

Chapter 6 Qualitative Abnormalities in Myeloid Cells

-Myeloid cells in haematological neoplasms

Mindray Morphology Corner / Series Course-II WBC

Today we will introduce the myeloid cells in haematological neoplasms, including leukemic myeloblasts, abnormal promyelocytes, monoblasts, promonocytes, and abnormal monocytes.

1. Hematology results example

- A Leukaemic myeloblast series case from Mindray hematology analyzer:

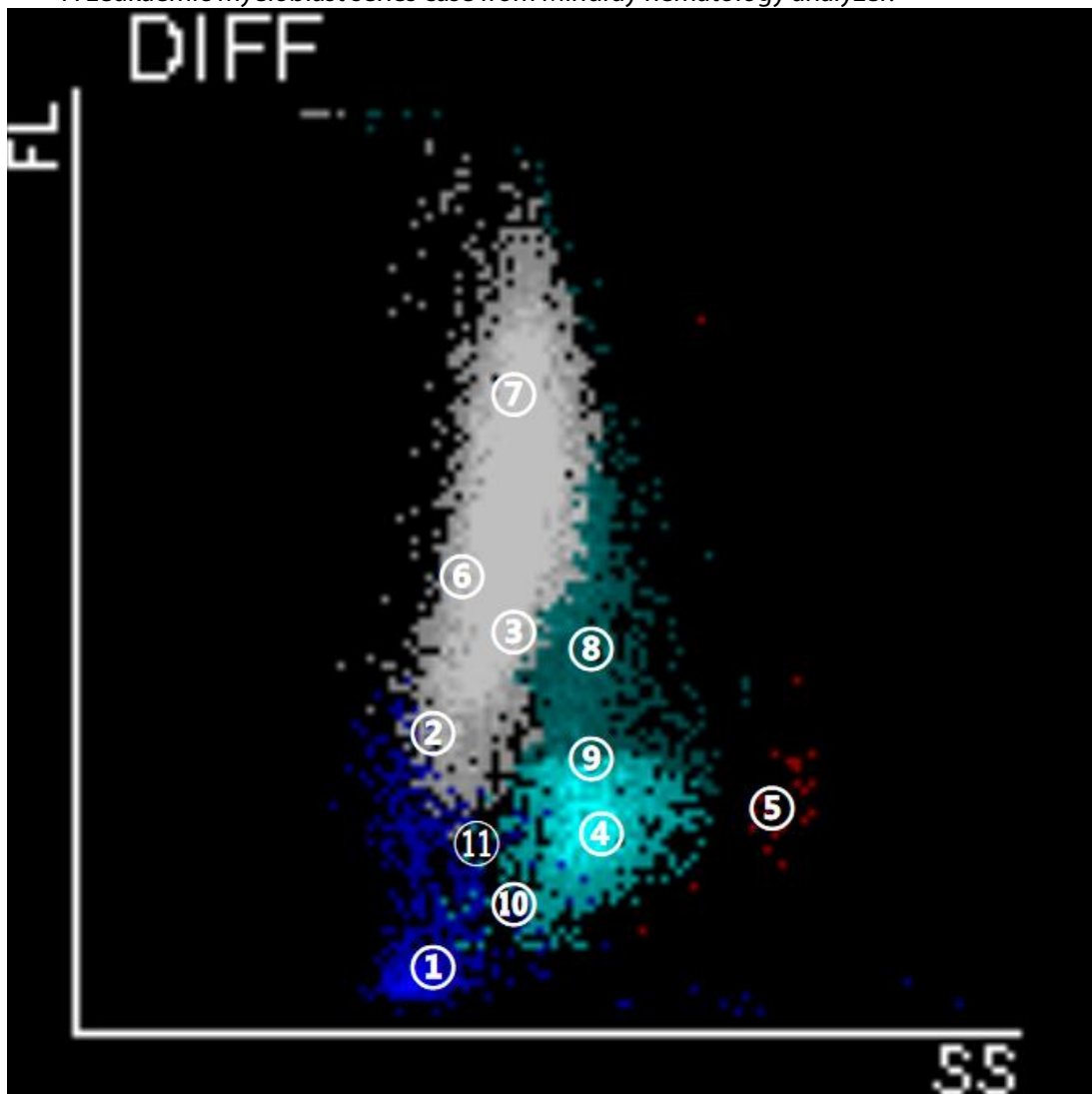


Figure1

Figure 1: DIFF Scattergram, FL, fluorescence signal; SS, side scatter signal

①ghost ②lymphocyte ③monocyte ④neutrophil ⑤eosinophil ⑥**blast** ⑦High fluorescence cell (reactive lymphocyte & **blast**, etc.) ⑧ **immature granulocyte** ⑨ band neutrophil ⑩ basophil ⑪ nucleated RBC

