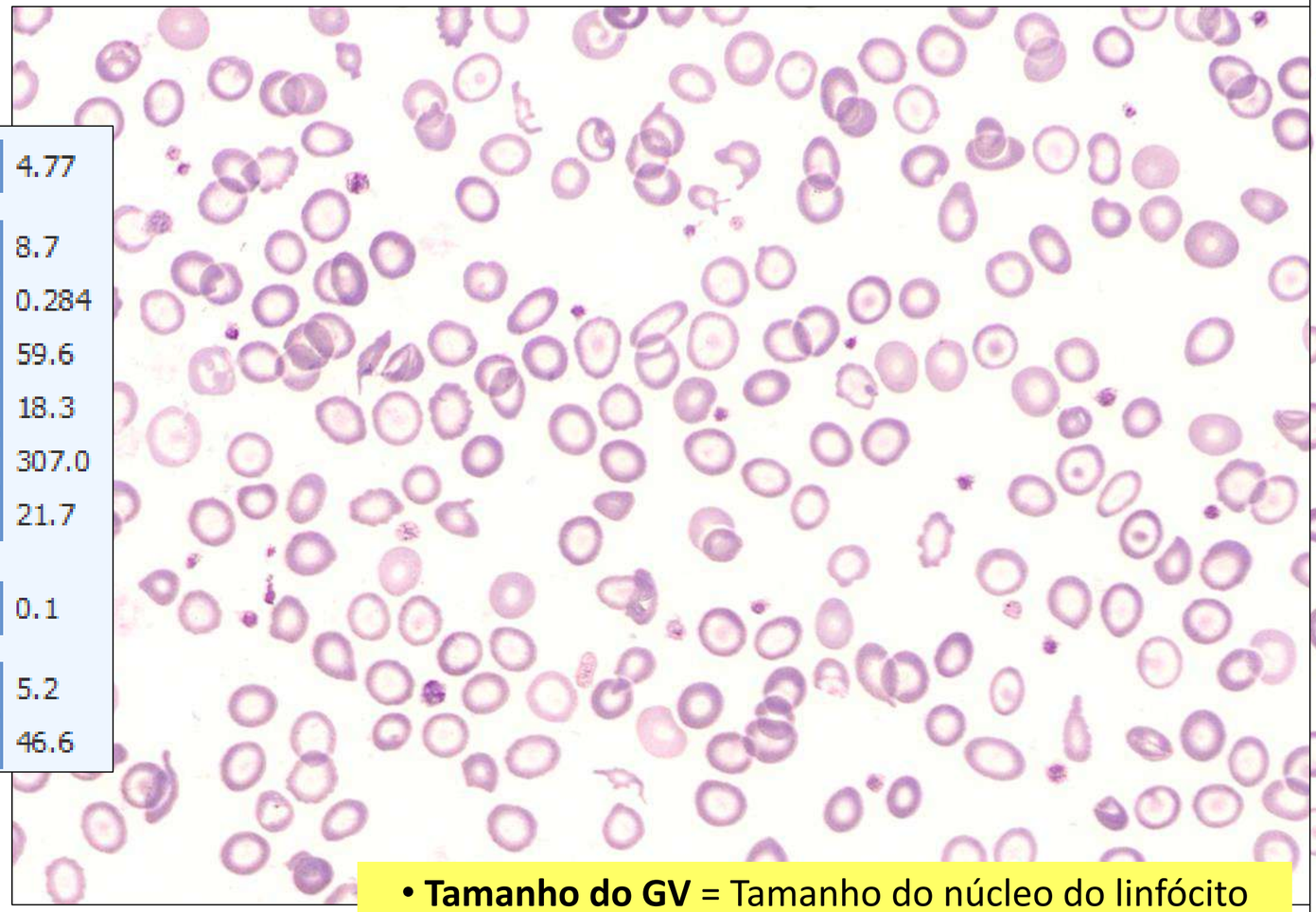
- Aglutininas frias

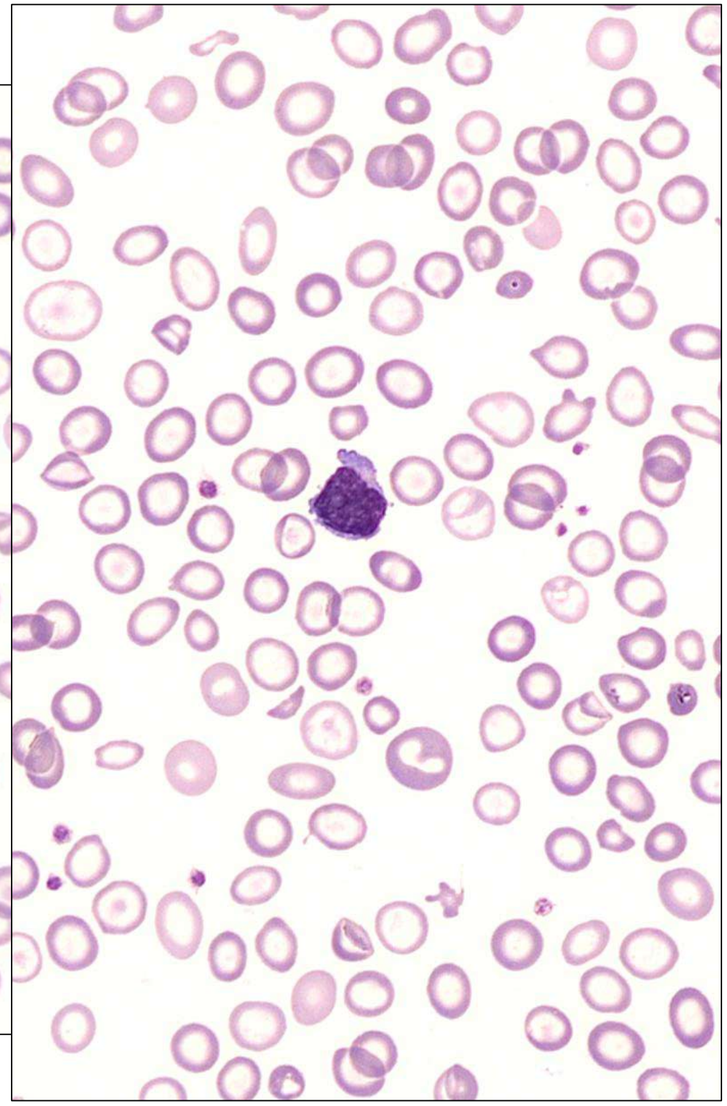




Anemia microcítica e hipocrómica

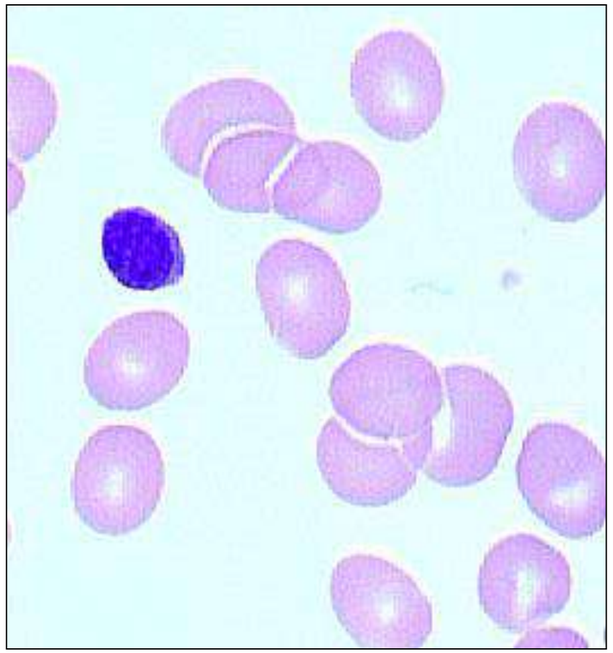
ERIT	4.38	4.77
Hgb	5.2 !	8.7
Hct	0.208	0.284
VCM	47.4	59.6
HCM	11.9	18.3
CHCM	252.0	307.0
RDW	23.1	21.7
NRBC	0.2	0.1
MAF	2.5	5.2
LHD	100.0	46.6

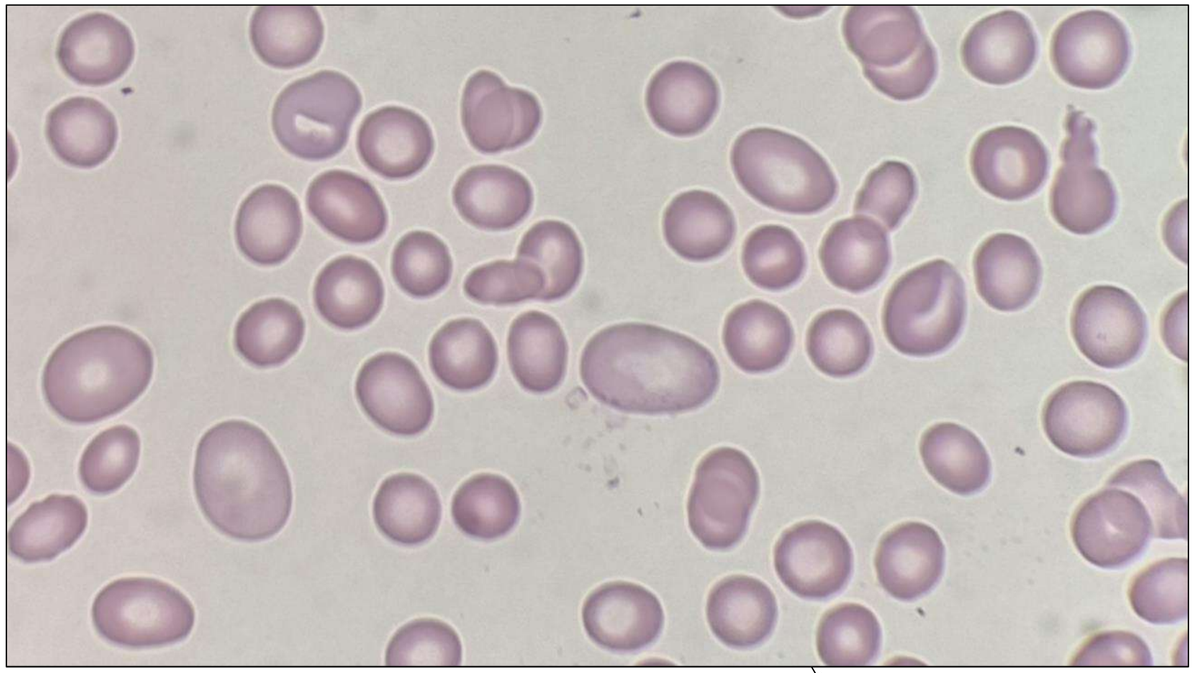


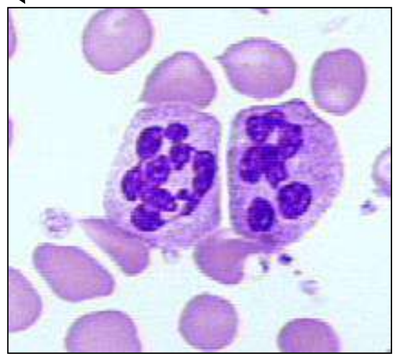


- **Tamanho do GV** = Tamanho do núcleo do linfócito
- **Palidez central do GV** = 1/3 do diâmetro do GV

Macrovalócitos



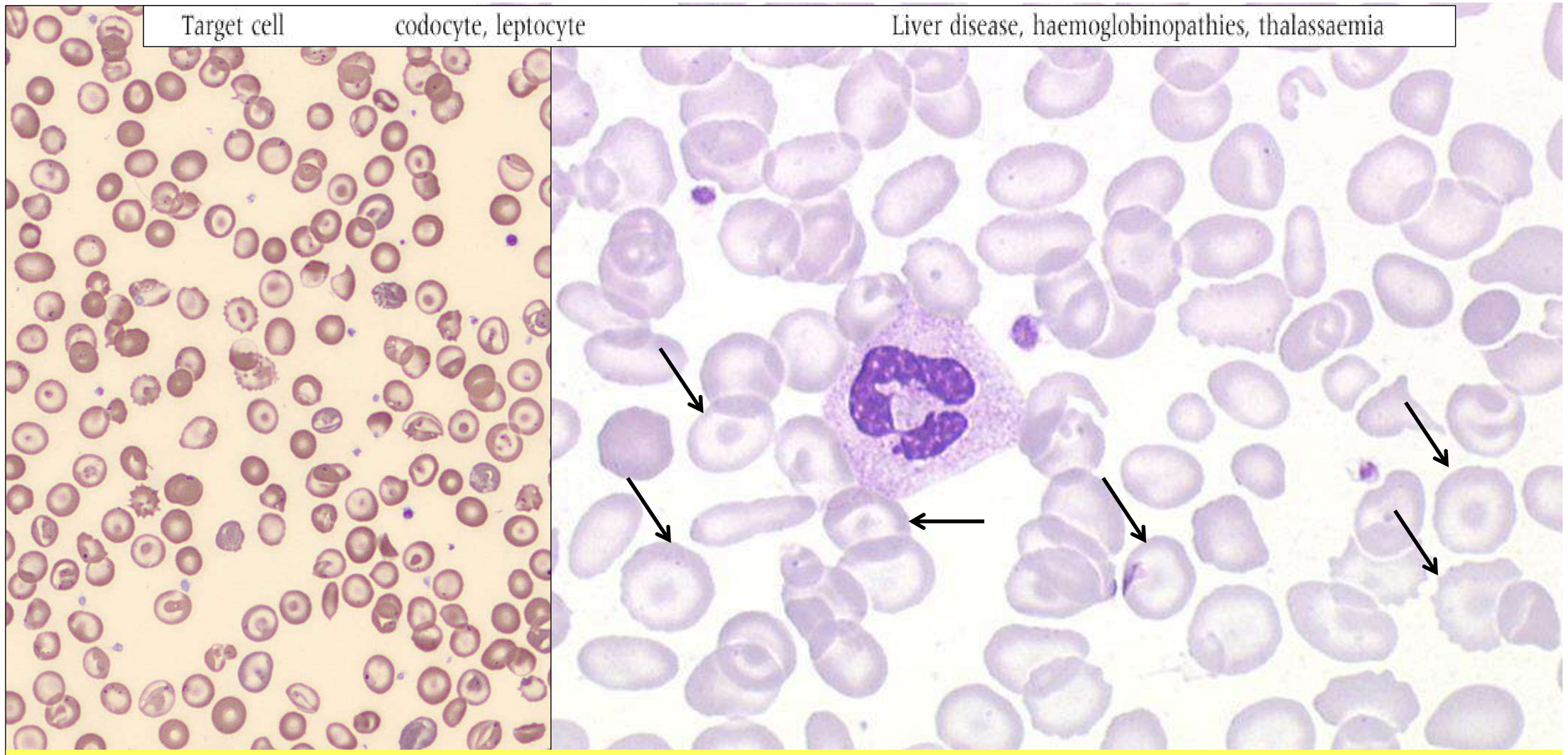




- **Macrócitos ovais** (**macrovalócitos) -** anemias megaloblásticas por deficiência de folatos / vitamina B12
- **Macrócitos redondos** – reticulocitose, doença hepática e hipotiroidismo

Células em alvo

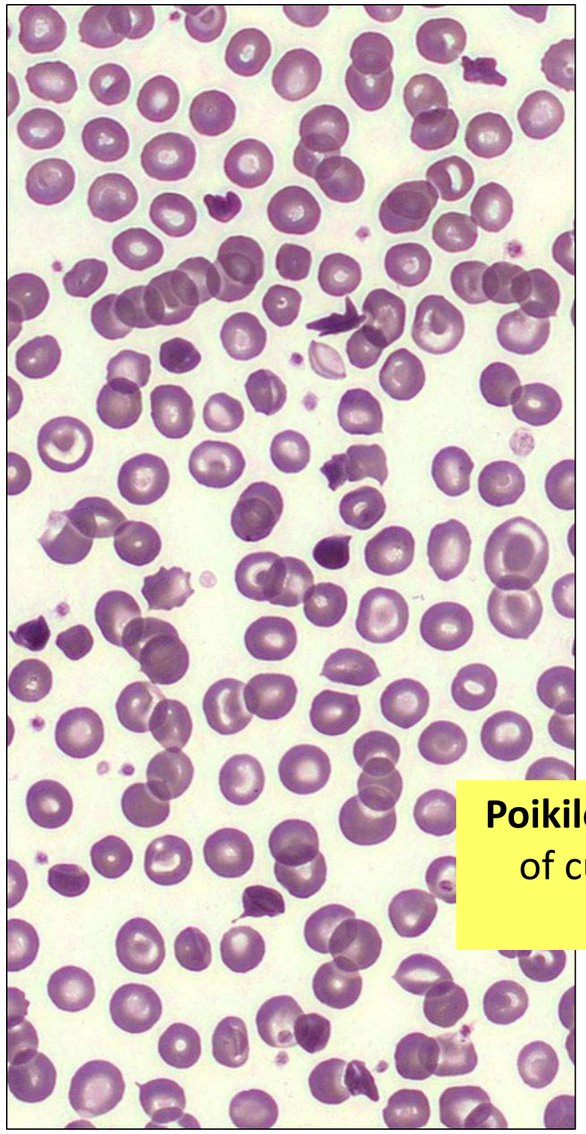
Target cell	codocyte, leptocyte	Liver disease, haemoglobinopathies, thalassaemia

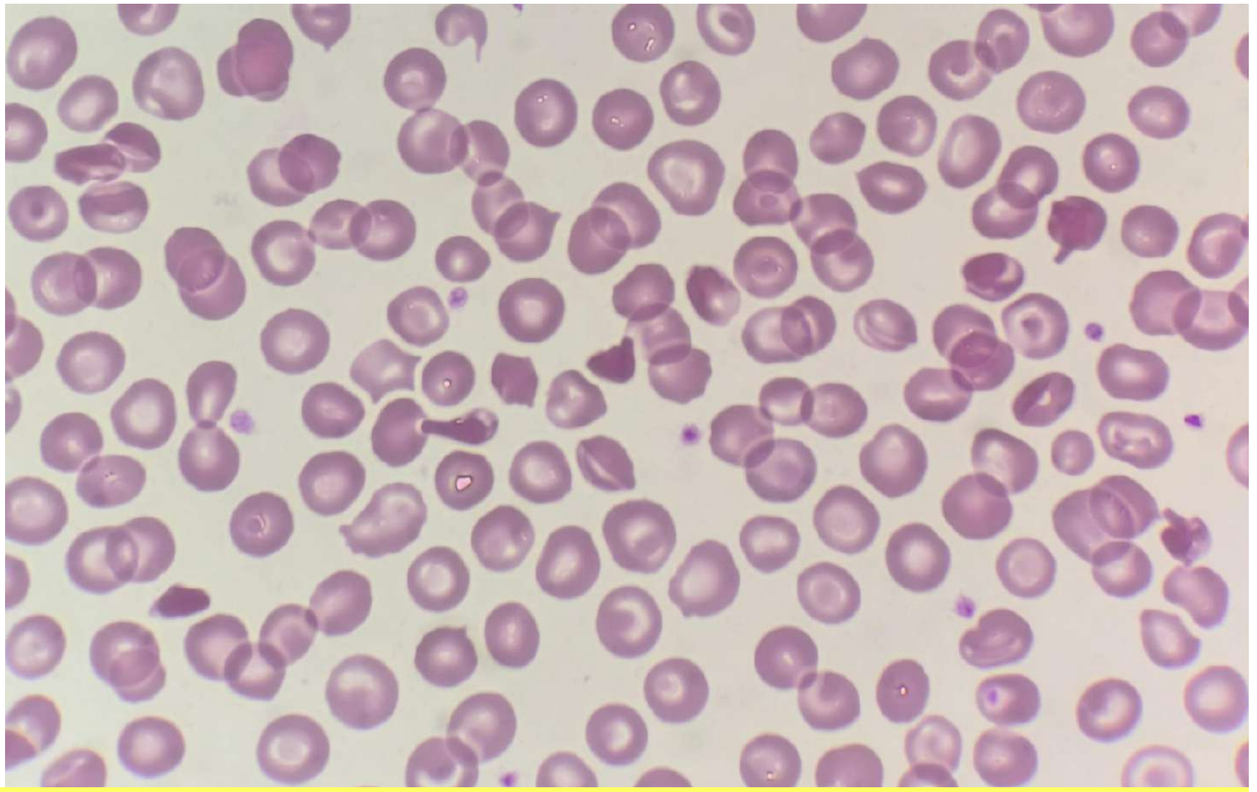


Target cells are thin cells with an increased surface area to volume ratio that have an area of increased staining which appears in the middle of the area of central pallor.

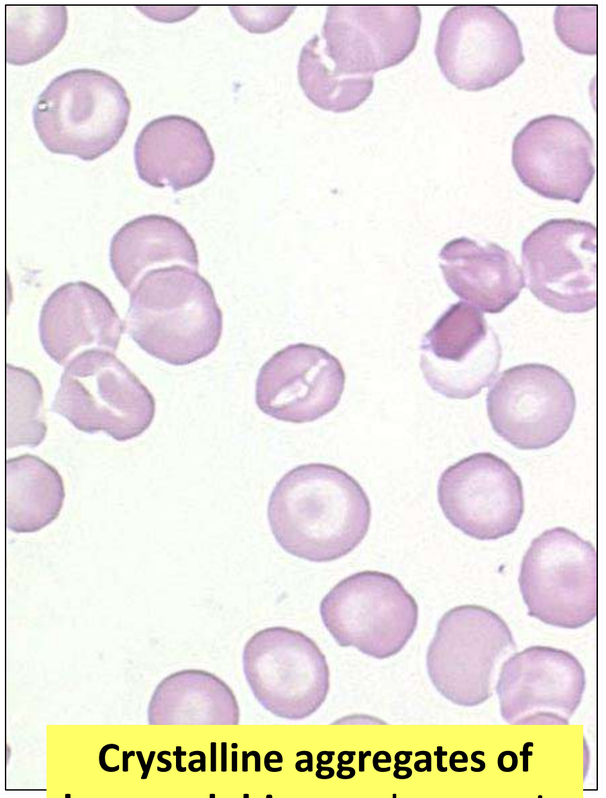
Células em alvo, poiquilócitos SC e cristal de Hb C

Target cell	codocyte, leptocyte	Liver disease, haemoglobinopathies, thalassaemia



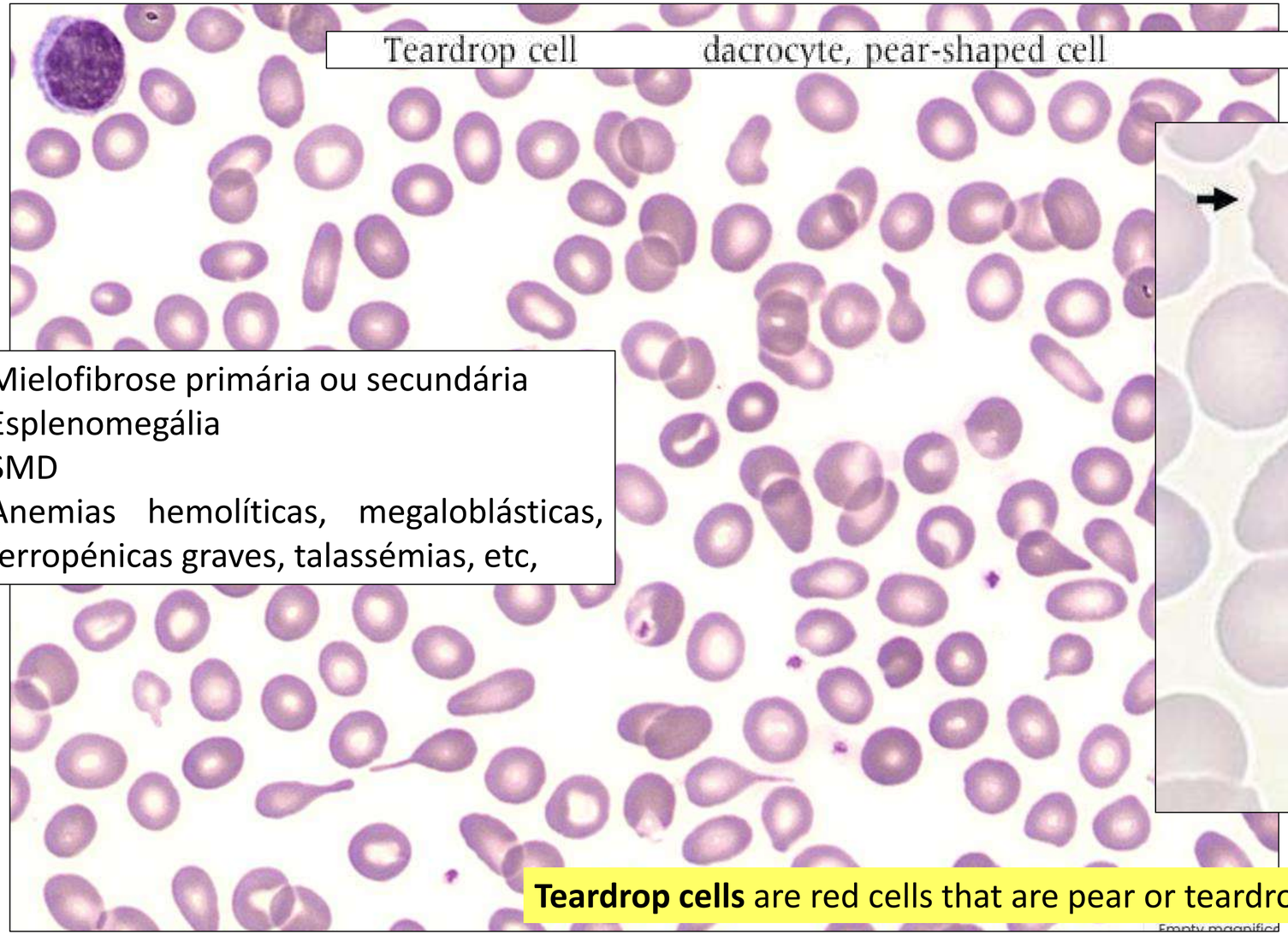


Poikilocytes SC resemble sickle cells in being dense and having some degree of curvature, but they differ in that they have some straight edges or are angulated or branched.

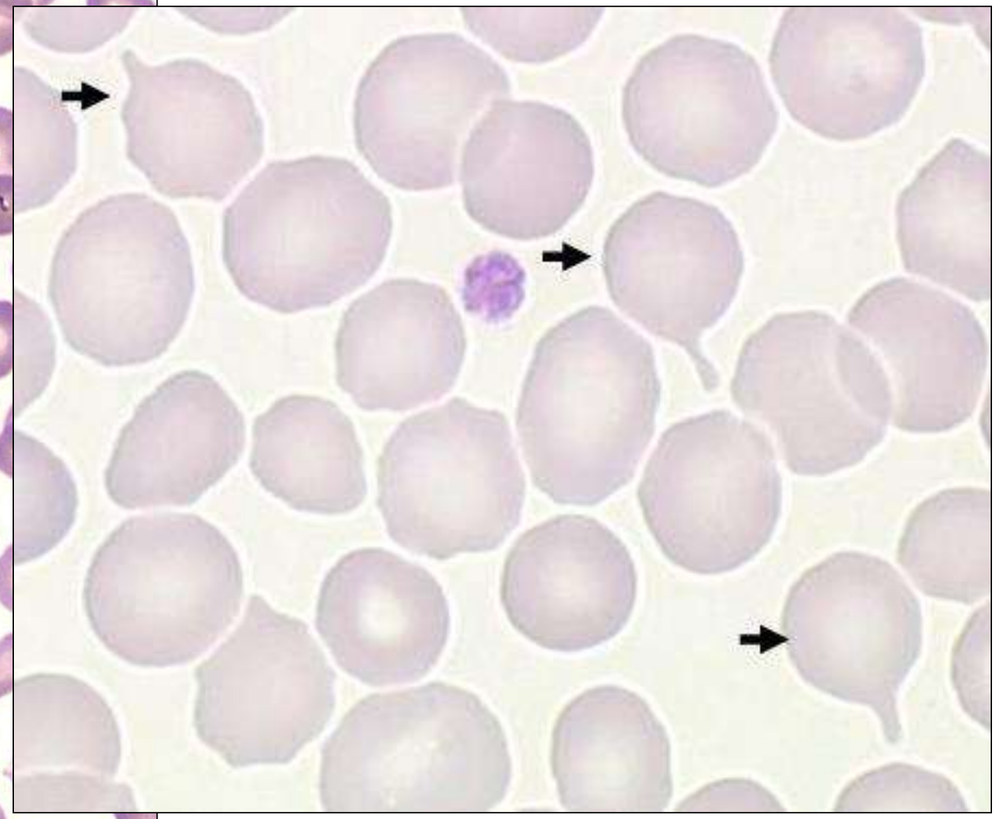


Crystalline aggregates of haemoglobin may be seen in HbC and HbSC disease. These **crystals** stain densely, vary in size and have straight edges with pointed ends.

Células em gota



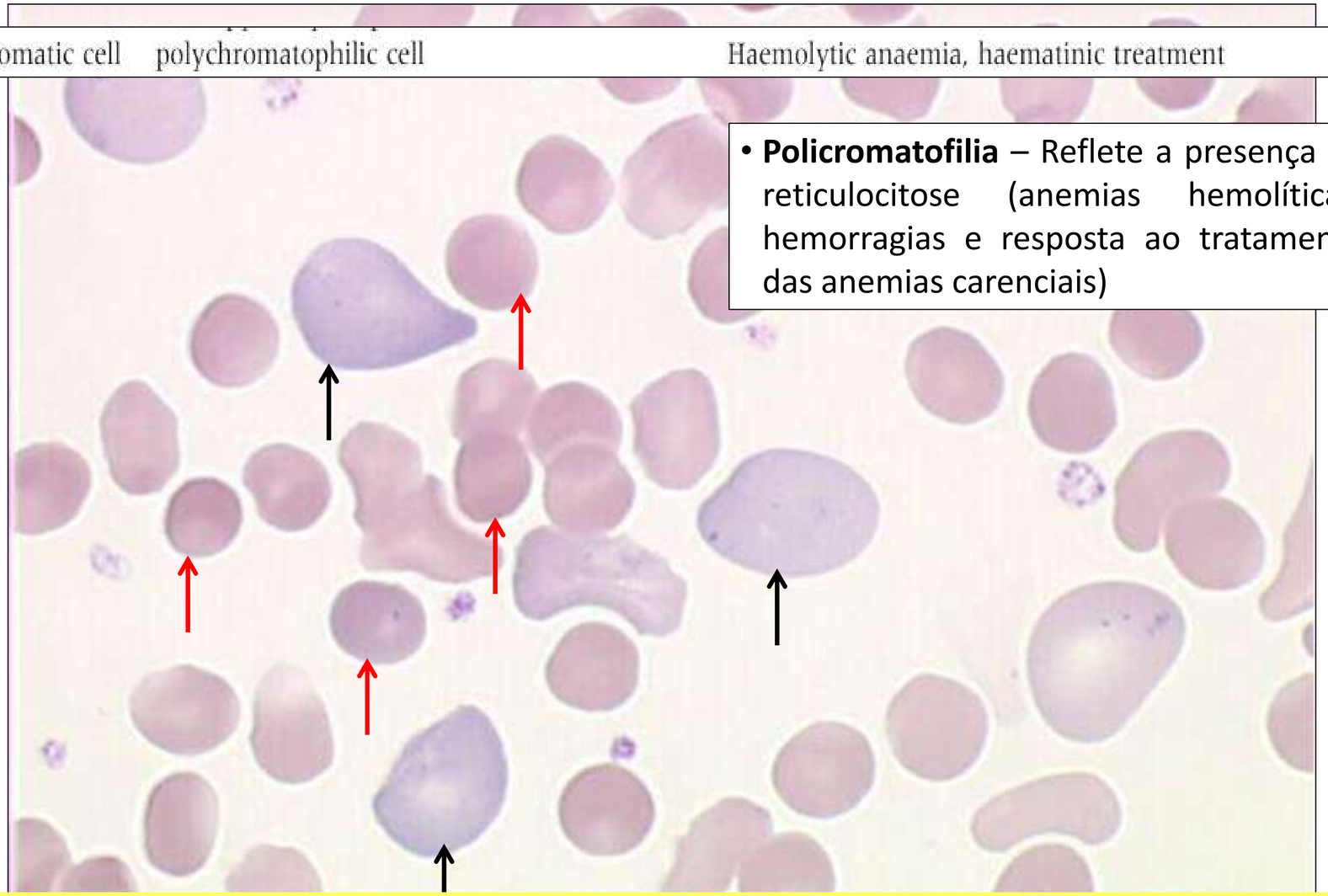
- Mielofibrose primária ou secundária
- Esplenomegália
- SMD
- Anemias hemolíticas, megaloblásticas, ferropénicas graves, talassémias, etc,



Teardrop cells are red cells that are pear or teardrop in shape.

Esferócitos e policromatofilia

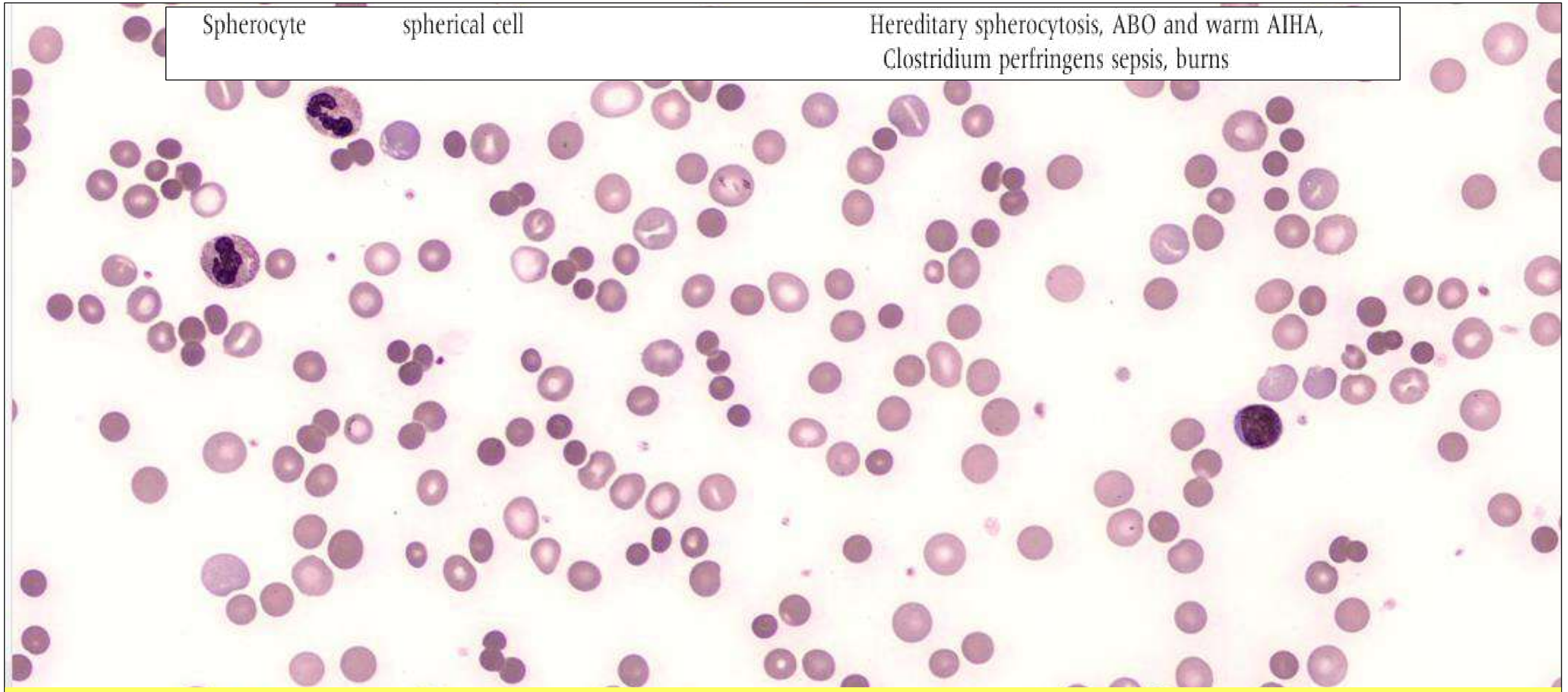
Polychromatic cell polychromatophilic cell Haemolytic anaemia, haematinic treatment



- **Policromatofilia** – Reflete a presença de reticulocitose (anemias hemolíticas, hemorragias e resposta ao tratamento das anemias carenciais)

Polychromasia refers to immature red cells that are pinkish blue-grey in appearance due to residual ribosomal RNA. They are larger in size than normal mature red cells. The recommendation is to grade polychromasia and perform a reticulocyte count if necessary.

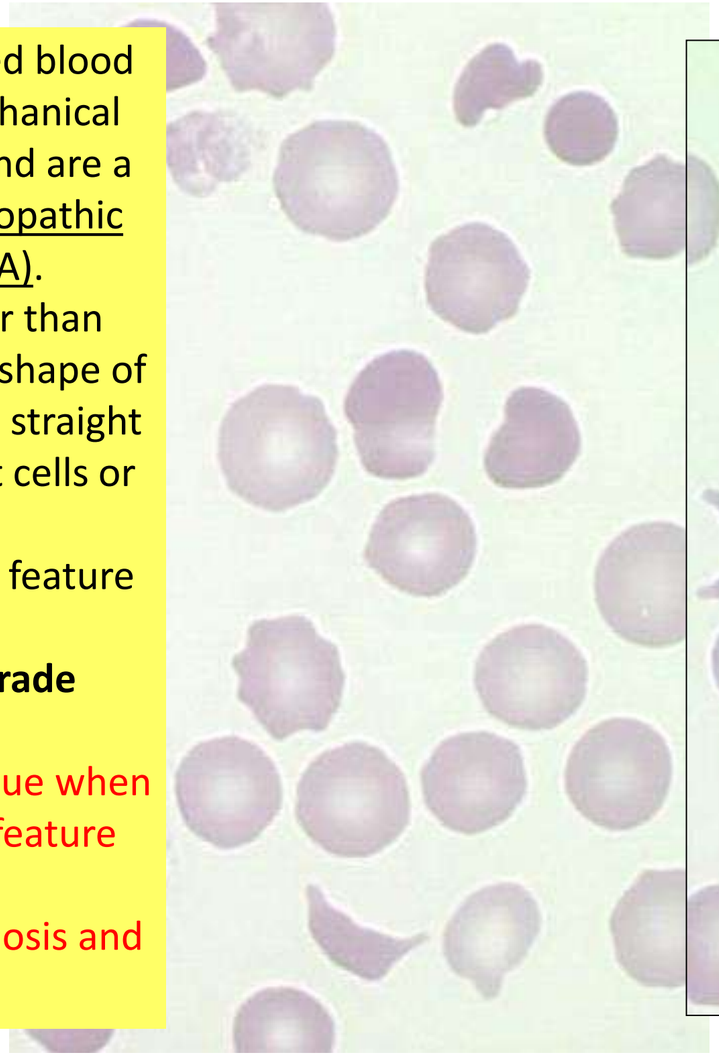
Esferócitos e policromatofilia

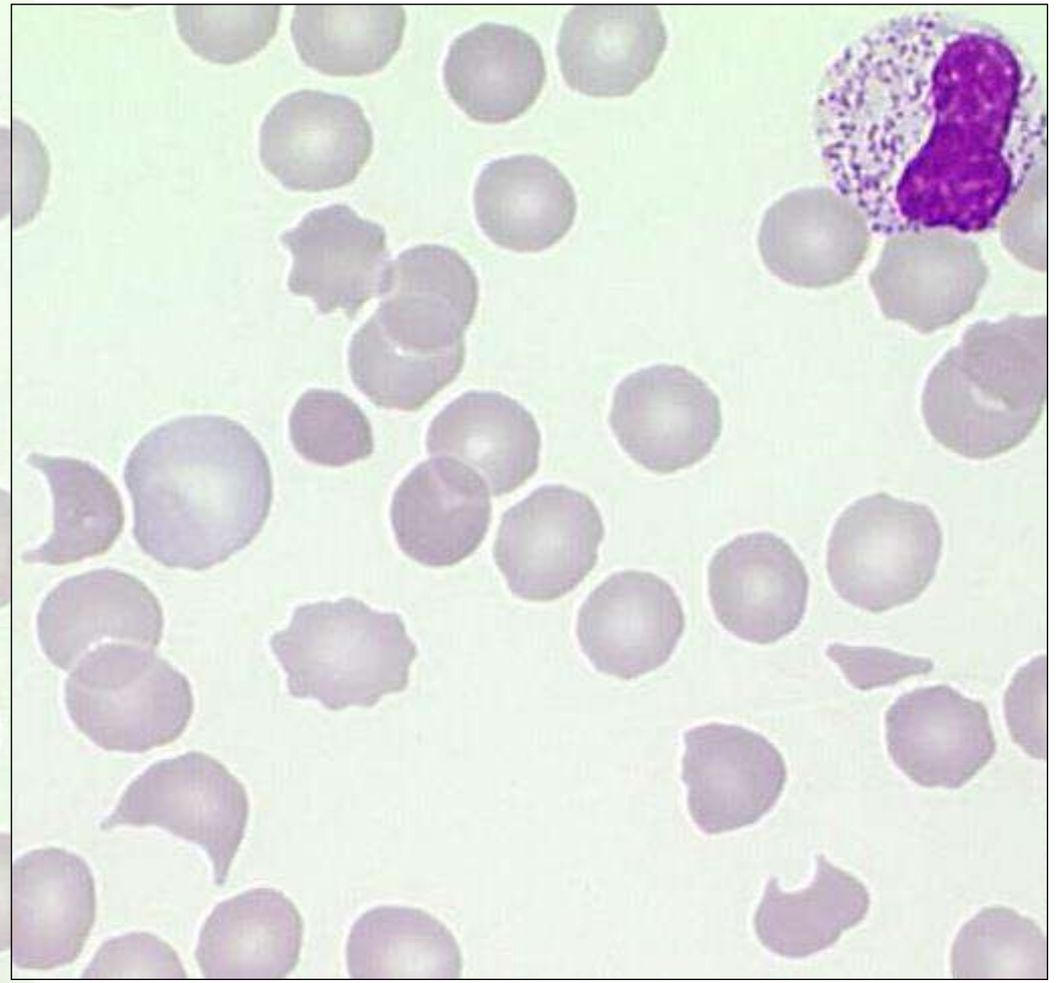


Spherocytes are of small diameter (< 6.5 µm) and are dense spheroidal RBC with a normal or decreased MCV and an absence of central pallor. They may be formed as a consequence of an abnormality of the RBC cytoskeleton and membrane, immune and microangiopathic haemolysis and direct damage to the red cell membrane.

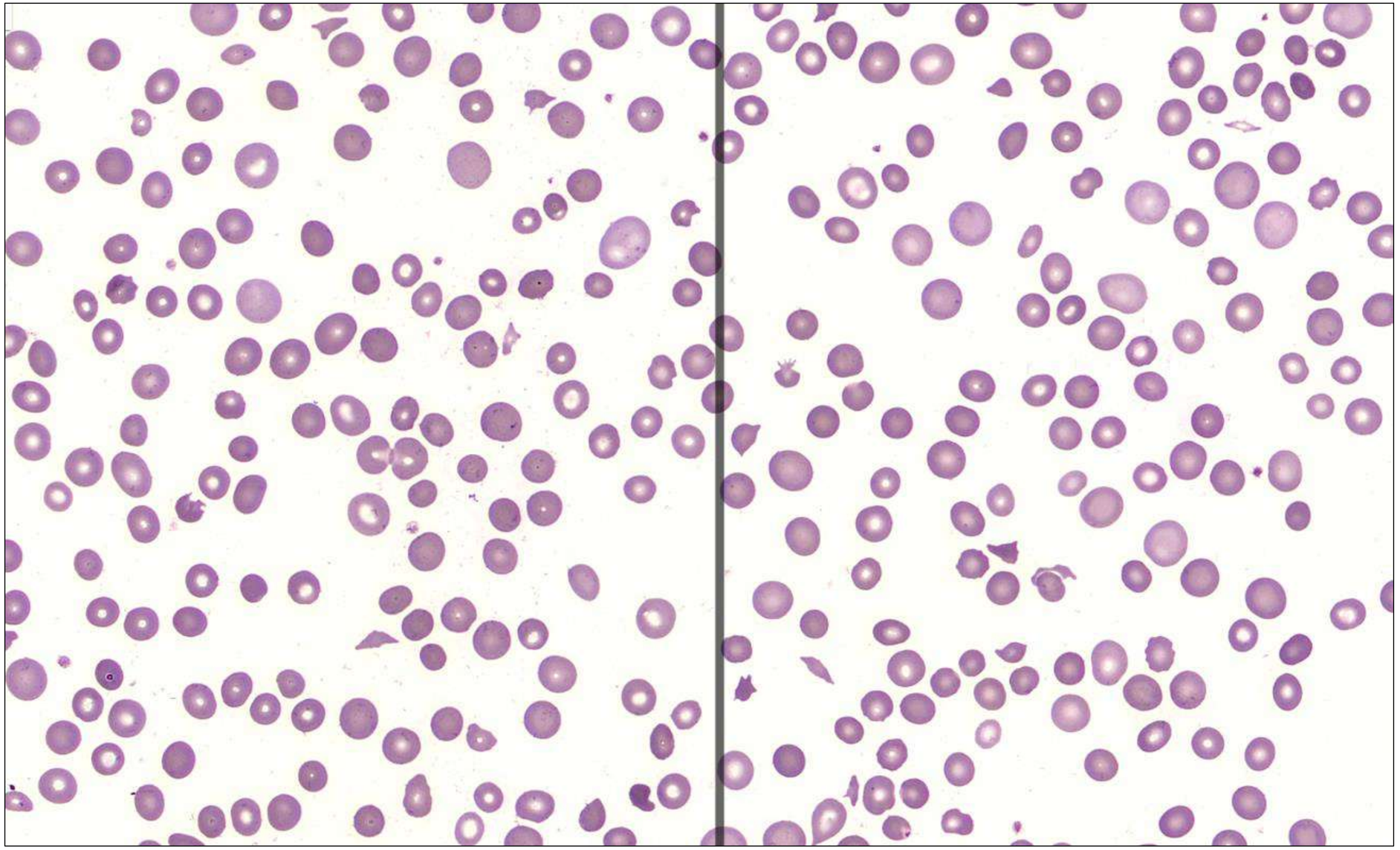
Esquizócitos

Schistocytes are fragments of red blood cells produced by extrinsic mechanical damage within the circulation and are a diagnostic feature of microangiopathic haemolytic anaemia (MAHA).
Schistocytes are always smaller than intact red cells and can have the shape of fragments with sharp angles and straight borders, small crescents, helmet cells or keratocytes.
Microspherocytes may also be a feature of MAHA.
The recommendation is to grade schistocytes.
A schistocyte count may be of value when schistocytes are the dominant feature (polychromasia, NRBC, thrombocytopenia) for the diagnosis and follow-up of MAHA.

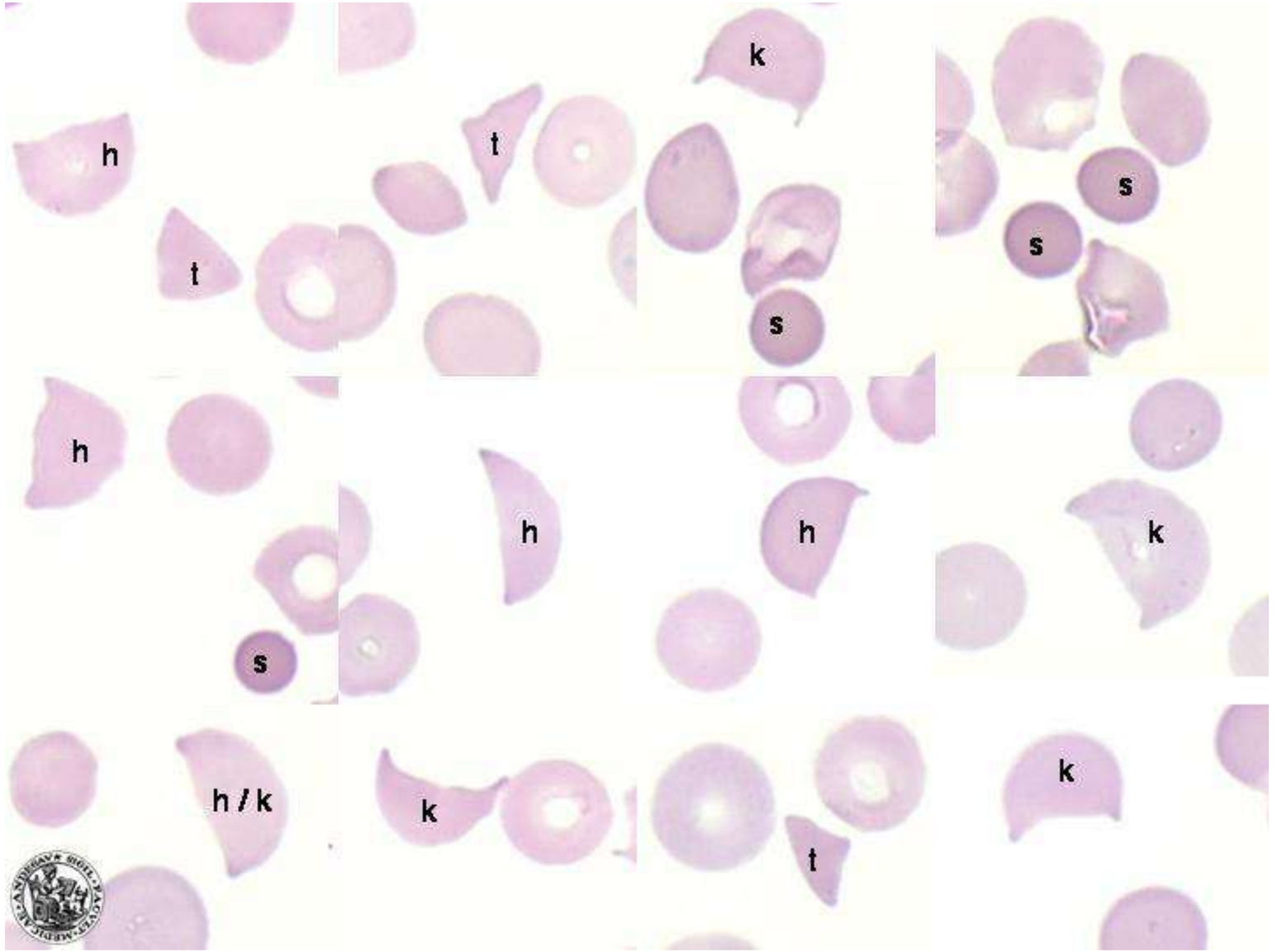




Esquizócitos



Esquizócitos

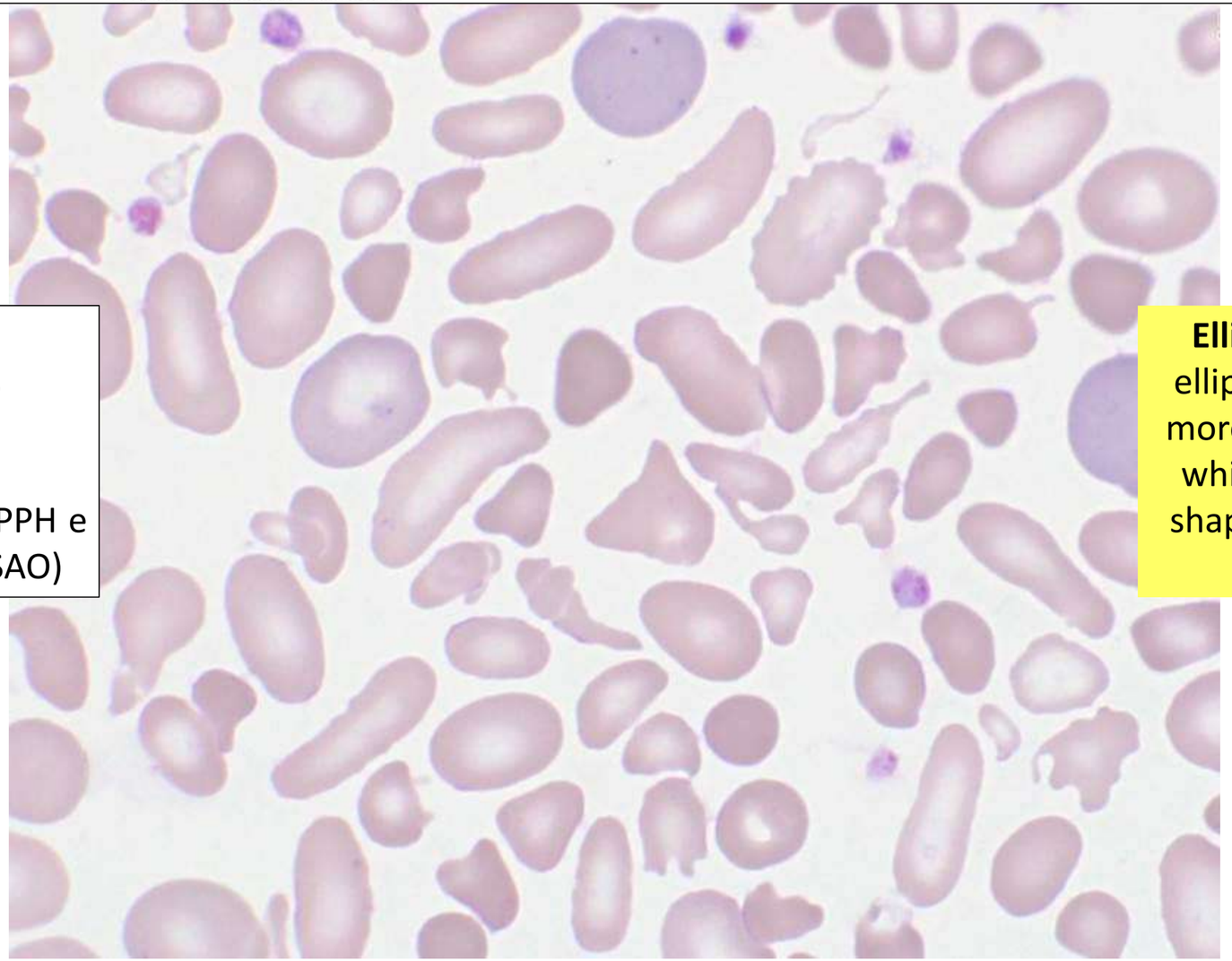


Esquizócitos

- ✓ **Excluir patologia urgente/emergente** (microangiopatias trombóticas – PTT, SHU, síndrome de HELLP, CIVD) – Anemia, **trombocitopénia**, **hemólise** (BNC, LDH e haptoglobina), reticulócitos ↑s, alterações neurológicas, função renal e/ou hepática alteradas, gravidez, testes da coagulação alterados (Ddímeros ↑s, fibrinogénio ↓, TP e aPTT)
- ✓ **Anemia hemolítica mecânica por disfunção de válvulas cardíacas?** História clínica e serviço/consulta de origem
- ✓ **Deficiência grave de vitamina B12?** – Anemia macrocítica/normocítica, reticulócitos ↓s, acentuada anisopoiquilocitose eritrocitária, ↓ vitamina B12

Eliptócitos, micropoiquilócitos e policromatofilia

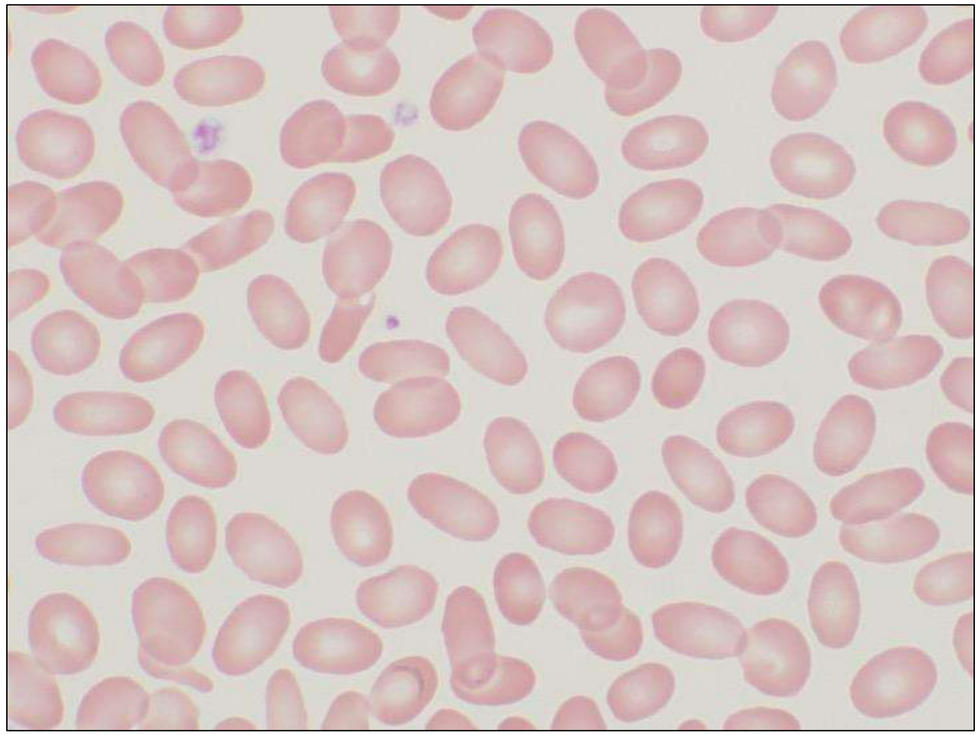
Elliptocyte	bacillary cell, cigar or rod shaped cell, ovalocyte, pencil cell	Hereditary elliptocytosis, iron deficiency

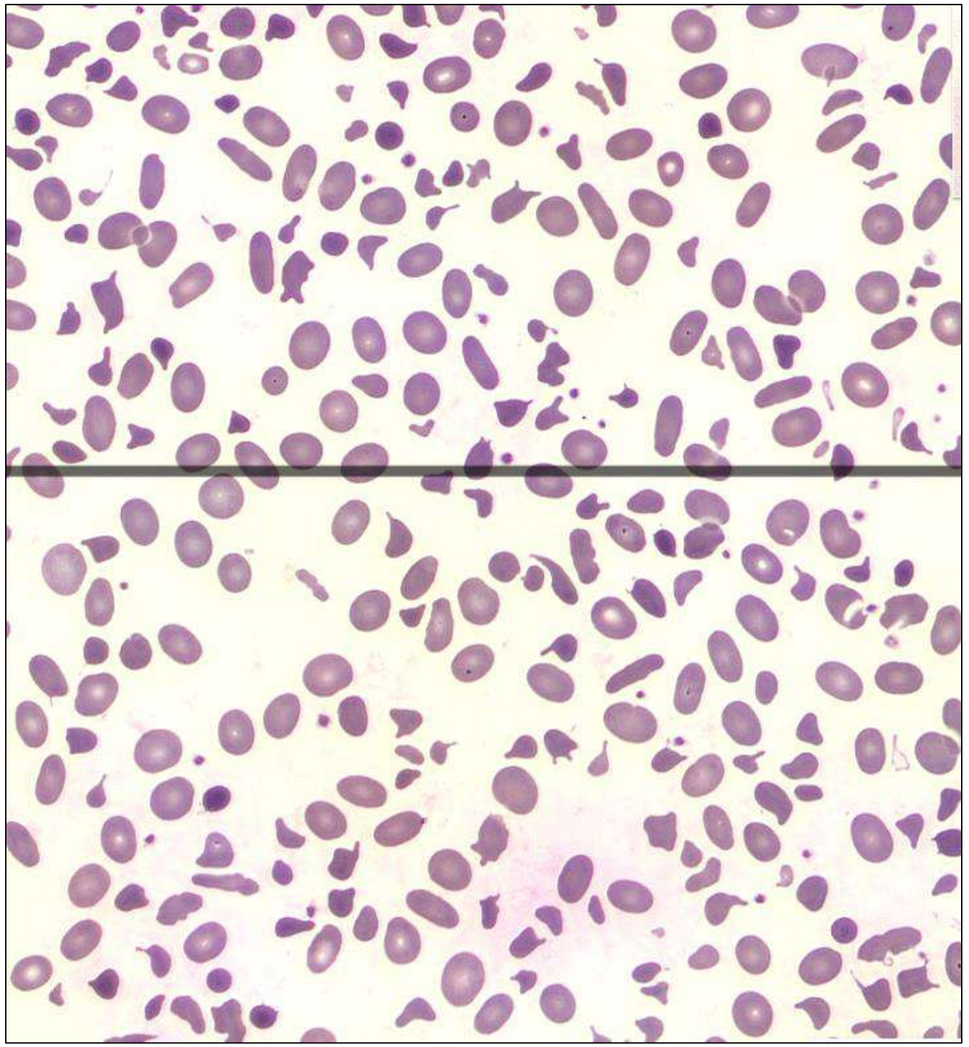


- Anemia ferropénica
- Anemias megaloblásticas
- SMD
- Mielofibrose
- Eliptocitose hereditária, PPH e ovalocitose hereditária (SAO)

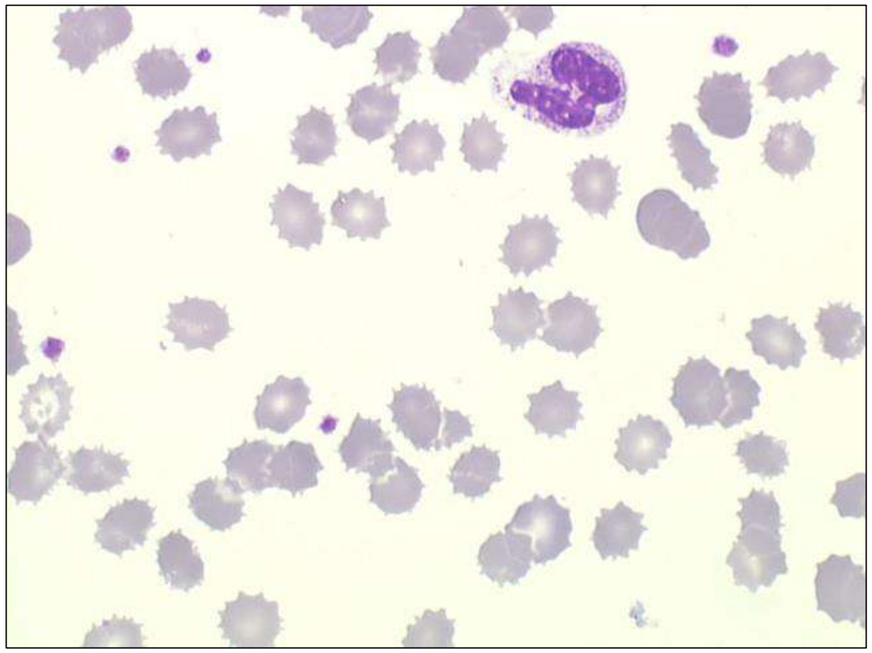
Elliptocytes are cells with an elliptical shape (the long axis is more than twice the short axis), while **ovalocytes** have an oval shape (the long axis is less than twice the short axis).

Eliptócitos, micropoiquilócitos e policromatofilia





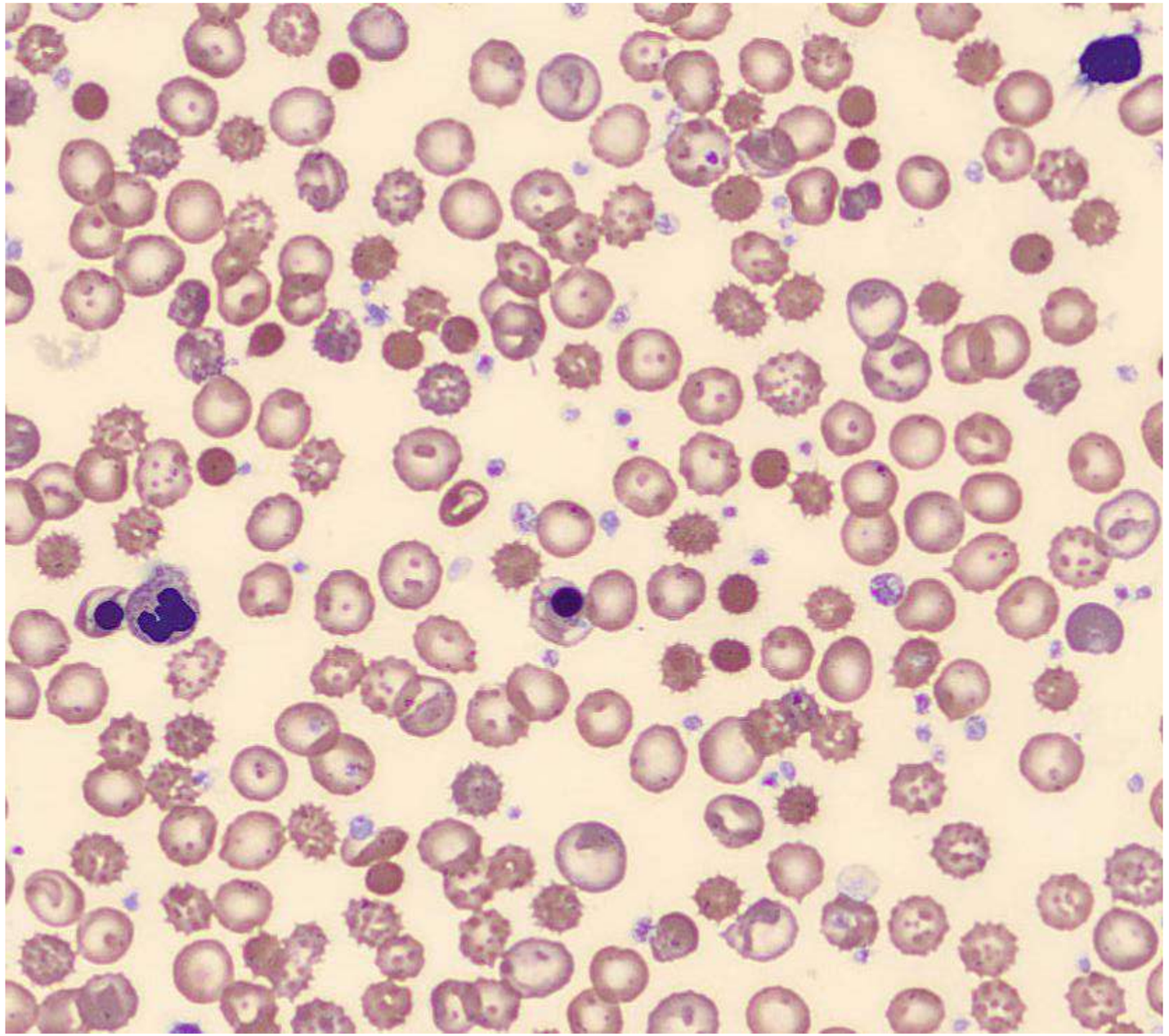
Equinócitos



Echinocytes are red cells that have lost their disc shape and are covered with 10-30 short blunt projections or spicules of fairly regular form.

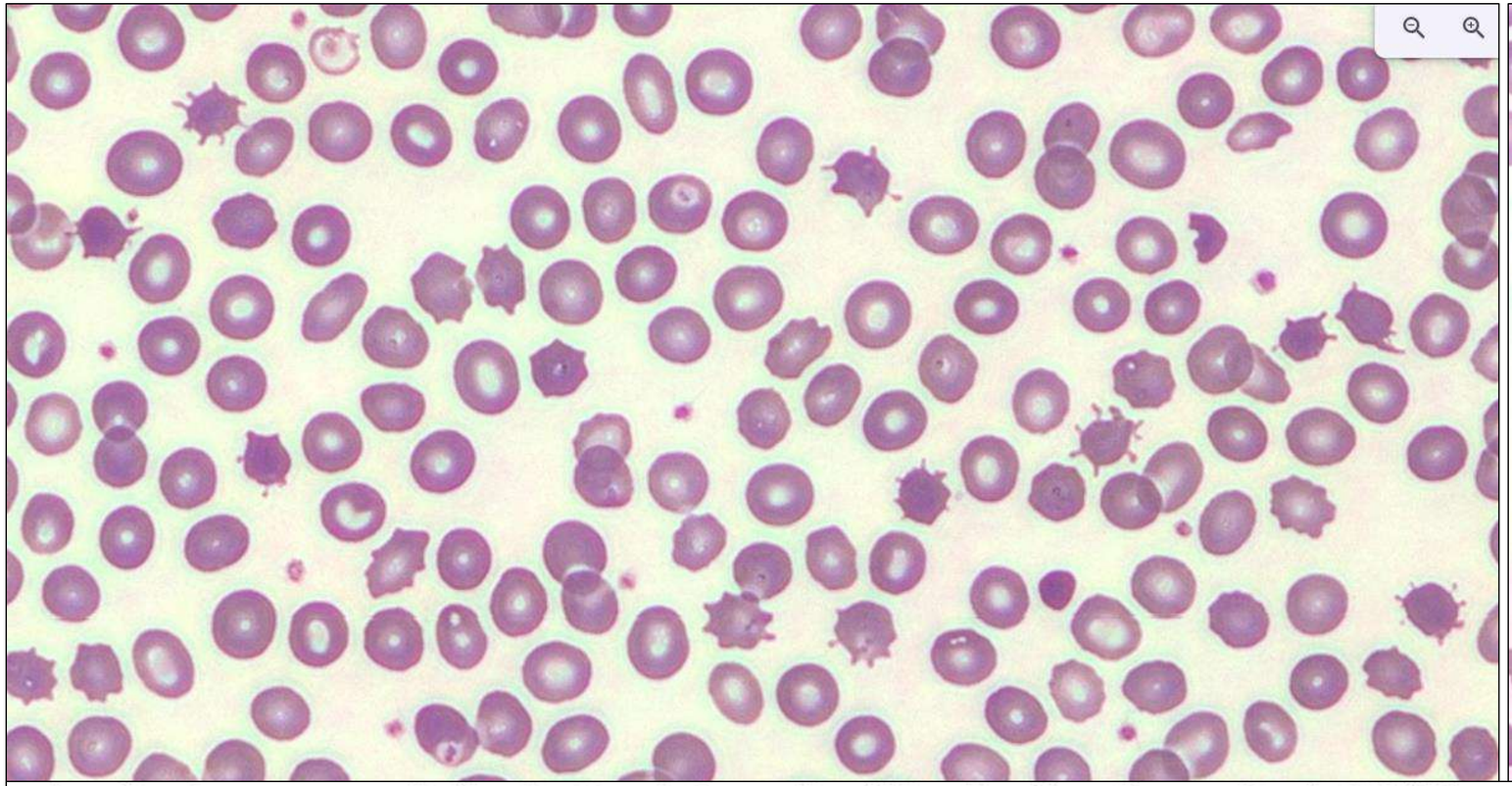
Echinocyte	berry cell, burr cell, crenated cell, mulberry cell, poikilocyte, pyknocyte, spiculated cell, spur cell, sputnik cell, star cell	Liver and renal disease, pyruvate kinase deficiency, storage artefact

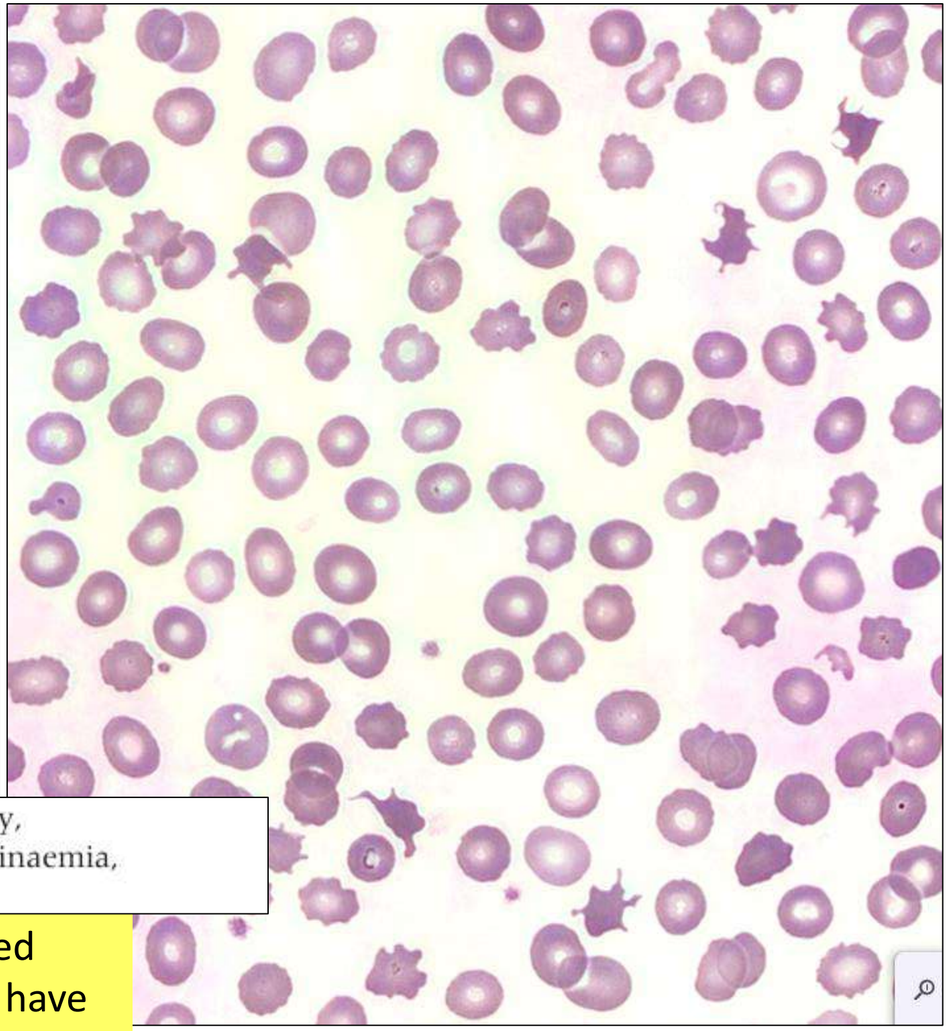
Défice de piruvato-quinase (doente esplenectomizado)



Muitos equinócitos, esfero-equinócitos, esferócitos, policromatofilia e eritroblastos

Acantócitos

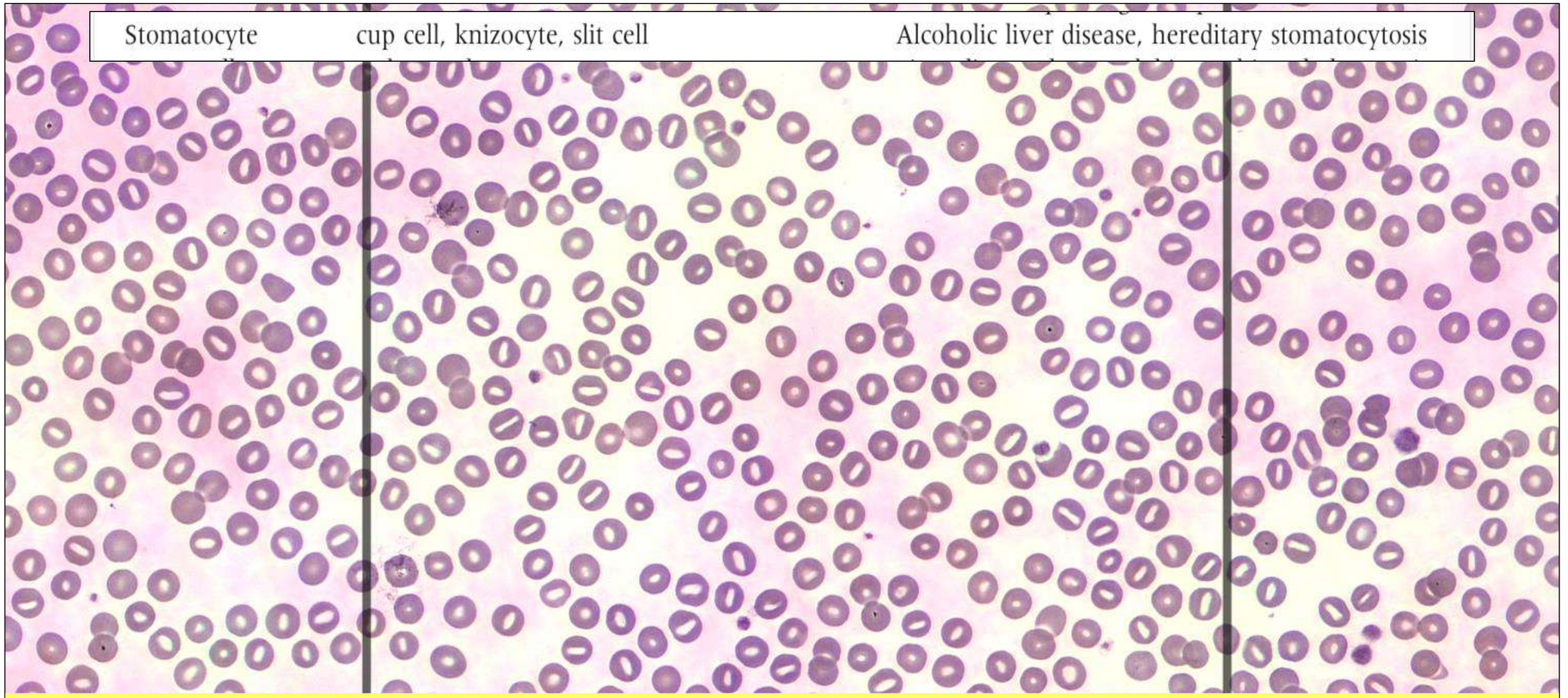




Acanthocyte	acanthoid cell, astrocyte, burr cell, prickle cell, pyknocyte, star cell, spur cell, thorn cell	Liver disease, vitamin E deficiency, postsplenectomy, abetalipoproteinaemia, McLeod RBC phenotype

Acanthocytes are round, hyperchromic red cells with 2-20 irregularly spaced projections or spicules of variable length, thickness and shape. Some spicules have club-shaped rather than pointed ends.

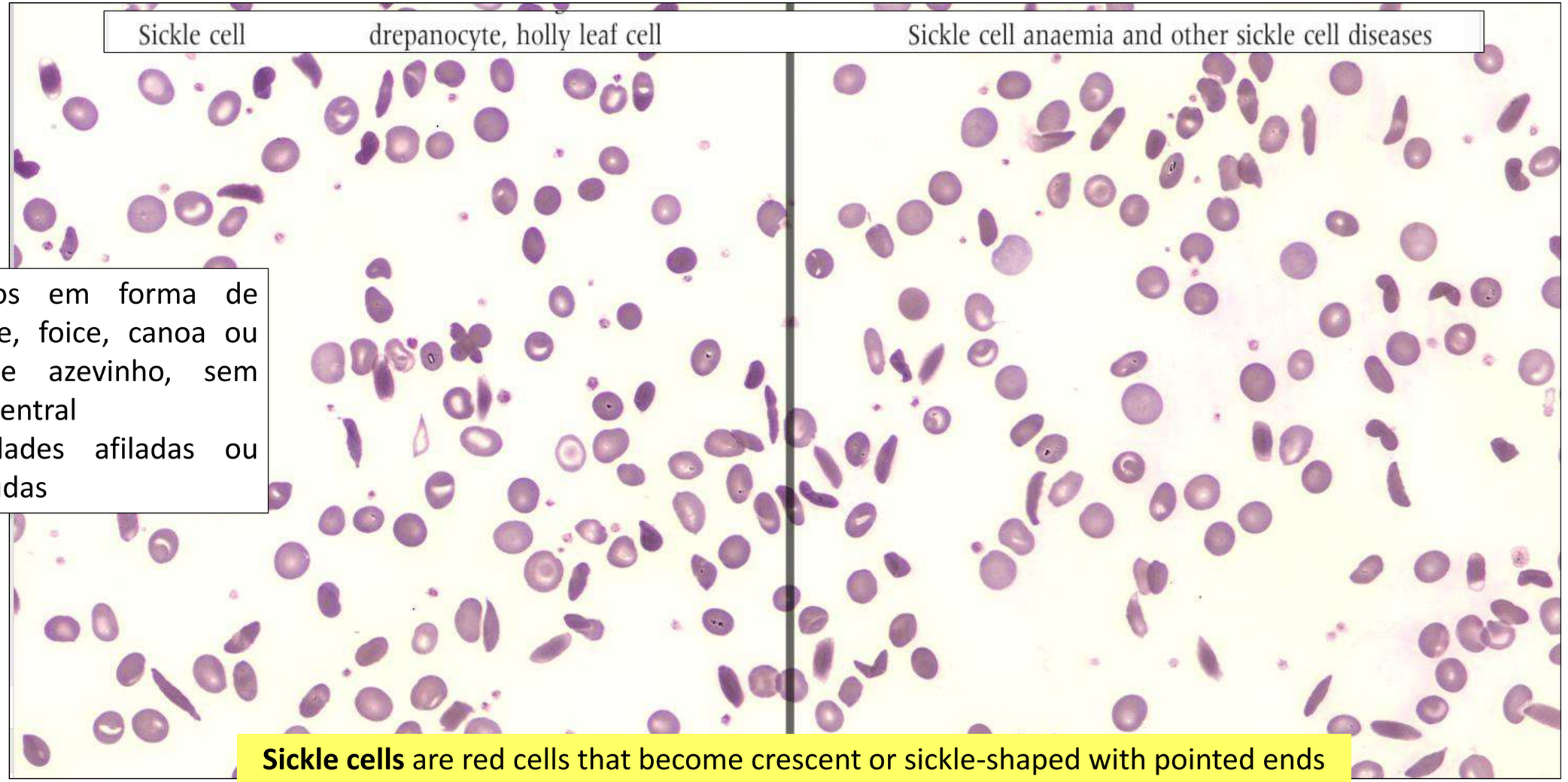
Estomatócitos



Stomatocytes are uniconcave cup-shaped red blood cells that appear on a stained blood film with a slit-like area of central pallor. In South East Asian ovalocytosis, the stomatocytes may have two stomas per cell which may be longitudinal, transverse, V or Y shaped.

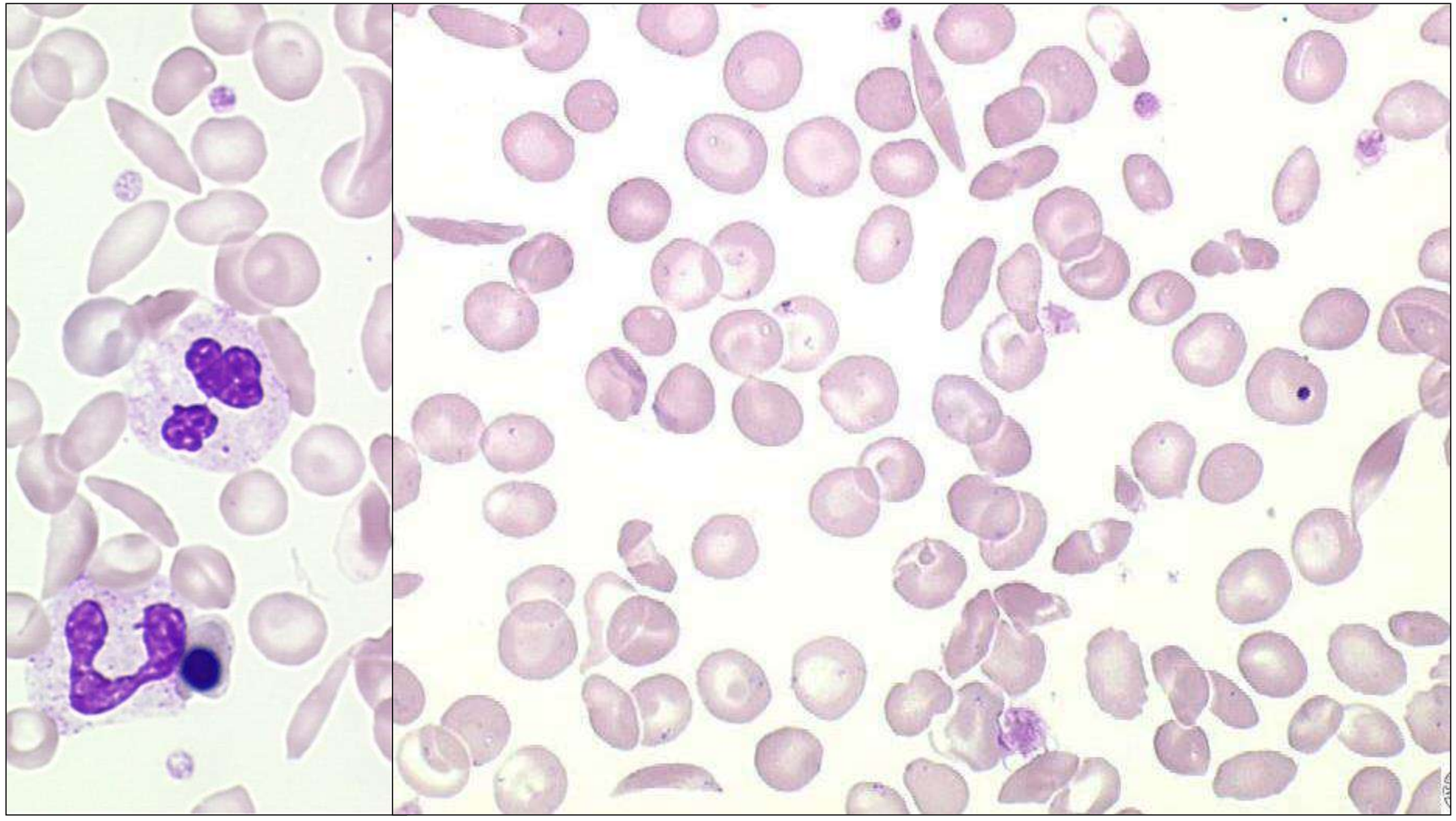
Drepanócitos / células falciformes

- Eritrócitos em forma de crescente, foice, canoa ou folha de azevinho, sem palidez central
- Extremidades afiladas ou pontiagudas



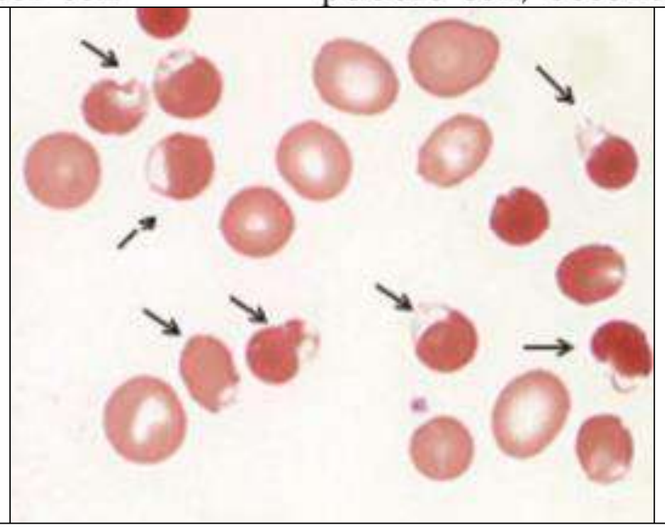
Sickle cells are red cells that become crescent or sickle-shaped with pointed ends as a result of polymerization of HbS.

Drepanócitos / células falciformes



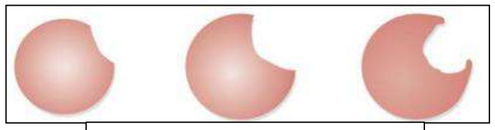
Défice de G6PD – *Blister cells* e *bite cells*

Bite cell	keratocytes	G6PD deficiency
Blister cell	puddle cell, eccentrocyte	Oxidative haemolysis, G6PD deficiency



“Hemighosts” / “blister cells”

Blister cells are red cells in which the haemoglobin appears retracted into one half of the cell to form a dense mass leaving the remainder of the cell as an empty membrane.

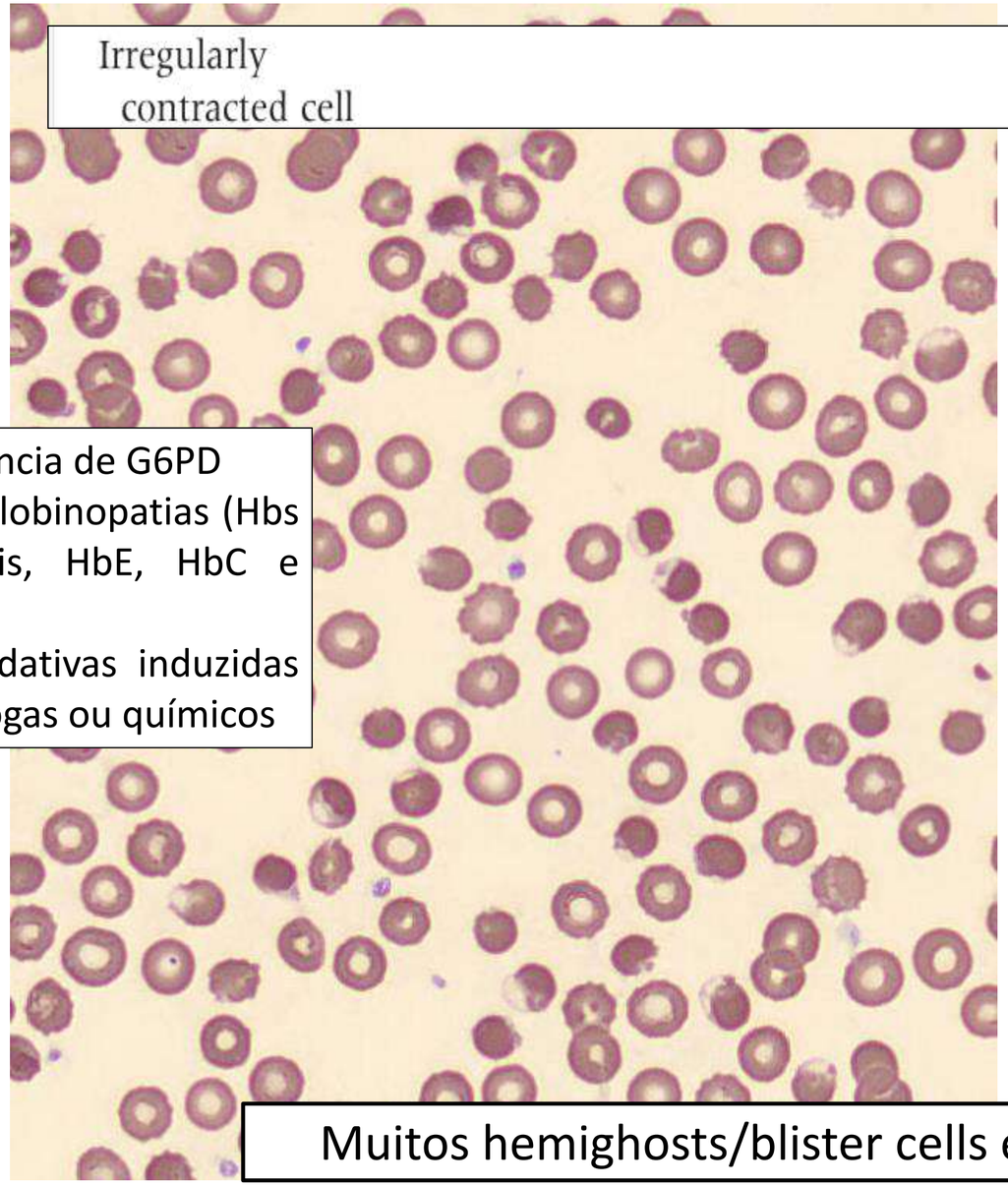


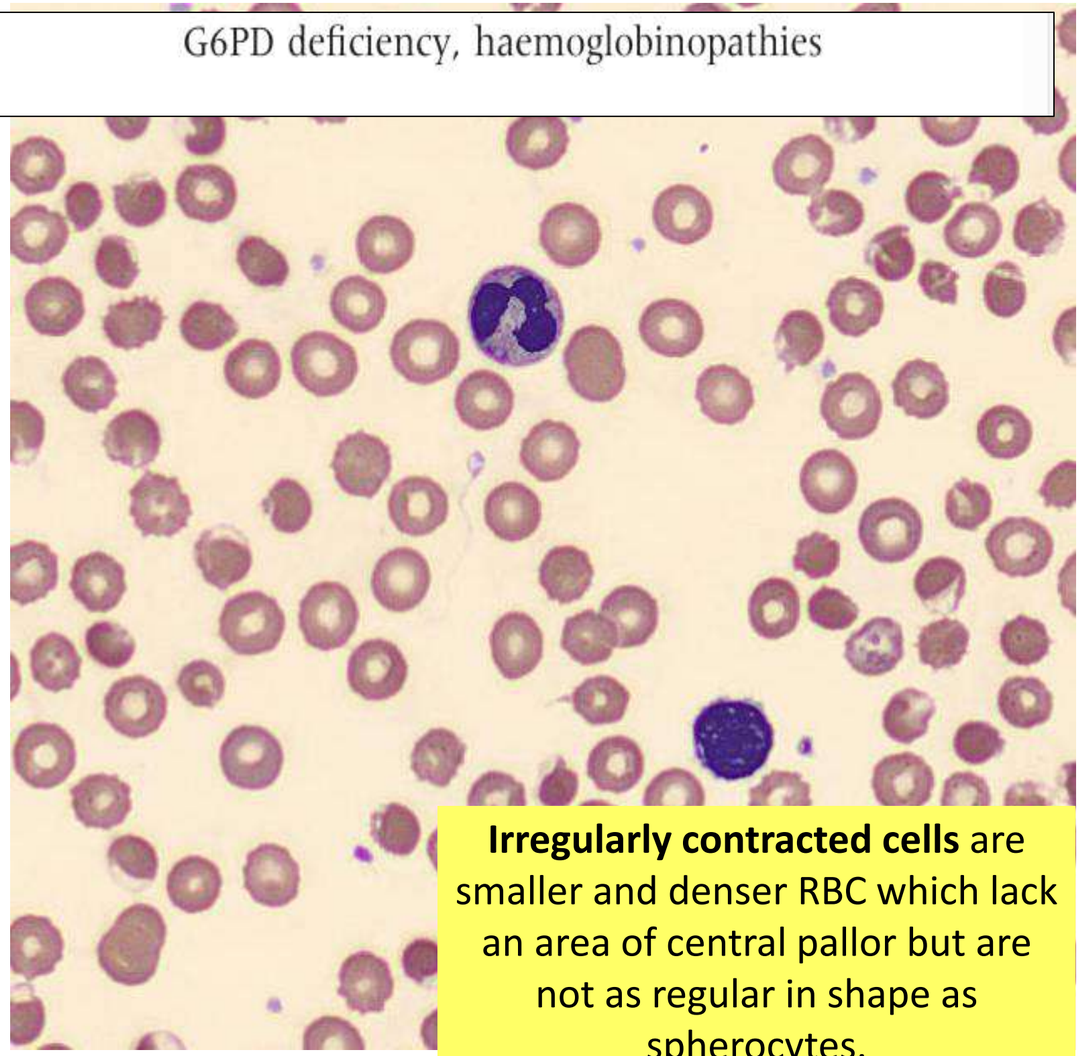
“Bite cells”

Bite cells are RBC with peripheral single or multiple arcuate defects (bites) caused by the removal of Heinz bodies by the spleen and are a feature of **oxidant haemolysis**.

Microangiopathic haemolytic anaemias and mechanical damage to the red cells may produce morphologically identical cells (keratocytes), which are formed by the rupture of peripheral pseudovacuoles and subsequent fusion of the red cell membrane.

Défice de G6PD – Eritrócitos irregularmente contraídos



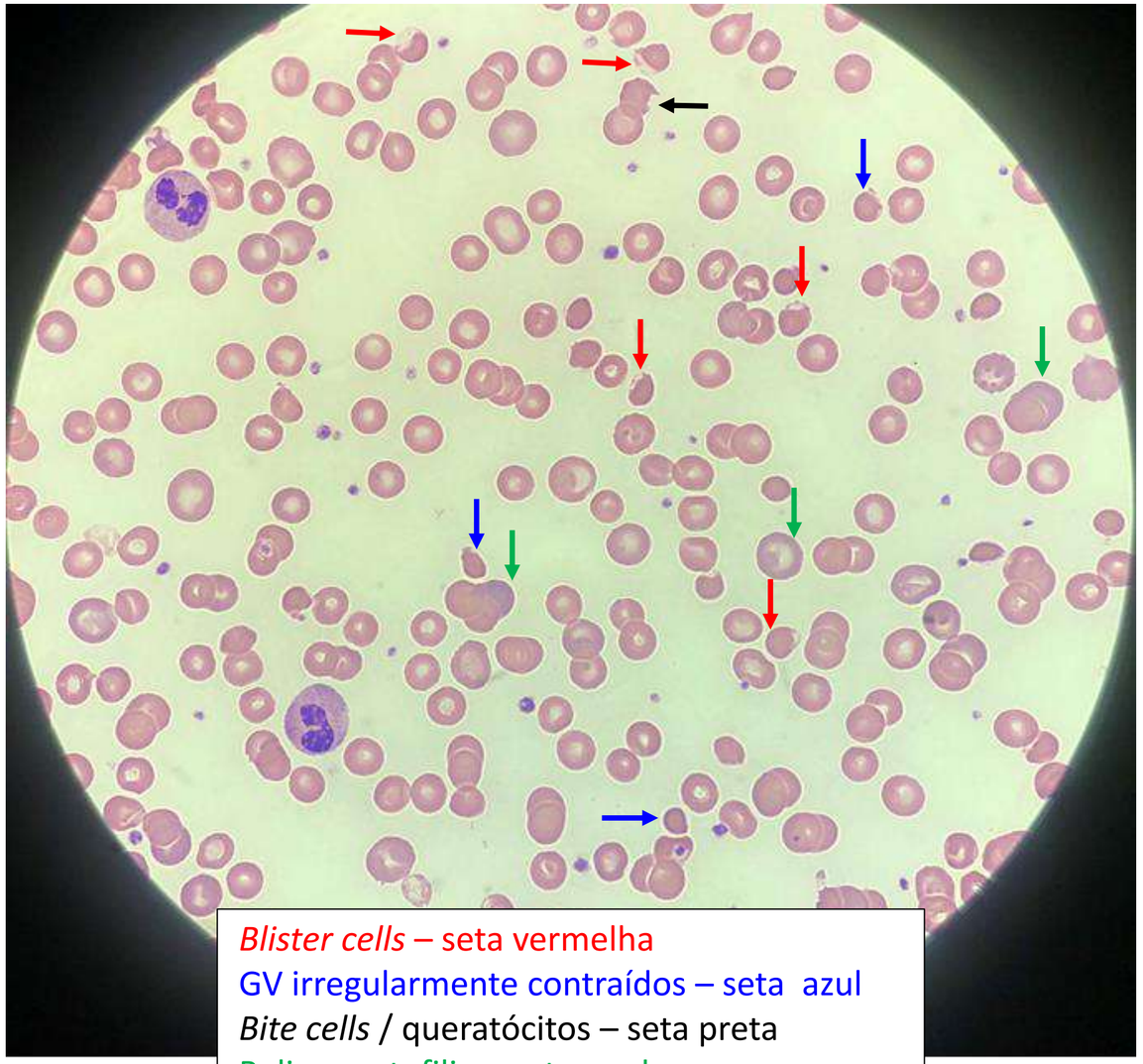


- Deficiência de G6PD
- Hemoglobinopatias (Hbs instáveis, HbE, HbC e HbSC)
- AH oxidativas induzidas por drogas ou químicos

Irregularly contracted cells are smaller and denser RBC which lack an area of central pallor but are not as regular in shape as spherocytes.