STAT	Para.	Flag	Result	Delta(Δ)	07-16	07-15	Unit
	WBC	& H	33.10	4.170	28.93	35.73	10 ³ /uL
	Neu%	& RL	20.5	-3.70	24.2	22.6	%
	Lym%	E L	16.5	5.30	11.2	11.9	%
	Mon%	E H	56.9	-4.20	61.1	60.3	%
	Eos%	L	0.1	0.10	0.0	0.0	%
	Bas%		0.1	0.00	0.1	0.1	%
	IMG%	R	5.9	2.50	3.4	5.1	%
	Neu#	& R	6.79	-0.210	7.00	8.08	10 ³ /uL
	Lym#	e H	5.46	2.222	3.24	4.25	10 ³ /uL
	Mon#	e H	18.83	1.154	17.68	21.54	10 ³ /uL
	Eos#		0.03	0.030	0.00	0.00	10 ³ /uL
	Bas#		0.03	0.000	0.03	0.04	10 ³ /uL
	IMG#	R	1.95	0.970	0.98	1.82	10 ³ /uL

Figure 2

Figure 5: WBC & DIFF results from the hematology analyzer

WBC	99	100%
• Unidentified		
• Segmented neutrophils	8	8.1
• Band neutrophils	1	1.0
• Lymphocytes	3	3.0
• Monocytes	1	1.0
• Eosinophils		
• Basophils		
• Metamyelocytes	1	1.0
• Myelocytes	14	14.1
• Promyelocytes		
• Blastos	71	71.8

Figure 3

Figure 6: Reviewed WBC & DIFF results from the MC-80 (Mindray blood film reading machine)

2. Morphology of Myeloid cells in haematological neoplasms

2.1 Leukaemic myeloblast

2.1.1 Leukaemic myeloblasts vary in appearance. ¹

2.1.1.1 They can be large or small in size. Some may have a **high N: C** (nucleus-to-cytoplasm) **ratio**, uncondensed chromatin, and usually one or more **prominent nucleoli**. [Figure 4, 5, 8, 9]

2.1.1.2 Others may have a lower N: C ratio and a few **red-purple** granules or **Auer rods**. [Figure 6]

2.1.1.3 Nuclear and cytoplasmic irregularities may be present, for example, nuclear folding, cytoplasmic basophilia, and cytoplasmic blebbing or **pseudopods**. [Figure 7]

✧ The recommendation is to count these as blasts and describe them in the film report with a suitable interpretive comment.