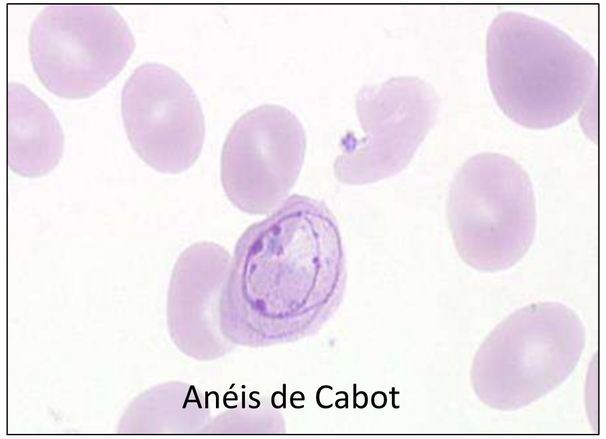
Muitos hemighosts/blister cells e eritrócitos irregularmente contraídos

Défice de G6PD

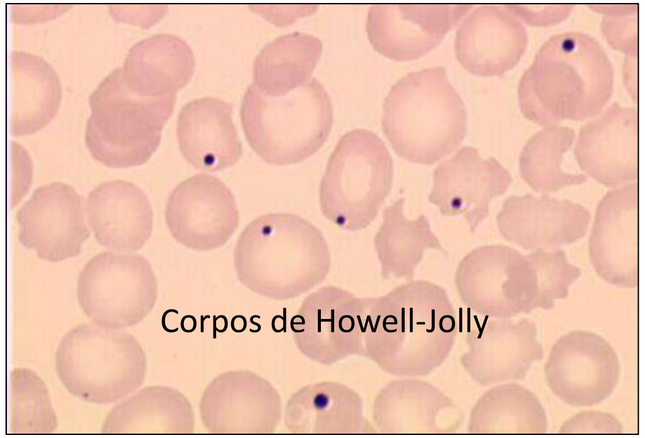


Blister cells – seta vermelha
GV irregularmente contraídos – seta azul
Bite cells / queratócitos – seta preta
Policromatofilia – seta verde

Inclusões eritrocitárias



Anéis de Cabot



Corpos de Howell-Jolly

Ponteado basófilo

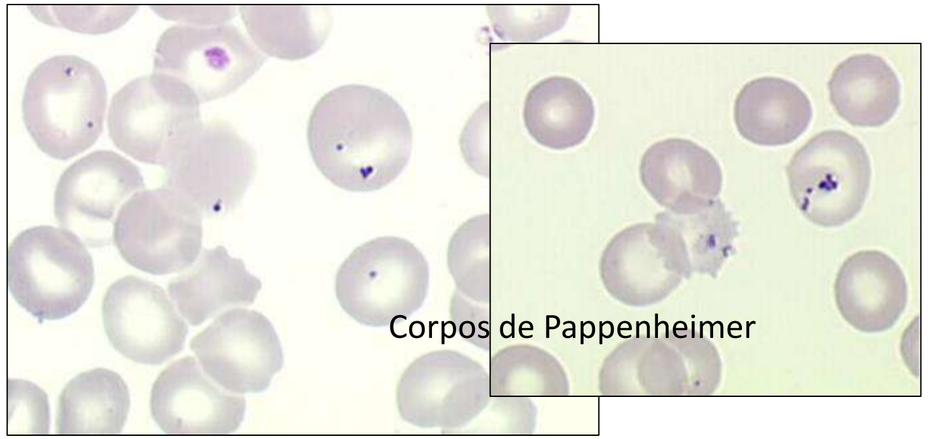
Howell-Jolly bodies are usually single, small (1 µm), dense, perfectly round basophilic inclusions that are fragments of nuclear material (DNA).

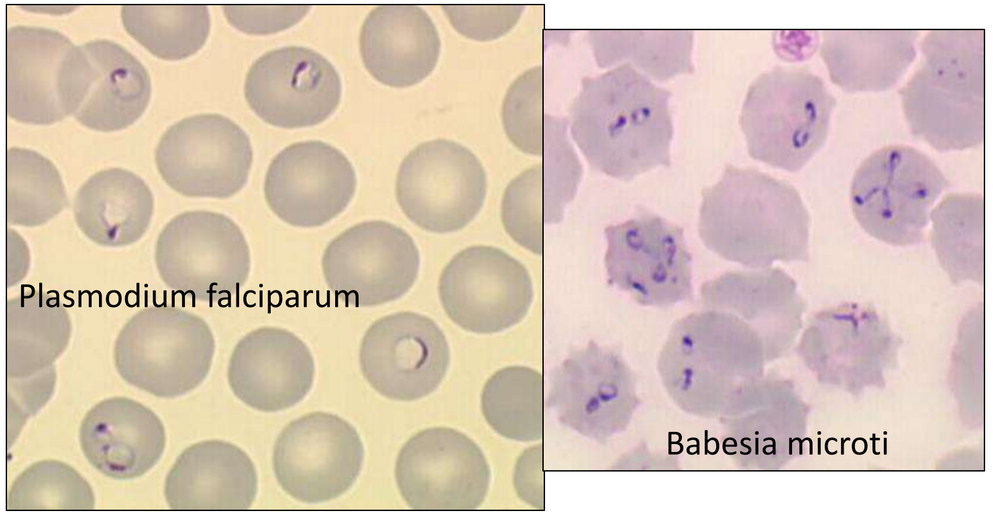
Basophilic stippling describes the occurrence of fine, medium, or coarse blue granules due to abnormally aggregated ribosomes, uniformly distributed throughout the RBC.

Howell-Jolly body		Hyposplenism, postsplenectomy, haemolytic anaemia, megaloblastic anaemia
Basophilic stippling	punctate basophilia	Lead poisoning, haemoglobinopathies, thalassaemia, abnormal haem synthesis

https://www.hematocell.fr/morphologie-des-hematies-sur-frottis-sanguin-et-principales-anomalies/morphologie-erythrocytaire-partie-3-anomalies-de-couleur-de-contenu-inclusions

Inclusões eritrocitárias



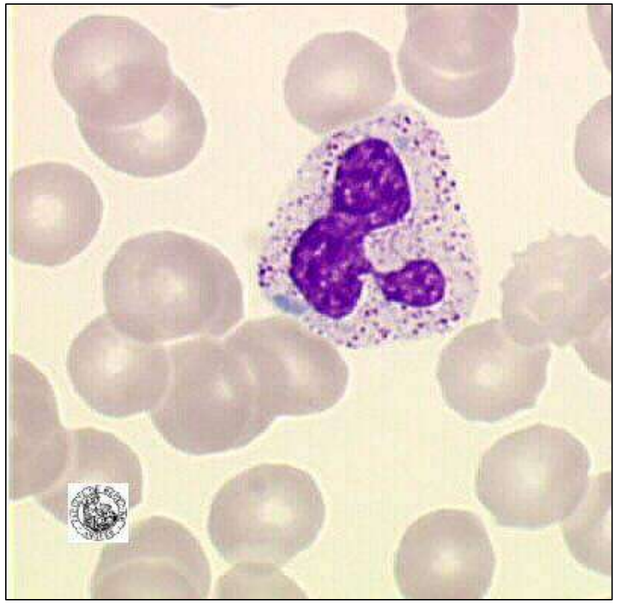
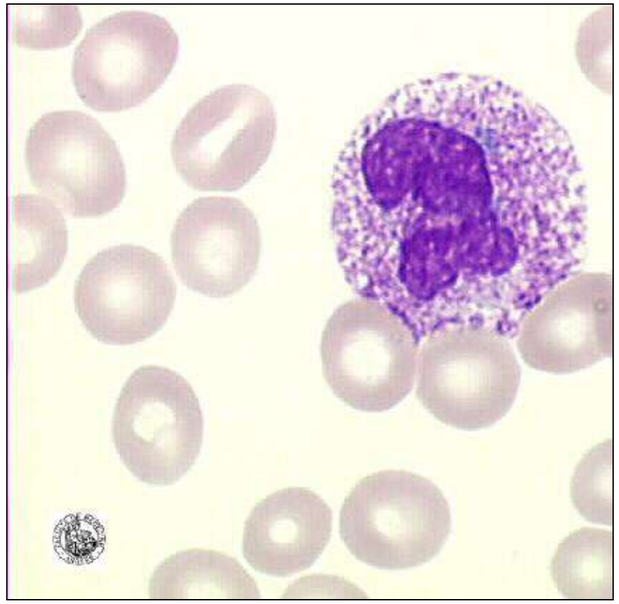
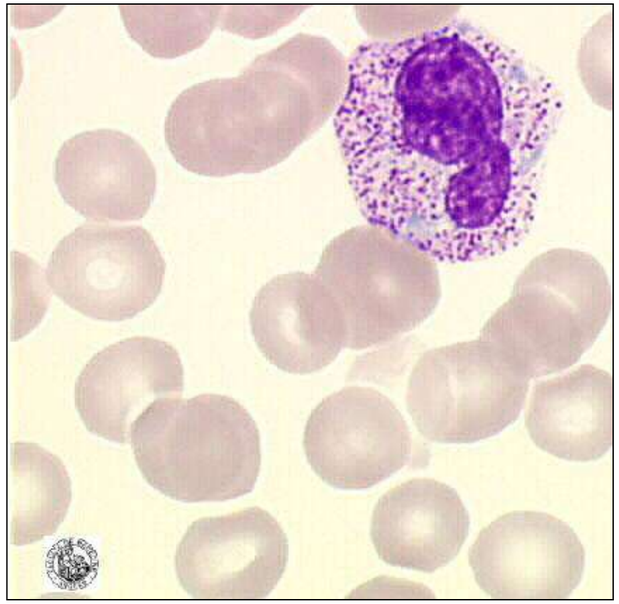


Pappenheimer bodies are ferritin aggregates in red cells, visible in Romanowsky stained PB films as multiple basophilic inclusions of variable size, shape and distribution usually in a limited cytoplasmic area.
They stain positively for iron (Perls Prussian blue reac tion).

Pappenheimer bodies	Sideroblastic anaemia, haemoglobinopathies,, hyposplenism

https://www.hematocell.fr/morphologie-des-hematies-sur-frottis-sanguin-et-principales-anomalies/morphologie-erythrocytaire-partie-3-anomalies-de-couleur-de-contenu-inclusions

Neutrófilos hipergranulosos e com corpos de Döhle

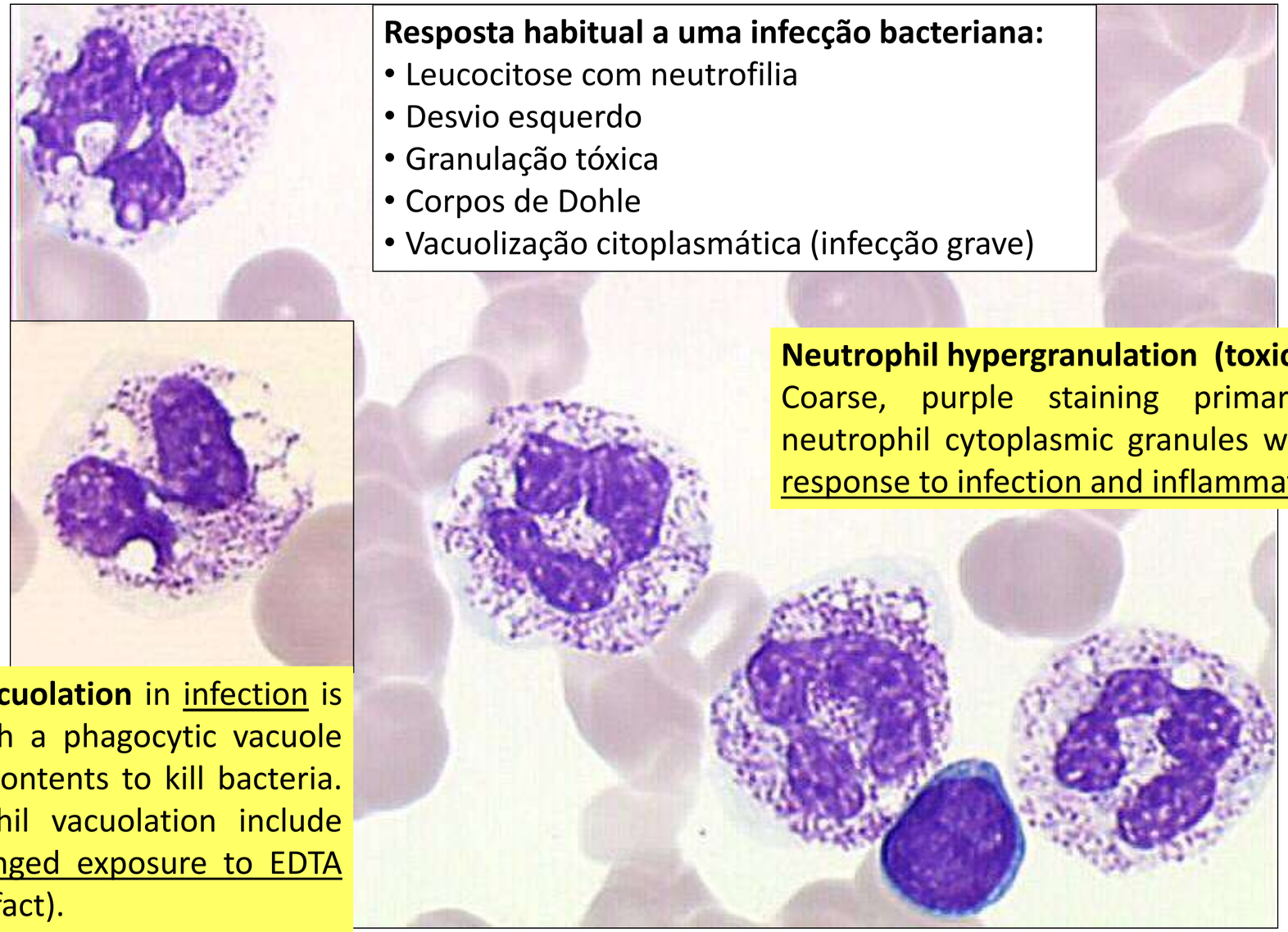
Dohle body

Pale light blue or grey, single or multiple, cytoplasmic inclusions found near the periphery of the neutrophil.

Dohle bodies are a non-specific reactive change and may also be seen in patients on growth factor therapy such as granulocyte colony-stimulating factor (G-CSF).

Neutrófilos hipergranulosos e com vacúolos citoplasmáticos

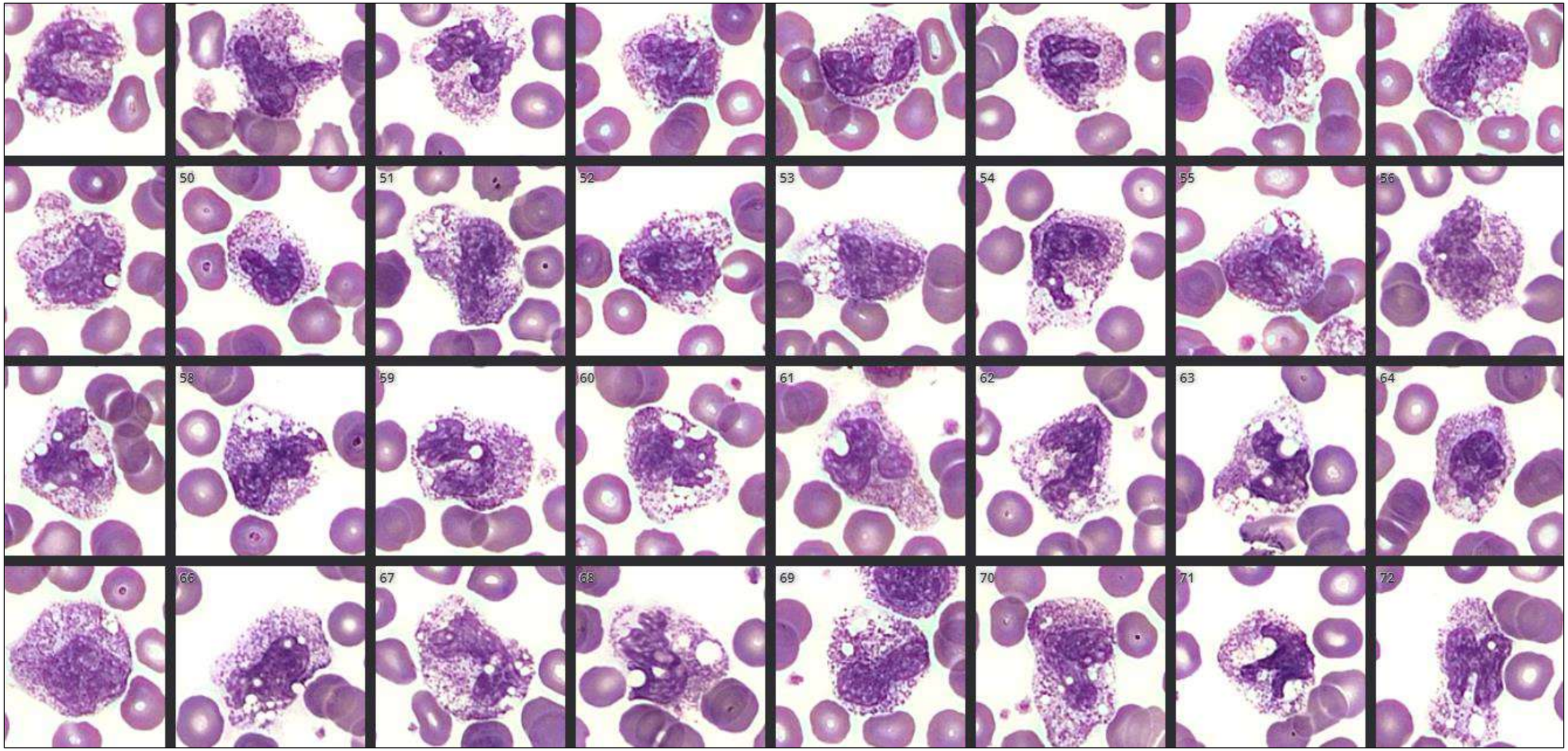
Resposta habitual a uma infecção bacteriana:
- Leucocitose com neutrofilia
- Desvio esquerdo
- Granulação tóxica
- Corpos de Dohle
- Vacuolização citoplasmática (infecção grave)



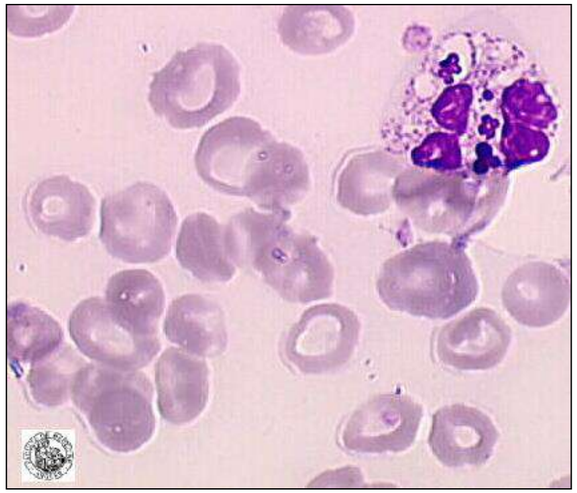
Neutrophil hypergranulation (toxic granulation)
Coarse, purple staining primary (azurophilic) neutrophil cytoplasmic granules which occur as a response to infection and inflammation.

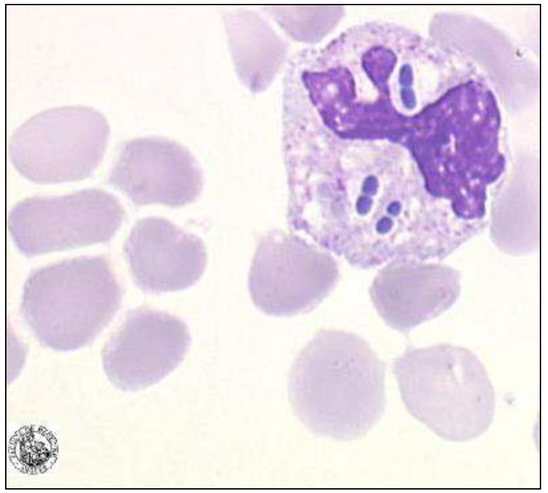
Neutrophil cytoplasmic vacuolation in infection is due to granule fusion with a phagocytic vacuole and release of lysosomal contents to kill bacteria. Other causes of neutrophil vacuolation include alcohol toxicity and prolonged exposure to EDTA anticoagulant (storage artefact).

Neutrófilos hipergranulosos e com vacúolos citoplasmáticos

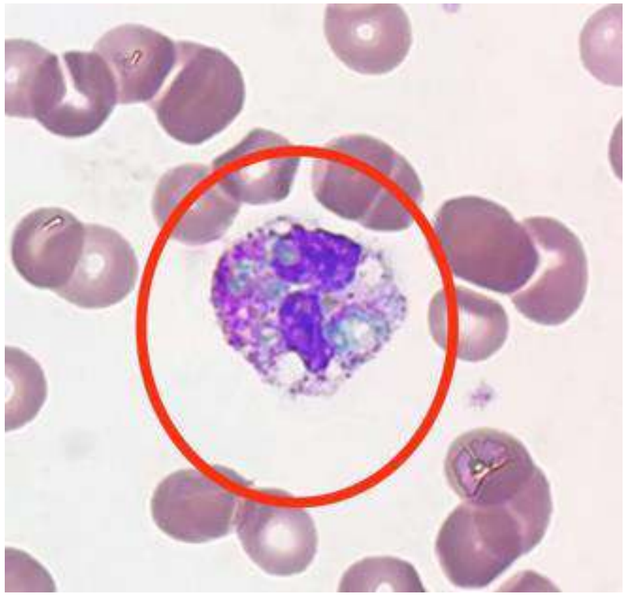


Neutrófilos com bactérias intracelulares



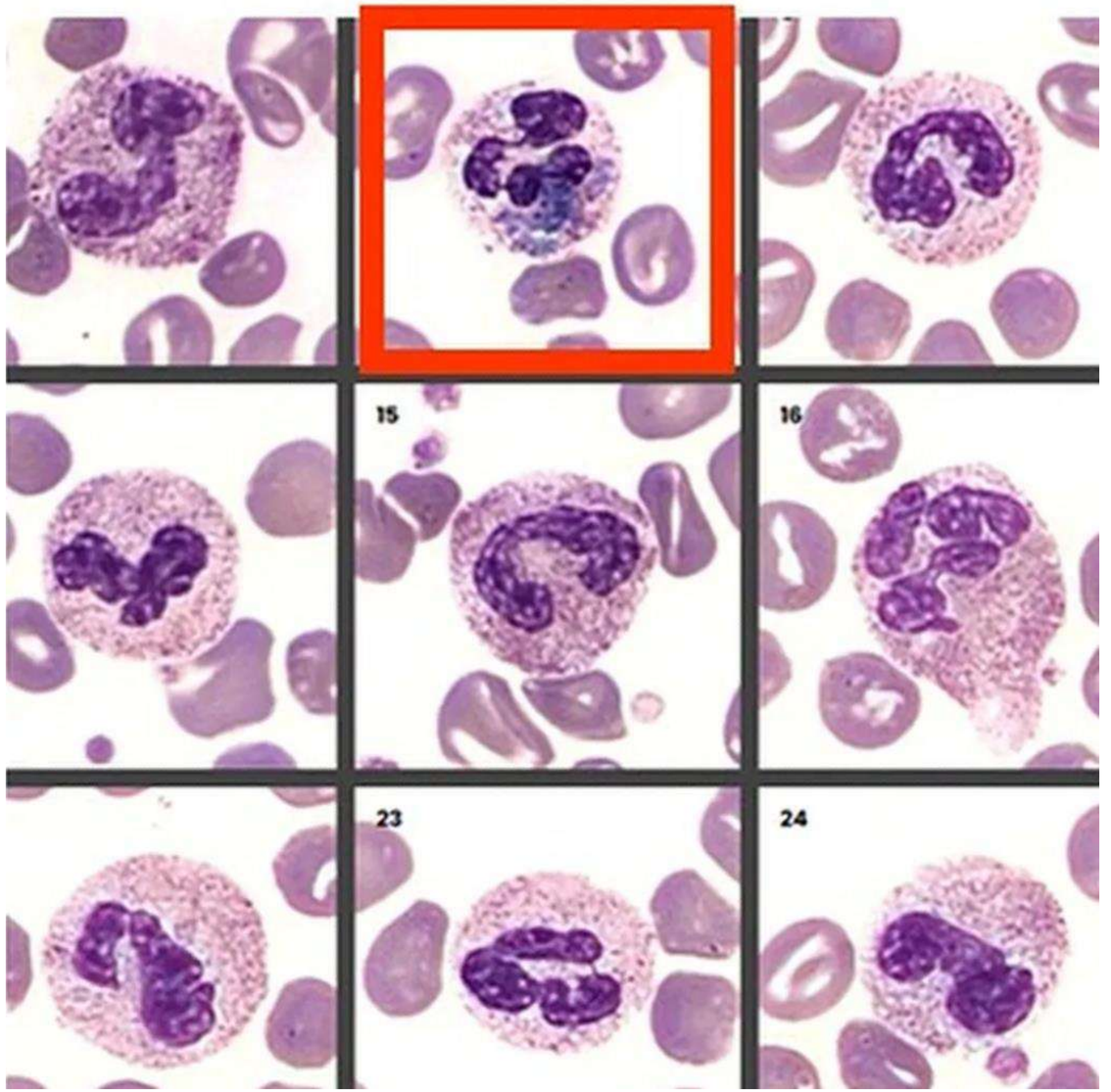


Inclusões citoplasmáticas verdes críticas

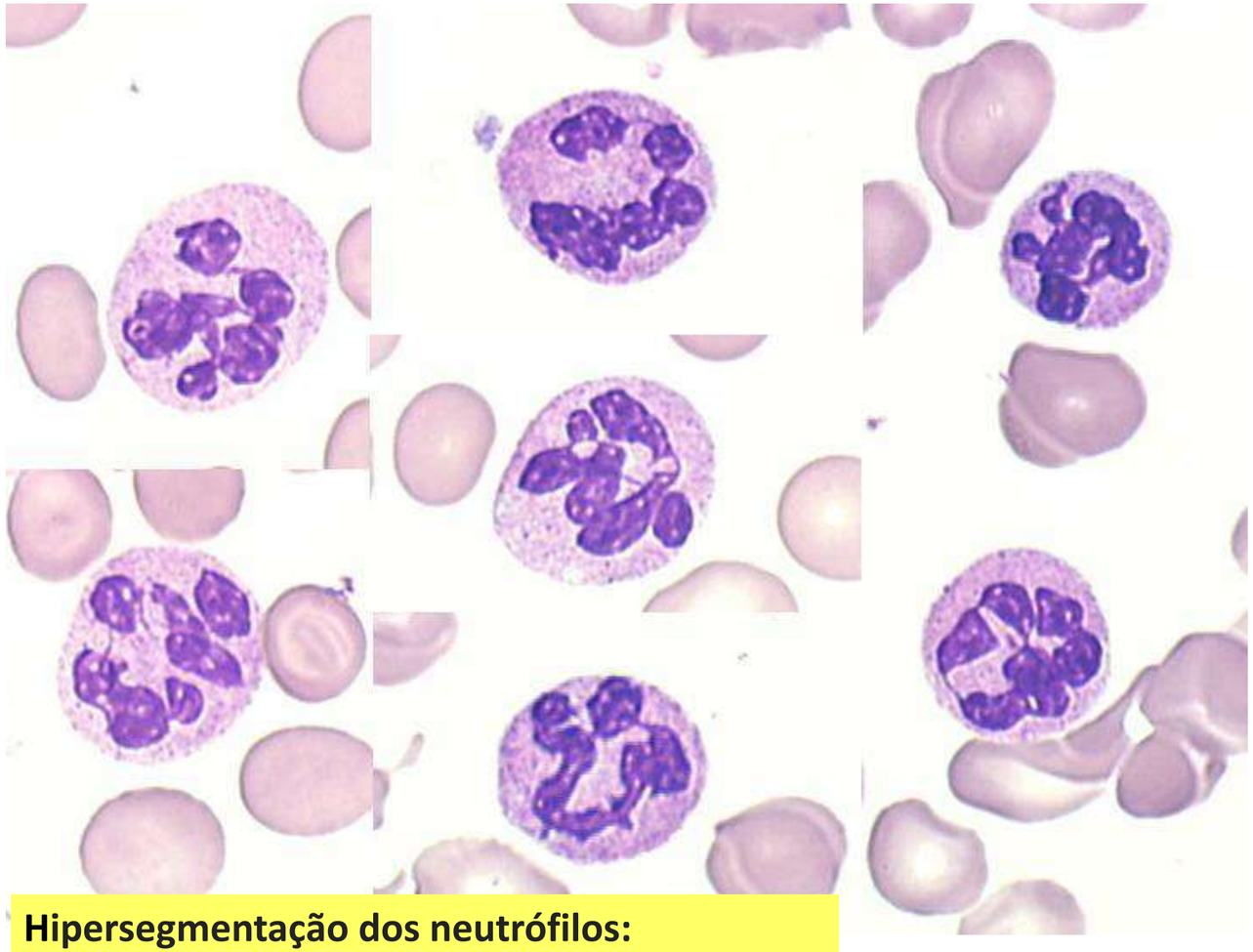


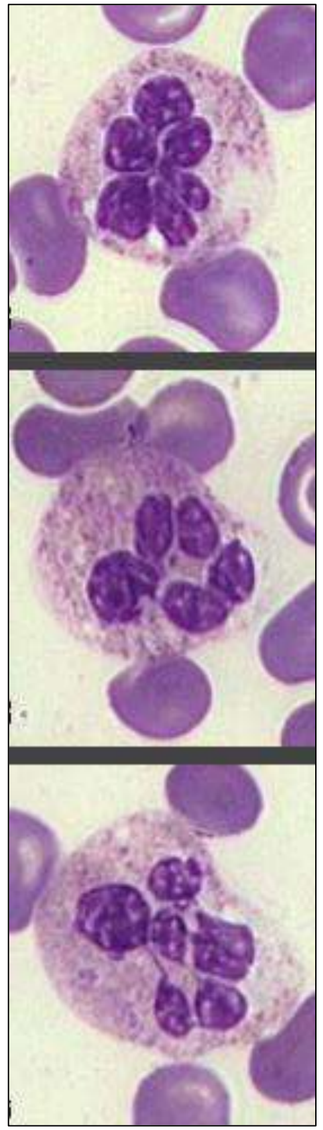
- Inclusões citoplasmáticas grosseiras, verde-vivo ou azul-esverdeadas, foram observadas em doentes com lesão hepática, sépsis e falência múltipla de órgãos.

- São provavelmente derivados de material semelhante à lipofuscina libertado por hepatócitos necróticos e têm um **grave significado prognóstico**.



Neutrófilos hipersegmentados



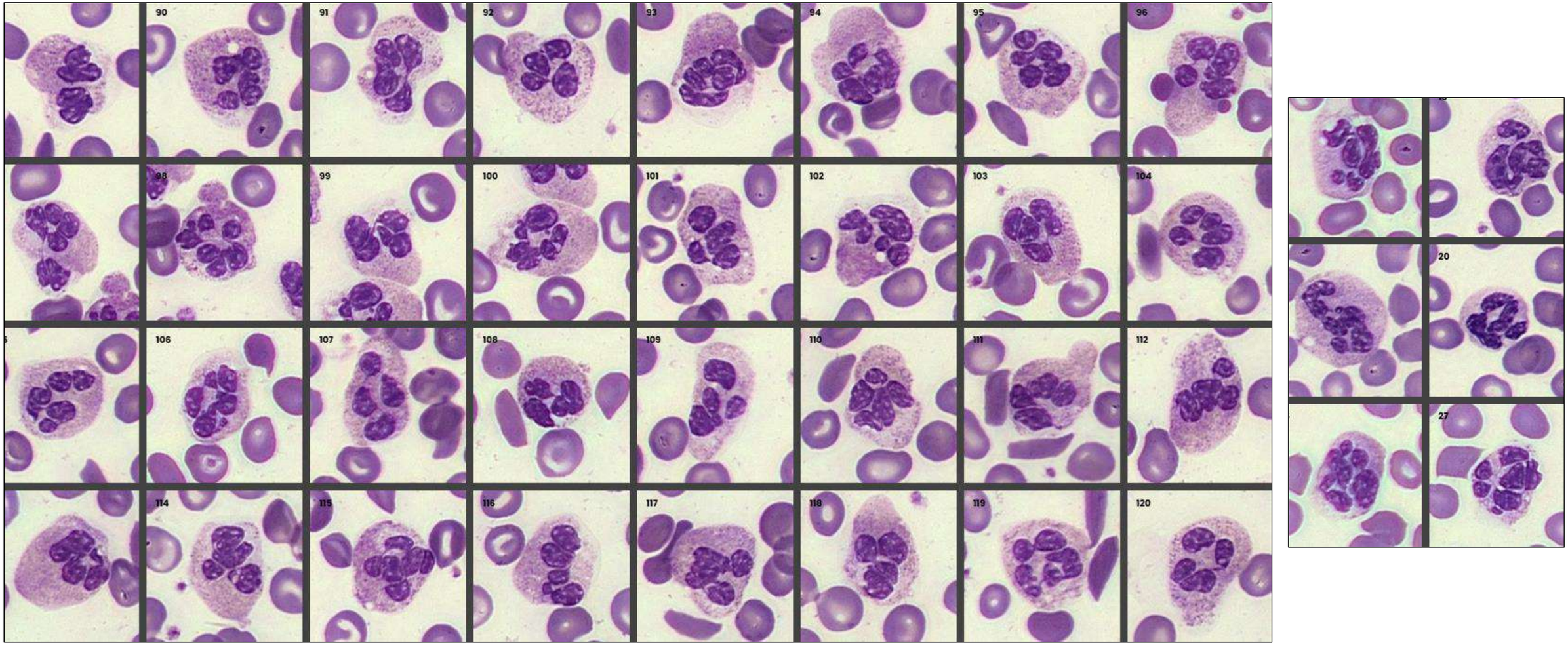


Hipersegmentação dos neutrófilos:

- Qualquer neutrófilo com 6 ou mais lobos nucleares ou
- ≥ 5% dos neutrófilos com 5 lóbulos nucleares

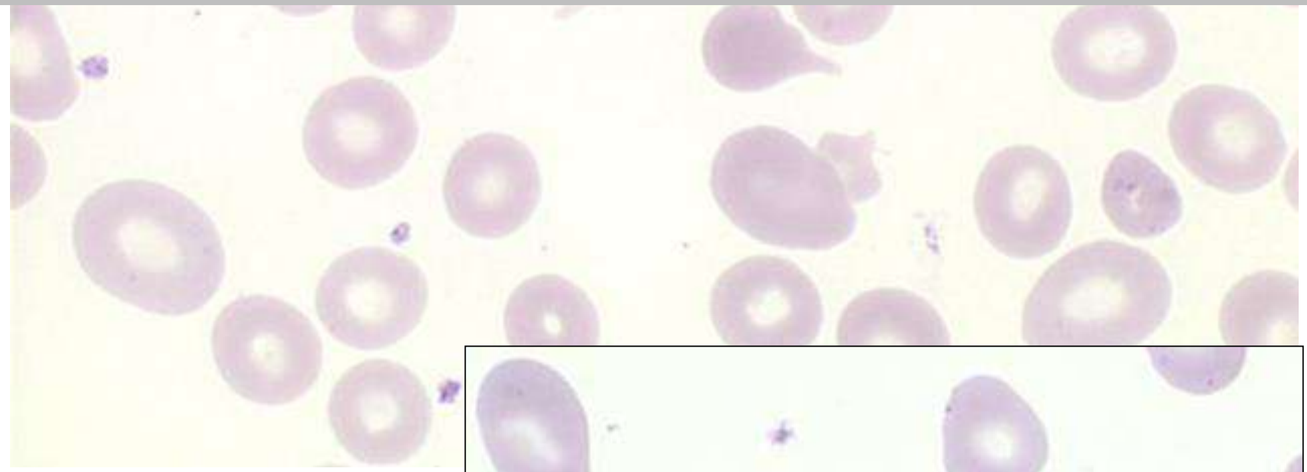
Neutrófilos hipersegmentados

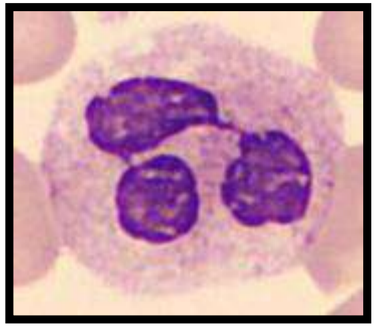
✅

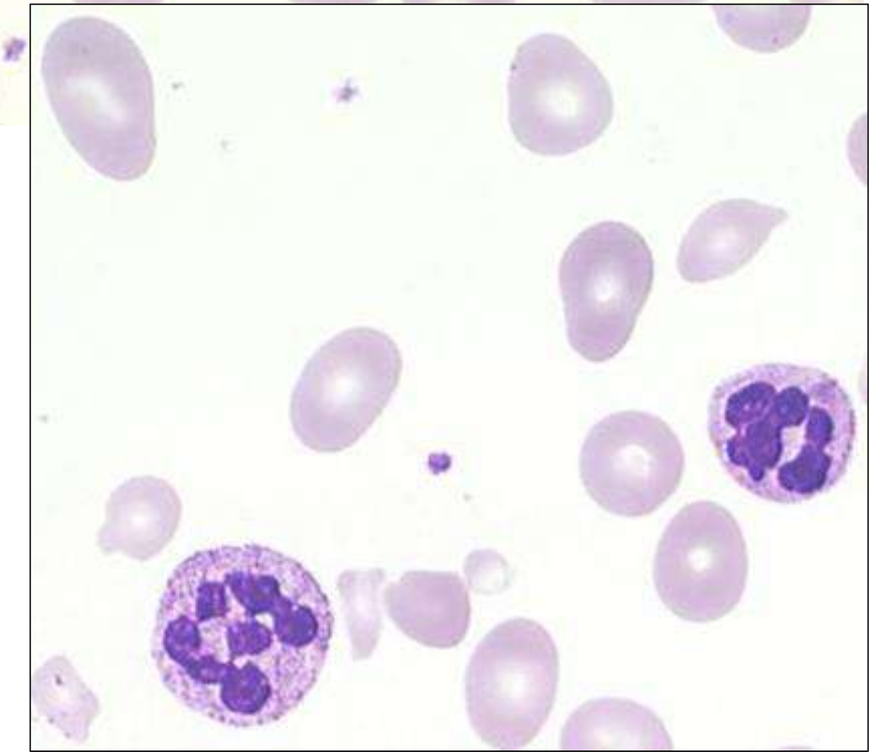


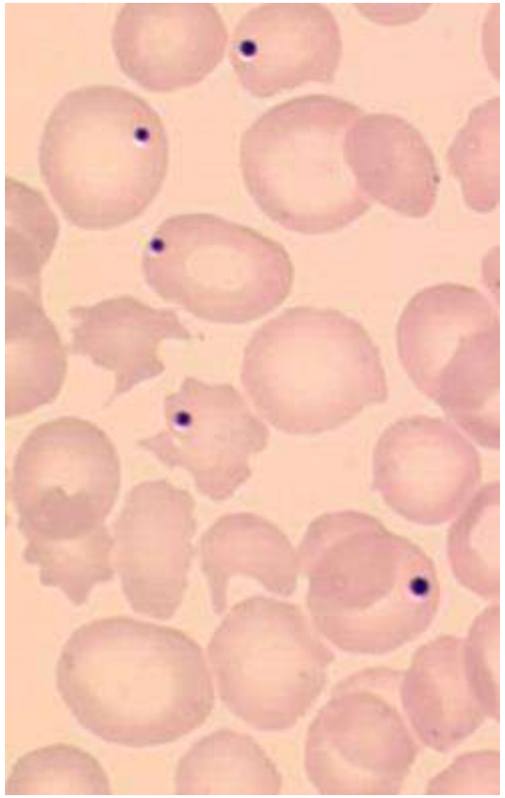
Anemia megaloblástica

Neutrófilos hipersegmentados, macrovalócitos e corpos de Howell-Jolly

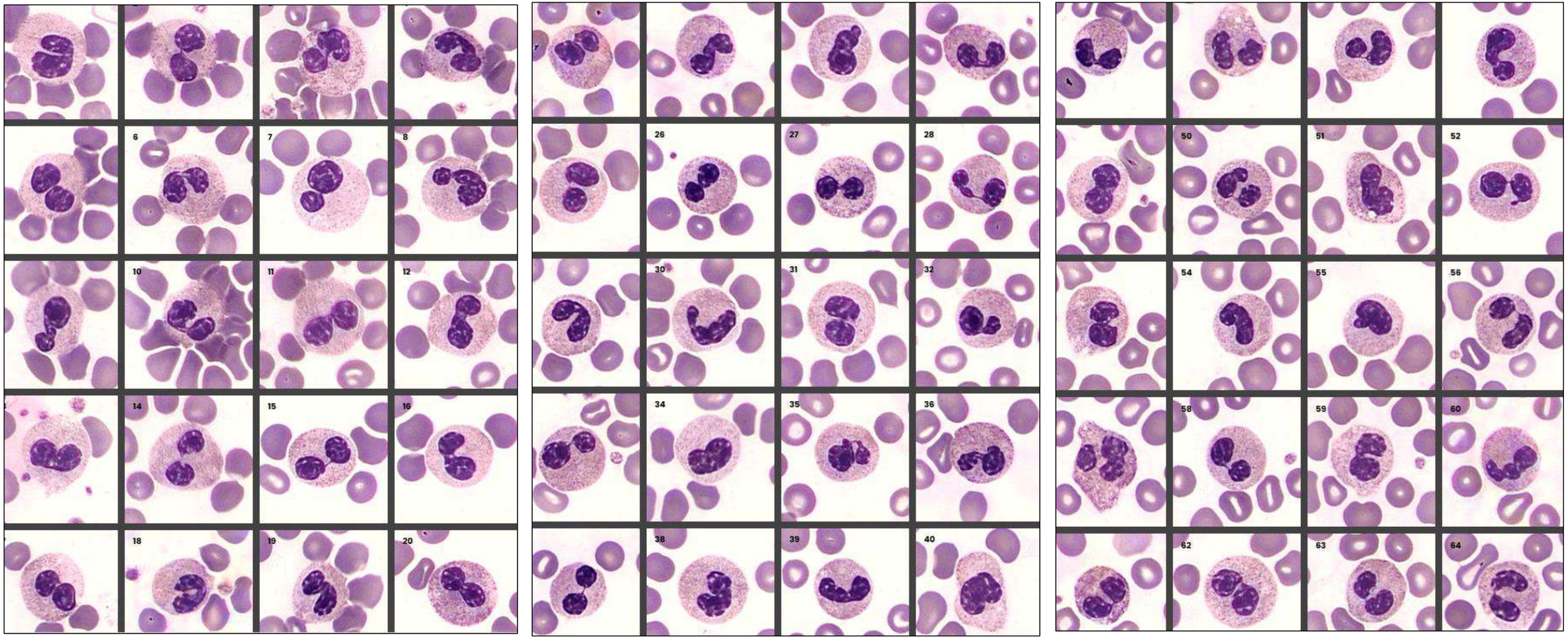




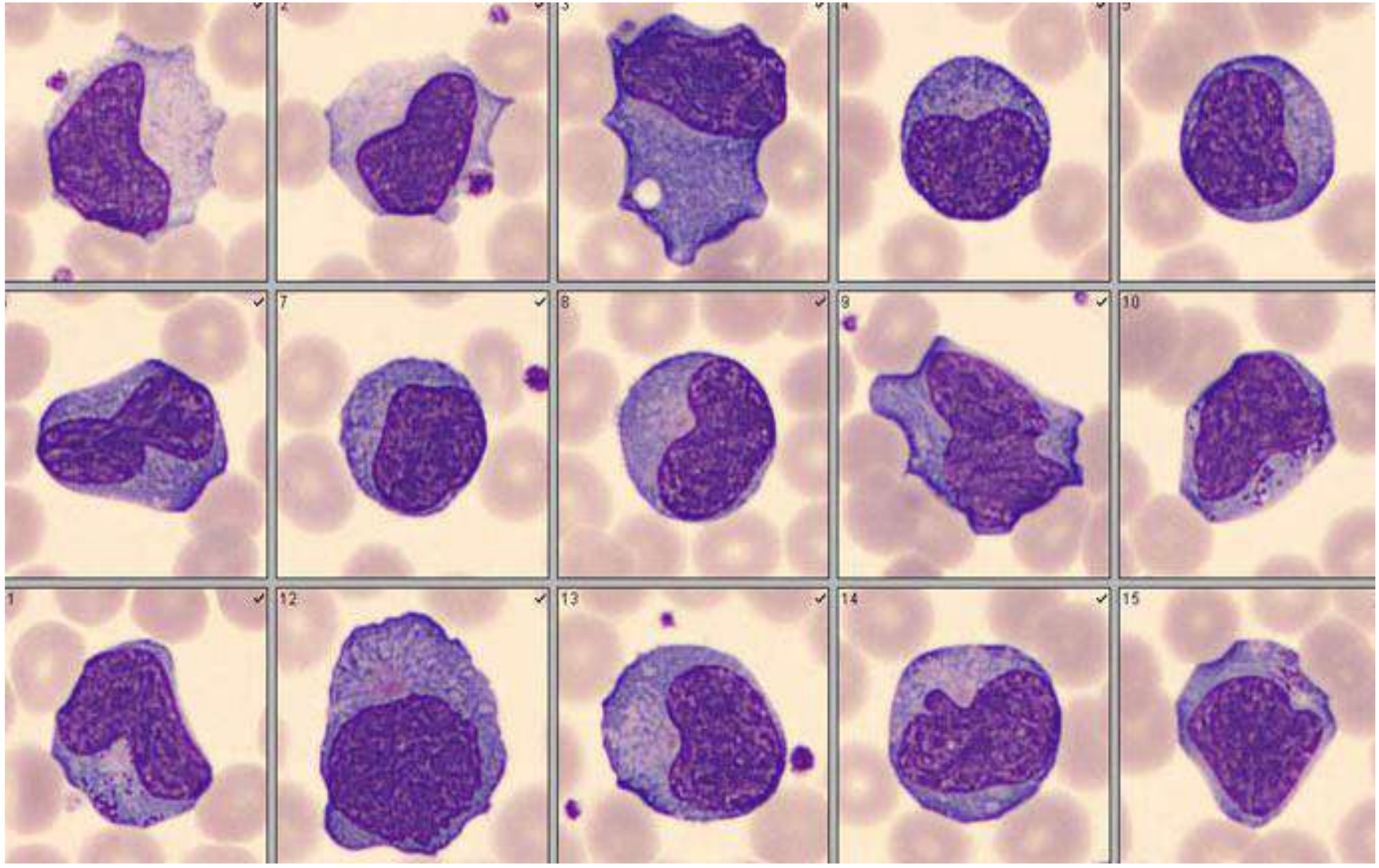




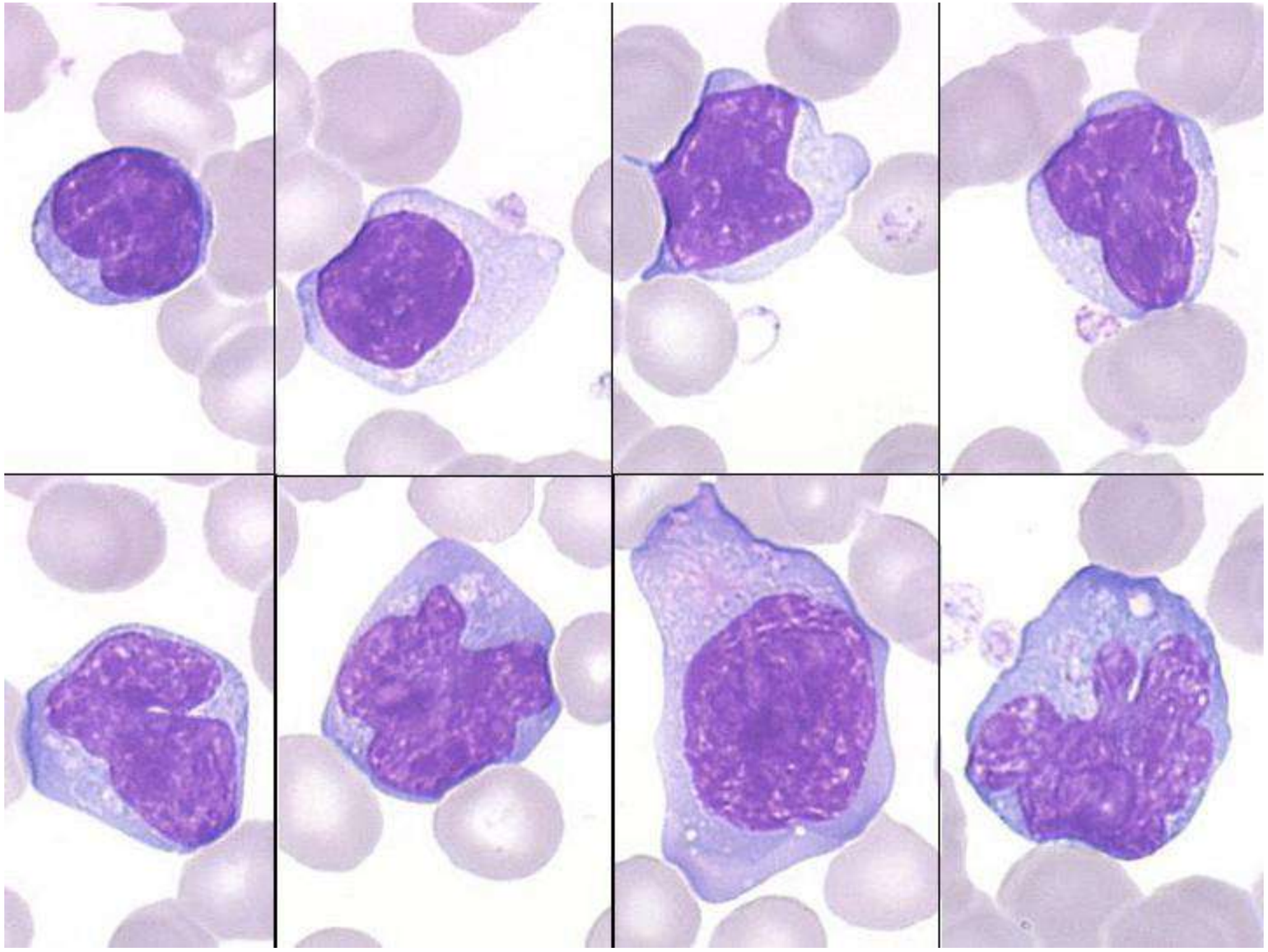
Neutrófilos hiposegmentados (Pelger-Huët hereditário)



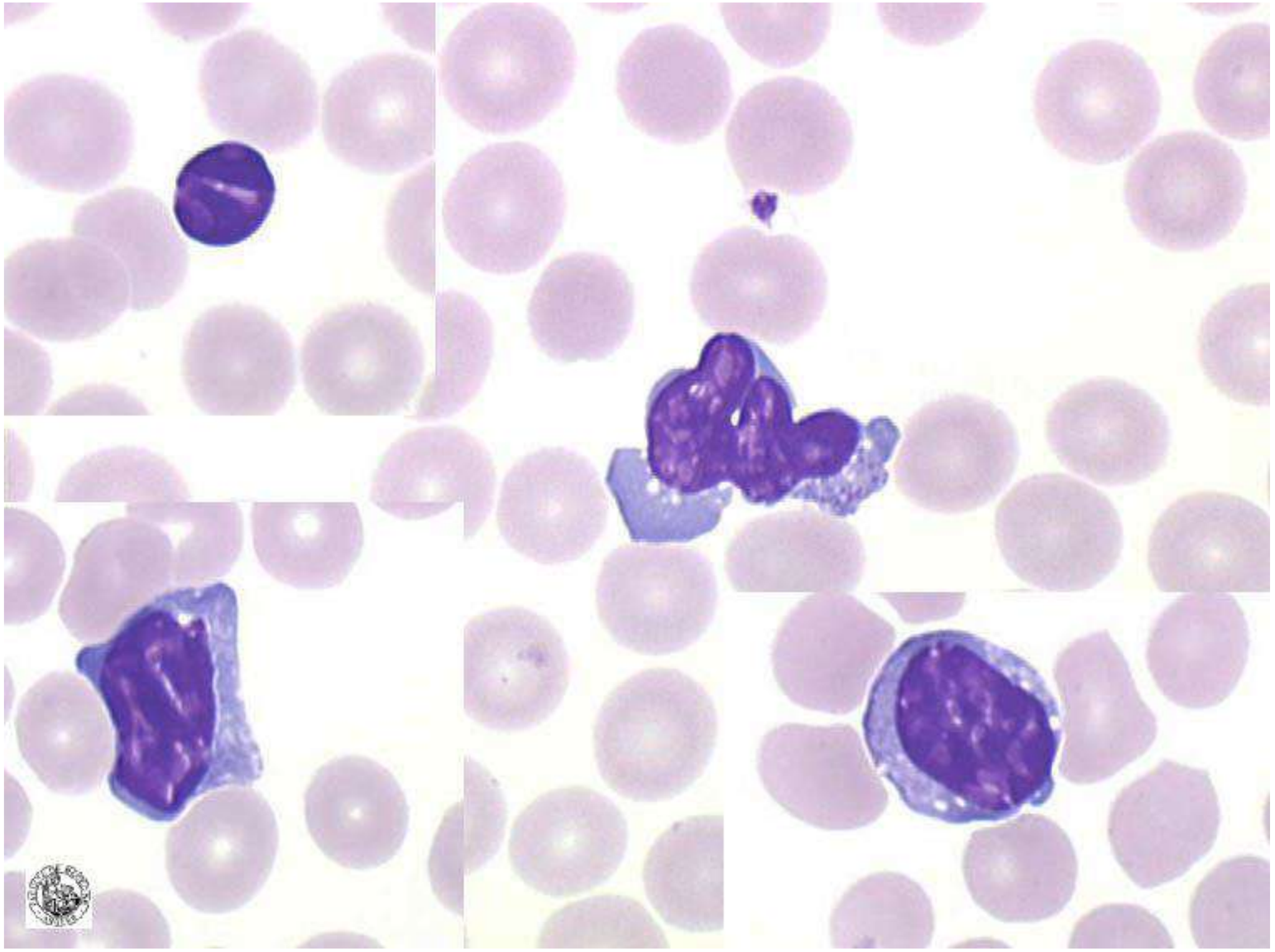
Linfócitos reactivos



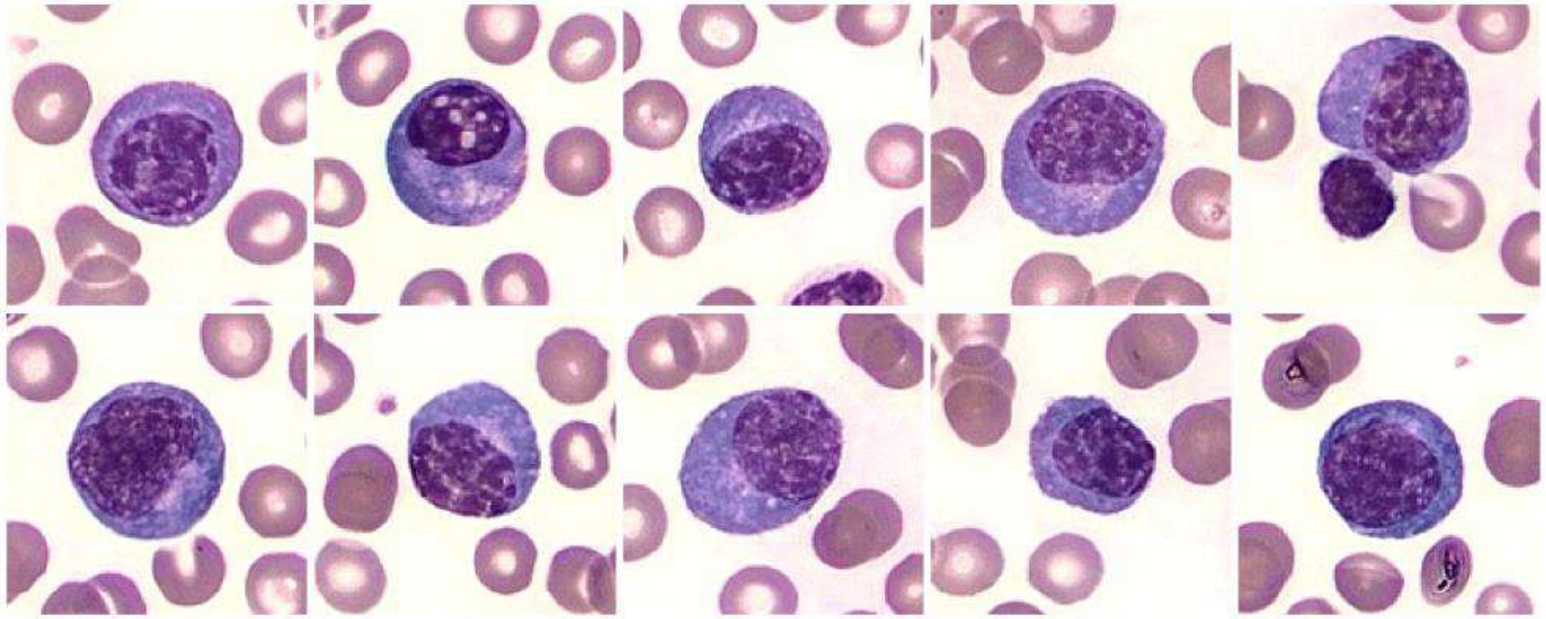
Linfócitos reactivos



Linfócitos em apoptose



Plasmócitos



Serviço de origem (Oncologia, Hematologia, Cirurgia, UCI)

História clínica e terapêutica (G-CSF)

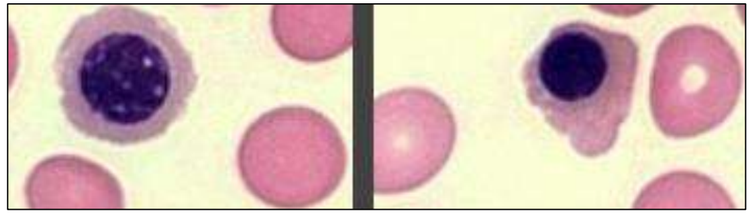
Parâmetros de hemólise

Parâmetros infecciosos (PCR)

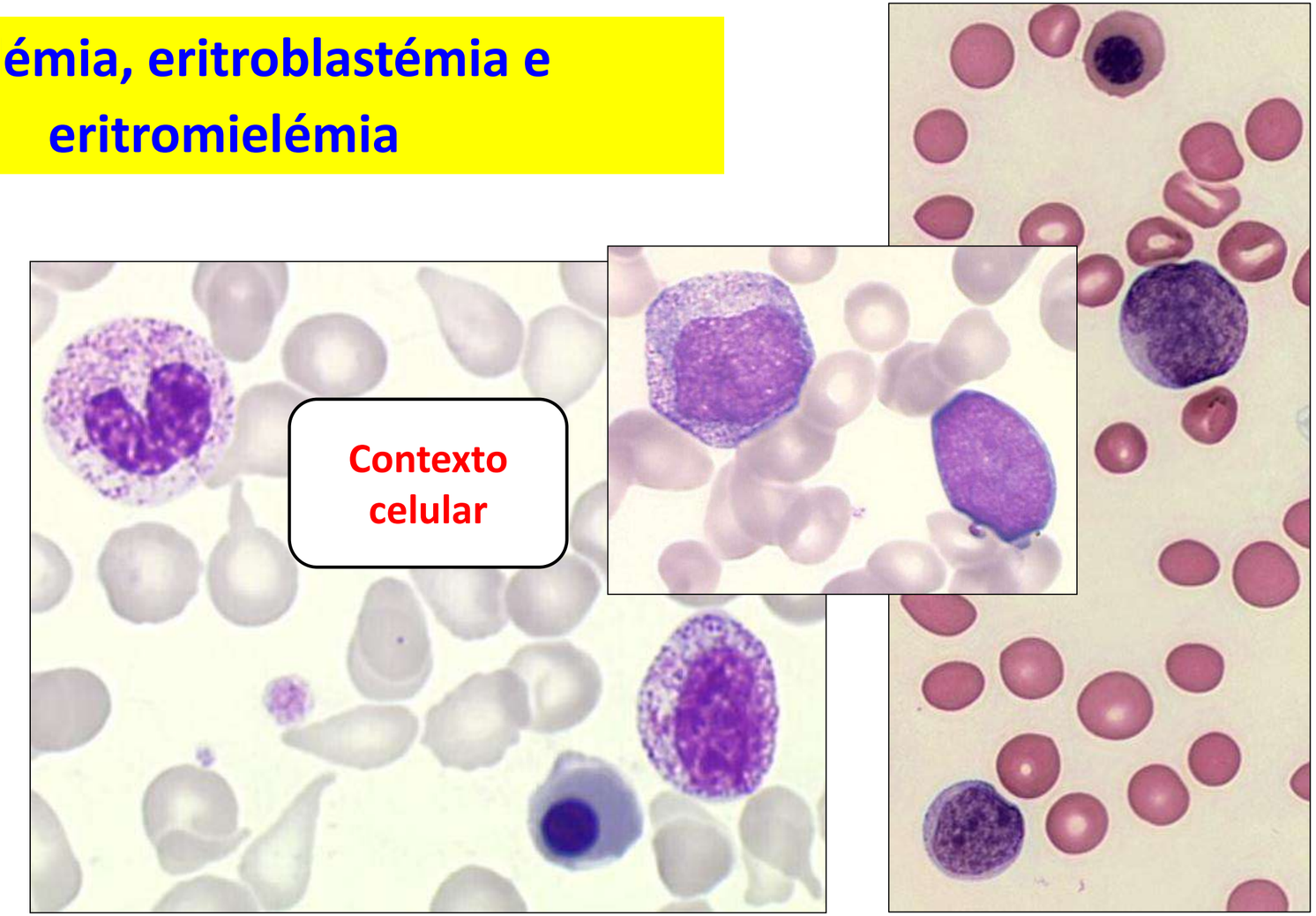
Citopénias ou citoses

Mielémia, eritroblastémia e eritromielémia

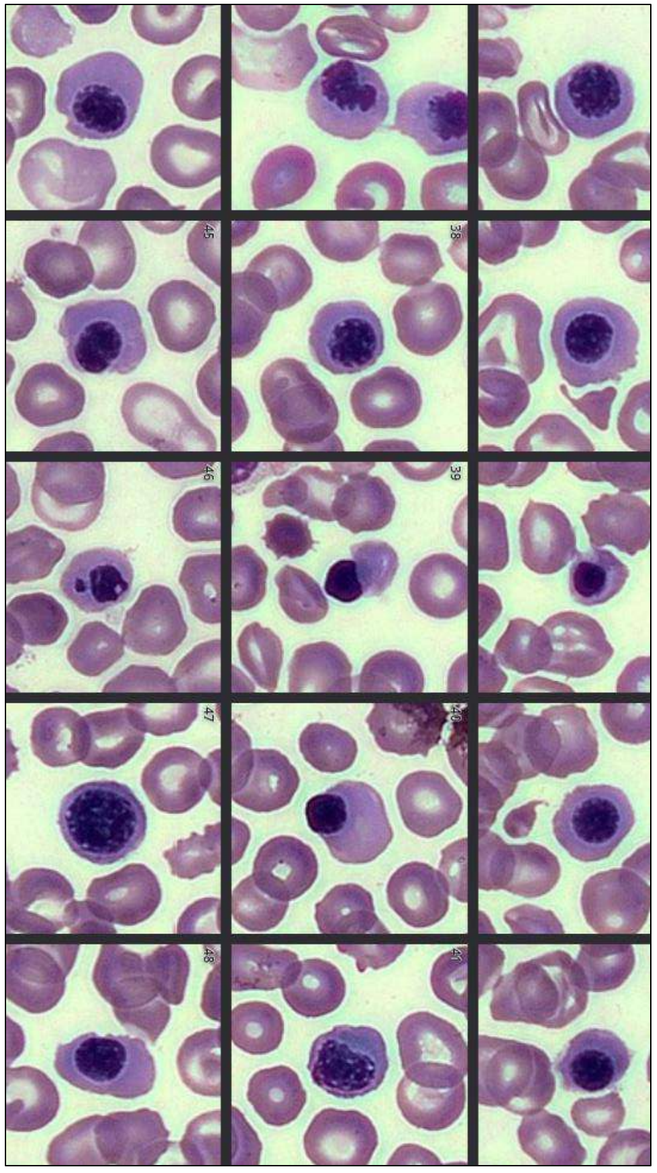
- Doenças infiltrativas da medula óssea
- Neoplasias mieloproliferativas
- Hemorragias agudas
- Grandes hemólises
- Hiperprodução granulocitária (sépsis, G-CSF)
- Fase inicial de recuperação de uma agranulocitose ou aplasia medular

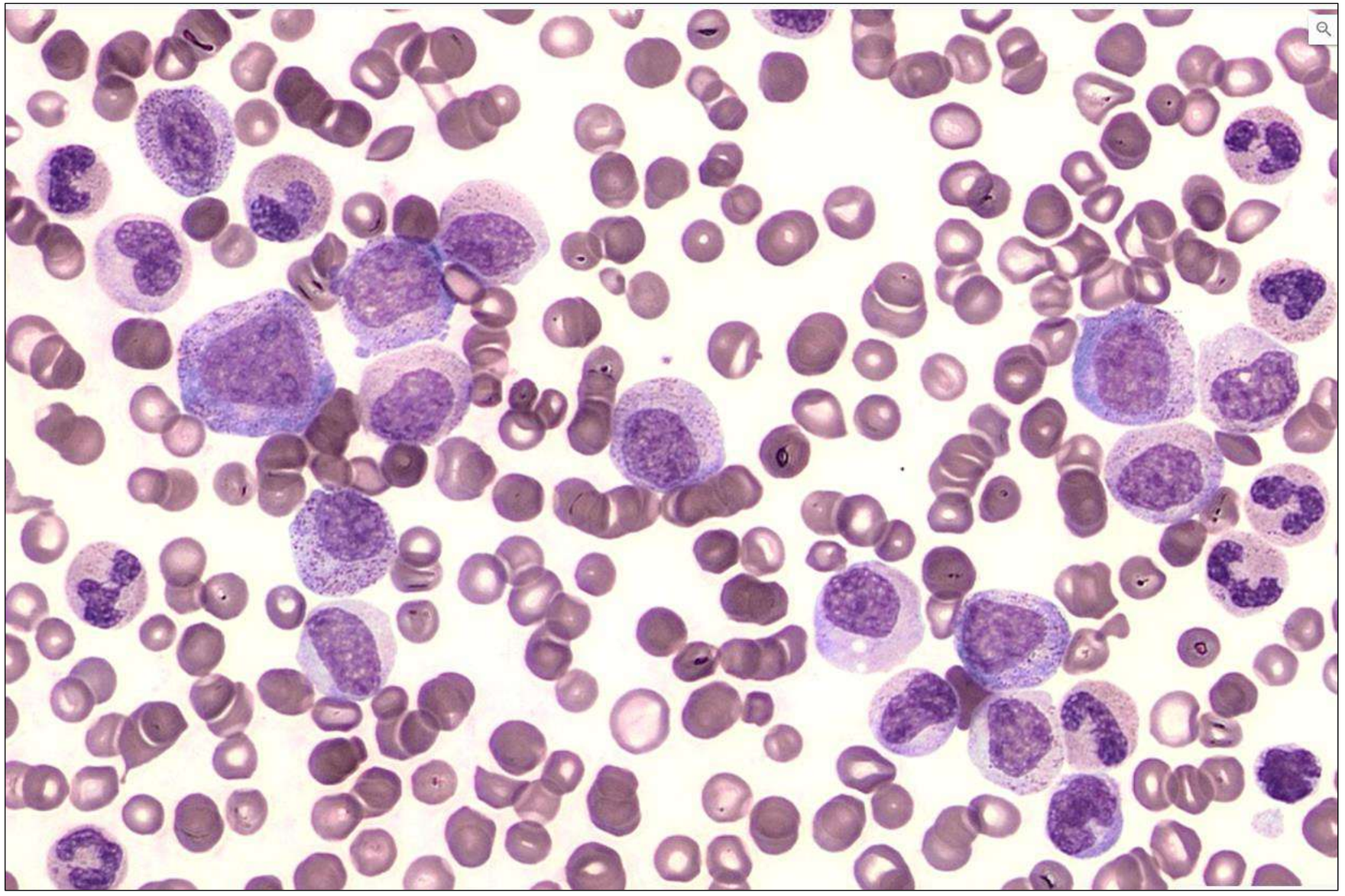


Contexto celular

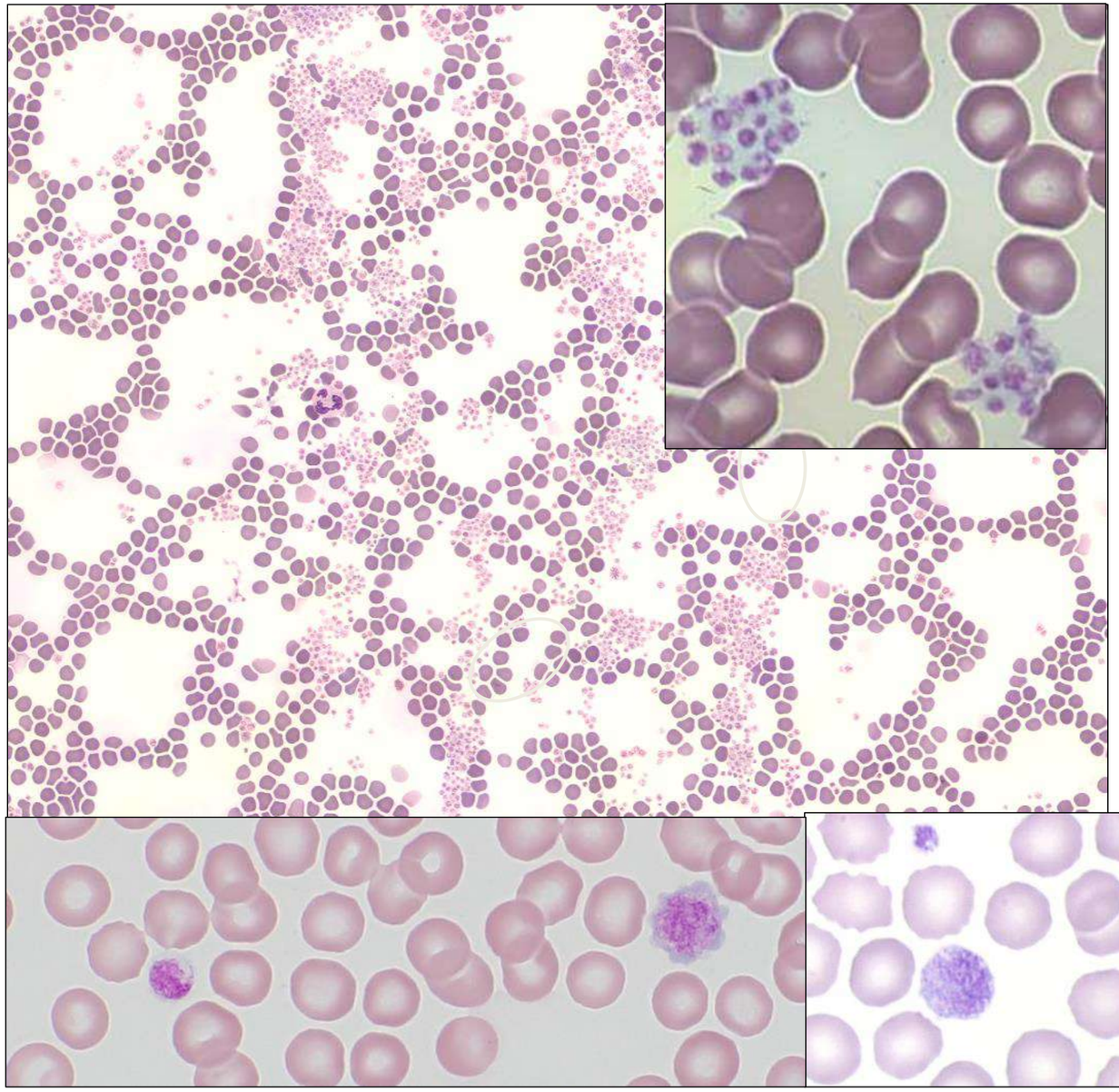


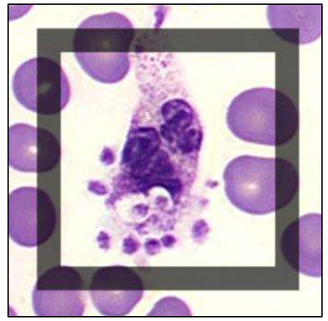
Eritromielémia

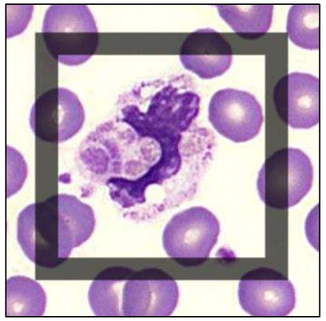


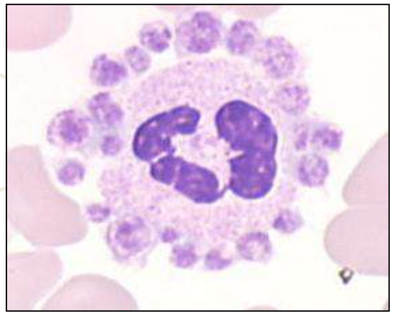


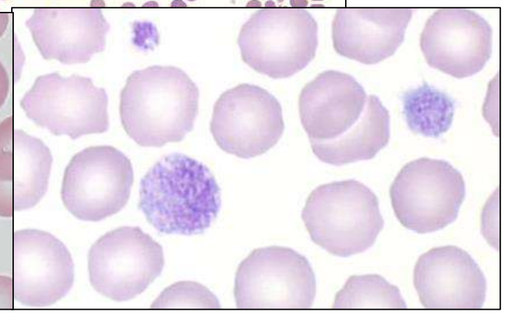
Alterações das plaquetas



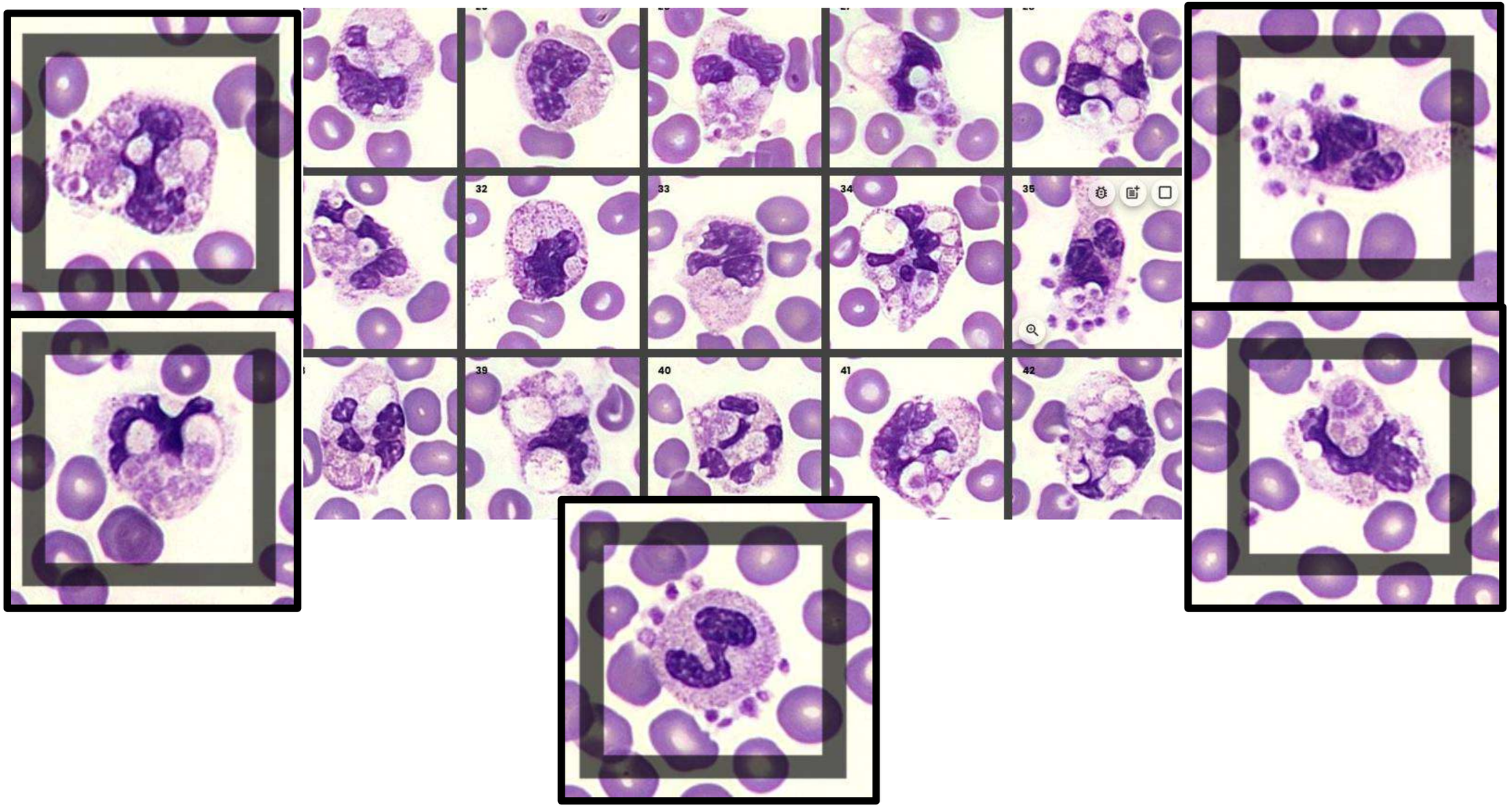




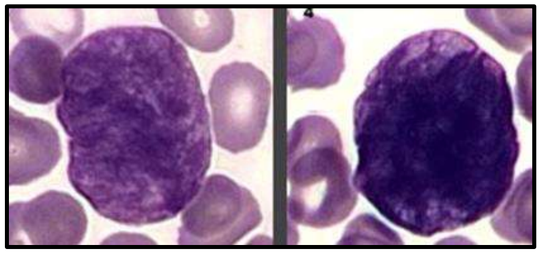


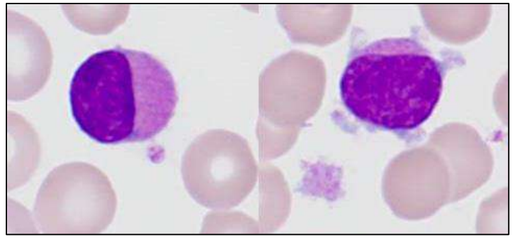


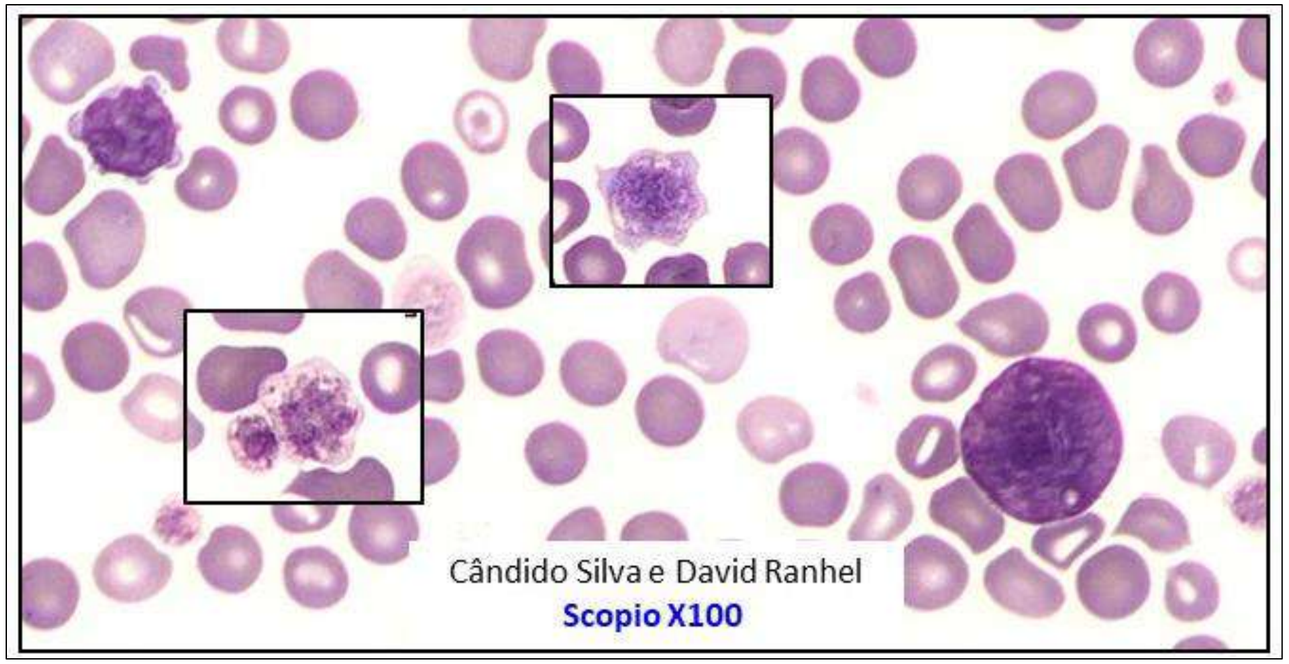
Trombofagocitose e satelitismo plaquetário