2.1.2 Leukaemic myeloblast figures

2.1.2.1 General leukemic myeloblast [Figure 4, 5, 6, 7]

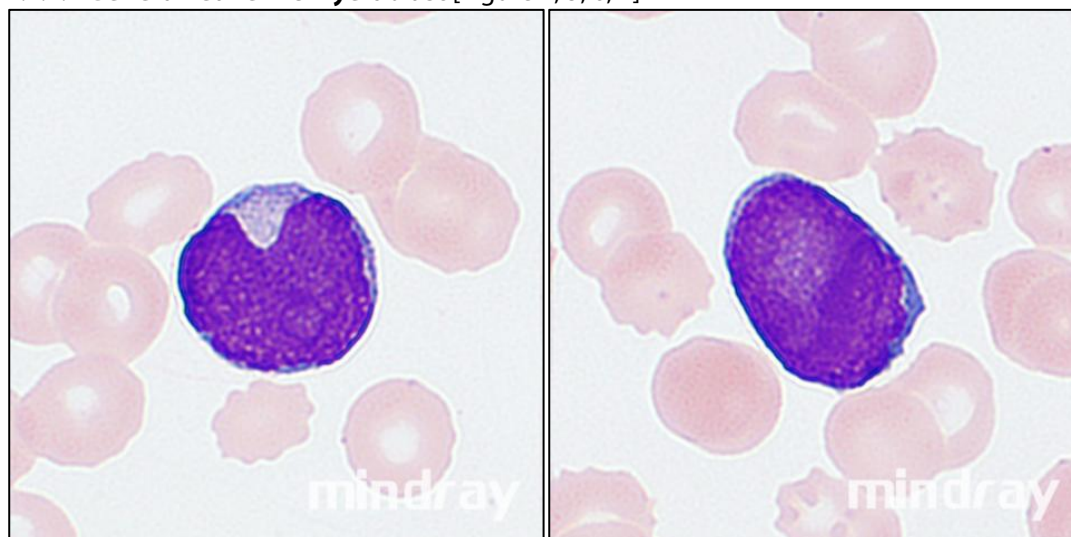


Figure 4

Figure 5

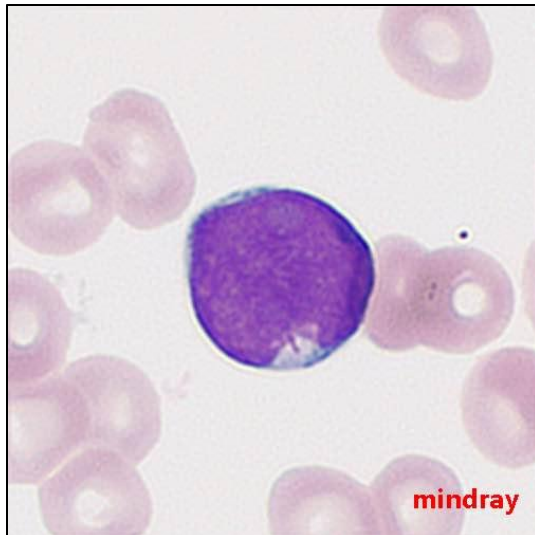


Figure 6

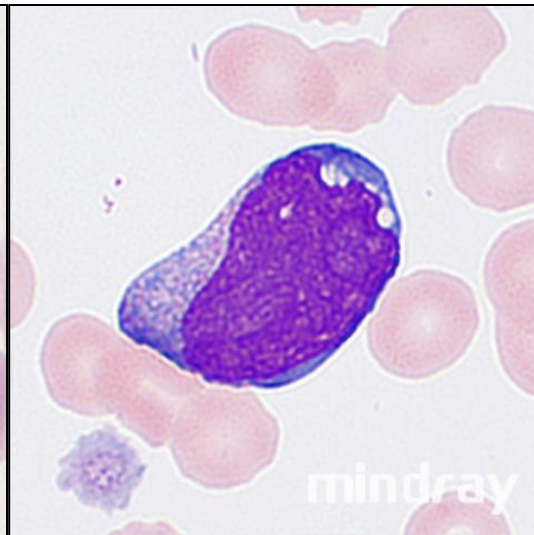


Figure 7

2.1.2 Cup-like blasts in AML (acute myelocytic leukemia) [Figure 8, 9]

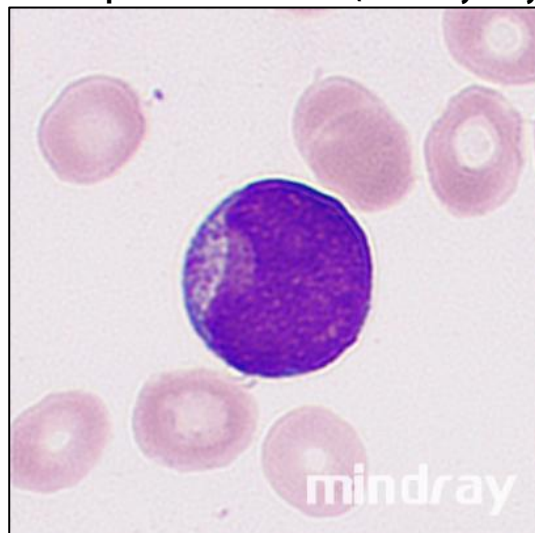


Figure 8

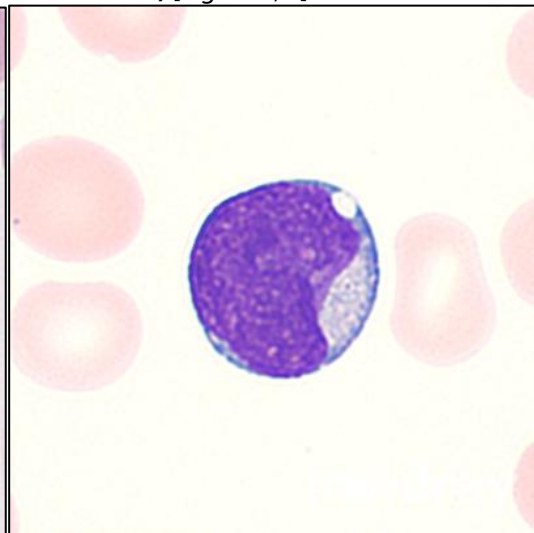


Figure 9

- Also called fish mouth blasts, occurs mostly in acute myelocytic leukemia (AML).

2.2 Abnormal promyelocytes

2.2.1 Abnormal promyelocytes in acute promyelocytic leukaemia (APL).¹

2.2.1.1 The promyelocytes in the hypergranular variant of APL have nuclei that vary in size and shape and are often kidney-shaped **or bilobed**. [Figure 10, 11, 12, 13]

2.2.1.2 The cytoplasm is packed with large coalescent **pink-purple** granules and may contain **Auer rods**. These may be grouped in bundles or "faggots" within the cytoplasm. [Figure 14, 15, 16, 17]

2.2.1.3 In the hypogranular or microgranular variant, the nuclear shape is usually bilobed, but the cytoplasm contains **few or no granules**. [Figure 13]

- ✧ The recommendation is to count these abnormal promyelocytes as blast equivalents in the differential, but it is important that a suitable description of the abnormal promyelocytes and an interpretive comment are added to the film report and a likely diagnosis of APL is communicated directly to the clinician.

2.2.2 Abnormal promyelocyte figures [Figure 10, 11], 12, 13, 14, 15, 16, 17]

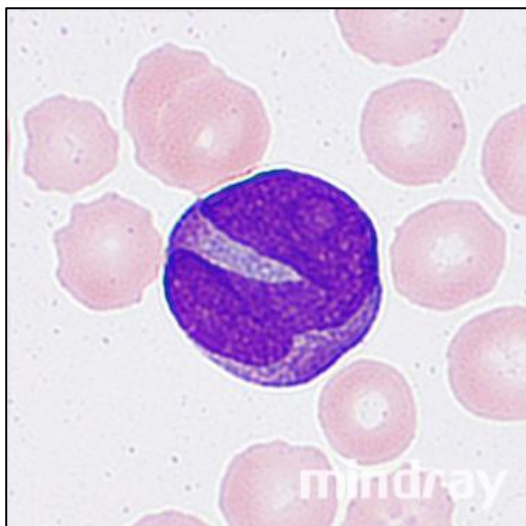


Figure10

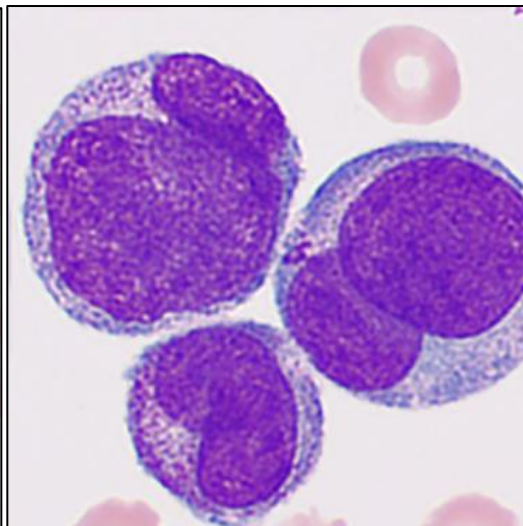


Figure11

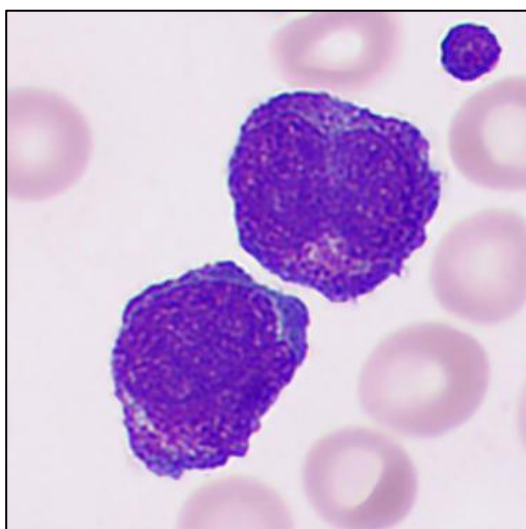


Figure12

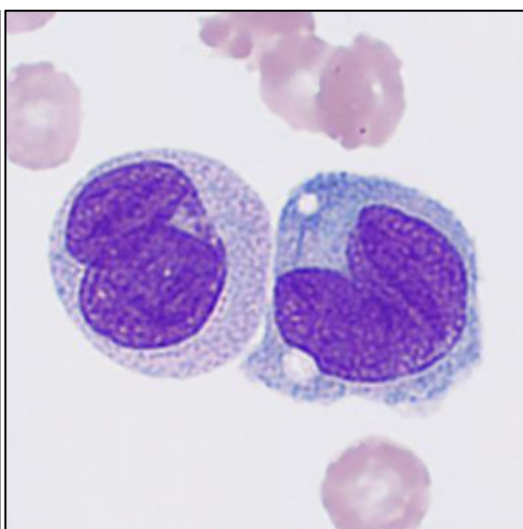


Figure13

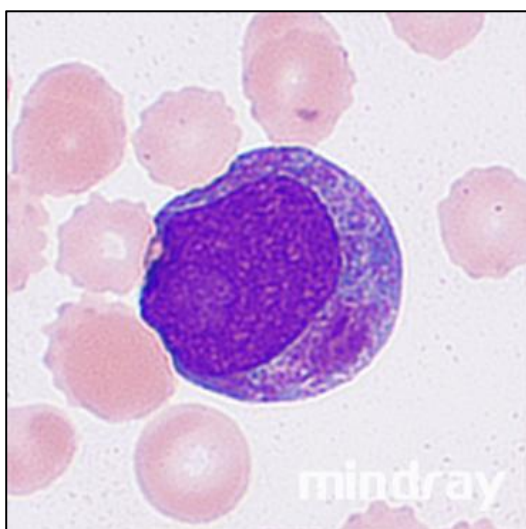


Figure14

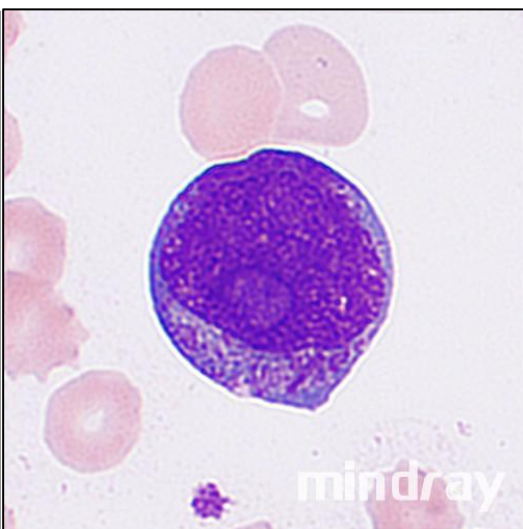


Figure15

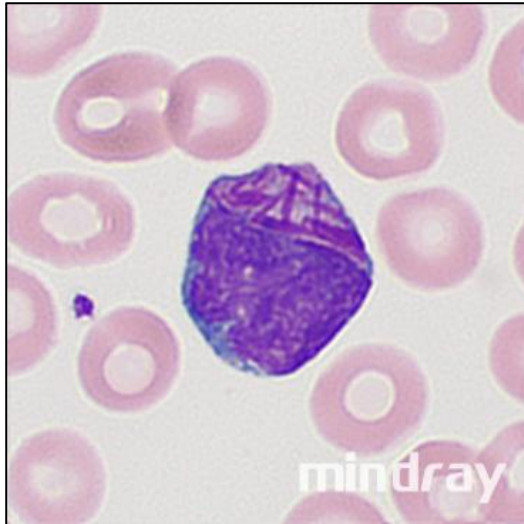


Figure16

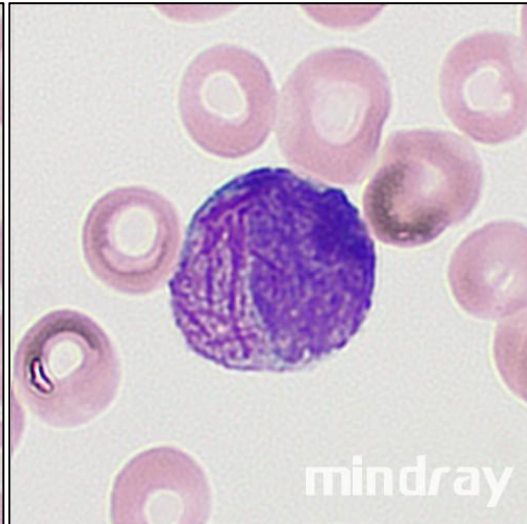


Figure17

2.3 Monoblasts.

2.3.1 Monoblast morphology description

2.3.1.1 Monoblasts are larger than myeloblasts (20 – 30 μm), with a round/oval nucleus, fine chromatin, and one or two prominent nucleoli.¹

2.3.1.2 The cytoplasm is basophilic and usually lacks granules. [Figure 18, 19]

- ✧ The recommendation is to count these as blasts and describe them in the film report with a suitable interpretive comment.