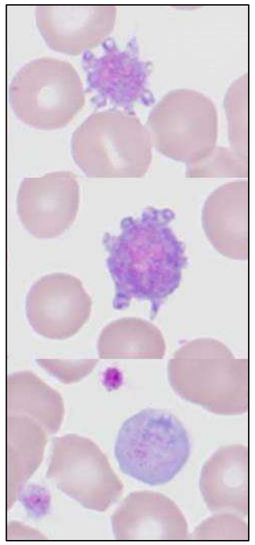


Plaquetas gigantes, núcleos de megacariócitos e micromegacariócitos

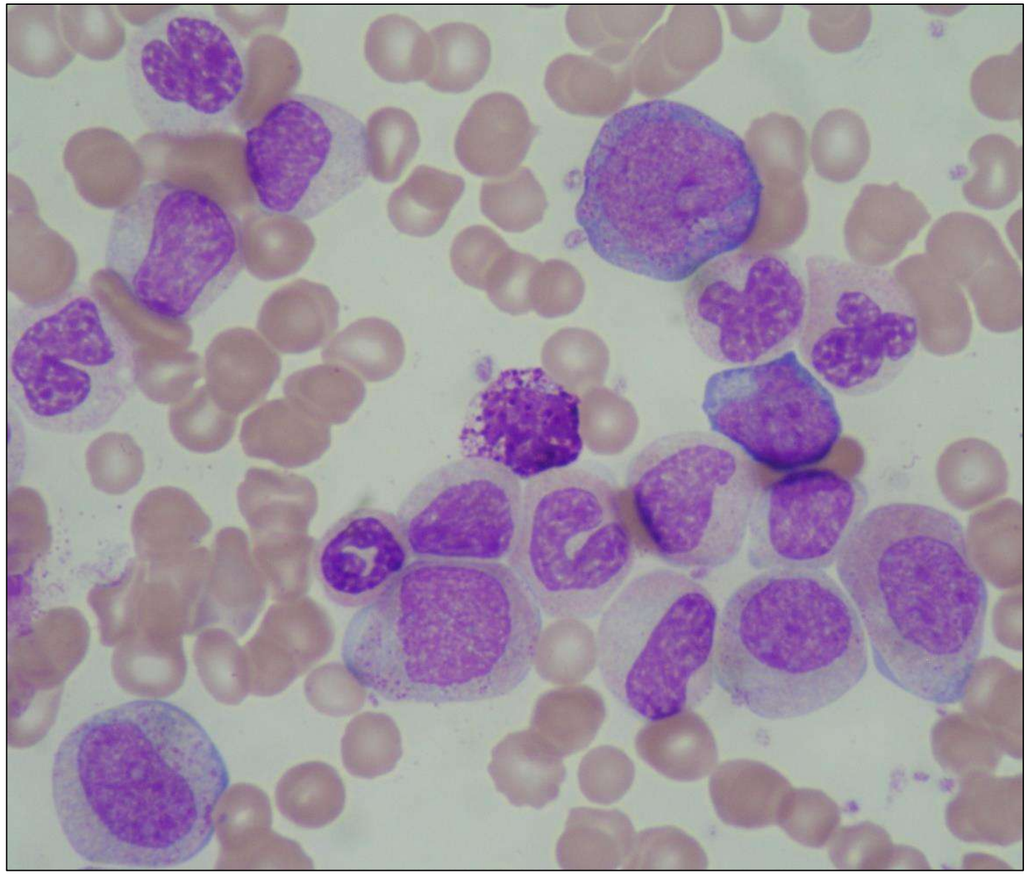


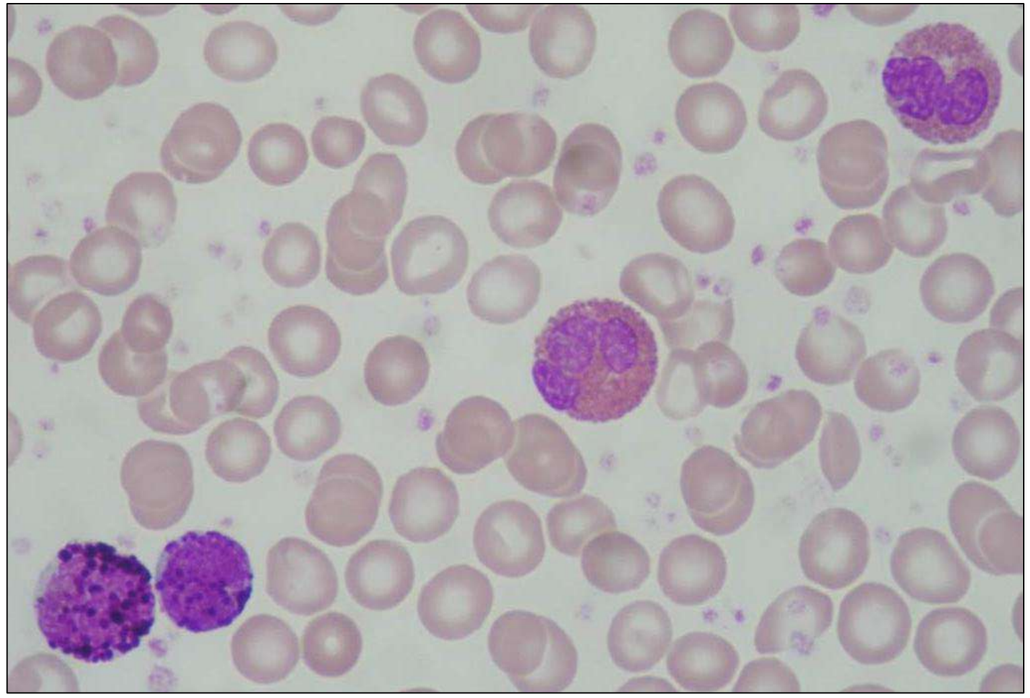






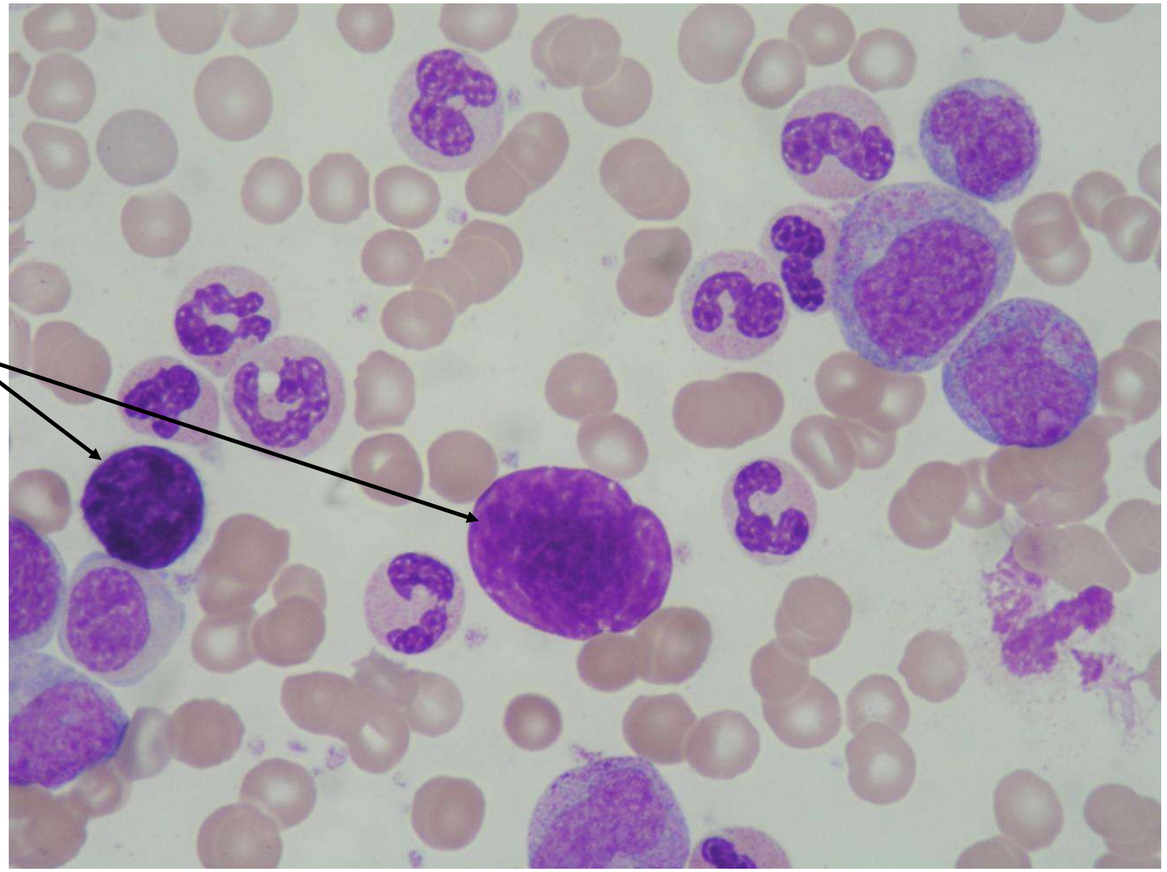
LMC BCR-ABL1+ - Fase crónica



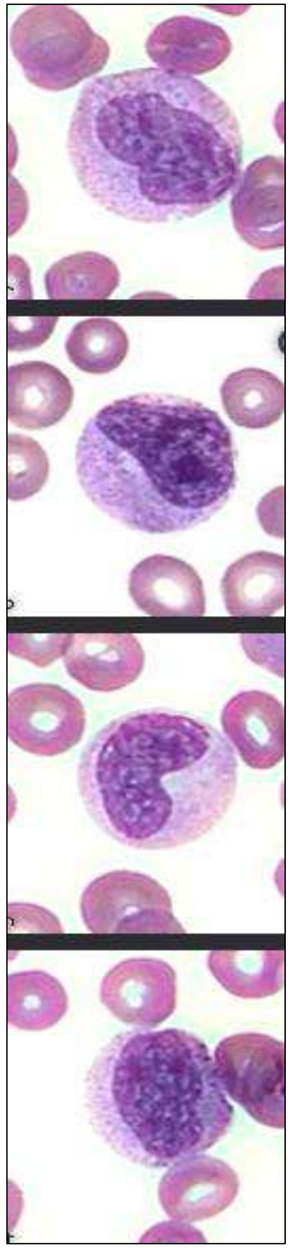


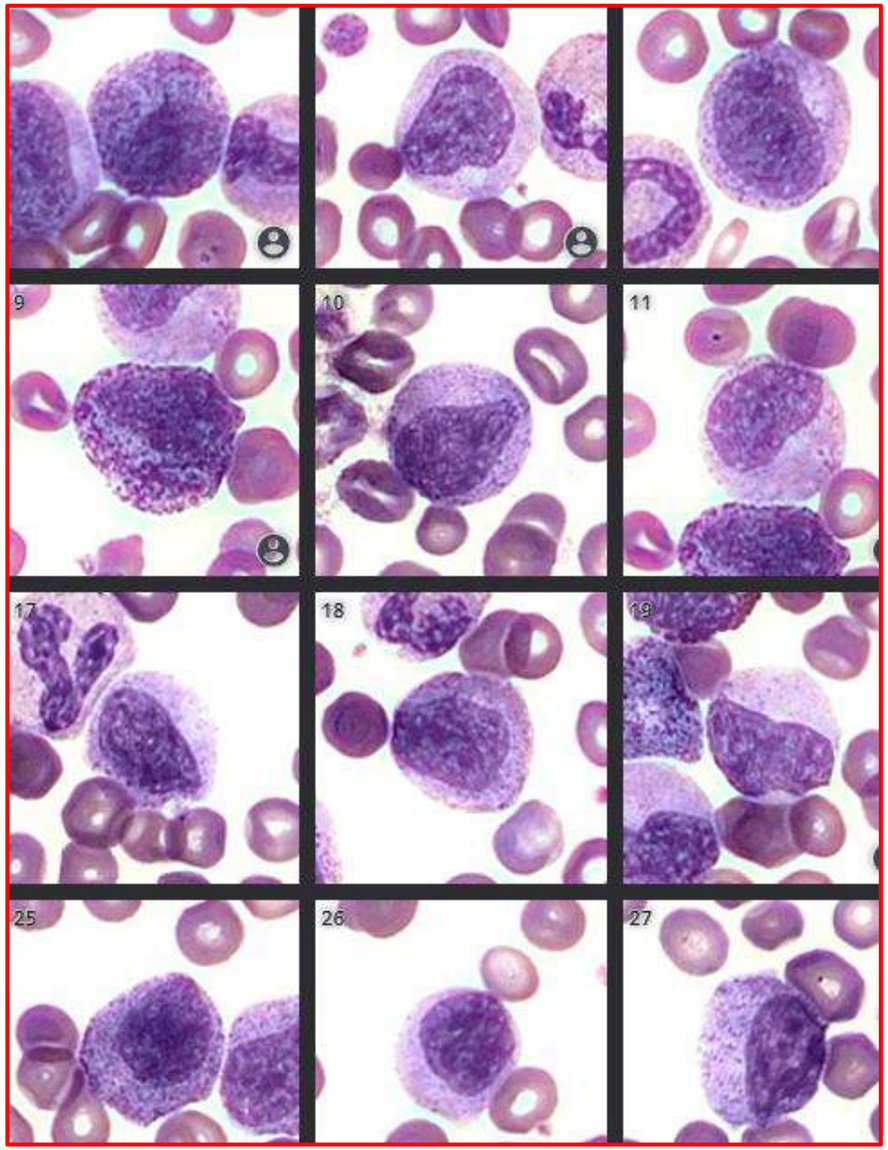
LMC BCR-ABL1+ - Fase crónica

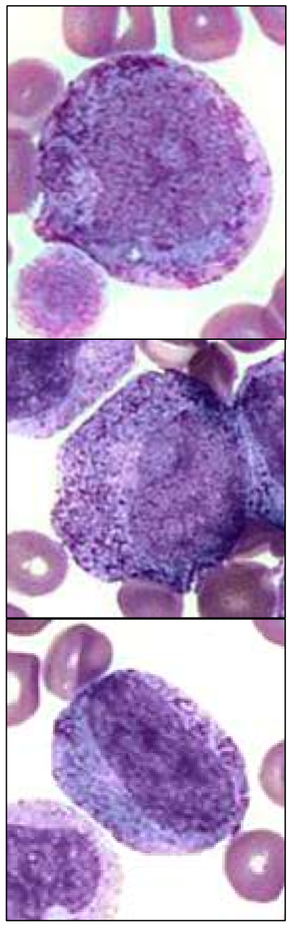
Núcleos de megacariócitos

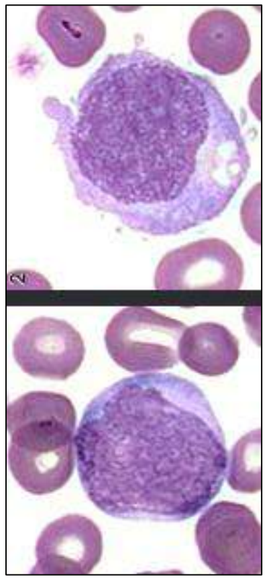


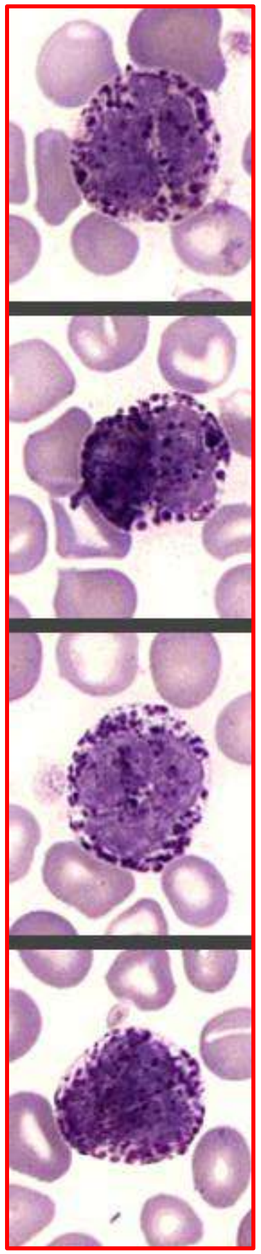
LMC BCR-ABL1+ - Fase crónica

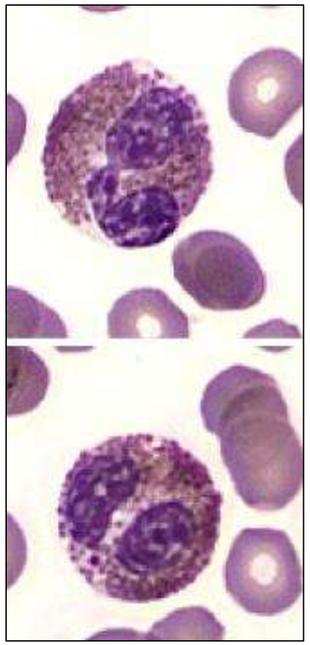




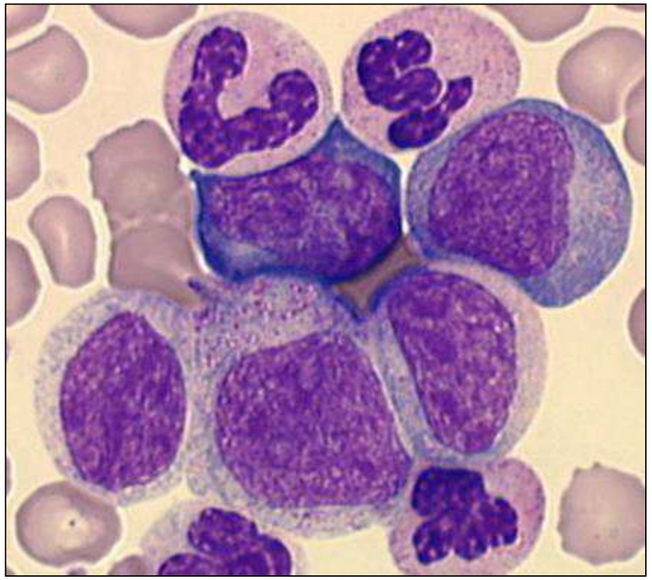


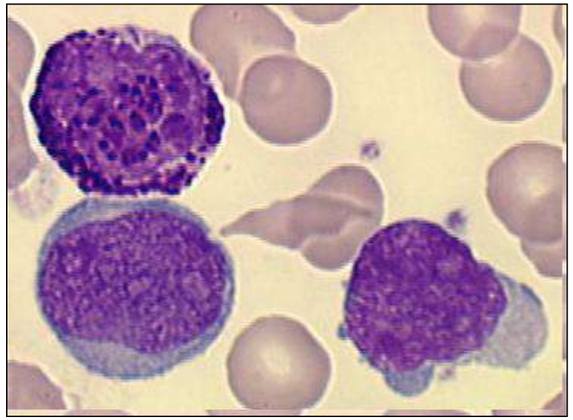


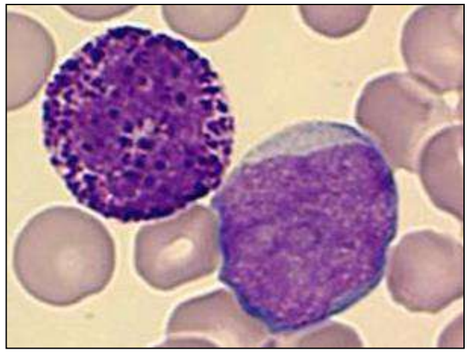


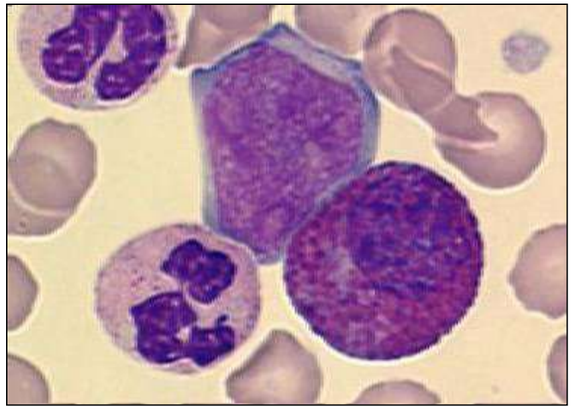


LMC BCR-ABL1+ - Fase blástica

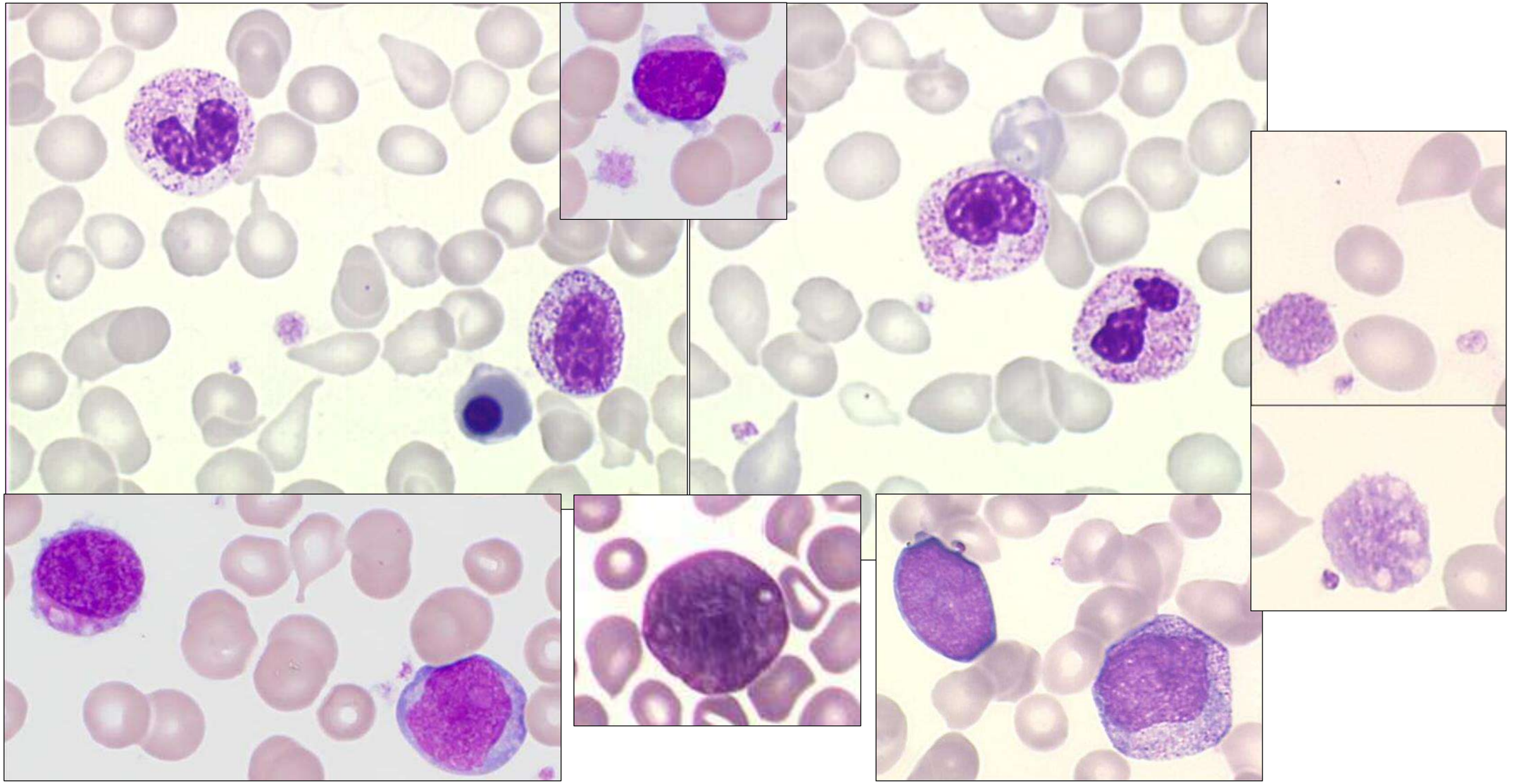




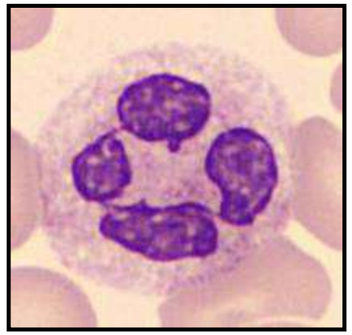


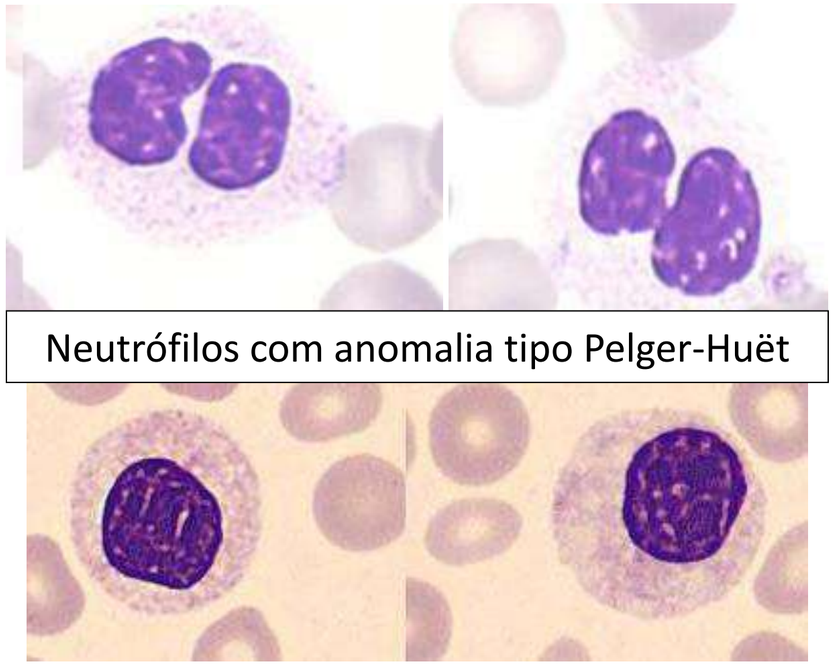


Mielofibrose primária

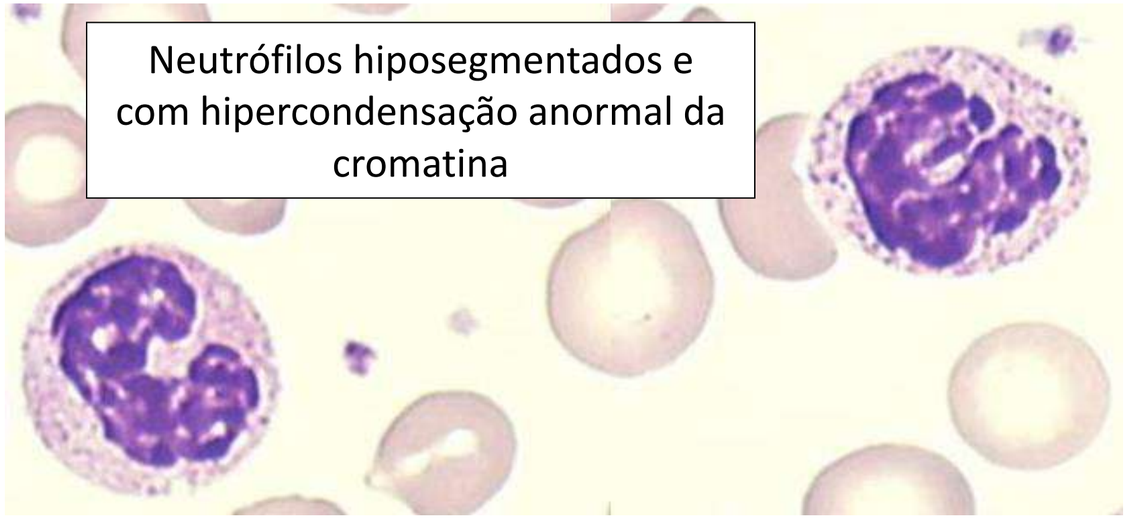


Disgranulopoiese

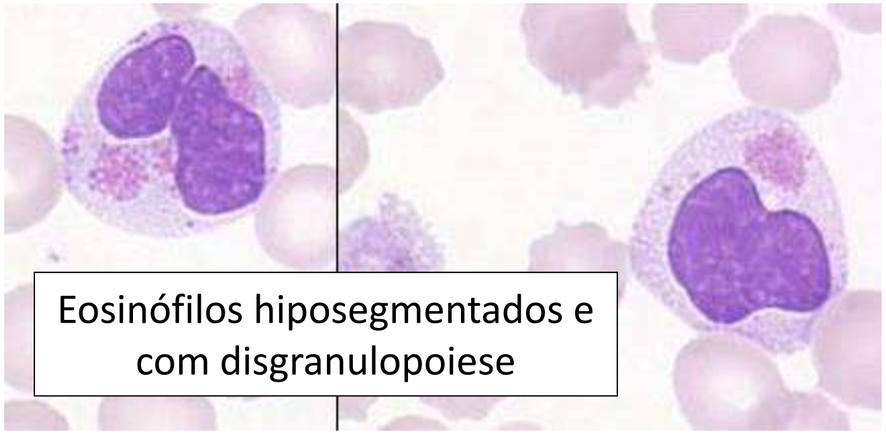




Neutrófilos com anomalia tipo Pelger-Huët



Neutrófilos hiposegmentados e com hipercondensação anormal da cromatina

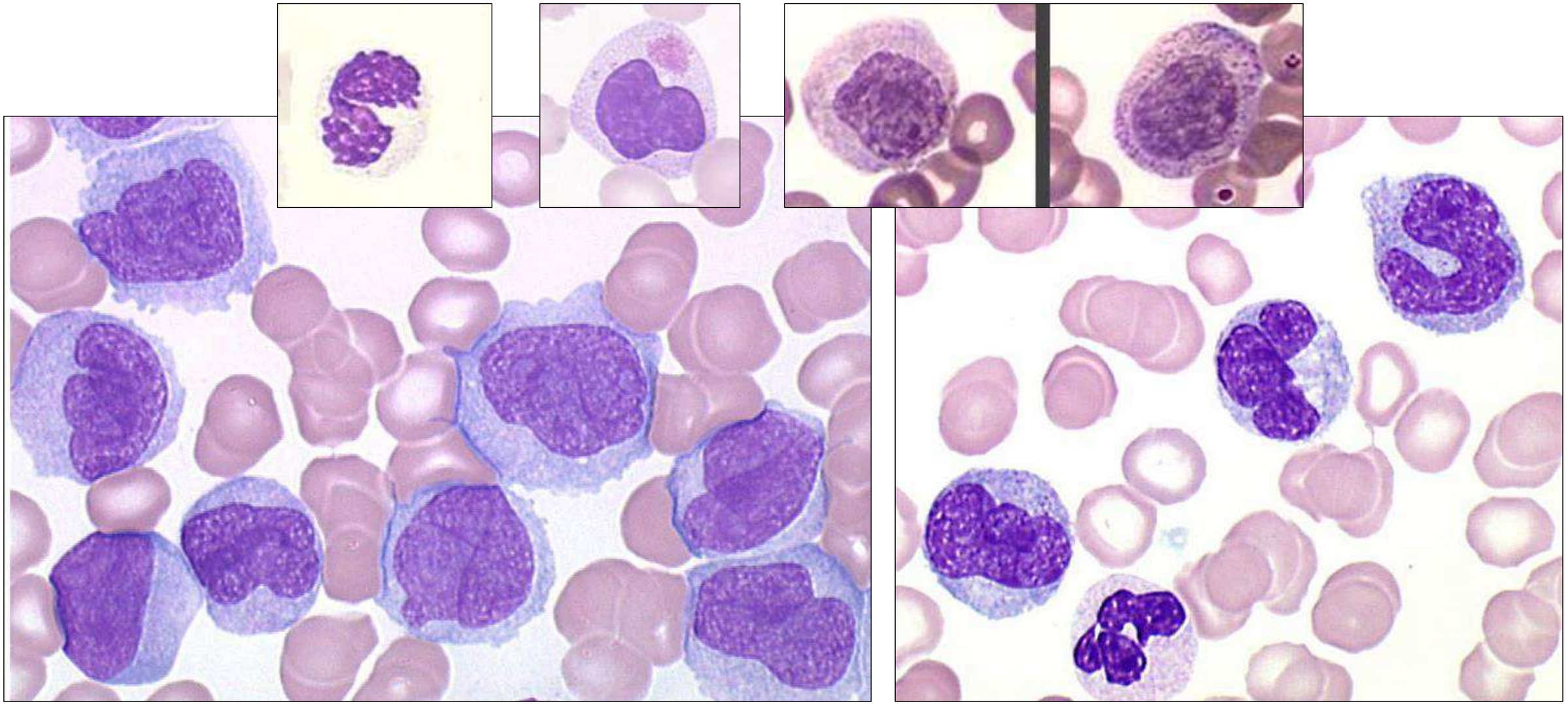


Eosinófilos hiposegmentados e com disgranulopoiese

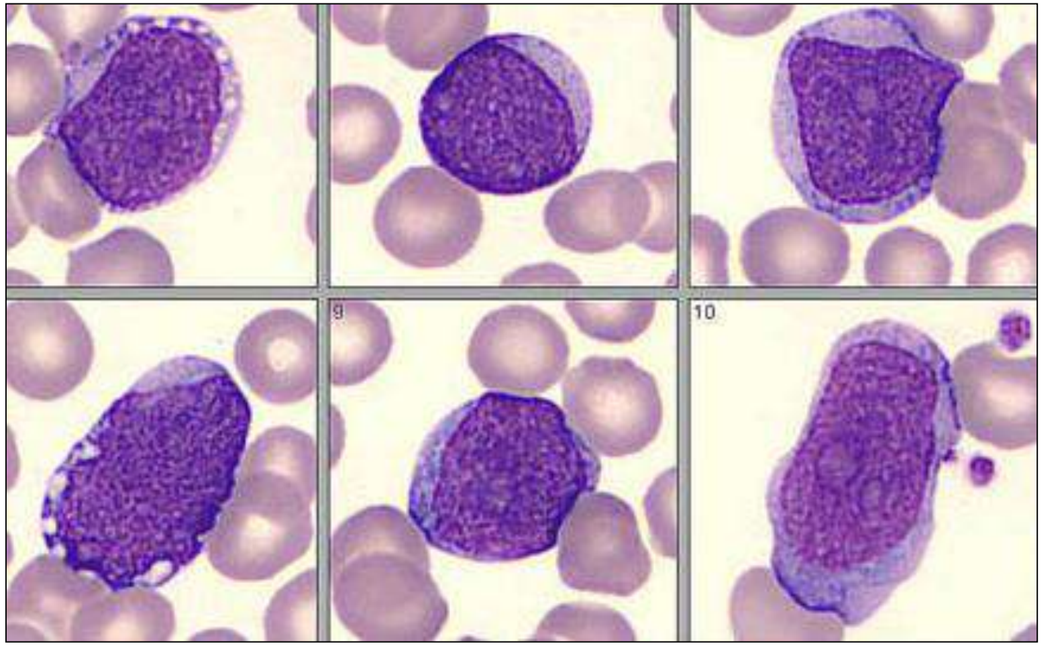
Neutrófilos hiposegmentados, com hipercondensação da cromatina e desgranulados

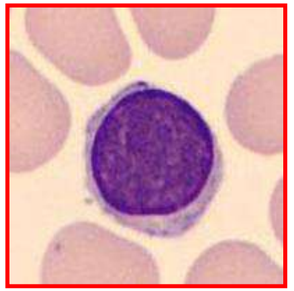
Hematocell.fr

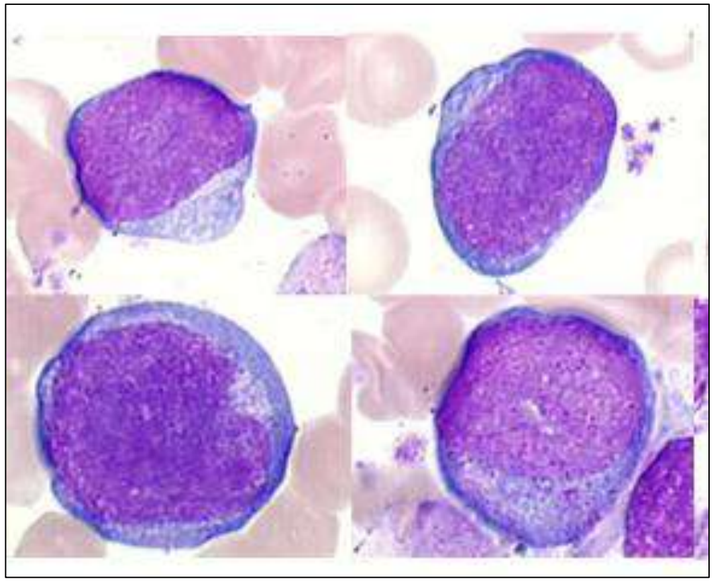
Leucémia mielomonocítica crónica (LMMC)



Blastos







A **presença de blastos no sangue periférico é sempre um achado anormal** e tem grande importância diagnóstica. O significado depende da quantidade, persistência e contexto clínico, mas quase sempre indica atividade medular patológica.

Geralmente implica:

- Doença mais avançada
- Maior risco de evolução para leucémia aguda (ex. NMP e SMD/MPN)
- Prognóstico mais reservado

(numa LA um número muito elevado de blastos no sangue pode causar leucostase, uma emergência médica)

O que significa encontrar blastos no sangue periférico?

1. Suspeita forte de neoplasia hematológica (principal causa)
(a presença de blastos no sangue periférico sugere que a medula óssea está a libertar células imaturas por dano grave, substituição medular ou expansão clonal maligna)

- Leucémias agudas (LMA ou LLA)
- Síndromes mielodisplásicas (SMD) com excesso de blastos
- Neoplasias mieloproliferativas e neoplasias mieloproliferativas/mielodisplásicas

(a presença de blastos no sangue é um sinal de evolução/aceleração da doença)

2. Stress medular severo ("leucoeritroblastose")
(quando não é infiltração por neoplasia, a libertação de blastos pode ocorrer devido a danos estruturais da medula, levando-a a expulsar células muito imaturas)

- Infiltração medular por tumores (metástases)
- Fibrose medular - primária (mielofibrose) ou secundária (doença autoimune, infecção, neoplasias)
- Infeções graves / sépsis fulminante (geralmente poucos blastos, mas podem aparecer)
- Recuperação pós-quimioterapia / pós-transplante (“regeneração medular”)

3. Causas benignas verdadeiras (muito raro)

- Stress hematopoiético extremo (hemorragia maciça ou anemia hemolítica grave)
  (a medula óssea pode libertar raros blastos, mas nunca em números altos)

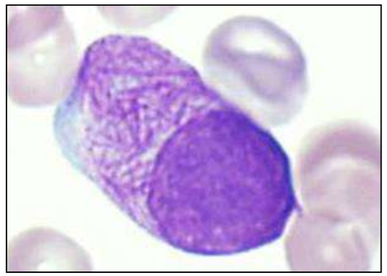
Contexto clínico

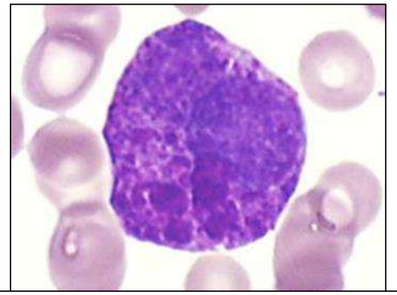
Anemia, trombocitopénia leucocitose, neutropénia, monocitose

Testes da coagulação

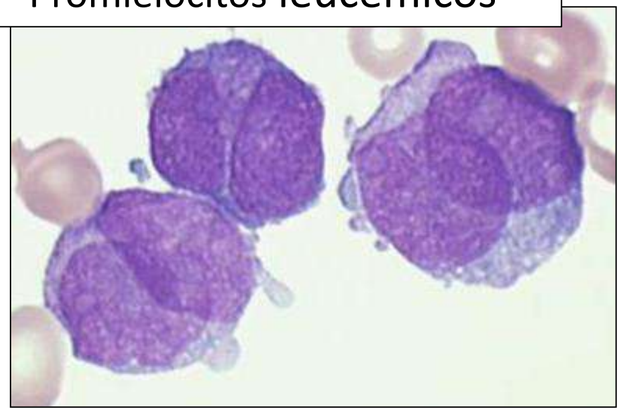
Evidência laboratorial de lise tumoral

Blastos





Promielócitos leucémicos

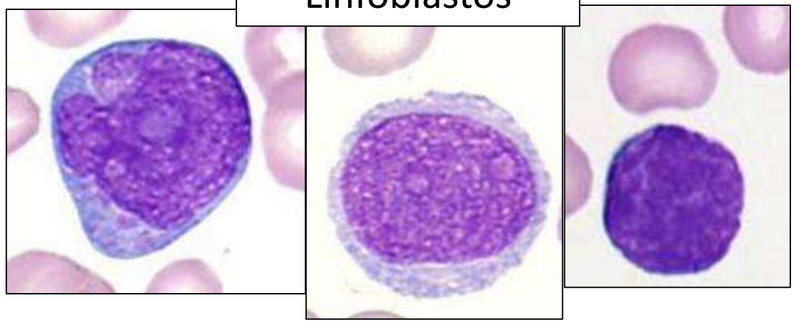


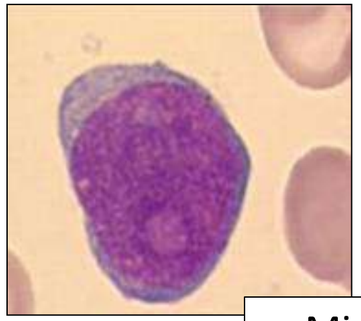
- Atenção à descrição das células com morfologia blástica
  - **Excluir** leucémia promielocítica aguda
  - **Imunofenotipagem por citometria de fluxo**
  - **Genética**

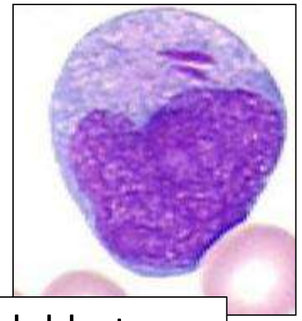
Contexto celular:
- Bastonetes de Auer?
- Promielocíticos leucémicos?

Linfócito normal

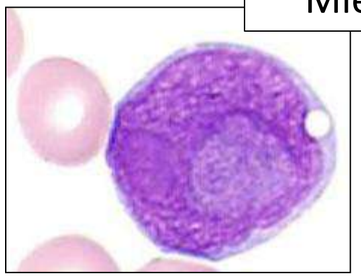
Linfoblastos

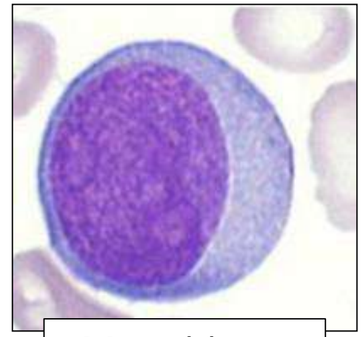






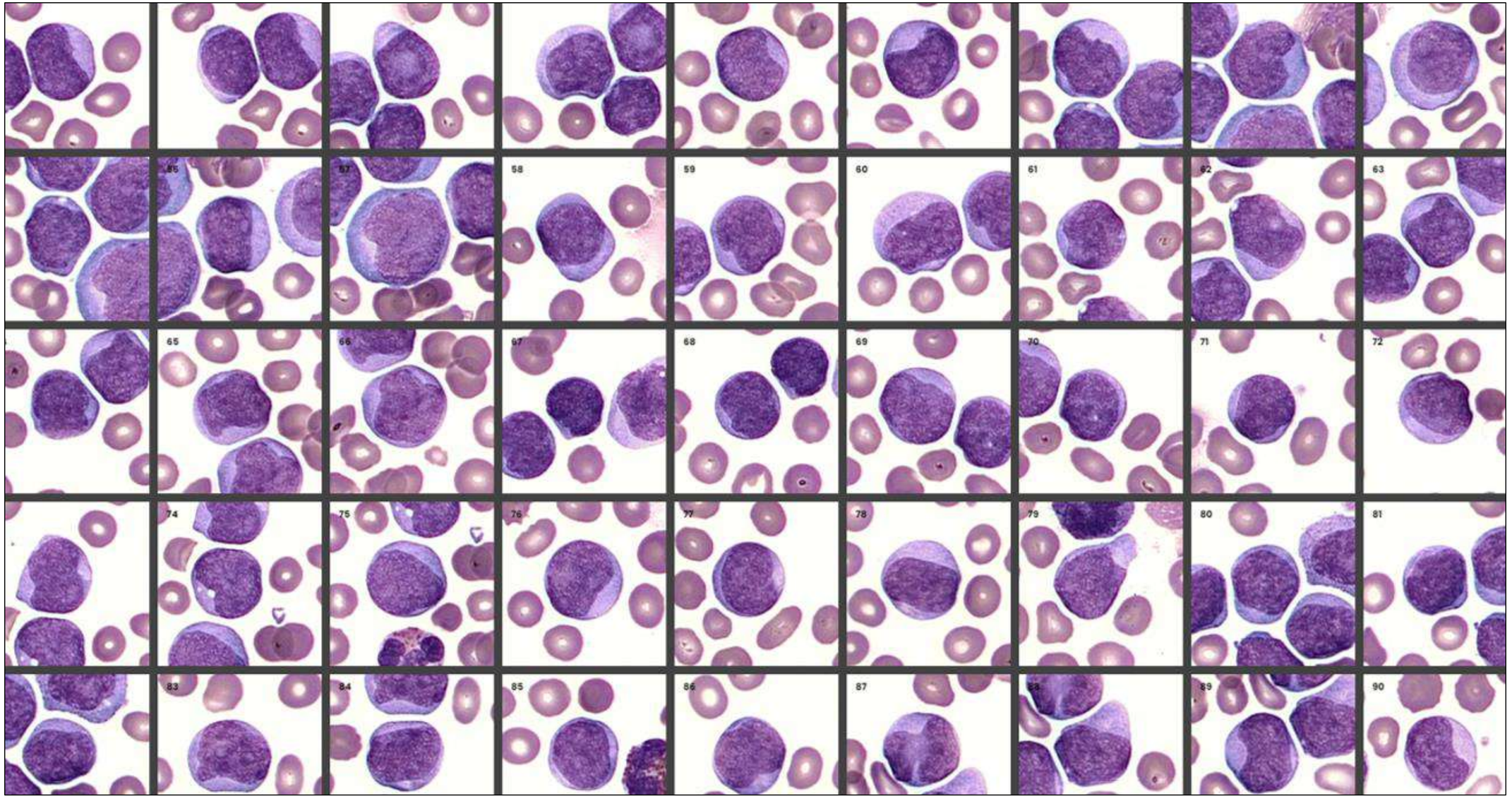
Mieloblastos





Monoblasto

Blastos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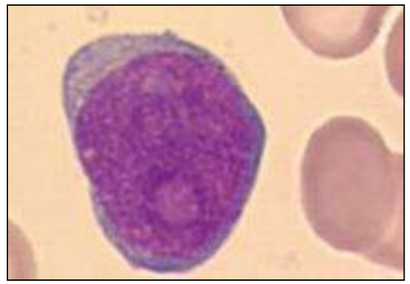
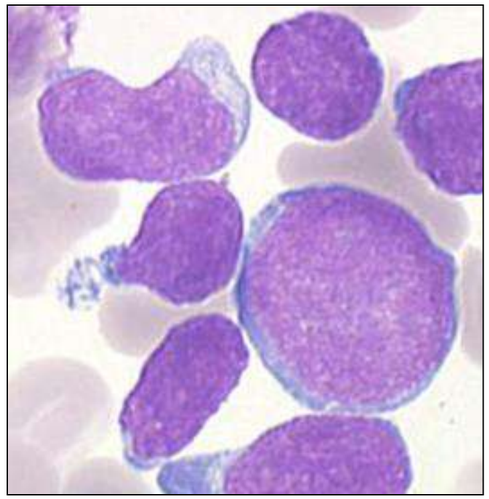
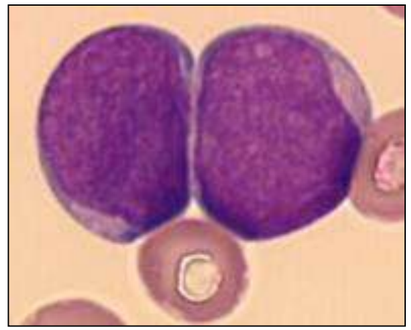
MIELOBLASTOS

- **Tamanho**
  - ✓ variável, desde ligeiramente maior que um linfócito até igual ou maior que um monócito
- **Relação núcleo-citoplasma** elevada

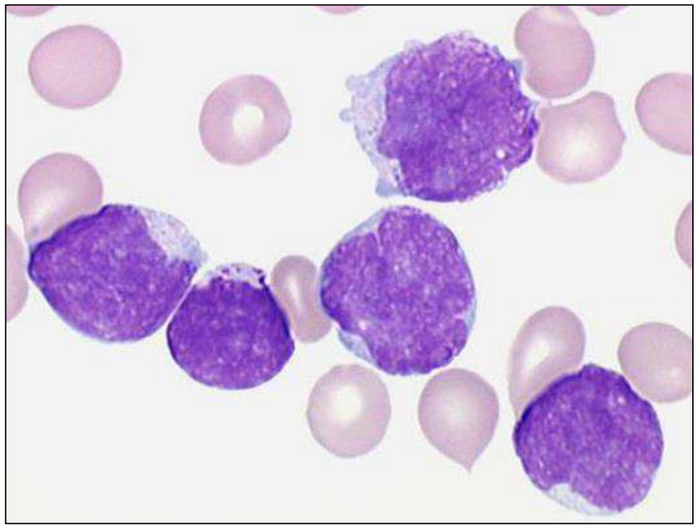


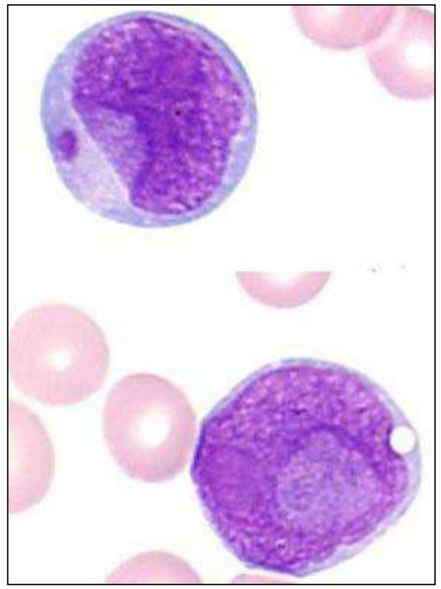




MIELOBLASTOS

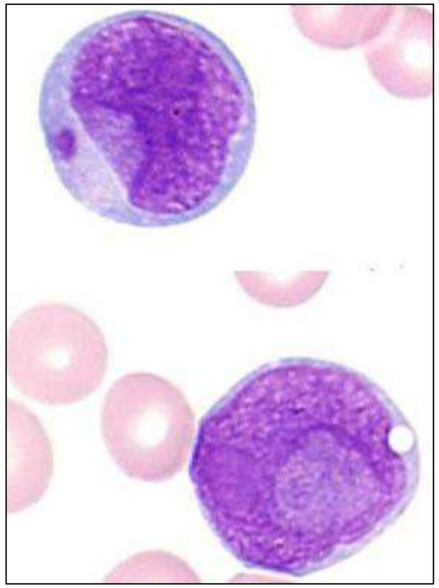
- **Núcleo**
  - ✓ redondo ou oval, pode ser irregular
  - ✓ a lobulação do núcleo não indica obrigatoriamente diferenciação monocítica
  - ✓ cromatina finamente difusa com um ou mais nucléolos
  - ✓ por vezes, com invaginação proeminente – morfologia “cup-like”
    - se à periferia do núcleo – aspecto de bordo de chávena ou boca de peixe, se sobreposta - assemelha-se a um grande nucléolo pálido

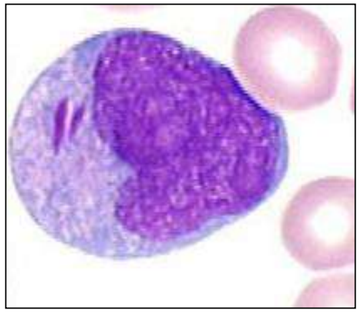


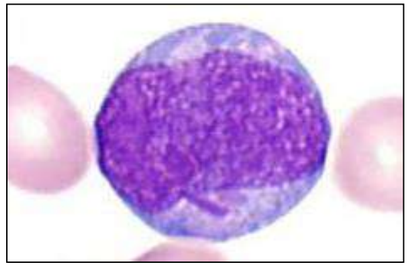


MIELOBLASTOS

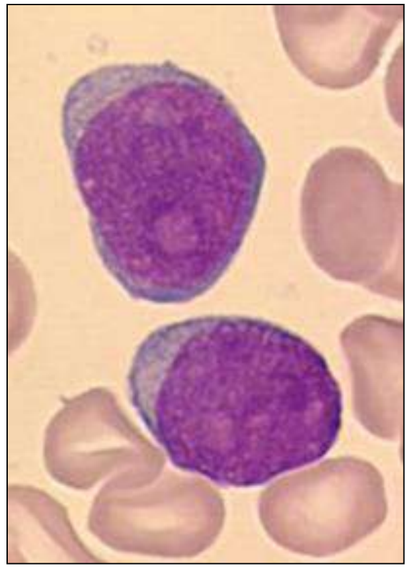
- **Citoplasma**
  - ✓ quantidade escassa a moderada
  - ✓ fraco a moderadamente basófilo
  - ✓ pode conter raros grânulos azurófilos e/ou bastonetes de Auer

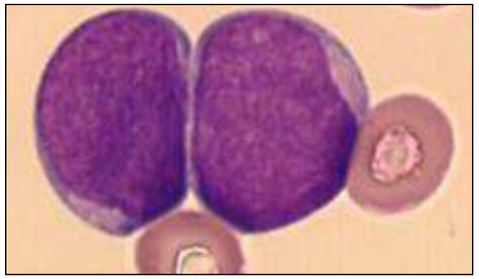


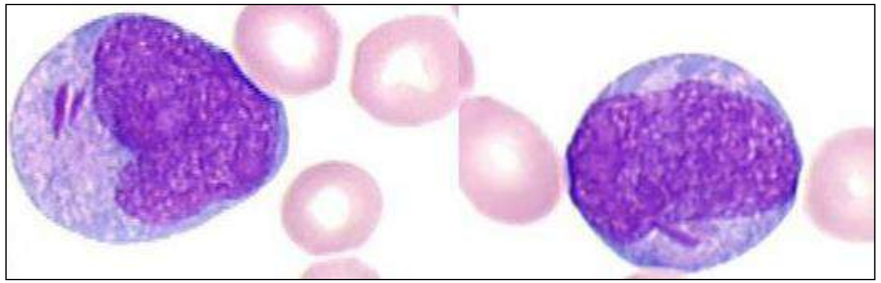


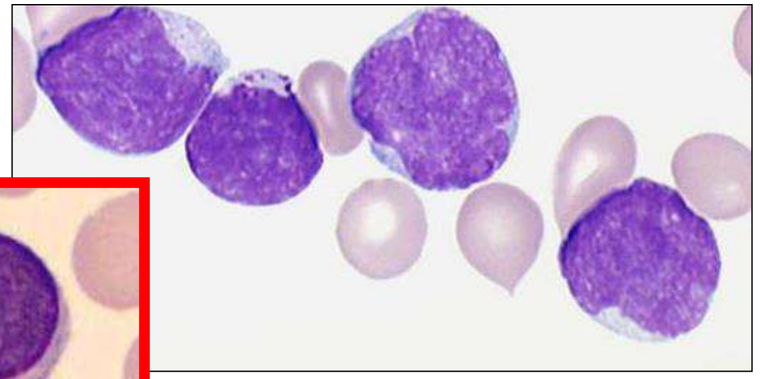


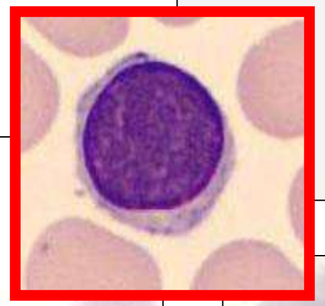
LMA - MIELOBLASTOS

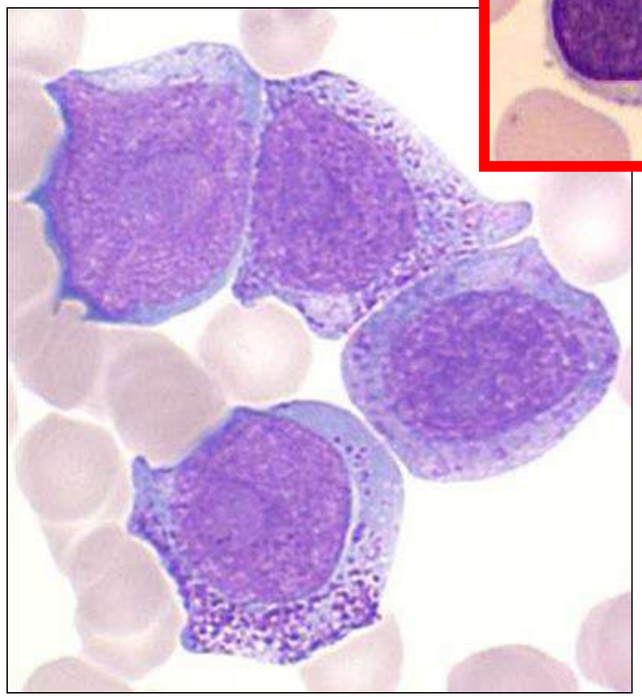


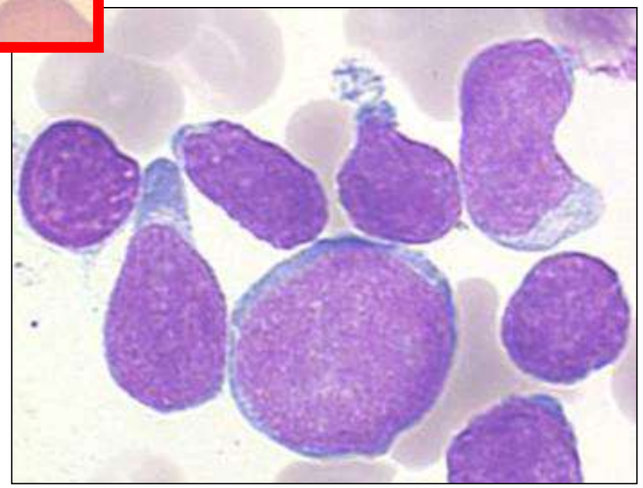




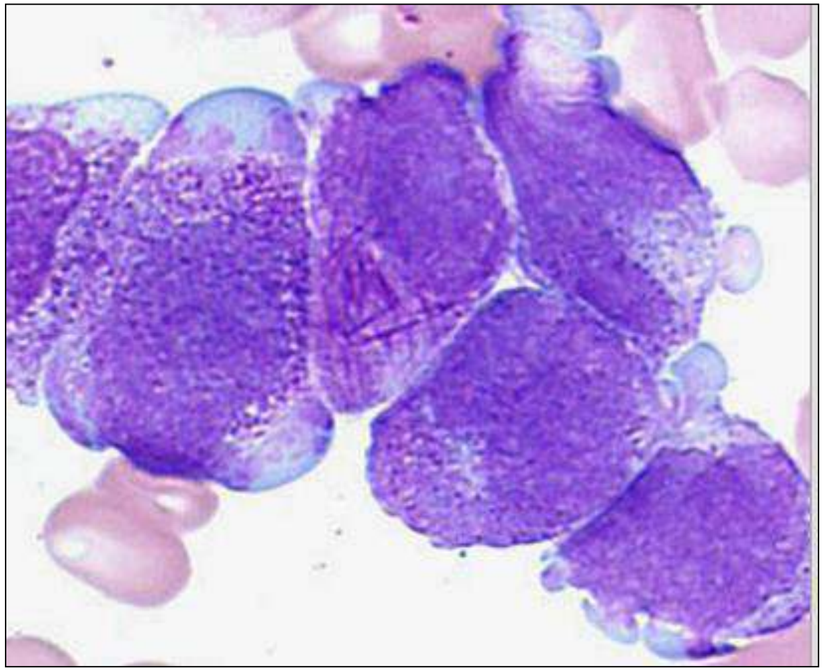


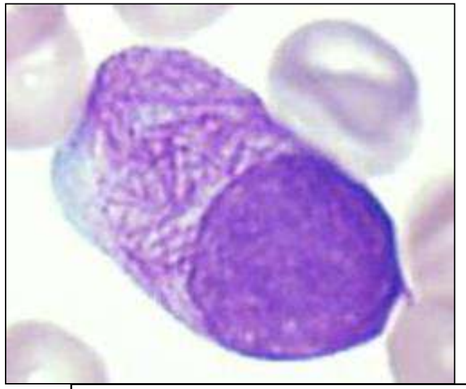


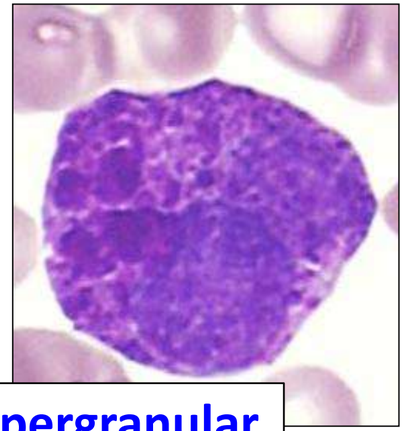




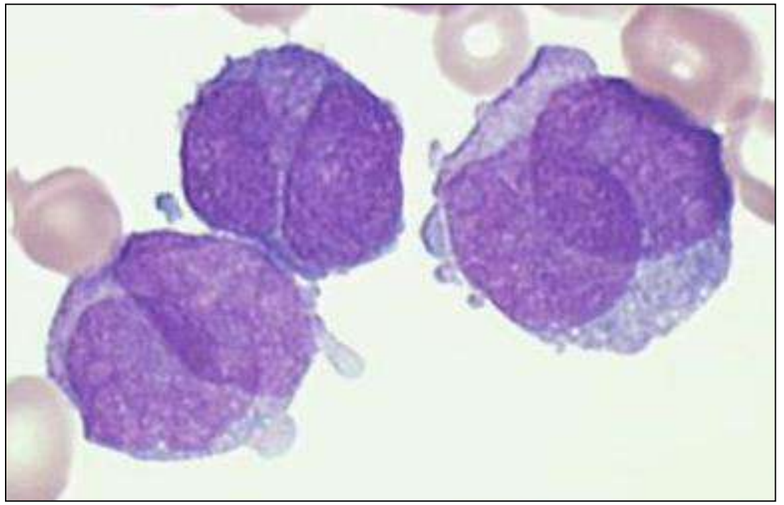
LEUCÉMIA PROMIELOCÍTICA AGUDA (LPA)

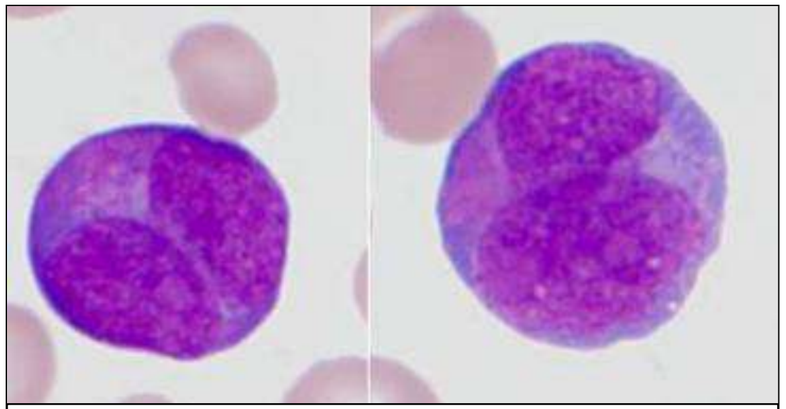






LPA – Variante hipergranular





LPA – Variante microgranular

PROMIELÓCITO ANORMAL - LPA

- **Tamanho**
  - ✓ célula grande (2 a 3 vezes um glóbulo vermelho)
- **Núcleo**
  - ✓ redondo, oval , variavelmente reniforme ou bilobado
  - ✓ frequentemente difícil de ver o seu contorno
- **Citoplasma**
  - ✓ com numerosos grânulos rosa brilhante ou vermelho púrpura, por vezes, de tamanho gigante
  - ✓ não se observa zona de Golgi
  - ✓ múltiplos bastonetes de Auer em feixes
    - "células em ouriço" ou "faggot cells"
  - ✓ granulações aglomeradas, de tipo pseudo Chédiak-Higashi
- **Promielócito microgranular** – núcleo, frequentemente, bilobado, por vezes, em "asa de borboleta", citoplasma fraca a moderadamente basófilo, aparentemente, agranular ou com finos grânulos avermelhados (tipo pó); nalguns casos a basofilia pode ser mais marcada e o citoplasma com protusões ou "blebs"

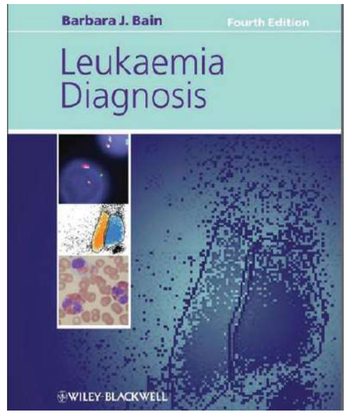
MONOBLASTOS

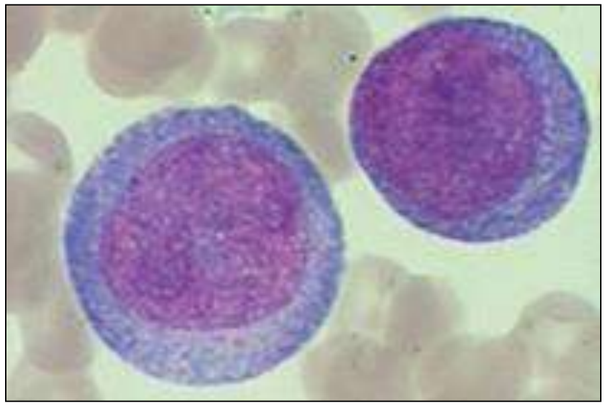
Monoblasts differ from myeloblasts in being larger with more voluminous cytoplasm.