2.3.2 Monoblast figures [Figure 18, 19]

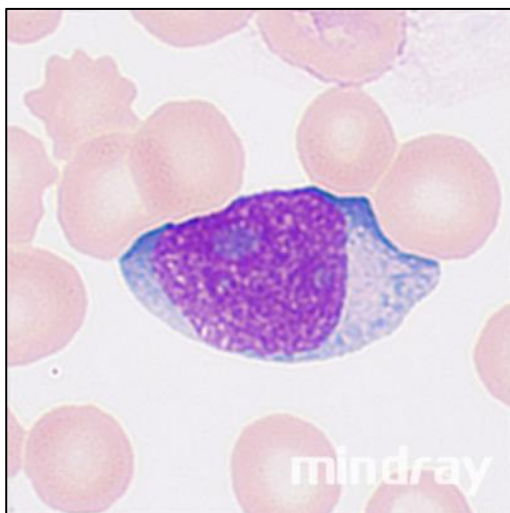


Figure 18

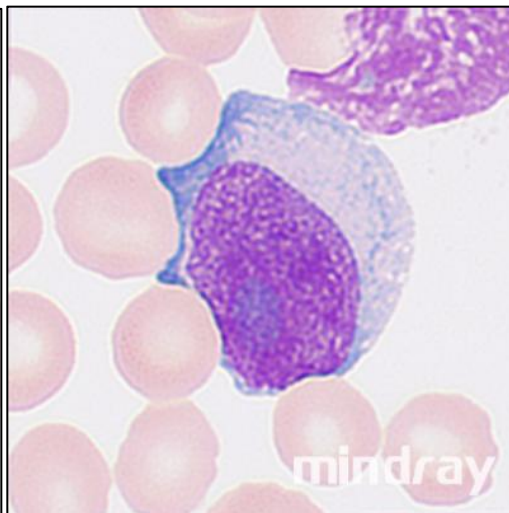


Figure 19

2.4 Promonocytes.

2.4.1 Promonocytes may be rarely seen in the peripheral blood in reactive conditions as well as in some leukemias.¹

2.4.1.1 They are large cells with a nucleus that is convoluted/indented with a delicate, lace-like chromatin pattern and a prominent nucleolus.

2.4.1.2 The cytoplasm is blue-grey and may contain a small number of fine red-violet granules.

- ✧ The recommendation is to count promonocytes in the differential and comment on their presence with a suitable interpretive comment. Leukemic promonocytes should be summated with blast cells when making a diagnosis of AML.

2.4.2 Promonocyte figures [Figure 20, 21]

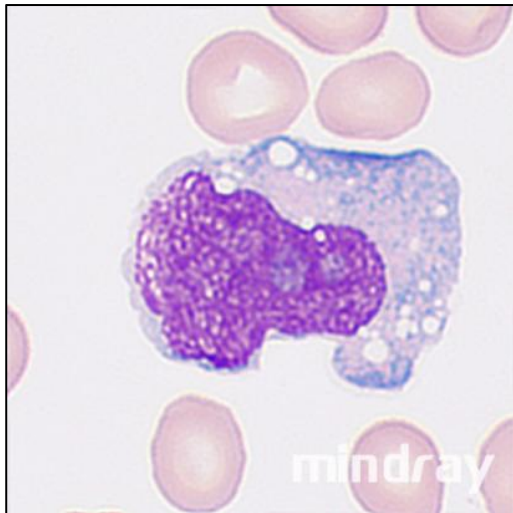


Figure 20

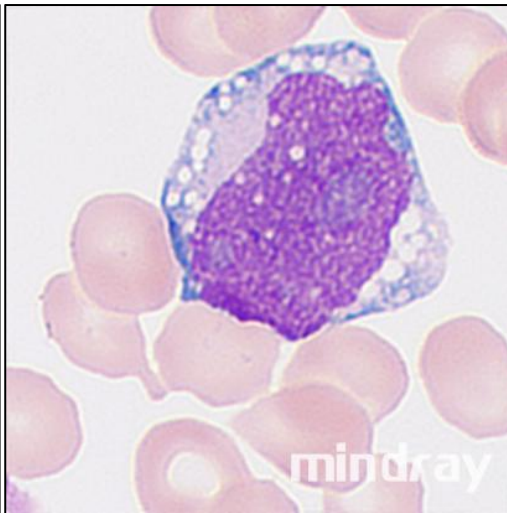


Figure 21

2.5 Abnormal monocytes.

2.5.1 Monocytes produced under conditions of bone marrow stress or stimulation, for example, infections, growth factor (GM-CSF) administration.¹

2.5.1.1 An increased N: C ratio, a more delicate chromatin pattern, nucleoli, and increased numbers of vacuoles. **Granulation and cytoplasmic basophilia** may also be increased.
[Figure 22, 23, 24, 25]

2.5.1.2 Abnormal monocytes can be seen in a number of haematological neoplasms.

2.5.1.3 In contrast to monoblasts and promonocytes, the abnormal monocytes are larger, have irregular nuclei, and increased cytoplasm.

- ✧ The recommendation is to count these as monocytes with a comment on their morphology and a suitable interpretive comment.