The cytoplasm is moderately to markedly basophilic and may have fine granules or vacuoles.

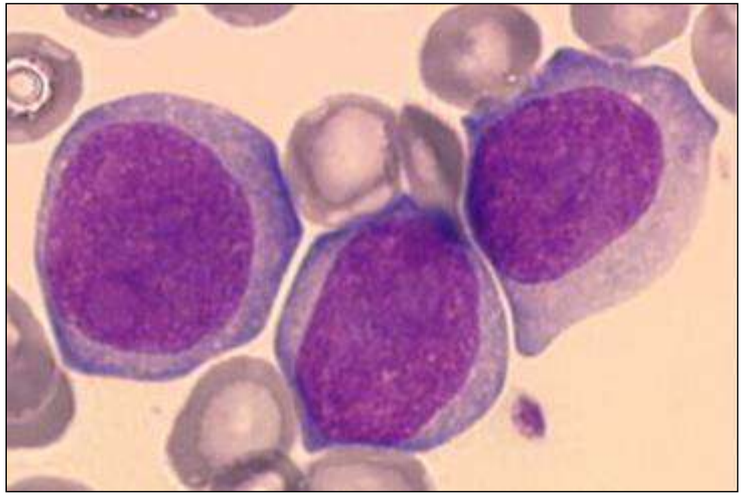
The nucleus is round or somewhat oval with a dispersed chromatin pattern and often a large single nucleolus.

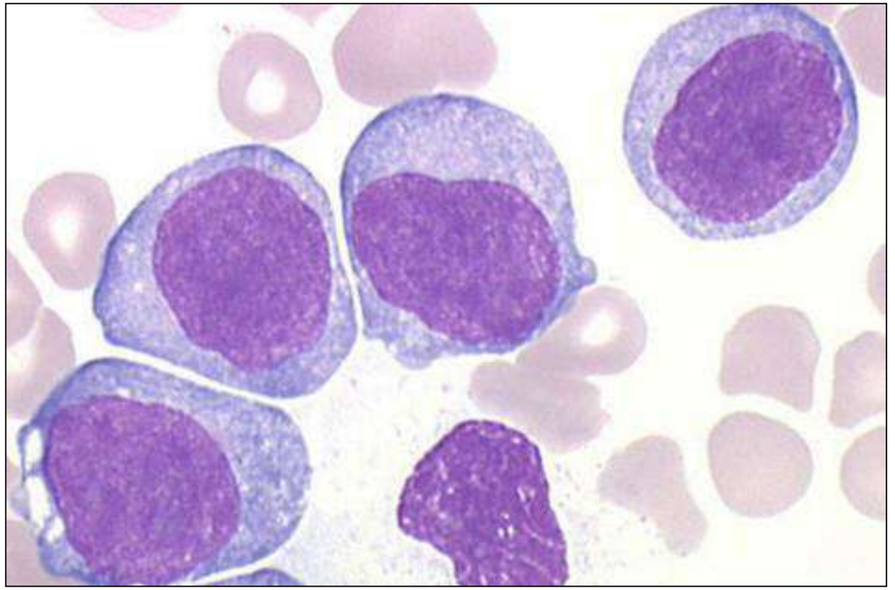
The cell may be round or have an irregular cytoplasmic margin.

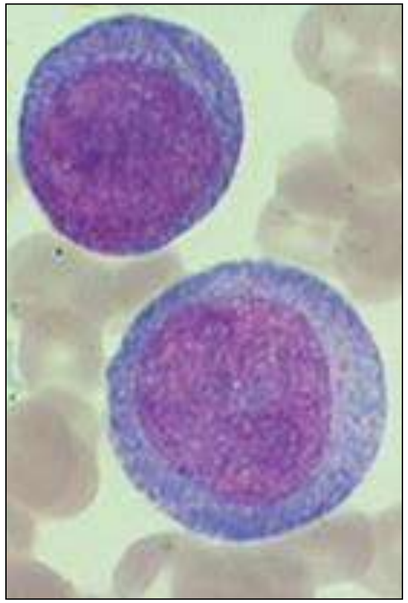


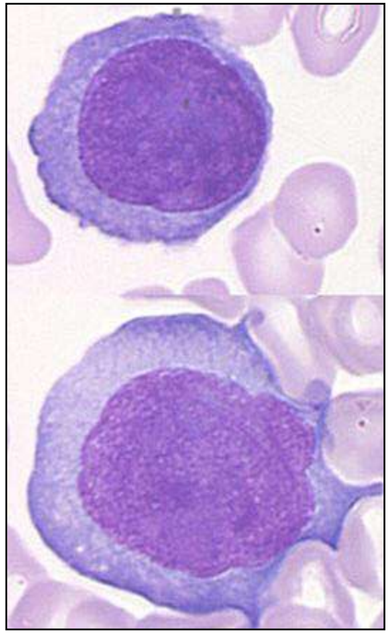


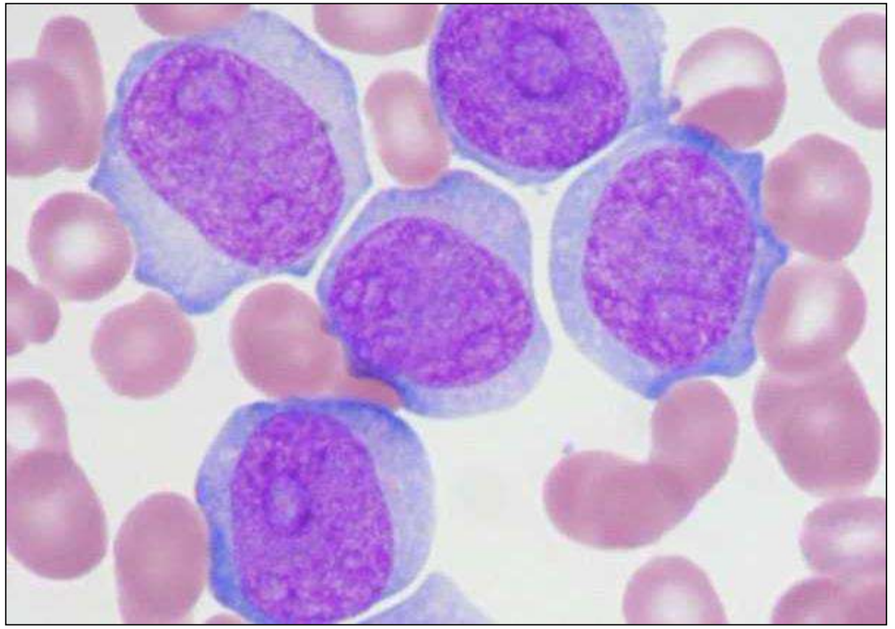
MONOBLASTOS











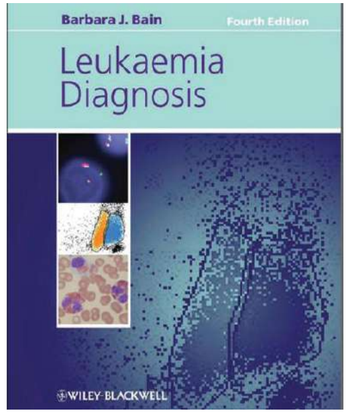
PROMONÓCITOS

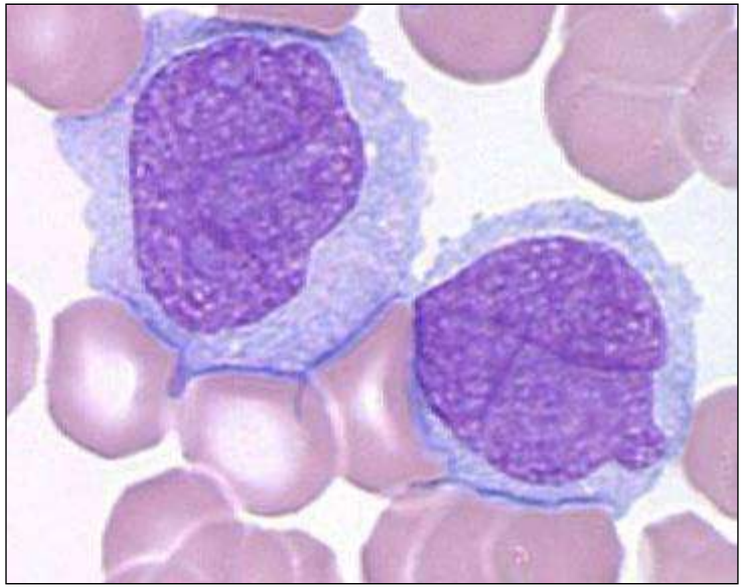
A **promonocyte** is a large cell with an irregular or convoluted nucleus.

The cytoplasm is weakly or moderately basophilic. The cytoplasm may be vacuolated or contain granules.

The chromatin pattern is diffuse, like that of a monoblast. A nucleolus with similar characteristics may be present or the nucleolus may be smaller.

It is the features of the nucleus that permit a distinction between a monoblast and a promonocyte; both have the same delicate or dispersed chromatin pattern but the monoblast has a regular nucleus whereas that of the promonocyte is irregular.

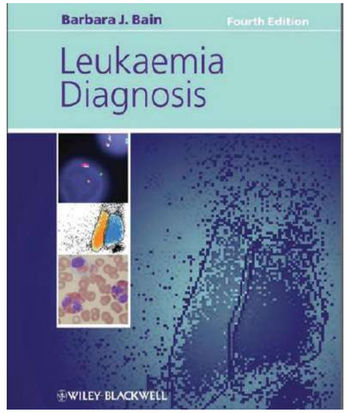




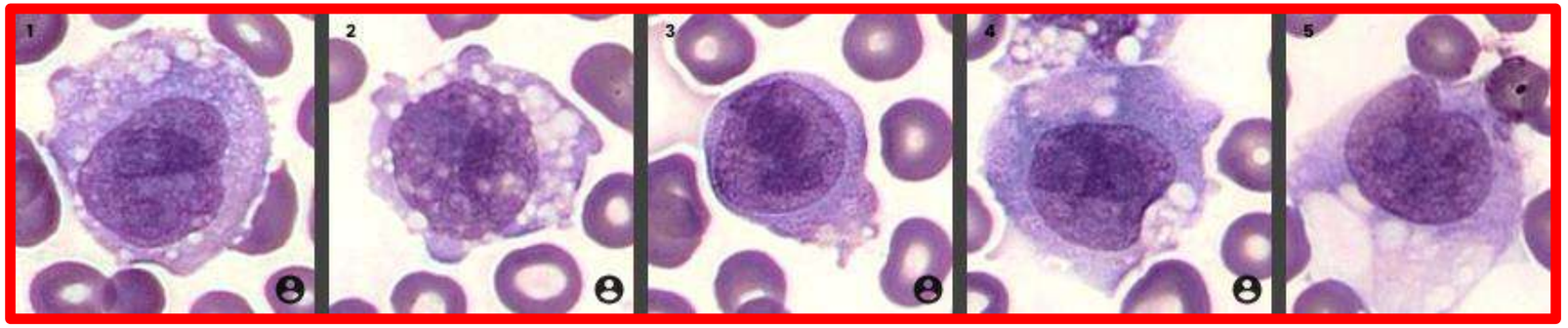
PROMONÓCITOS – Equivalentes blásticos

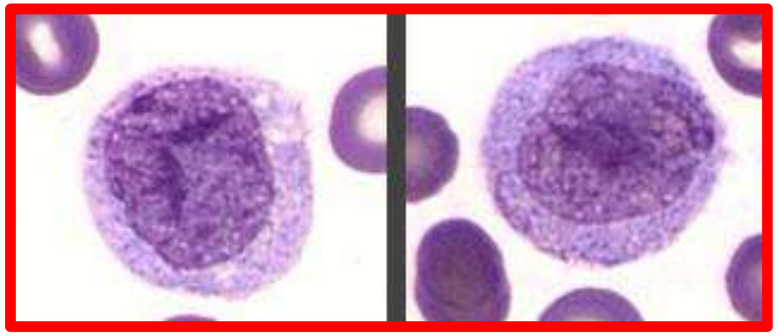
Promonocytes must be distinguished from **immature or atypical monocytes**, which have some chromatin condensation and rarely have nucleoli, these being the essential features that differentiate them from promonocytes.

Since the WHO classification regards the promonocyte as a 'blast equivalent' in the diagnosis of myeloid neoplasms, its recognition has become of considerable importance.

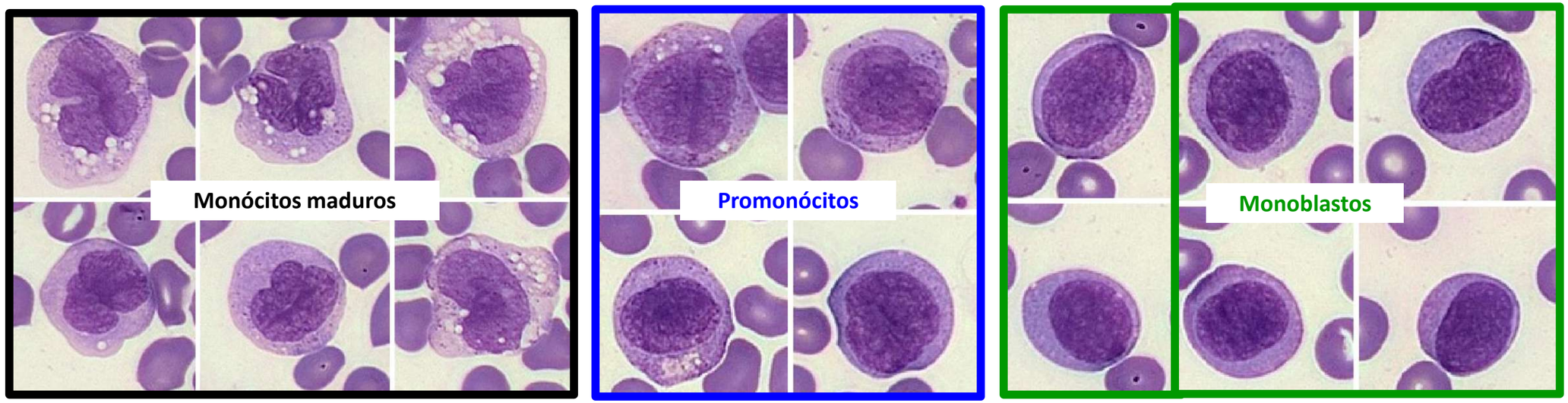


The misclassification of immature or abnormal monocytes as promonocytes can lead to a disease being categorized as AML rather than as MDS or CMML.





MONÓCITOS, PROMONÓCITOS e MONOBLASTOS

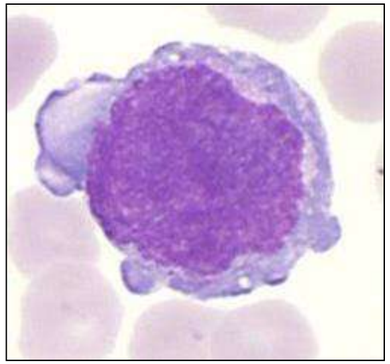


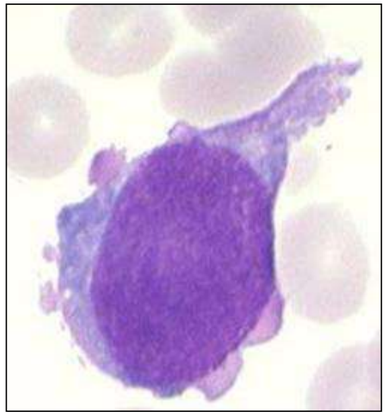
@candido_silva_hematologia

Cândido Silva e Júlia Henriques

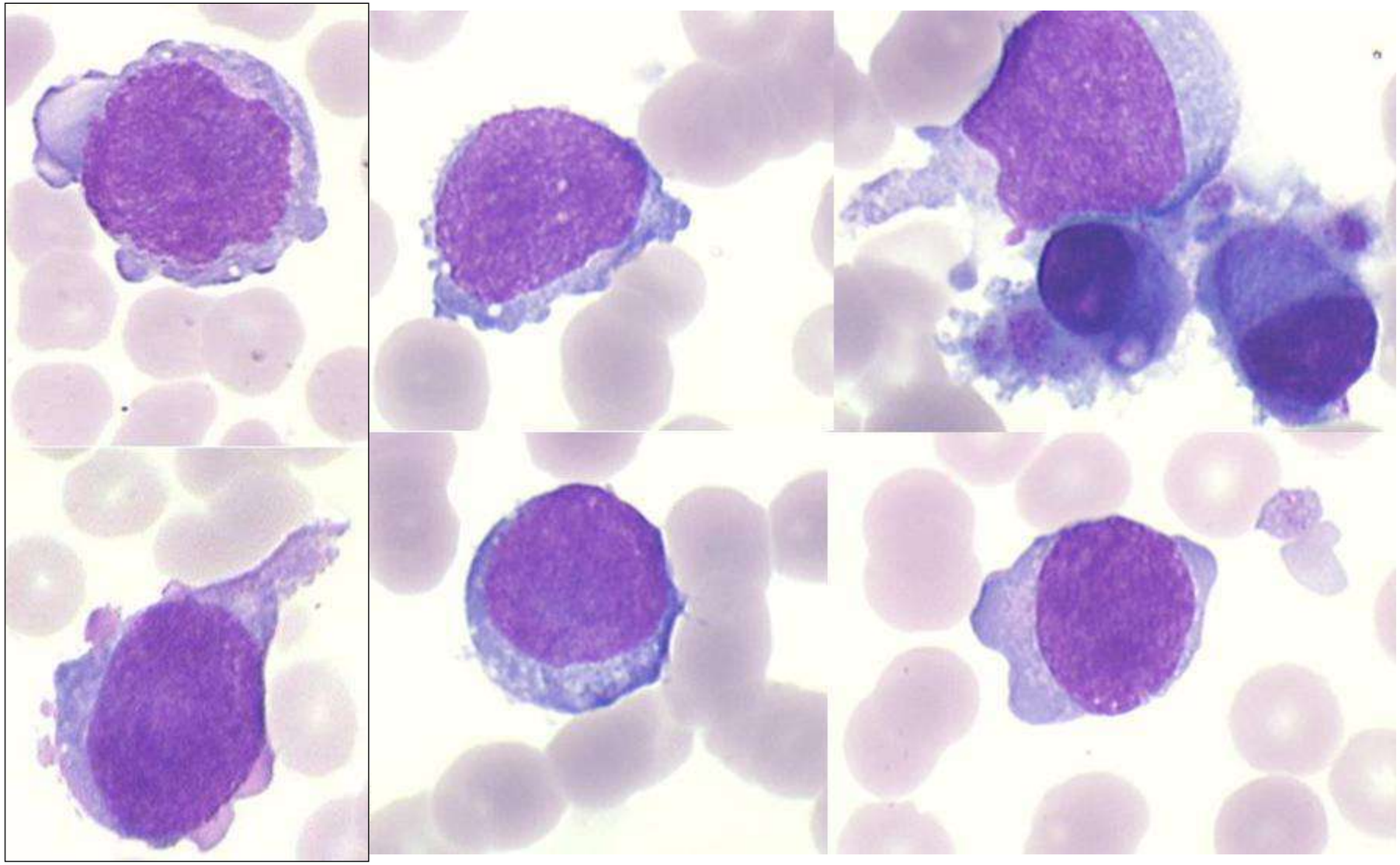
MEGACARIOBLASTOS

- Os megacarioblastos leucémicos, frequentemente, são muito pleomórficos
- Nucléolos múltiplos e evidentes e basofilia citoplasmática têm sido referidos
- Binuclearidade e *clumping* dos blastos
- Protusões ou *blebs* citoplasmáticas
- Coexistência com núcleos nús, plaquetas gigantes bizarras ou células mais maduras com diferenciação megacariocítica, incluindo micromegacariócitos
- Noutros casos, não são distinguíveis dos mieloblastos ou são semelhantes a linfoblastos (pequenos com elevada relação núcleo-citoplasma e com alguma condensação da cromatina)





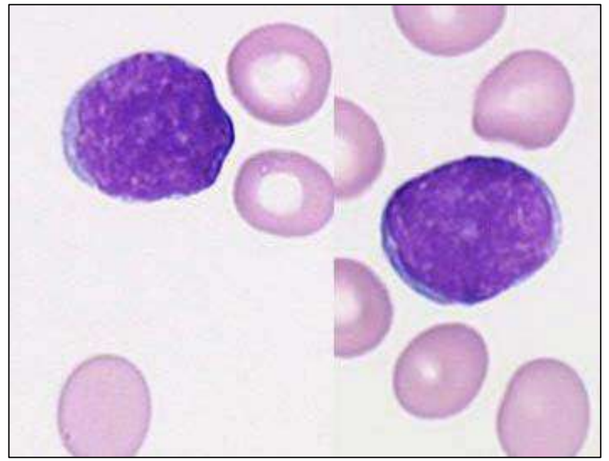
MEGACARIOBLASTOS



LINFOBLASTOS

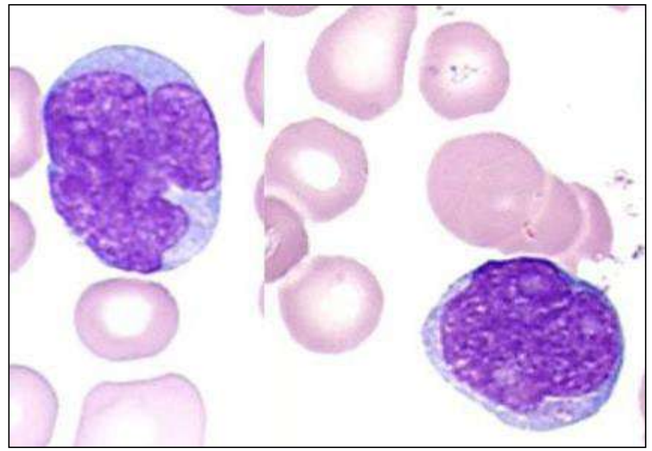
Linfoblasto tipo L1

- Tamanho médio, elevada relação núcleo-citoplasmática, contorno nuclear regular, cromatina difusa e homogénea, por vezes, condensada e nucléolo(s) não visíveis, inconspícuos ou pequenos

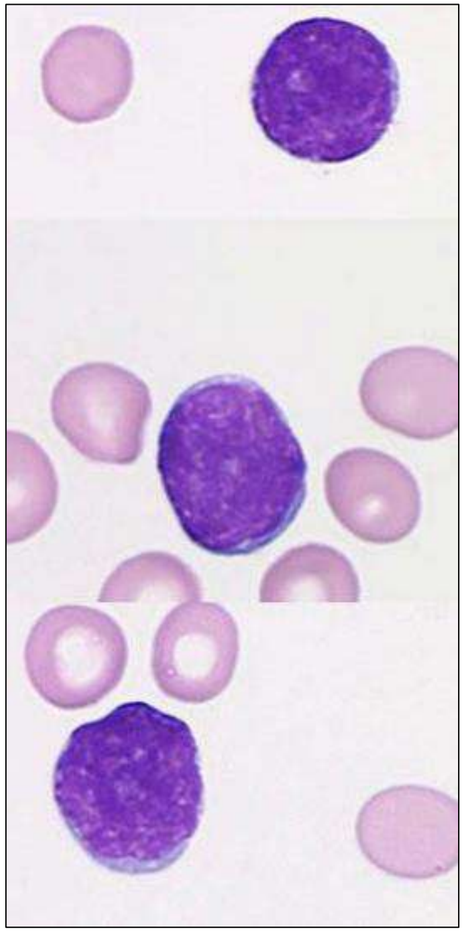


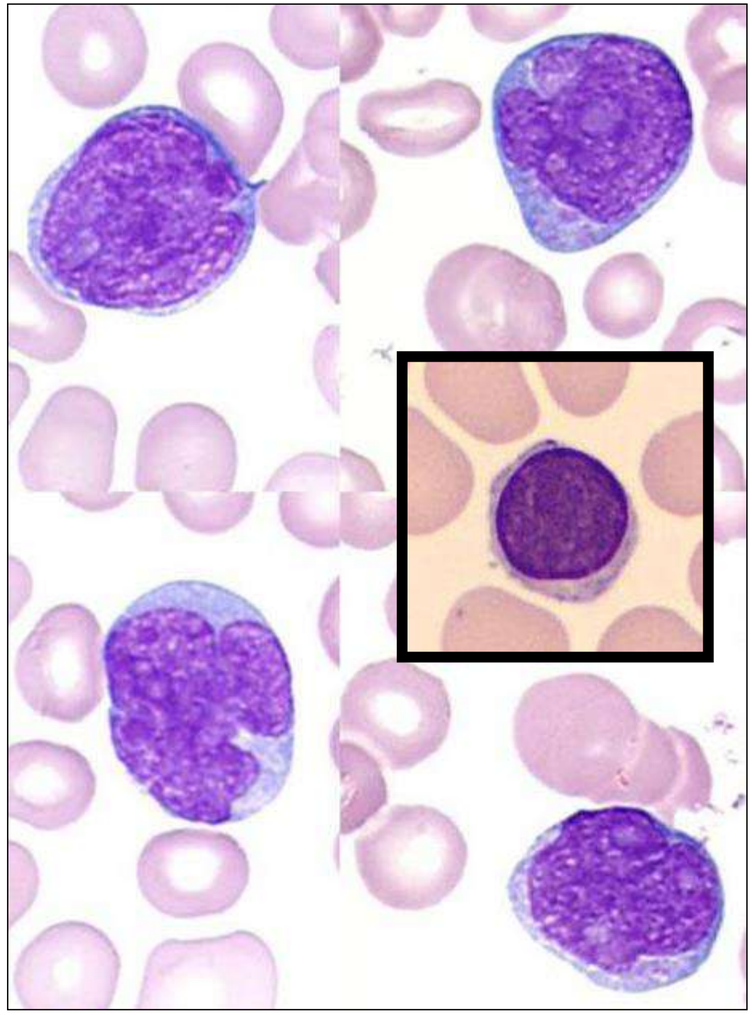
Linfoblasto tipo L2

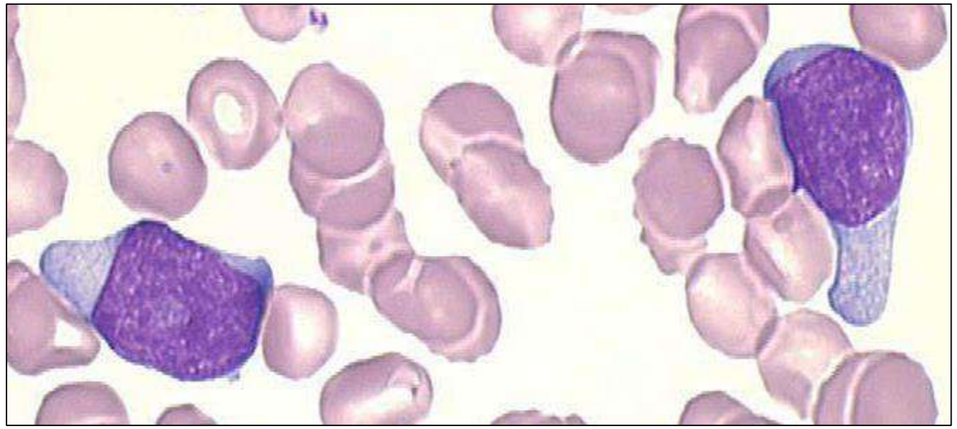
- Maiores e mais pleomórficos, relação núcleo-citoplasmática variável, contorno nuclear irregular (indentações e clivagens frequentes), cromatina heterogénea e nucléolo(s), geralmente, visíveis e, frequentemente, grandes

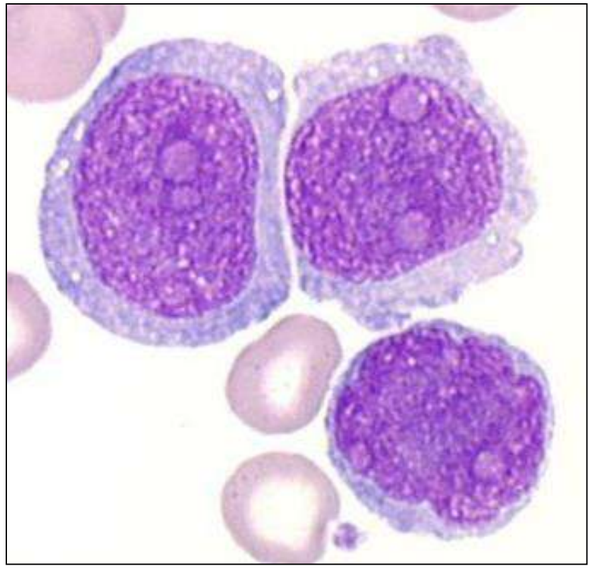


LINFOBLASTOS









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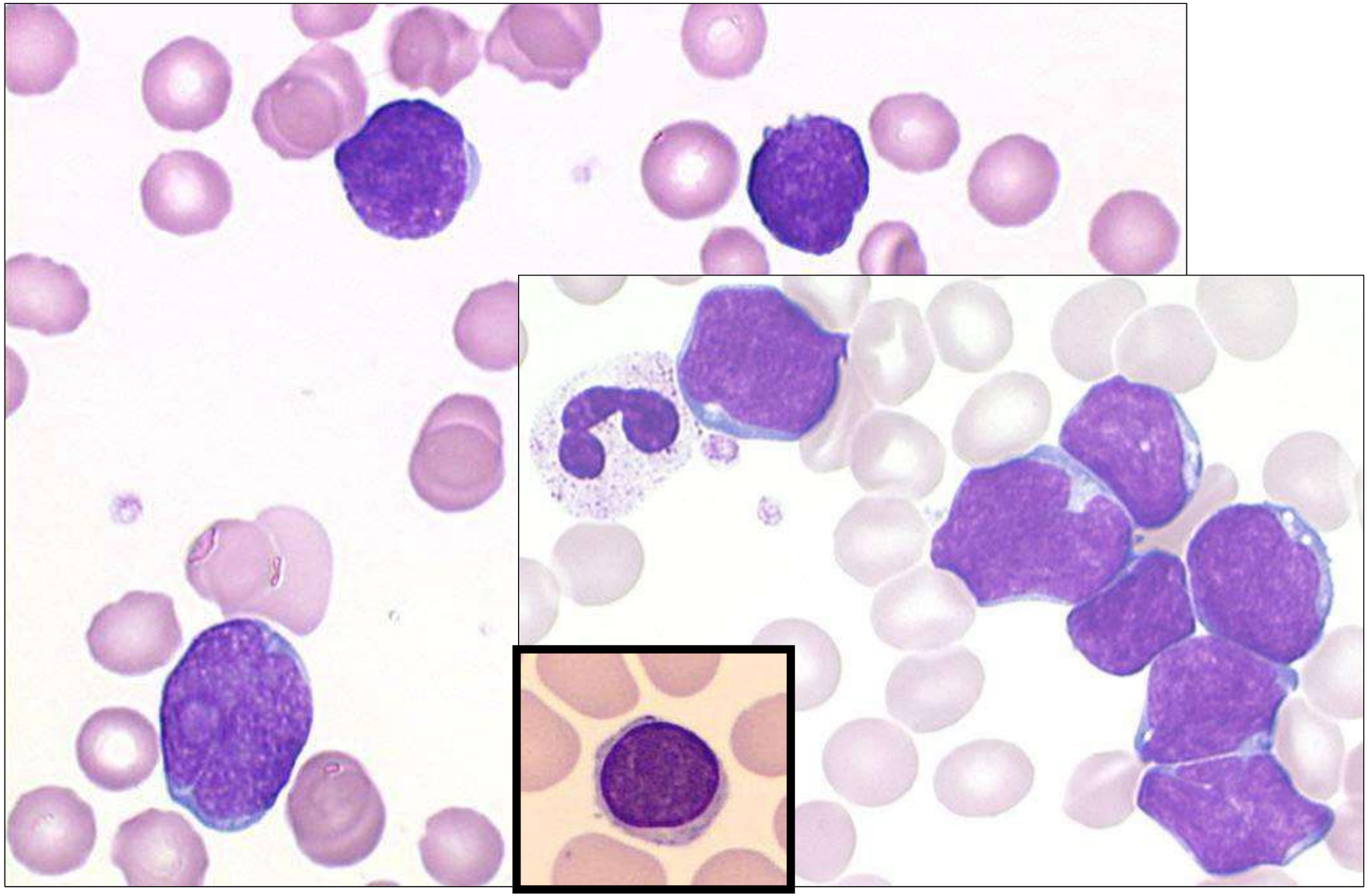

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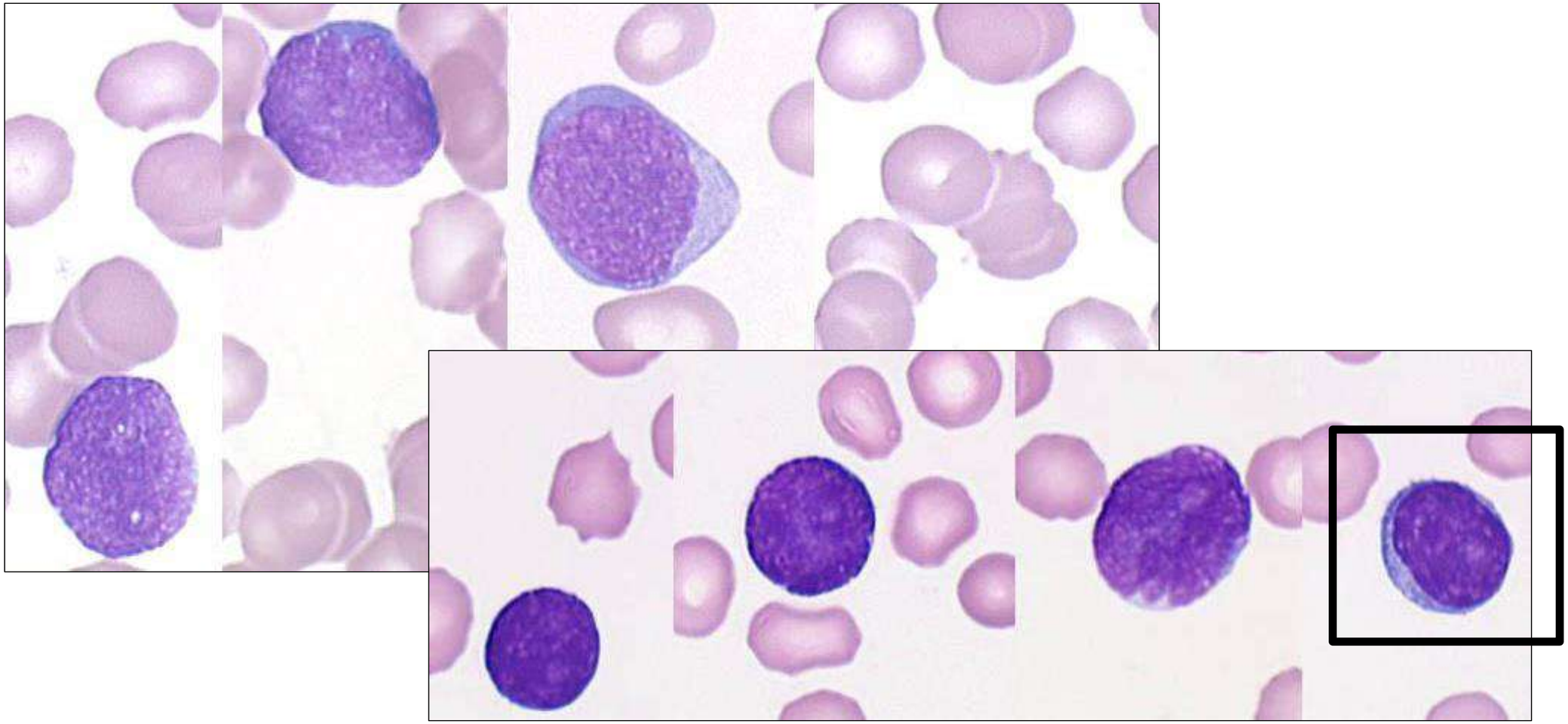

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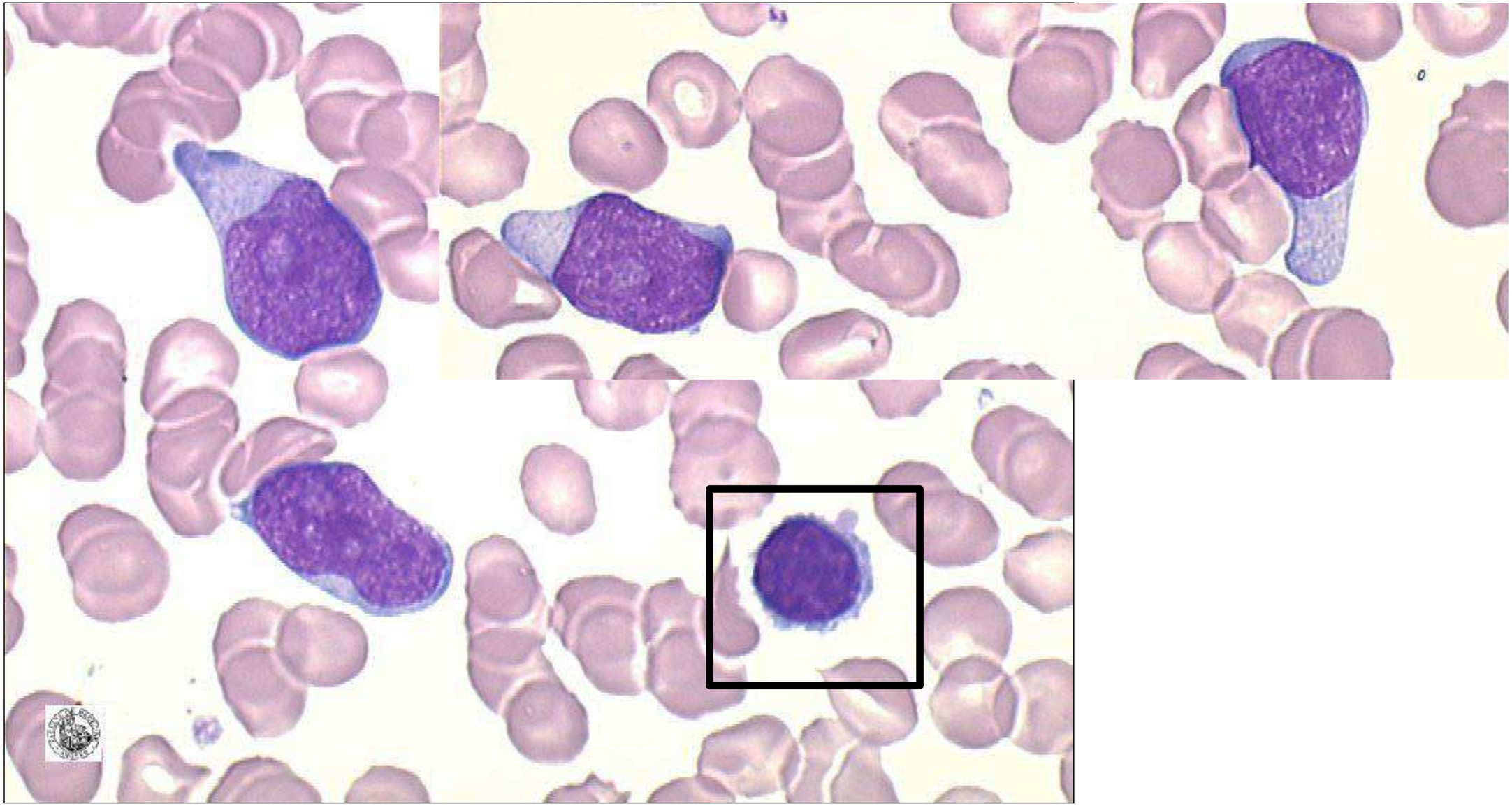
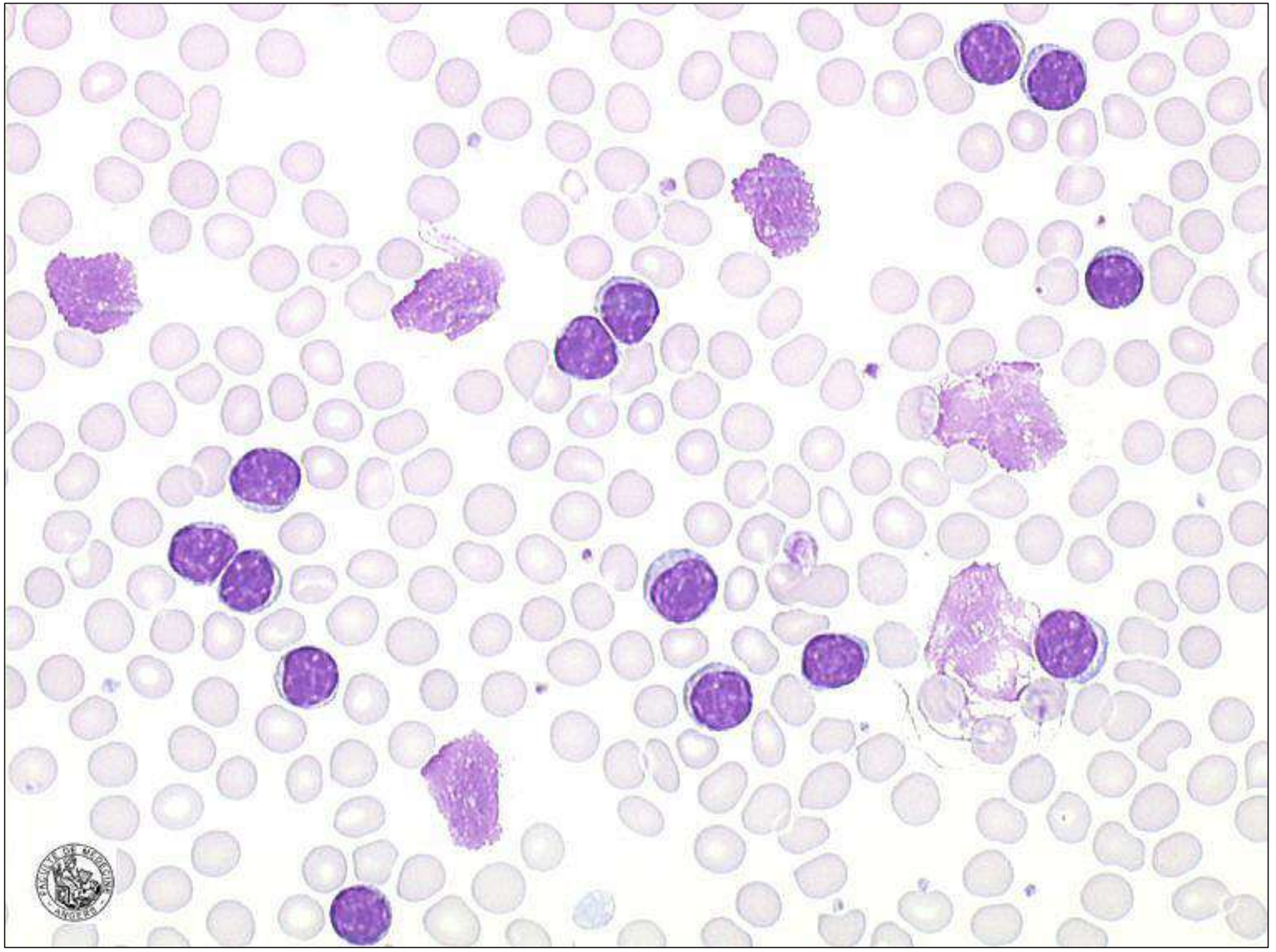
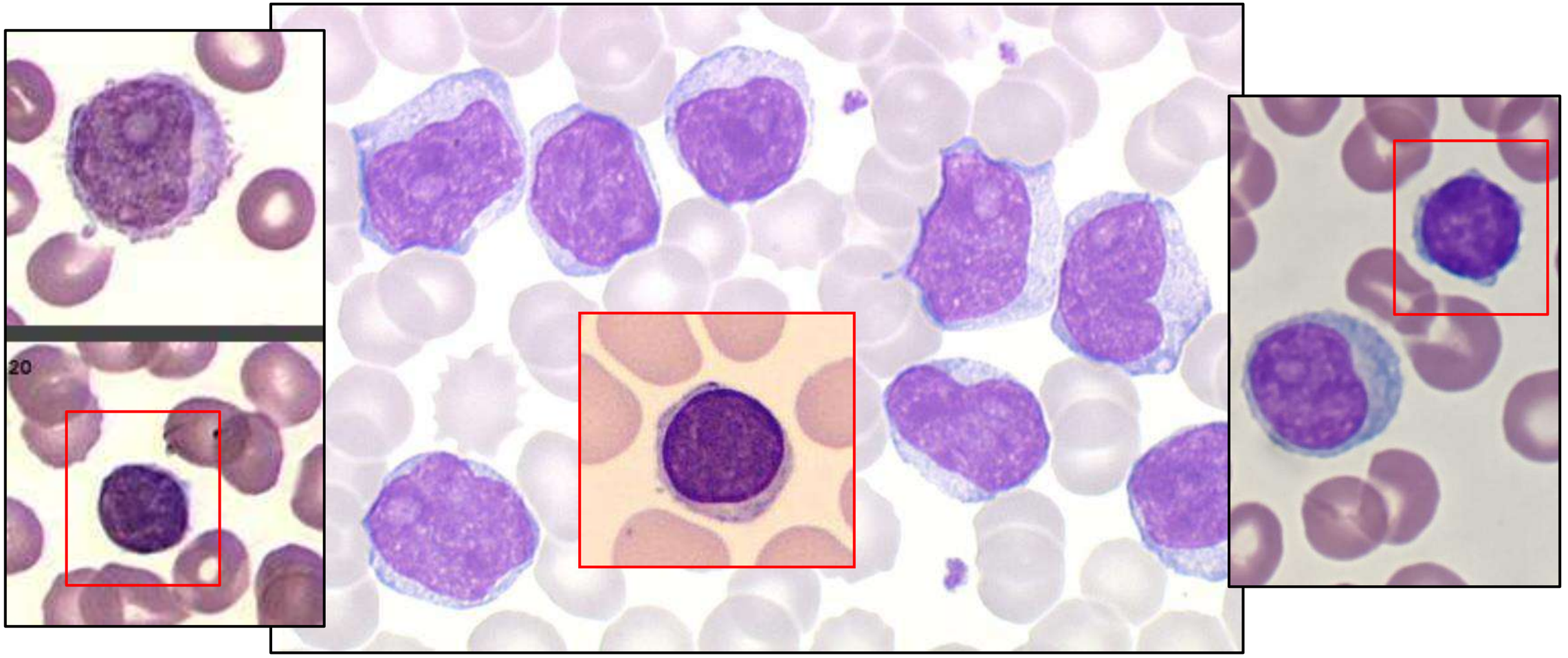


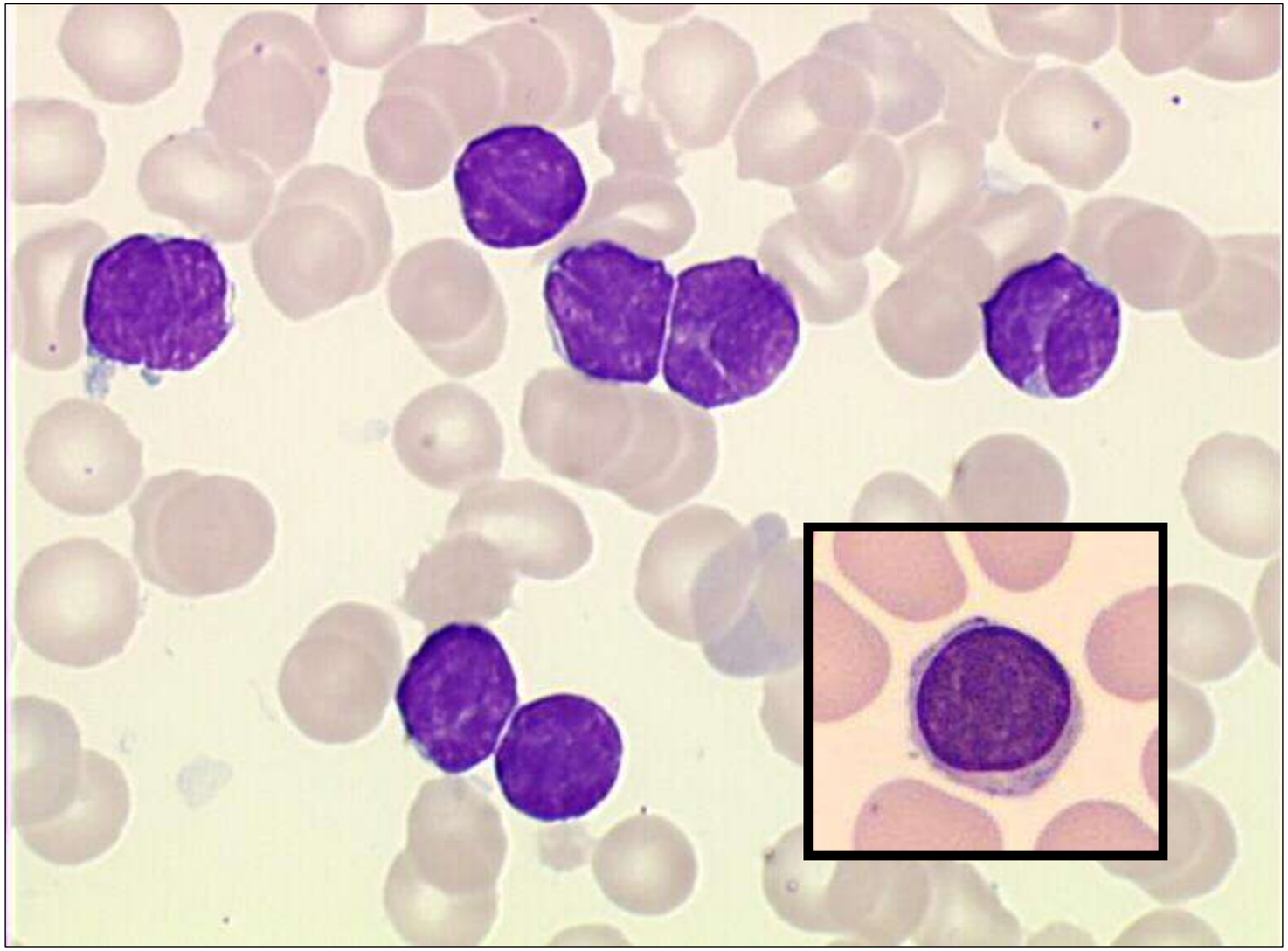
LLC B



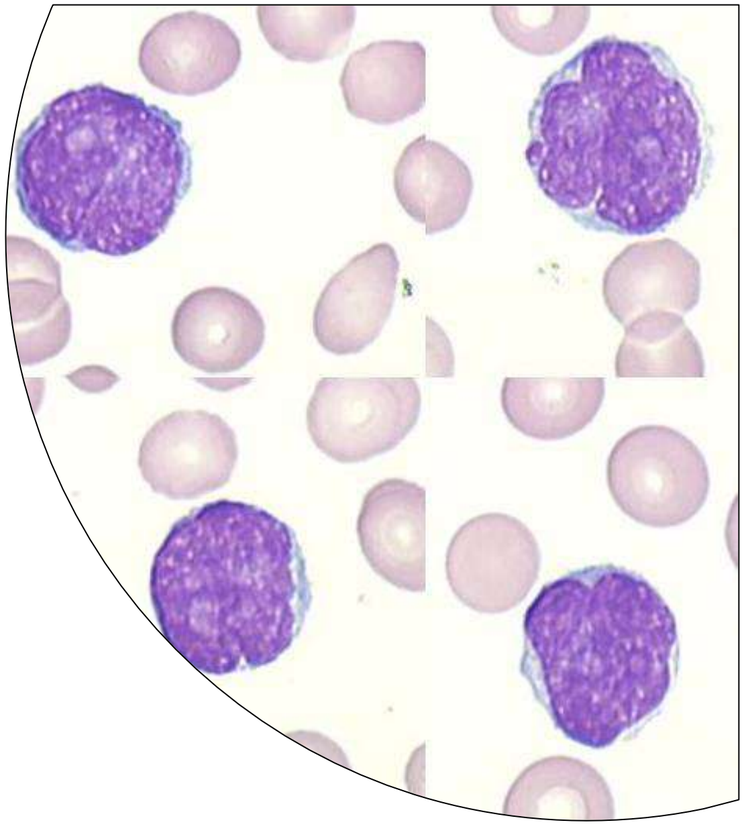
Leucémia prolinfocítica B (ICC 2022)
Linfoma/leucémia esplénico de células B com nucléolos proeminentes (OMS 2022)

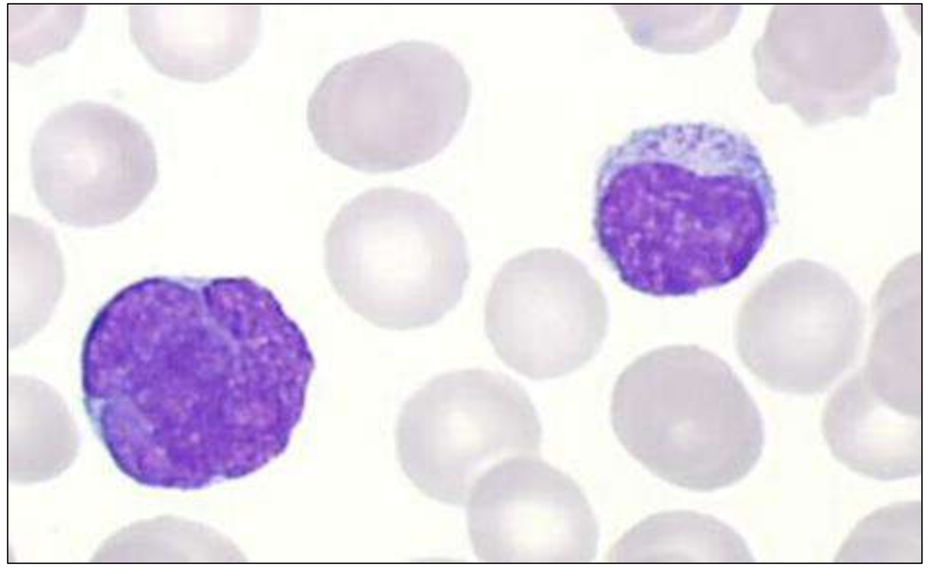


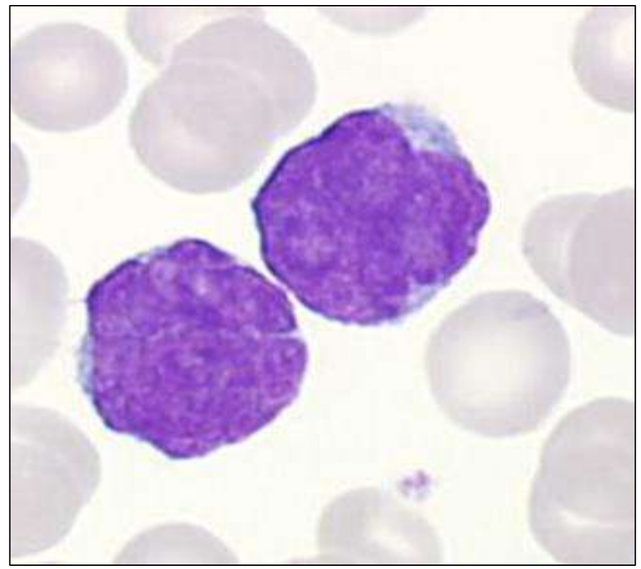
Linfoma folicular

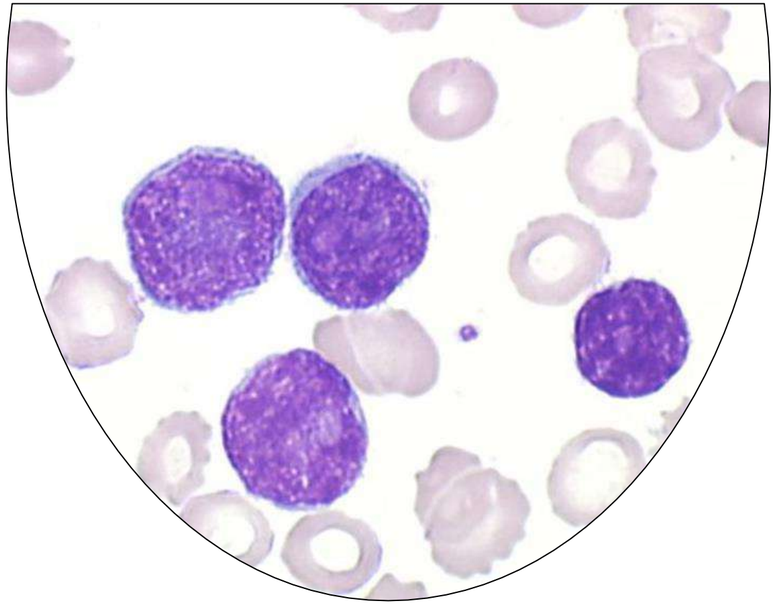


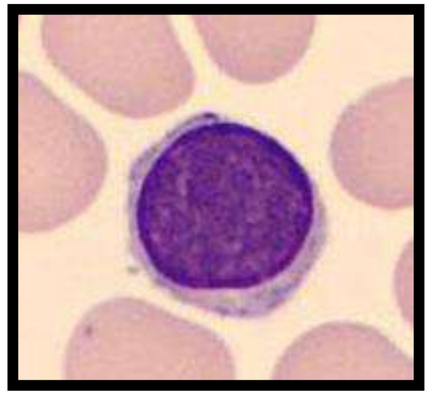
Linfoma do manto



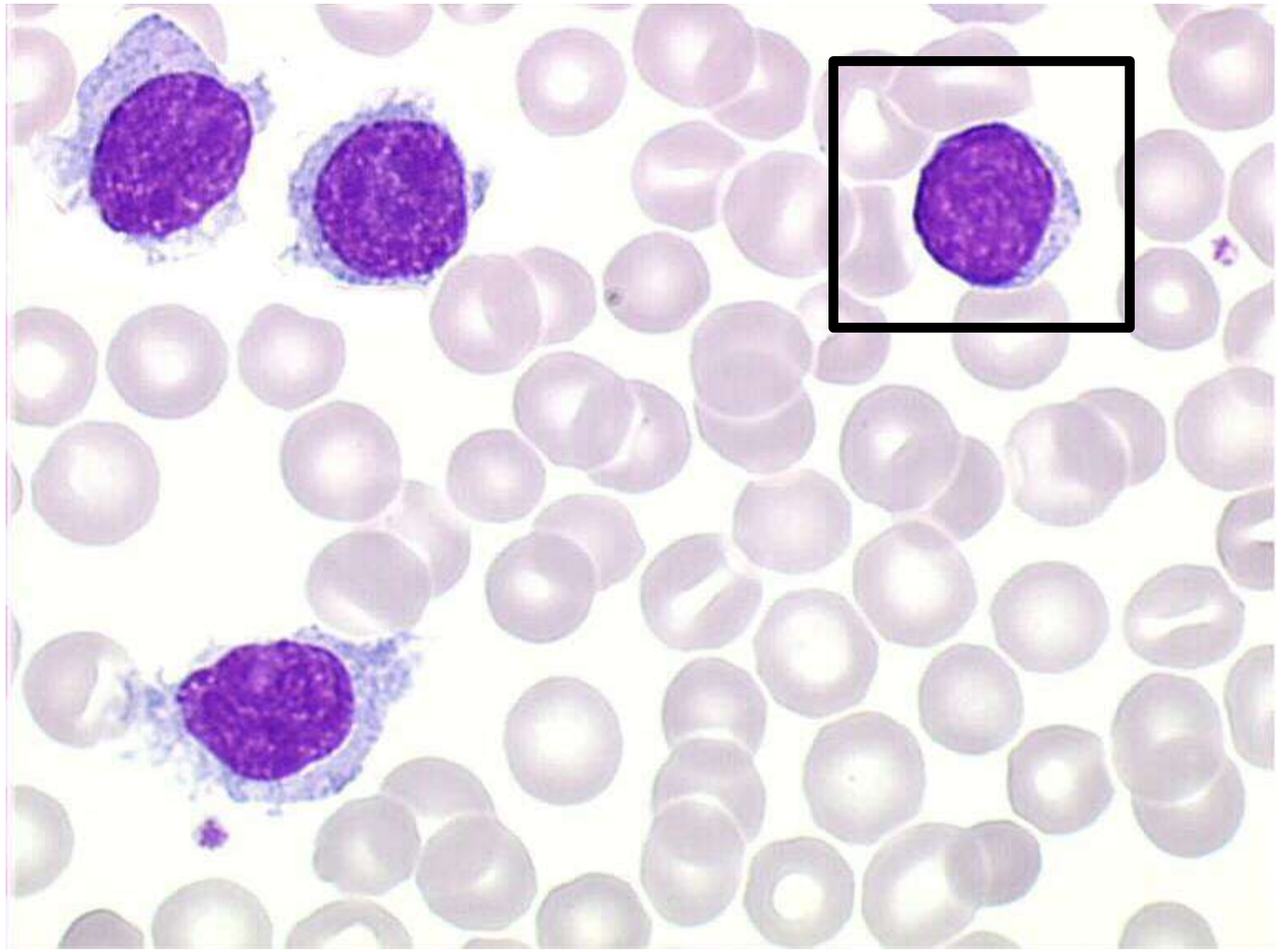




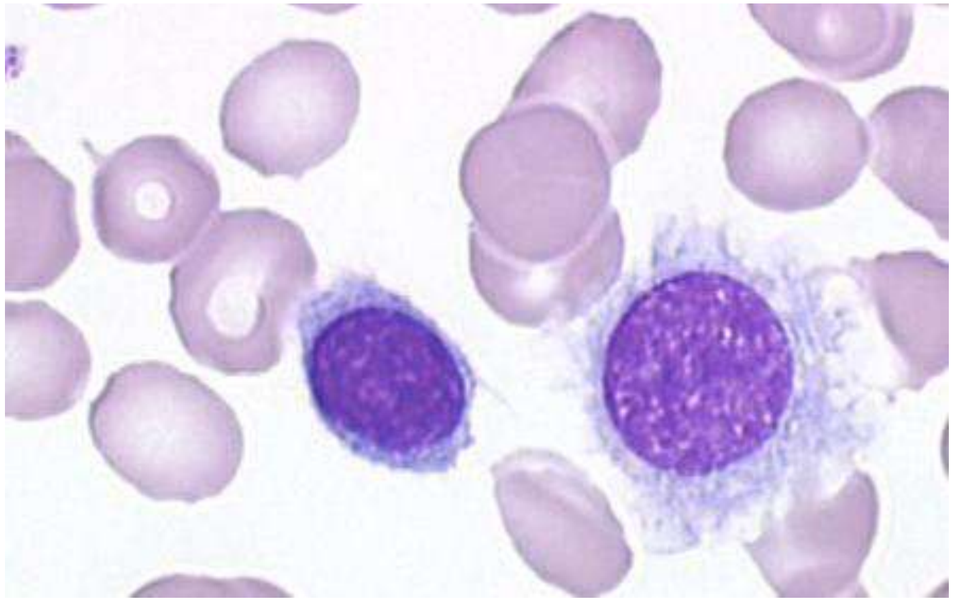


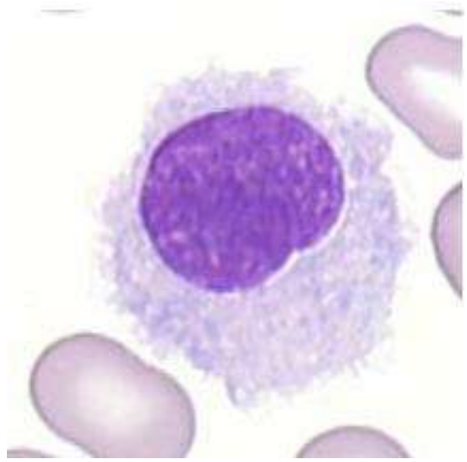


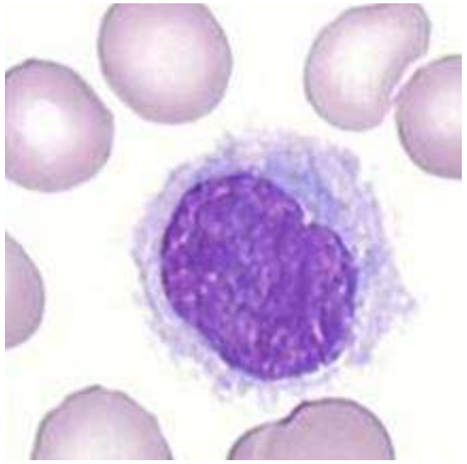
Linfoma B esplénico da zona marginal

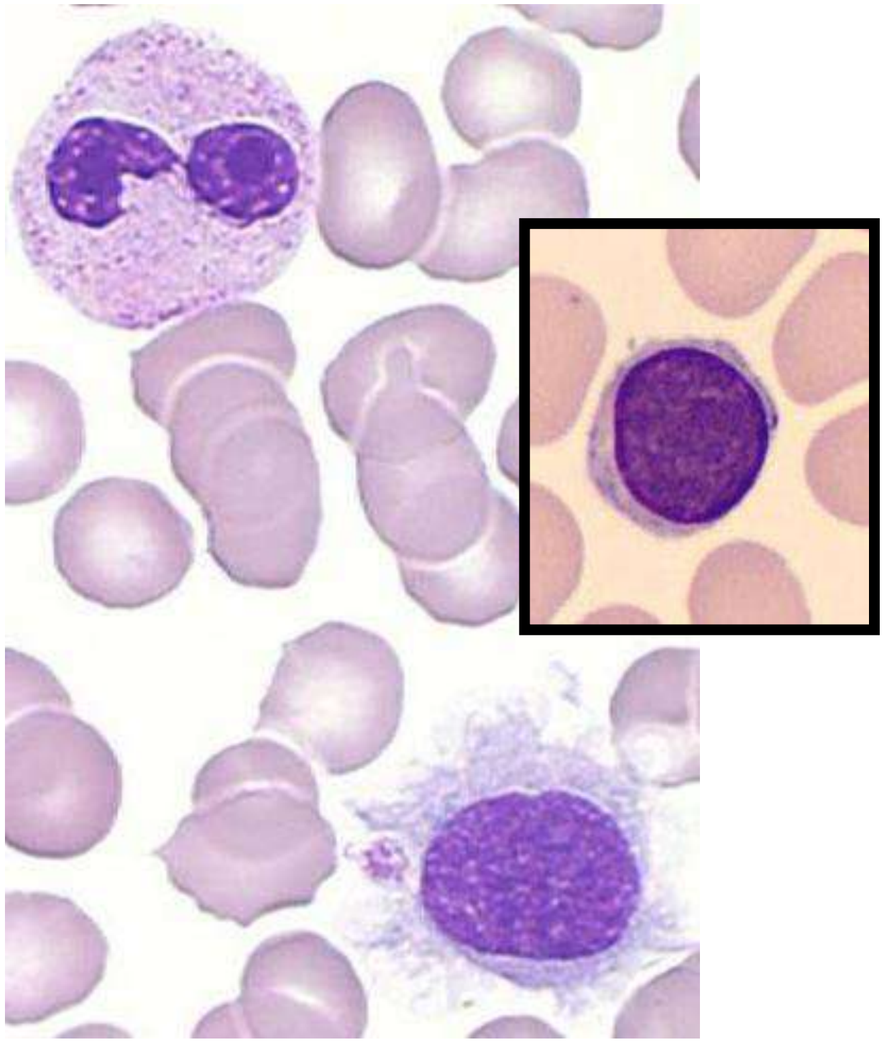


Tricoleucémia (HCL)



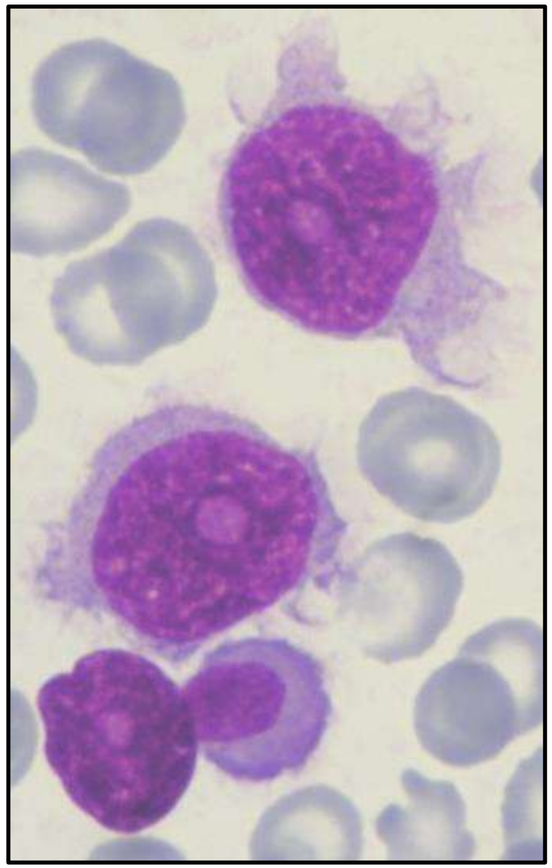


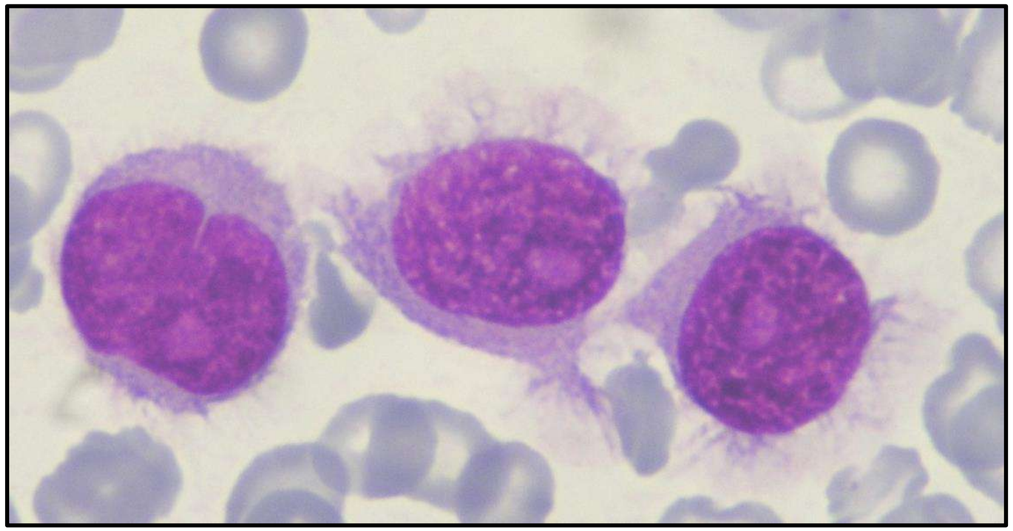




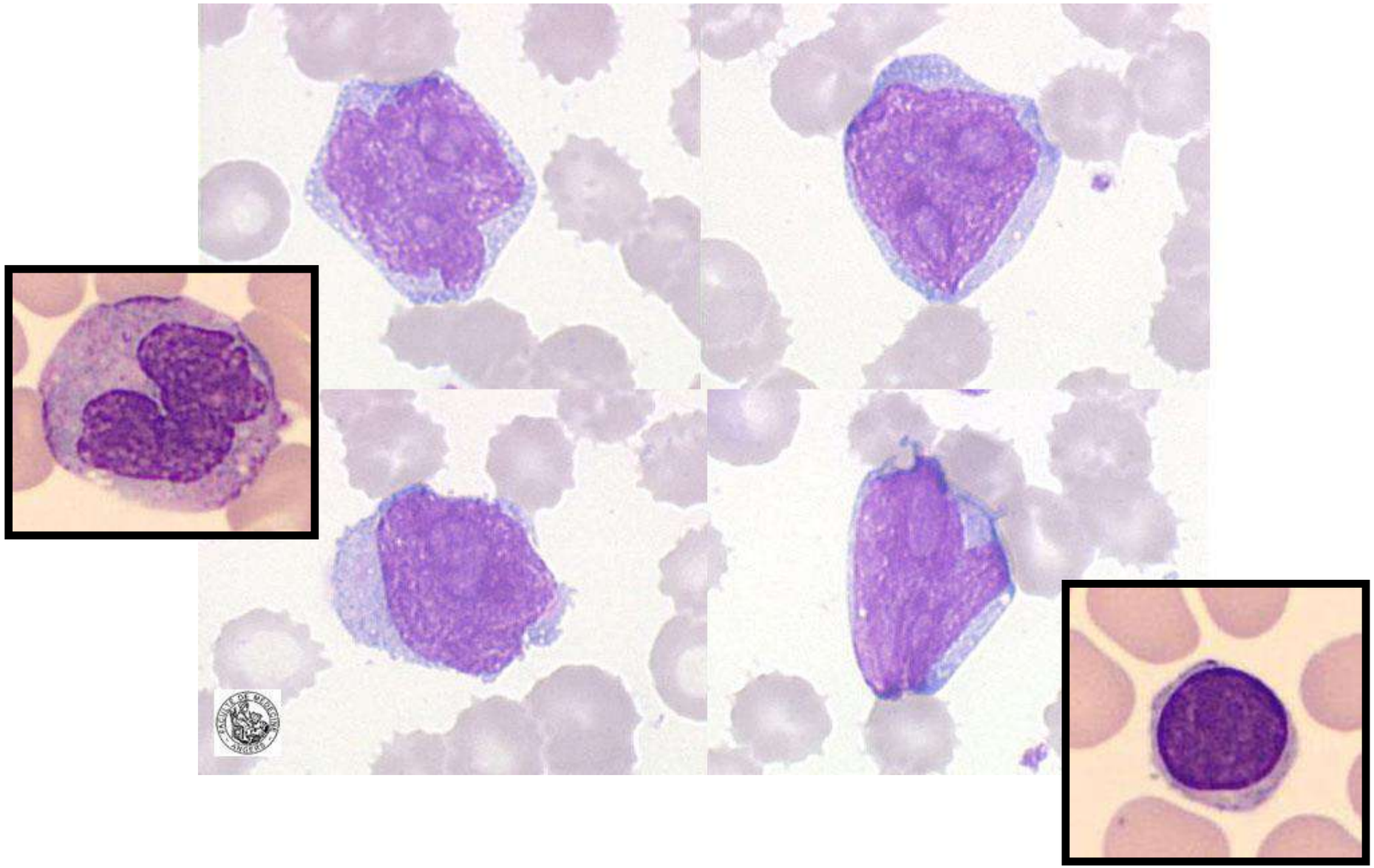
Linfoma/leucémia esplénico de células B com nucléolos proeminentes (OMS 2022)
Linfoma/leucémia esplénico de células B, não classificável (ICC 2022)

(**antiga tricoleucémia variante - HCLv**)

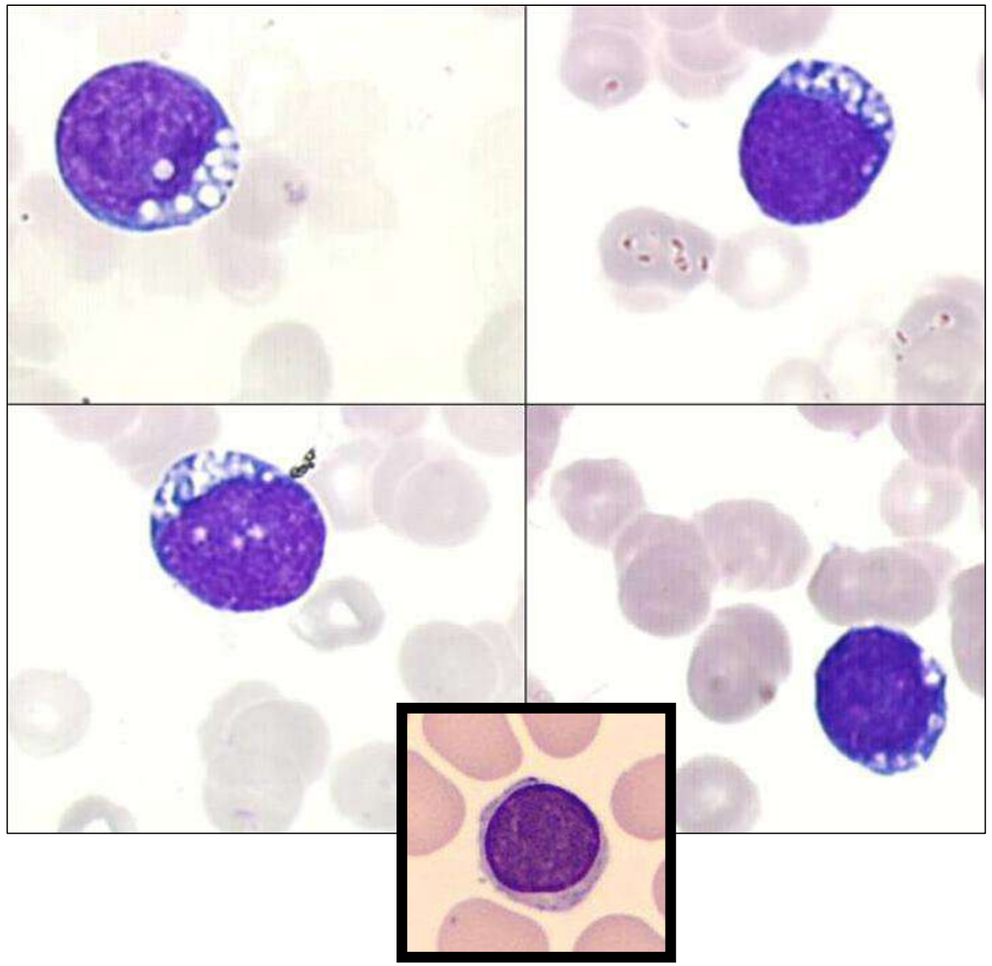


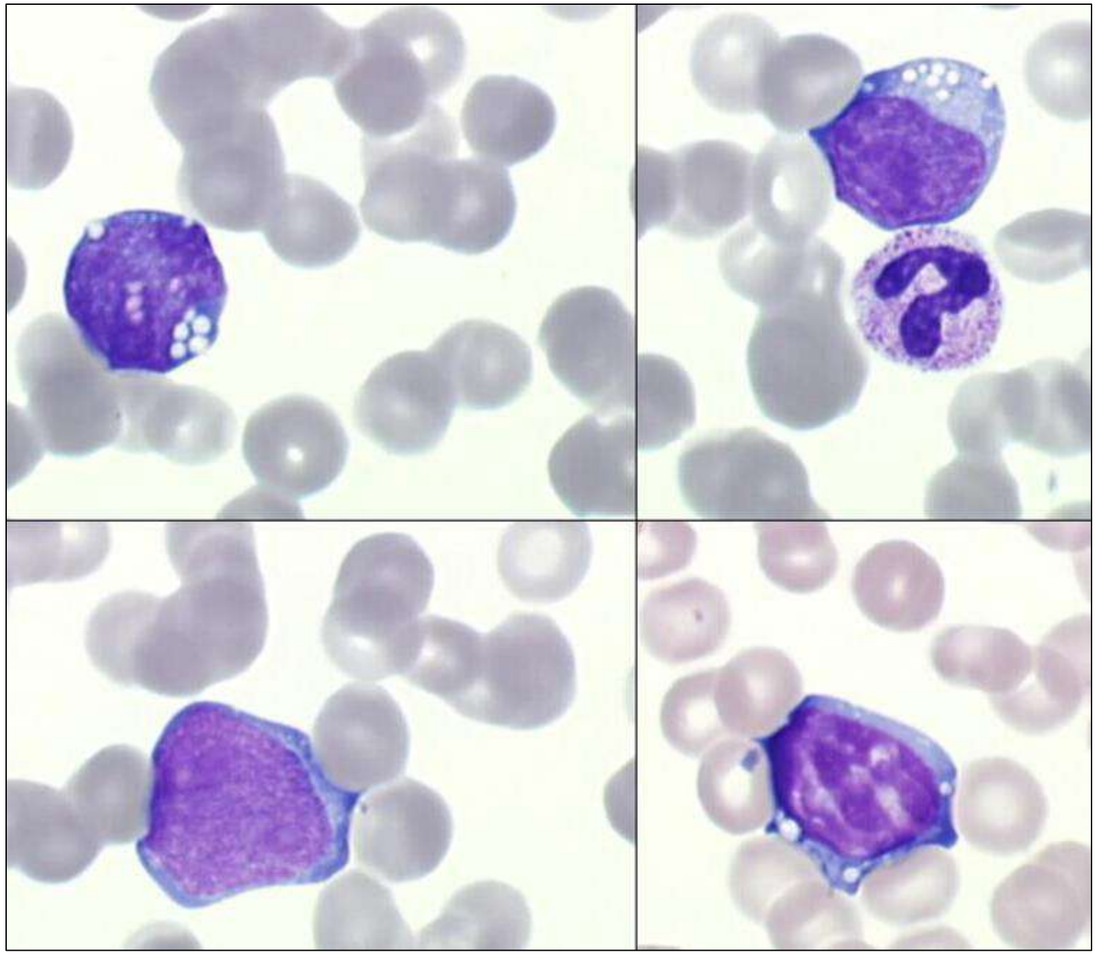


Linfoma de grandes células B

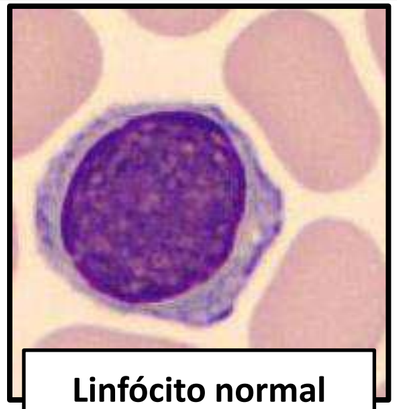


Linfoma de Burkitt

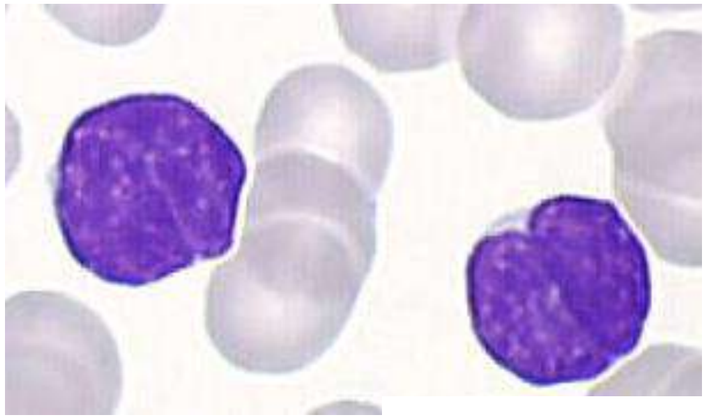


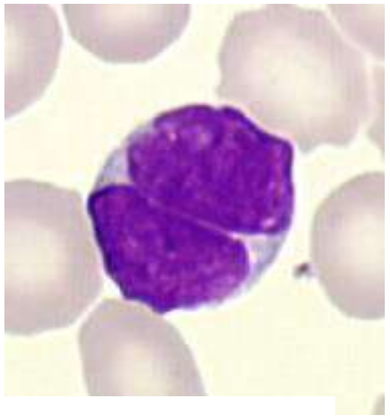


Neoplasias linfóides de células B maduras

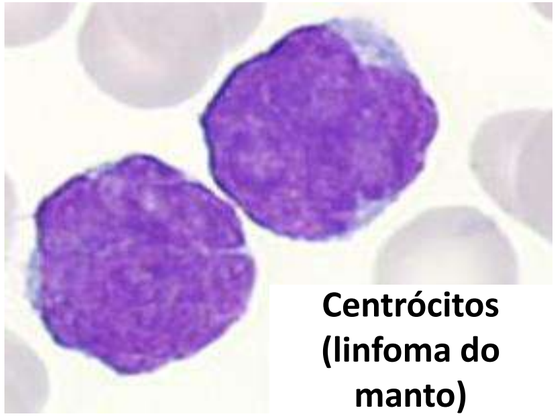


Linfócito normal

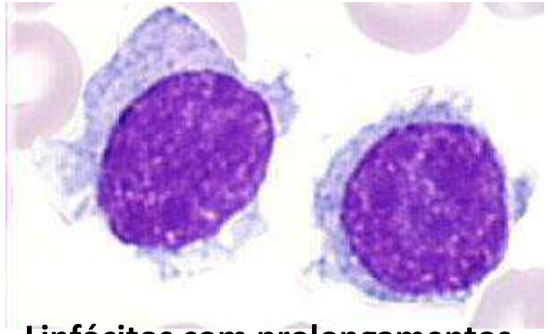




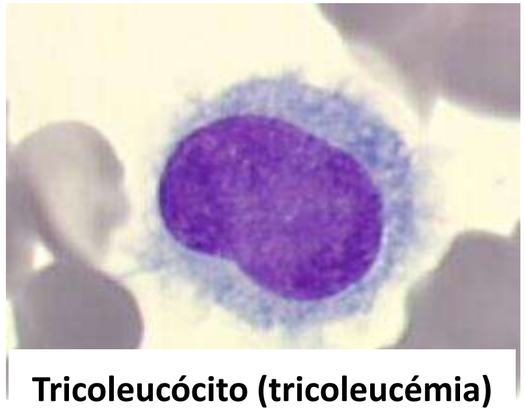
Linfócitos clivados (linfoma folicular)



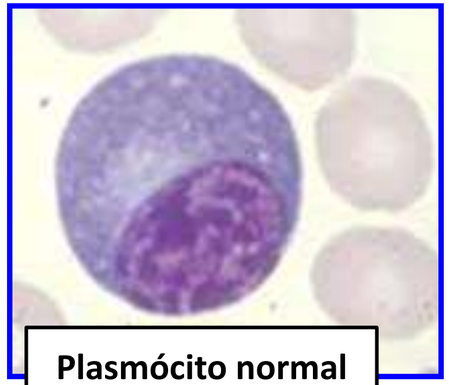
Centrócitos (linfoma do manto)



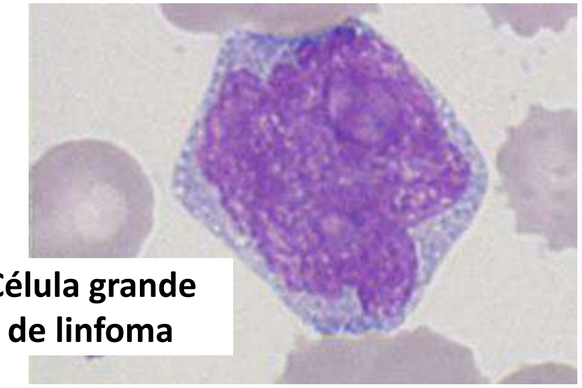
Linfócitos com prolongamentos citoplasmáticos (linfoma esplénico da zona marginal)



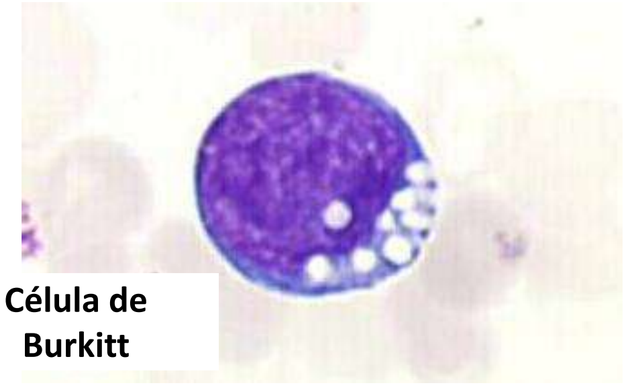
Tricoleucócito (tricoleucémia)



Plasmócito normal

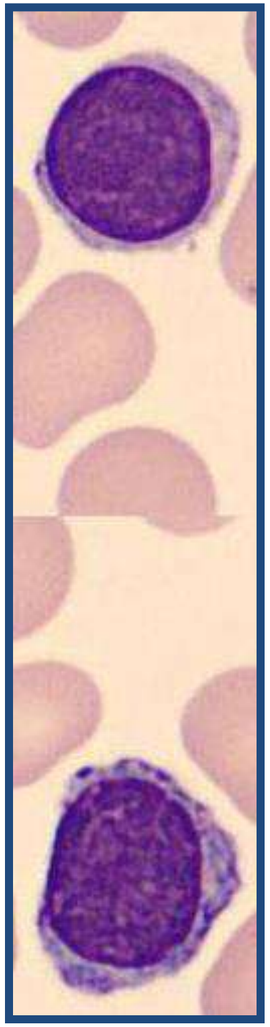


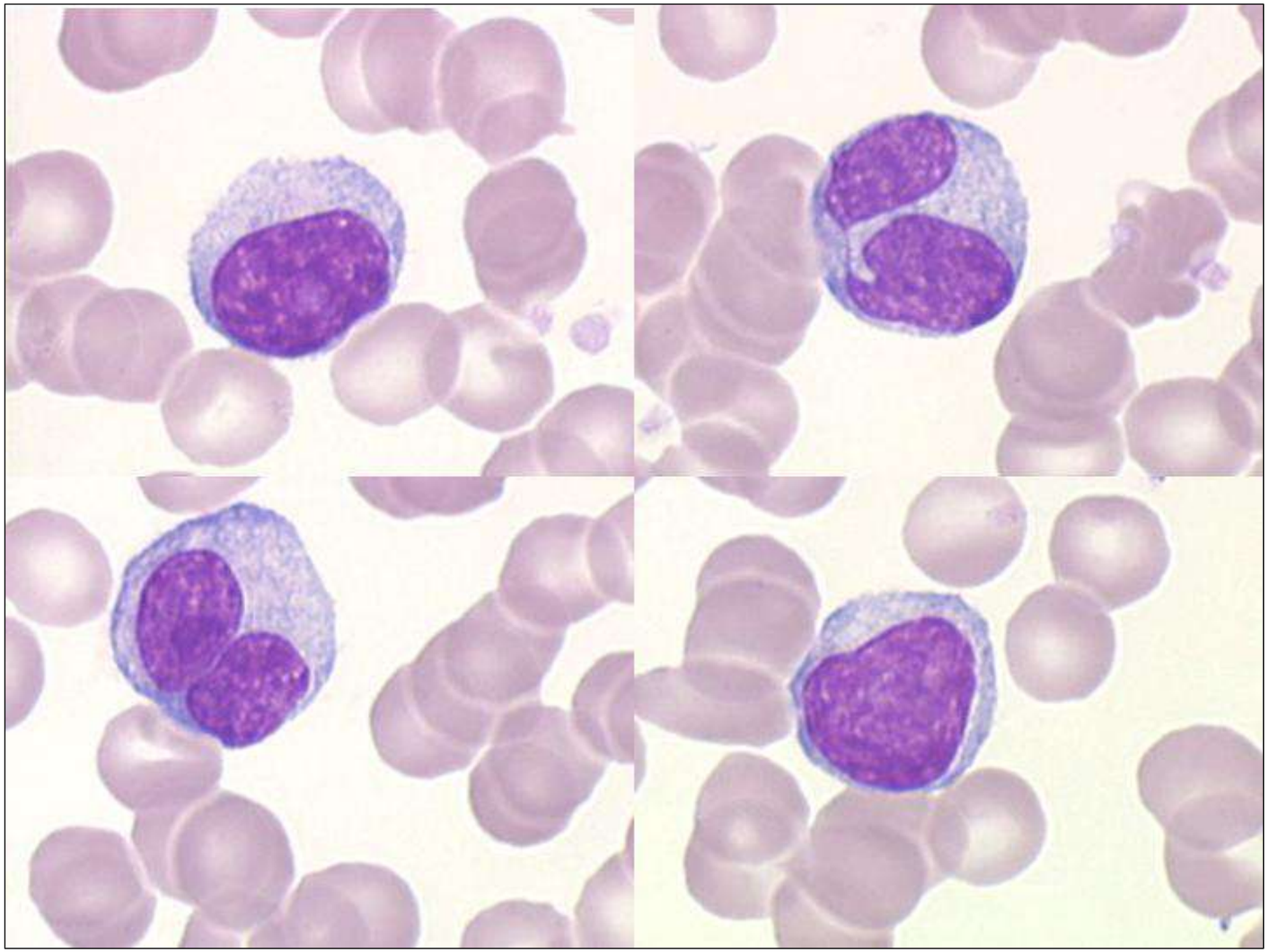
Célula grande de linfoma



Célula de Burkitt

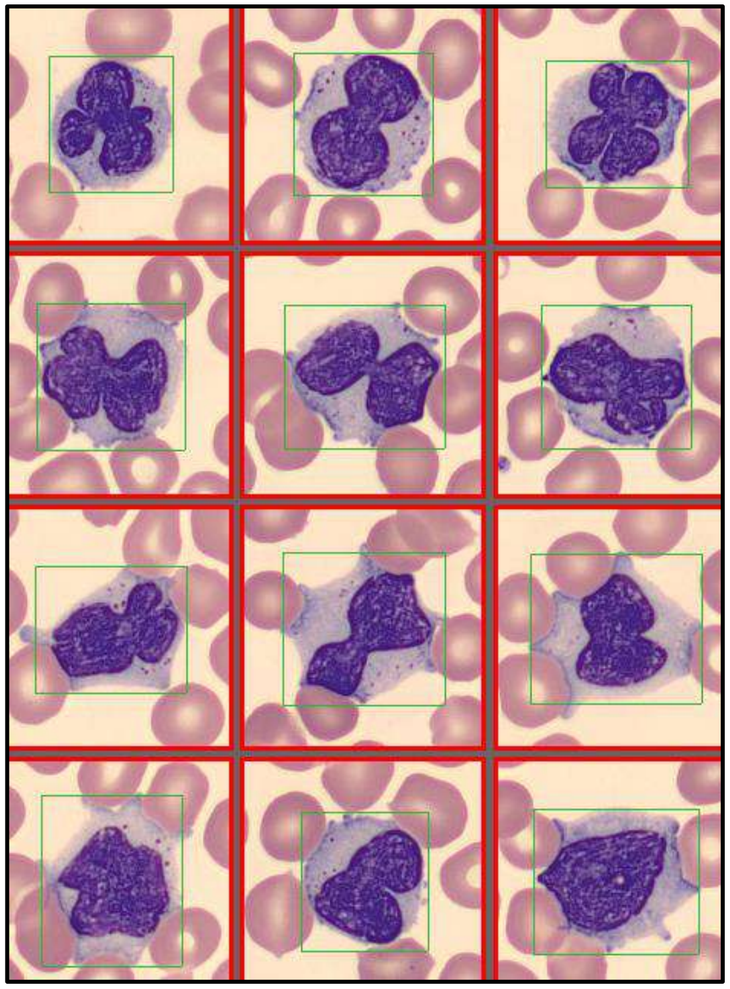
Linfocitose B policlonal com linfócitos binucleados

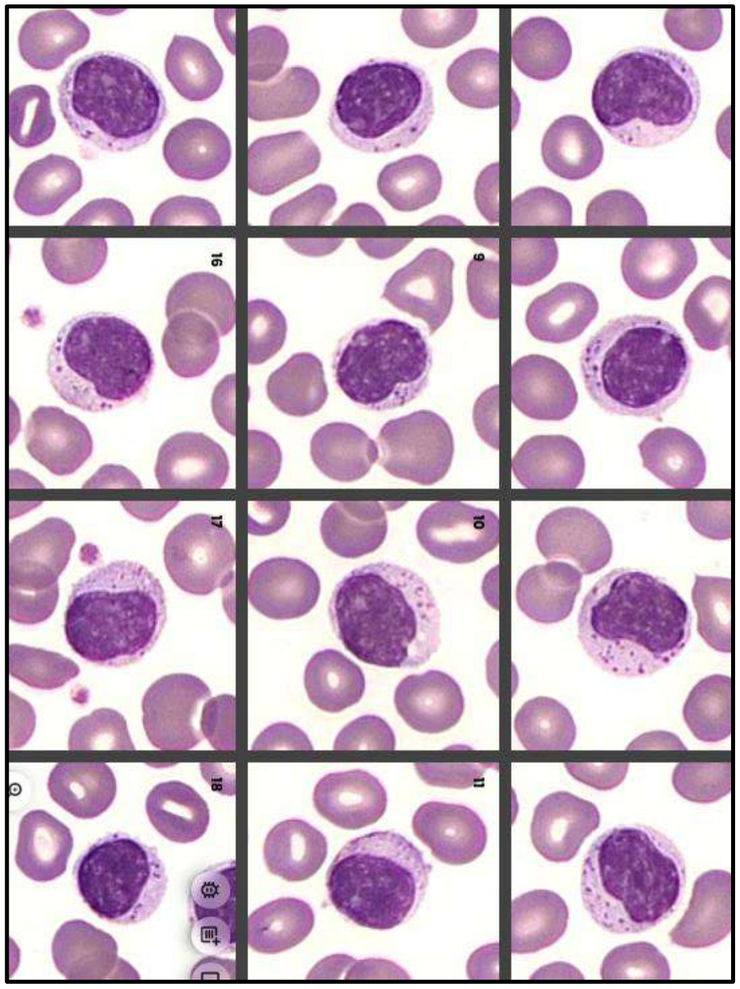


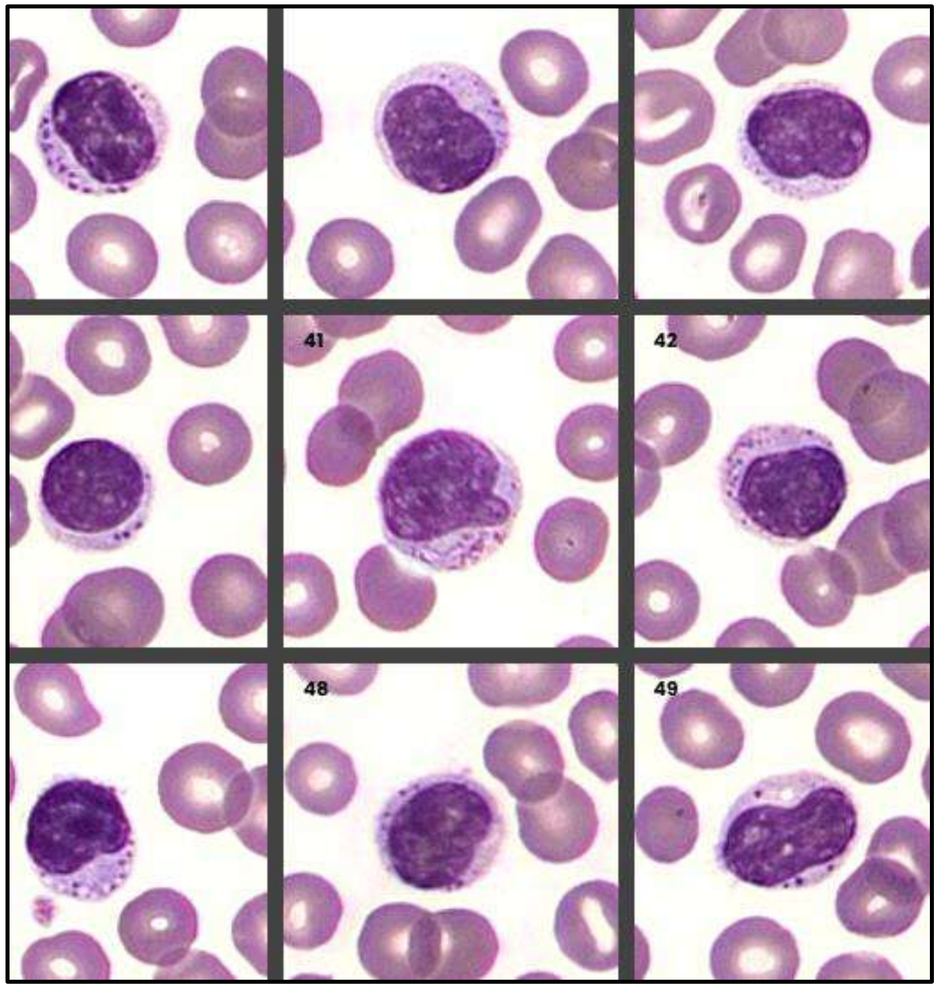


Linfocitoses de linfócitos granulares grandes

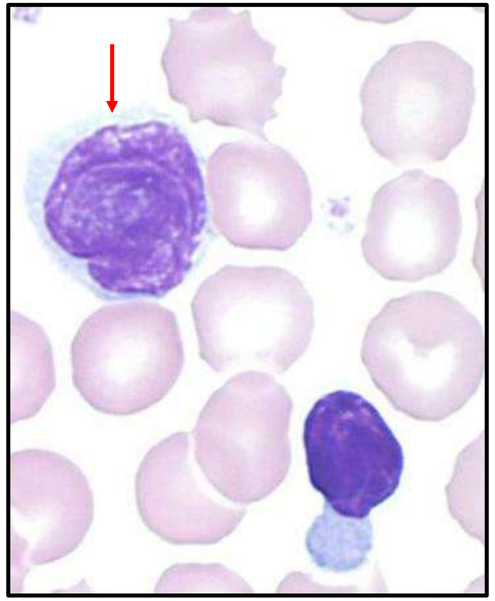
(reactivas, LGL-T e LGL-NK)