2.5.2 Abnormal monocyte figures [Figure 22, 23, 24, 25]

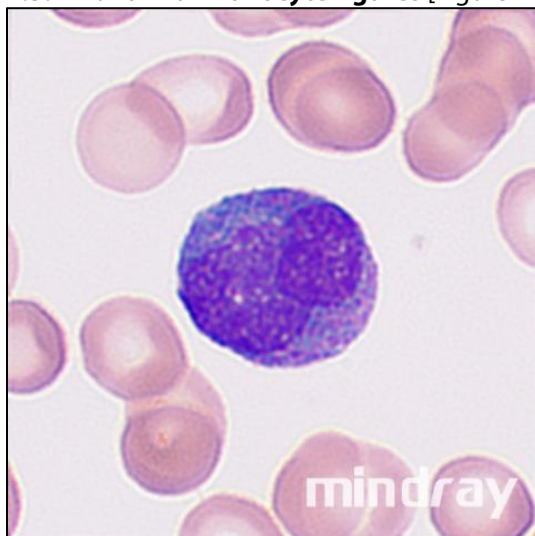


Figure 22

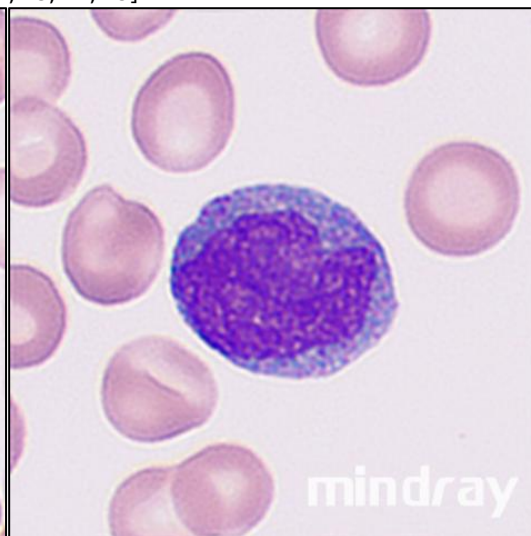


Figure 23

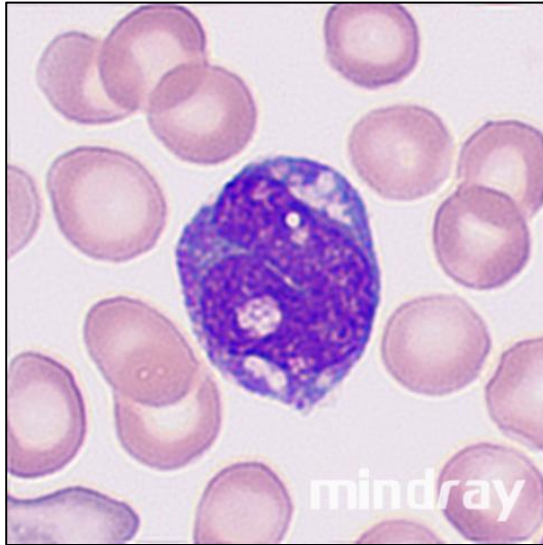


Figure 24

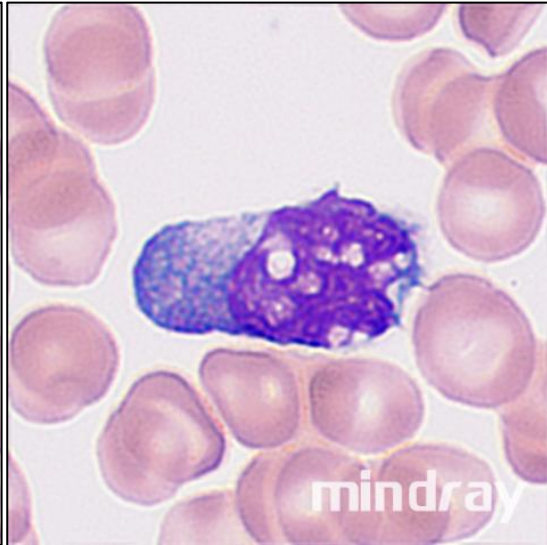


Figure 25

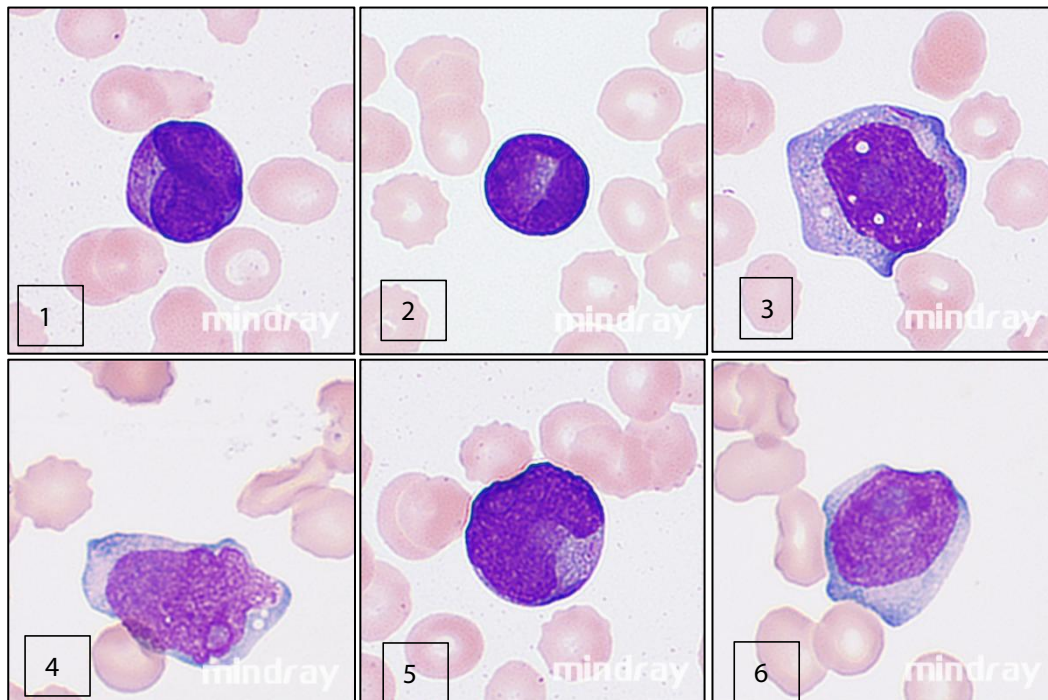
References & Image Sources

References:

1. Palmer, Lynn, et al. "ICSH Recommendations for the Standardization of Nomenclature and Grading of Peripheral Blood Cell Morphological Features." International Journal of Laboratory Hematology, vol. 37, 2015, pp. 1-17. Wiley Online Library, <https://doi.org/10.1111/ijlh.12327>.

Images & Technical Support: Most morphology images in this course are derived from analysis by the Mindray automated digital morphology analyzer MC-80.

Practice



[The answers will be at the end of the next chapter]

The answers to the last chapter:

1. Ring-Shaped Nuclei Neutrophil 2. Hypersegmentation-Neutrophil
3. Hyposegmentation Neutrophil; 4. Segmented Neutrophil; 5. Eosinophil; 6. Band Neutrophil

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— Coming Next: **Atypical lymphocytes & Reactive lymphocytes**—