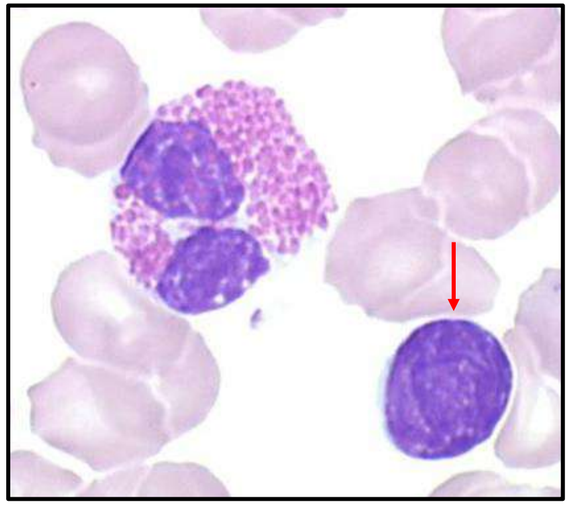


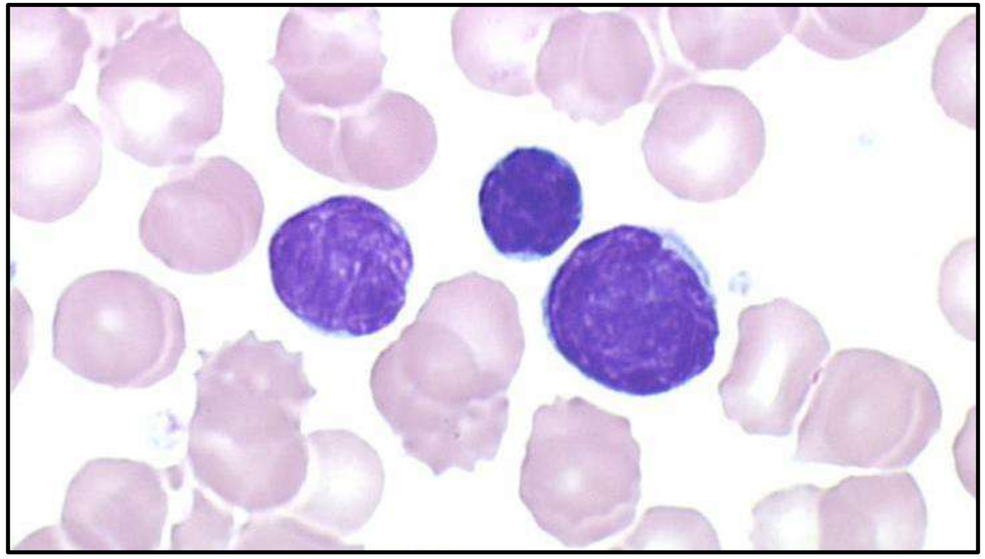


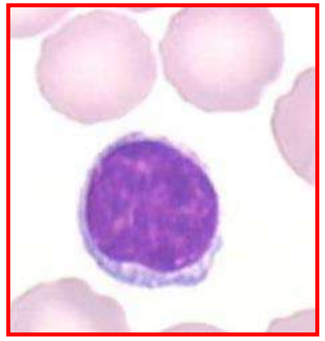


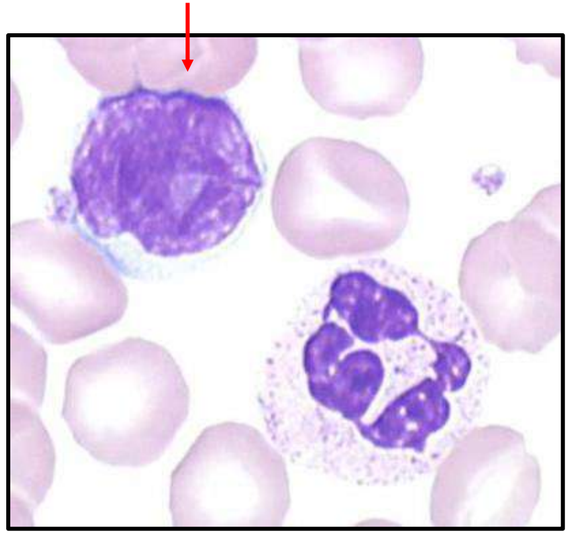
Síndrome de Sézary

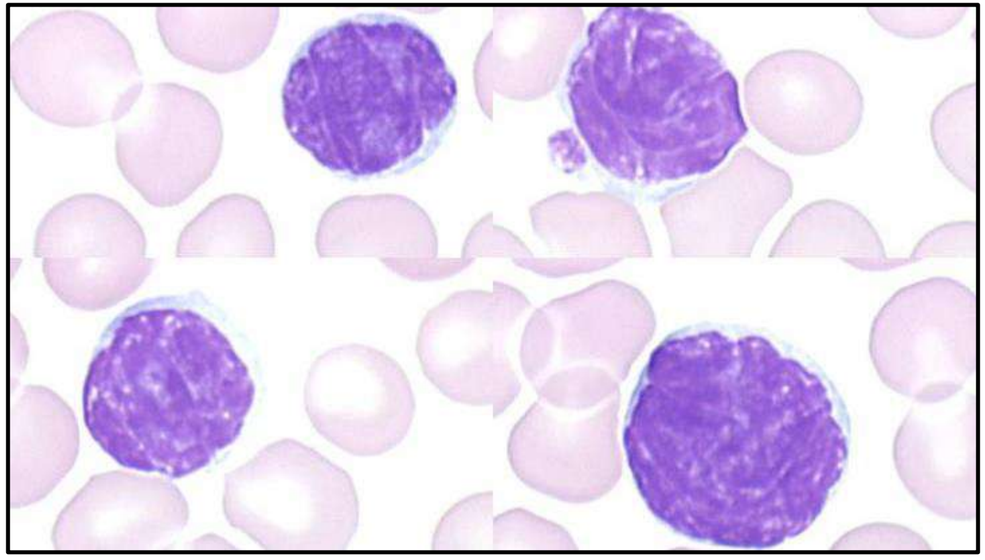




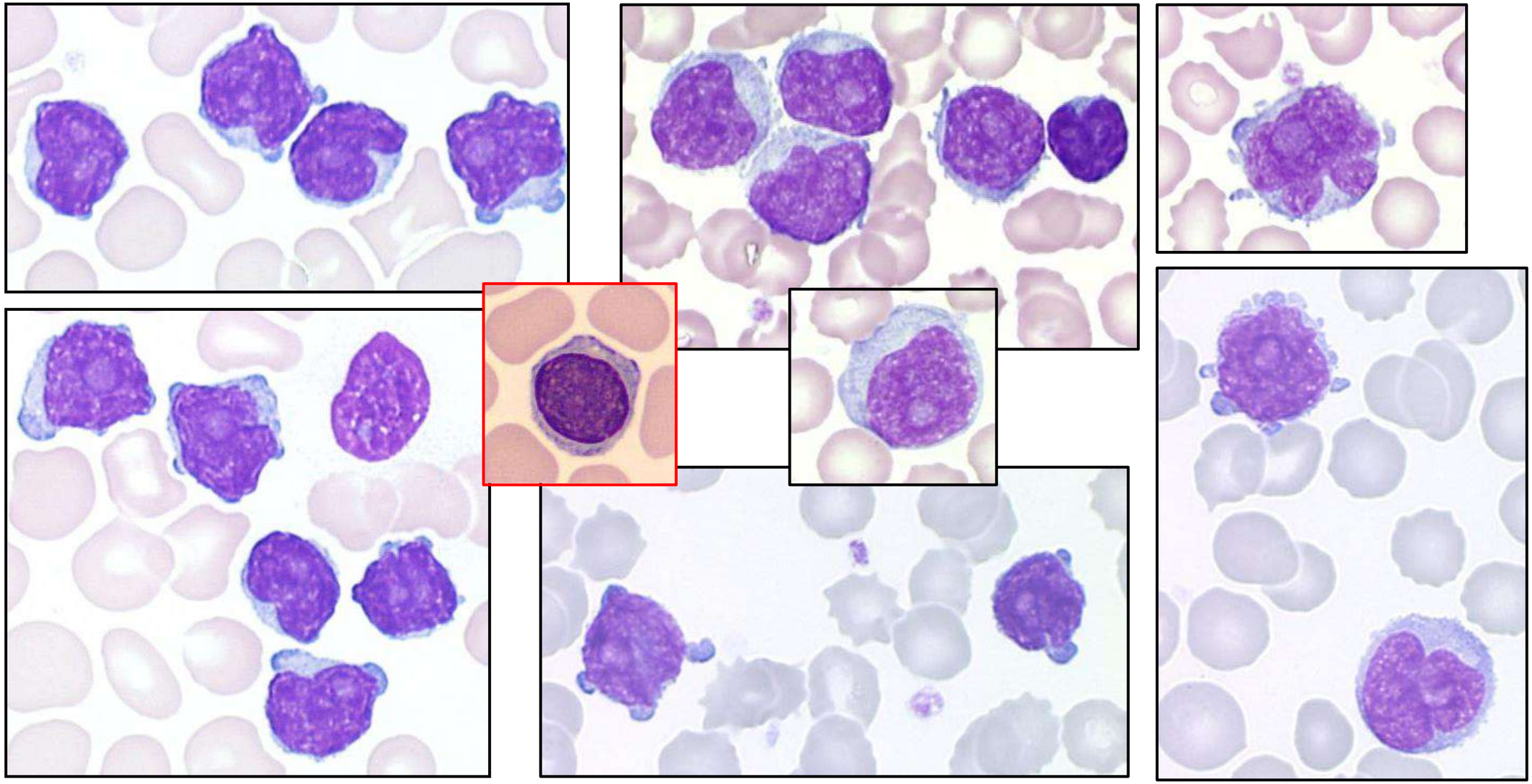




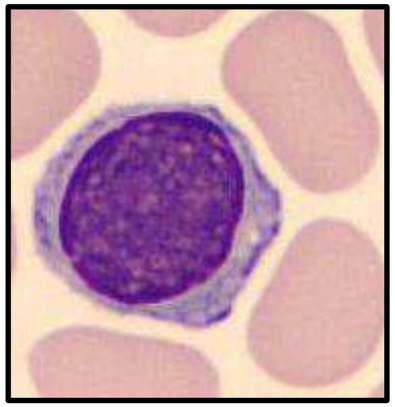




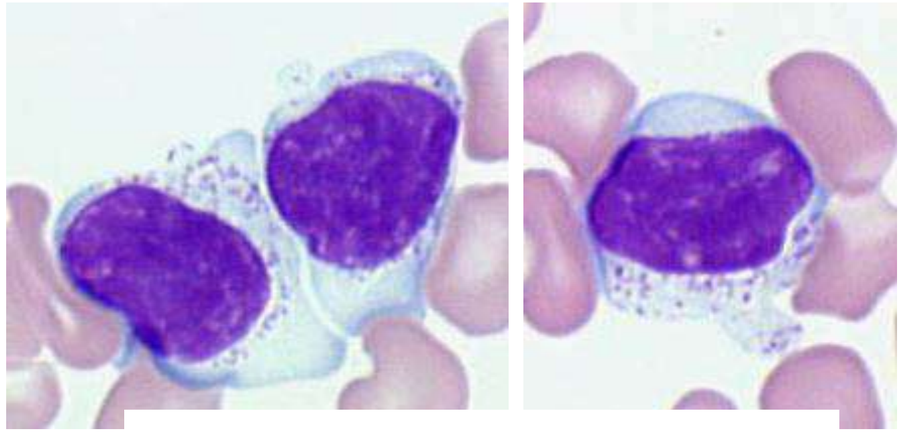
Leucémia prolinfocítica T



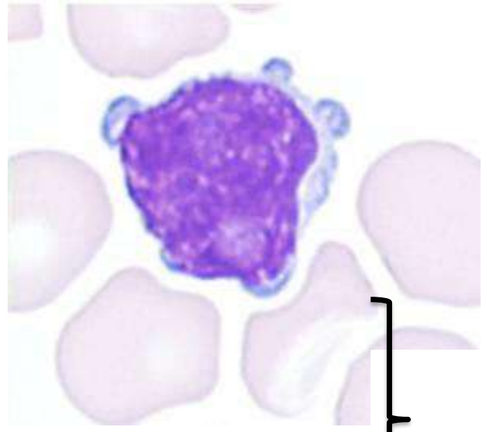
Neoplasias linfóides de células T/NK maduras



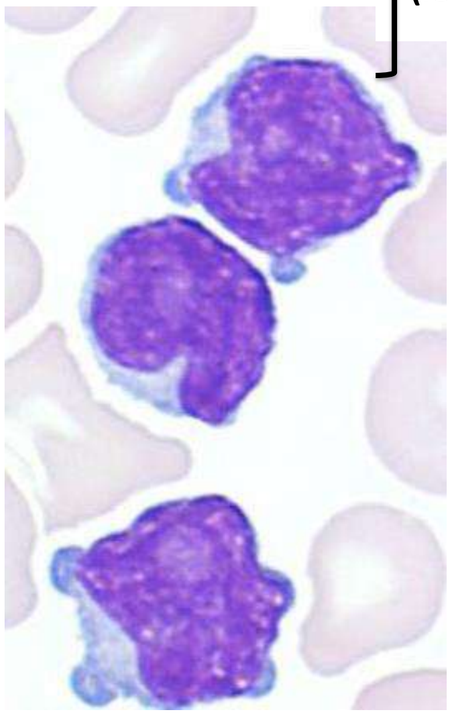
Linfócito normal

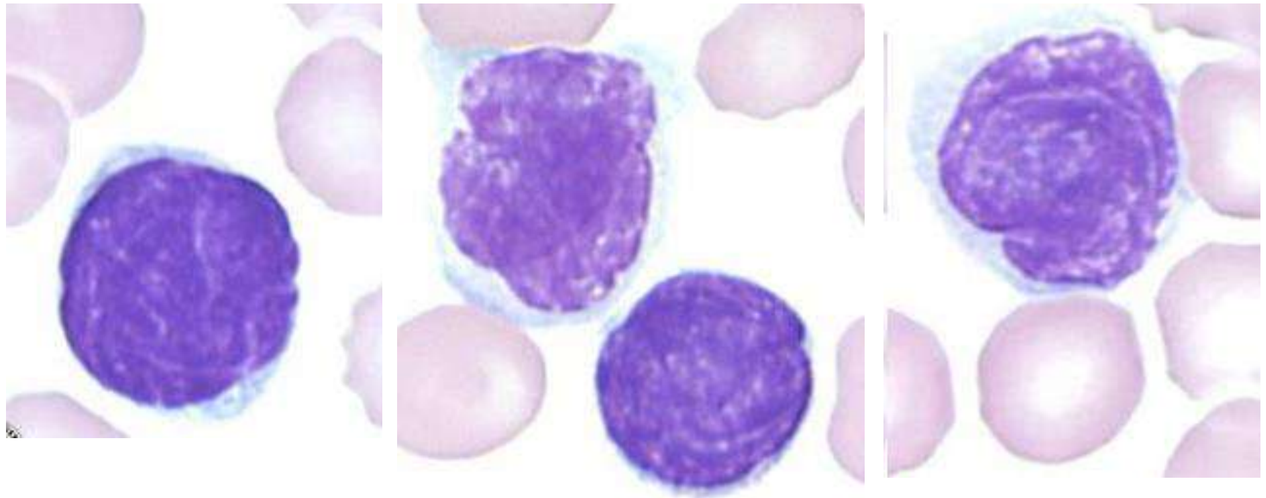


Linfócitos grandes granulares (LGLs)



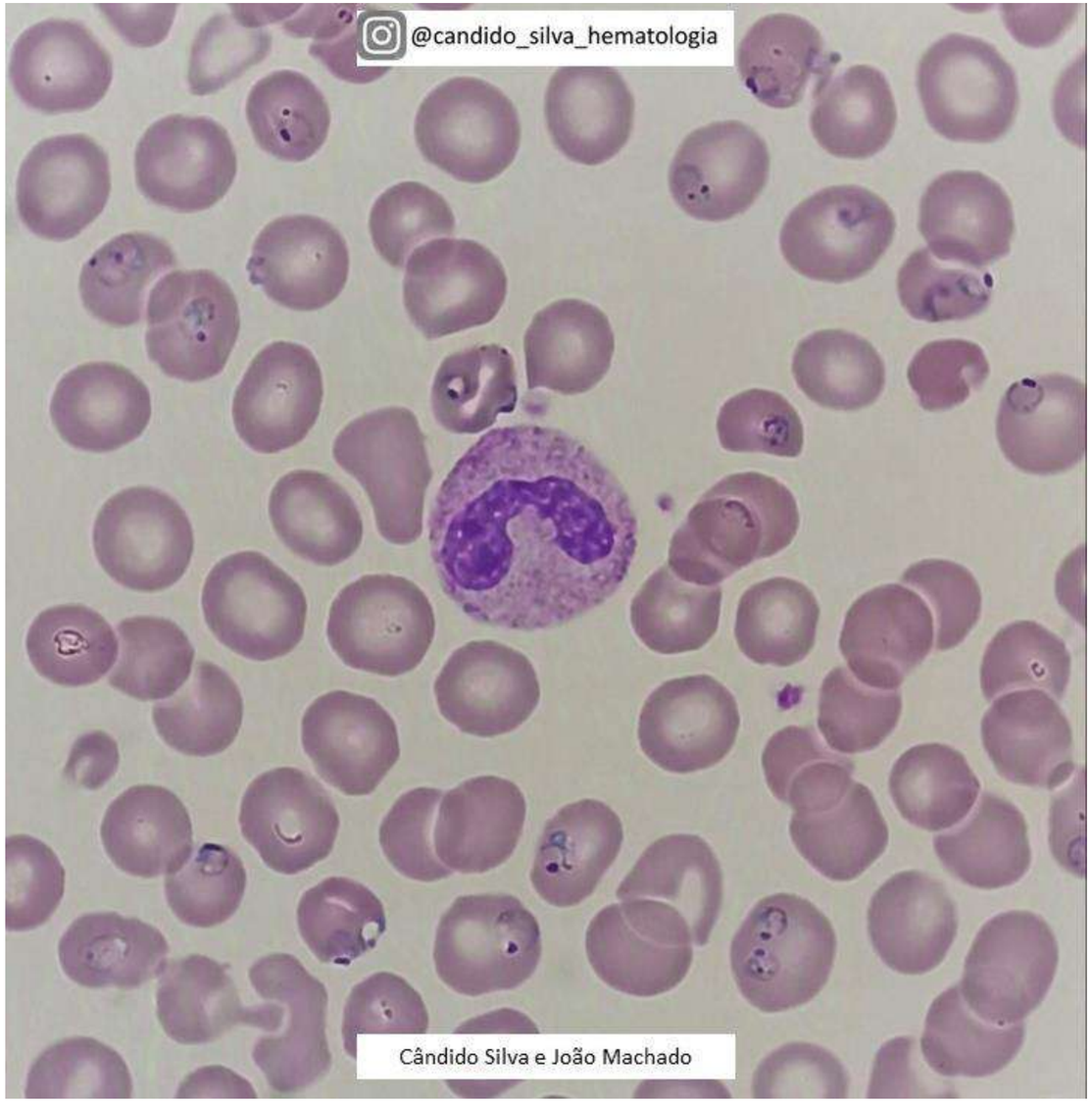
Prolinfócitos T
(leucémia prolinfocítica T)

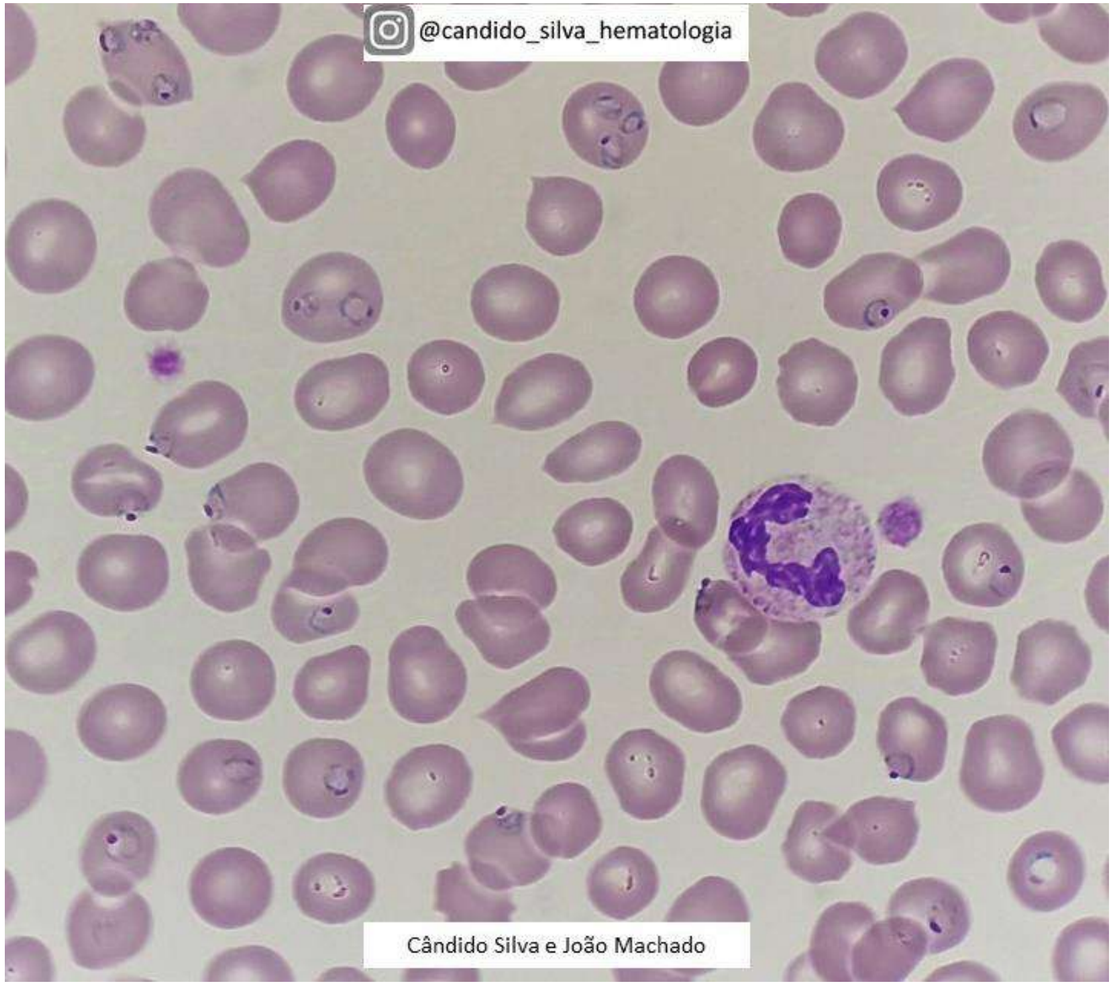




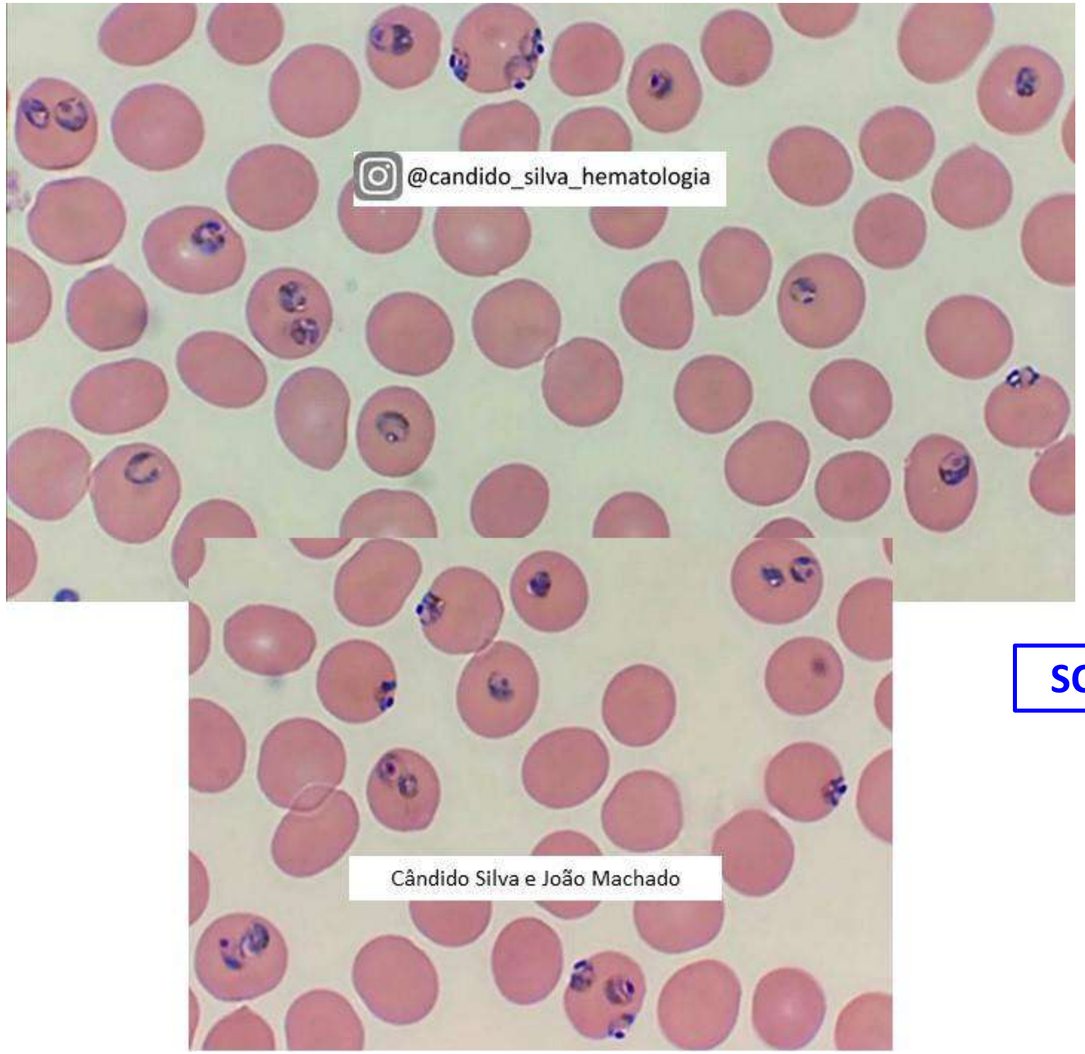
Células de Sézary (síndrome de Sézary)

Malaria (Plasmodium *falciparum*)

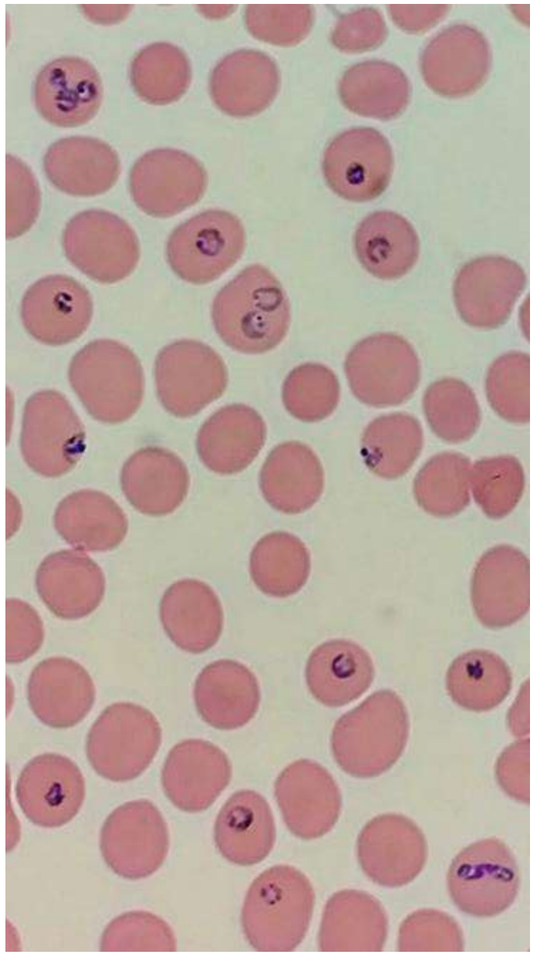




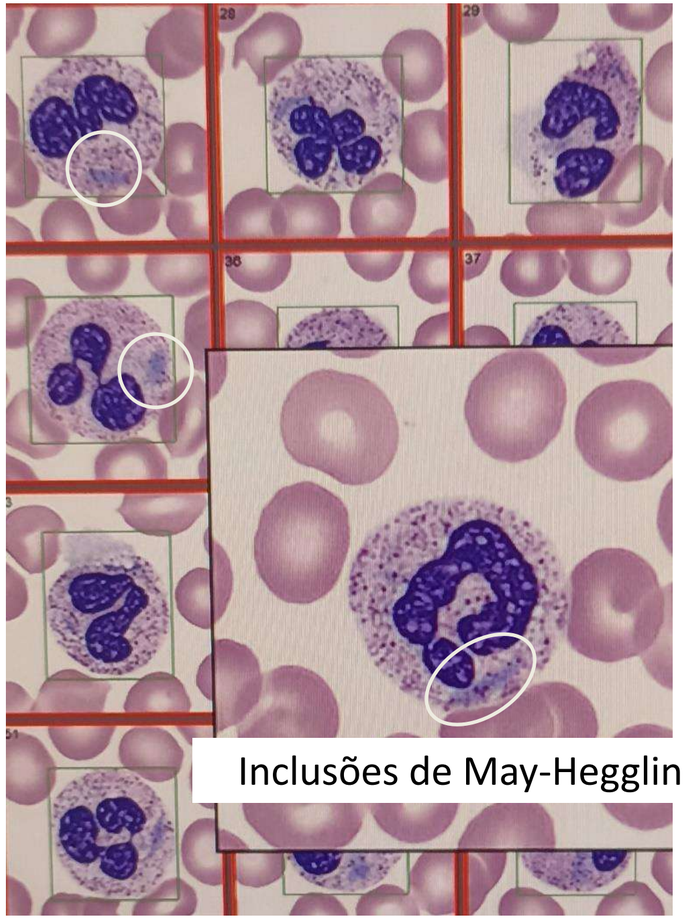
Malaria (Plasmodium *falciparum*)



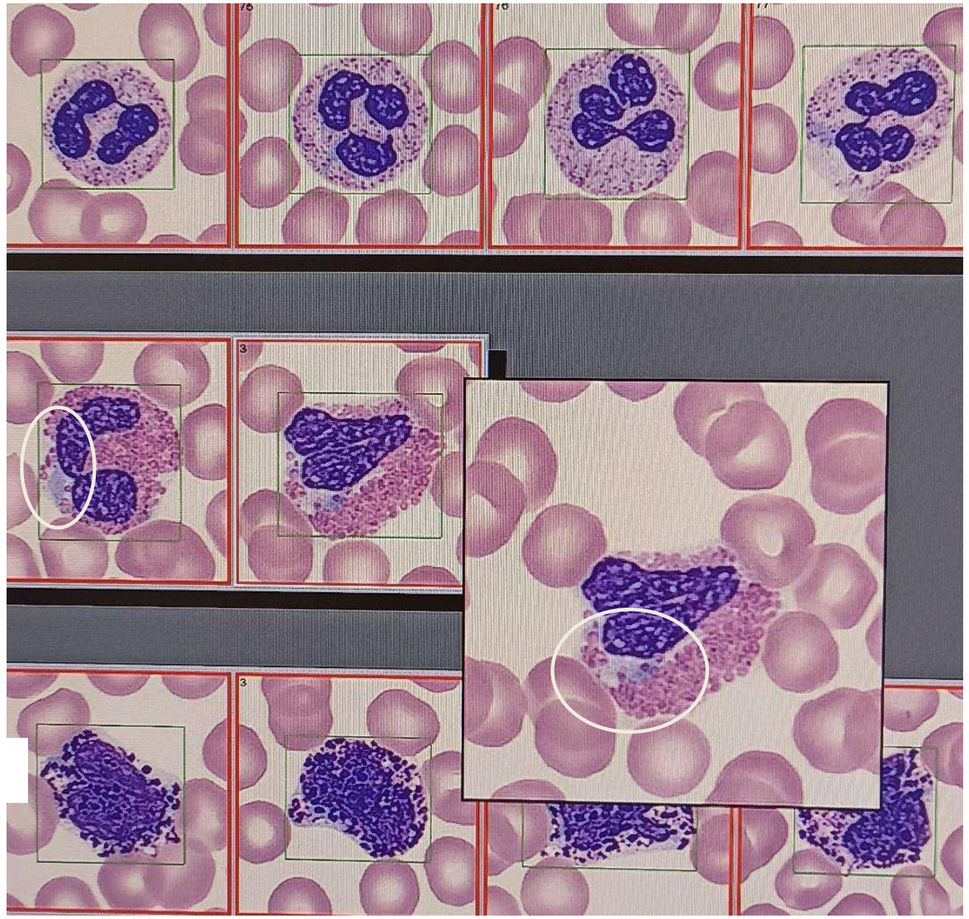
SCOPIO X100

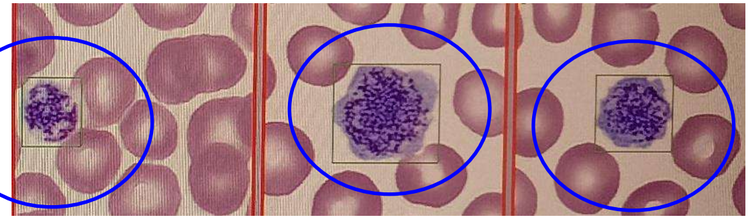


Anomalia de May-Hegglin

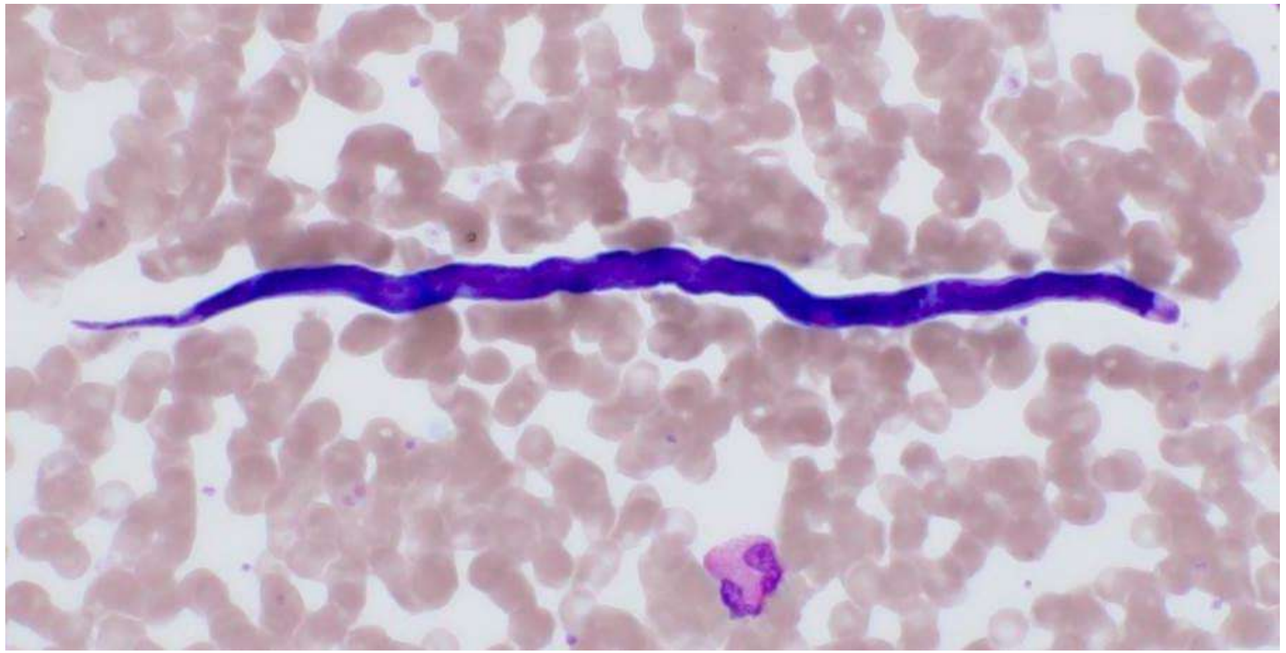


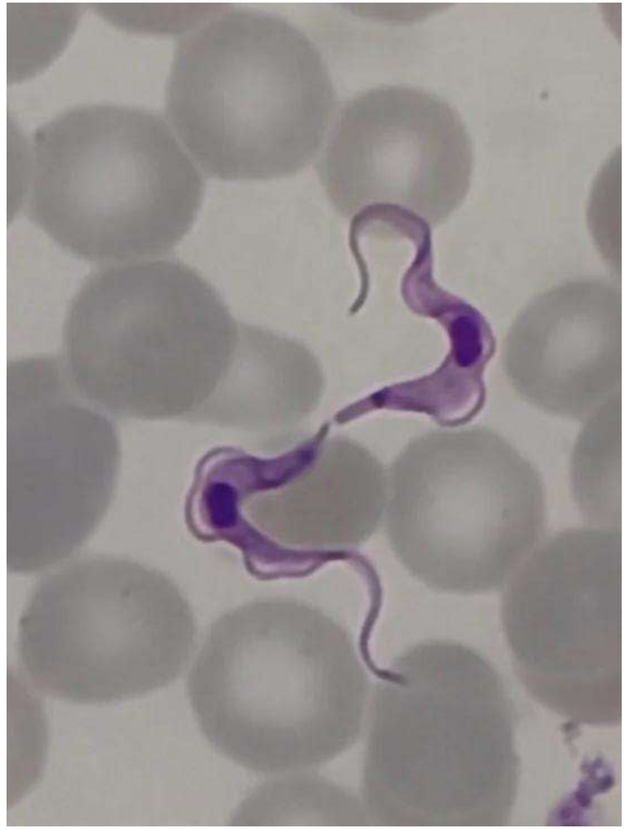
Inclusões de May-Hegglin



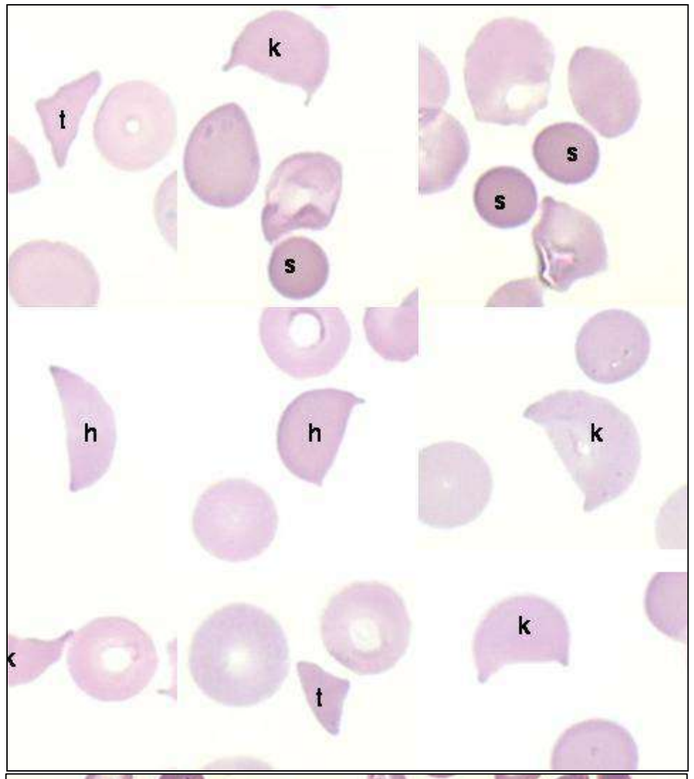


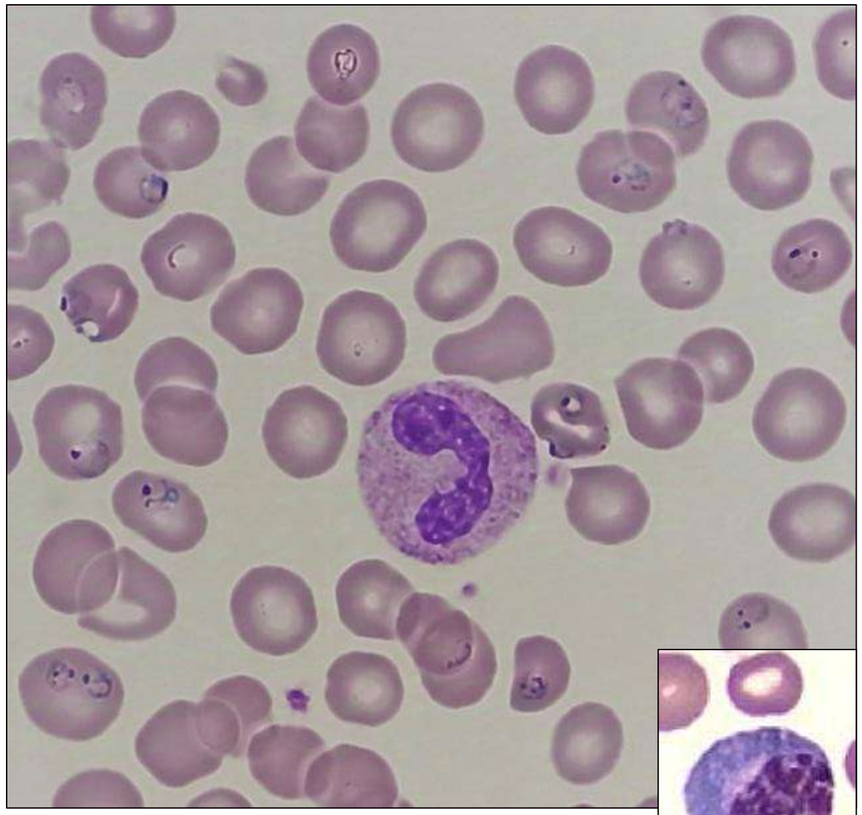
Leishmania spp, Trypanosoma cruzi, Loa Loa

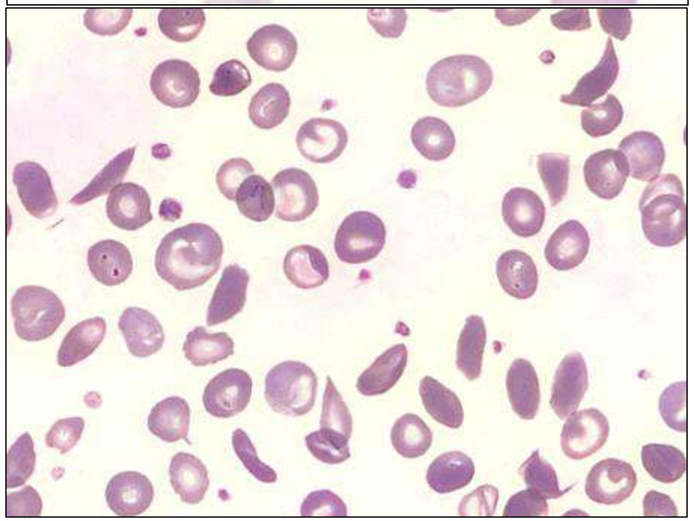


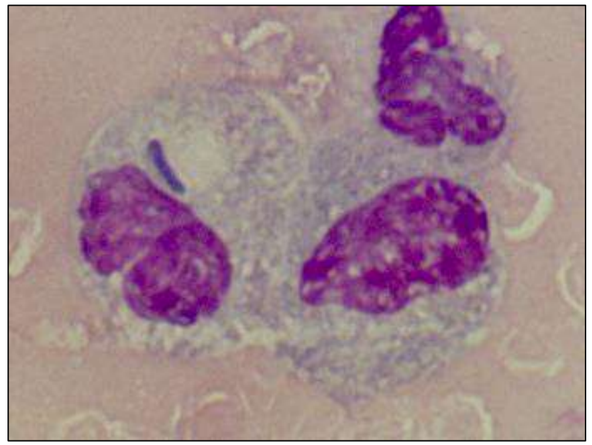


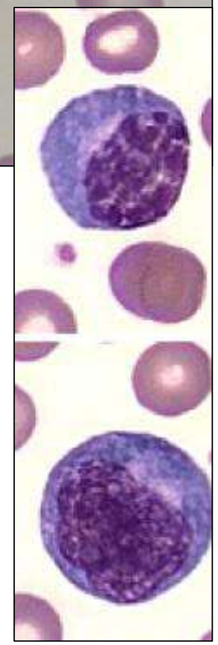
Achados morfológicos críticos

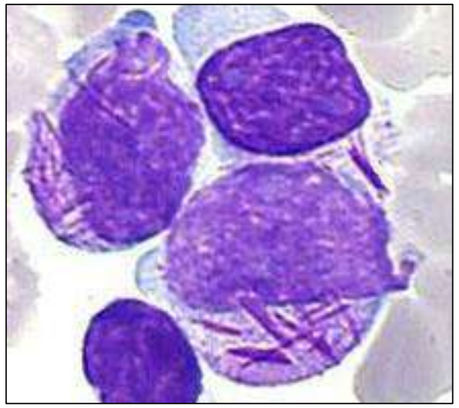


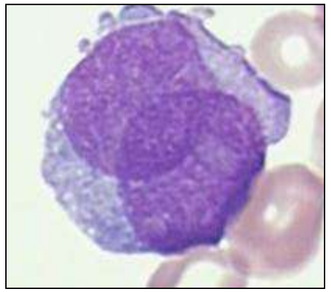


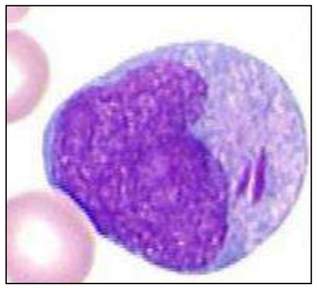


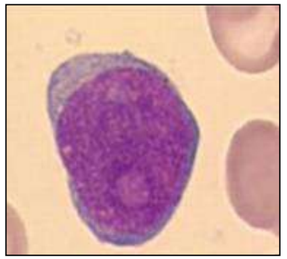


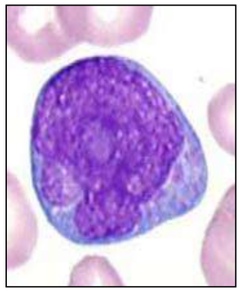


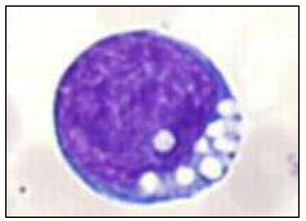












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“Quem não sabe o que procura, não percebe quando encontra”

Obrigado

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