# A Clearer Truth?
Find it Faster!

In the laboratory, what is the most common reason for you to gather with colleagues to look at and discuss samples or patient results on the screen or in a report?

The answers may vary. One of the reasons may be to discuss the special cell cases you find in a morphological examination. The routine hematology analysis is one of the most important screening tools among in-vitro diagnostics methods. The professionalism of the pathologist guarantees fast and accurate diagnosis based on the results from hematology analysis. Experienced and skilled cell morphology experts, in particular, play a vital role in it.
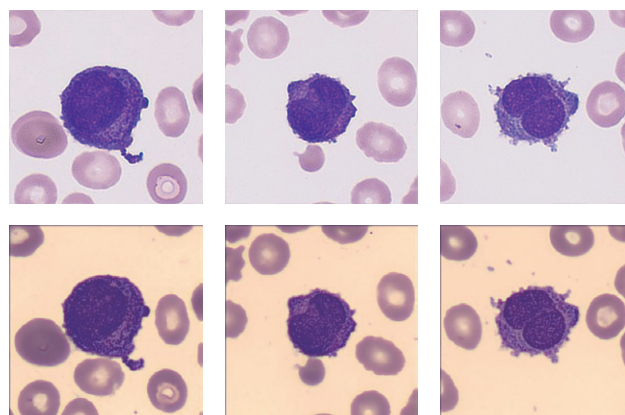
A Clinical Case

According to the IDF, there are approximately 232 million people with undiagnosed DM worldwide. Many guidelines tend to suggest DM screening in the population with or without specific medical conditions, and HbA1c is a convenient test to meet this objective. [2] Unlike glucose tests, HbA1c is not affected by recent food intake, so patients do not have to fast or intake certain quantities of glucose before the test. Accompanied with medical history and some auxiliary evidence, doctors can make the DM diagnosis if the patient's HbA1c matches the criteria.

The hematology results showed pancytopenia and flagged many causes for concern, including anemia, thrombocytopenia, white blood cell abnormal scattergram, and immature granulocytes.

Sore throat

Rheumatism

Hypertension

Hyperuricemia
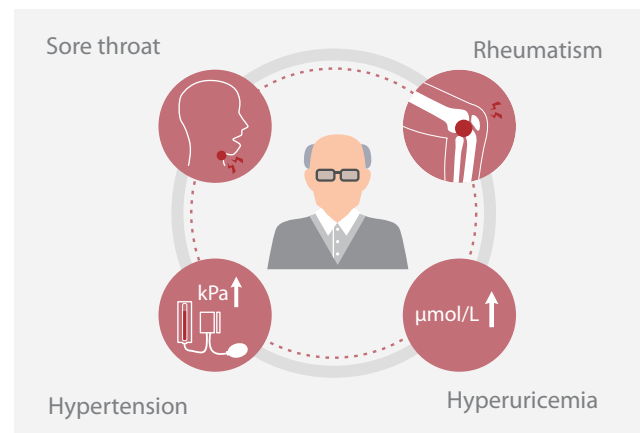
The re-exam rule was triggered, so the doctor carried out the smear and stained it in the slide marker. The current digital cell morphology system read the blood smear automatically, and a high percentage of blasts and a few immature granulocytes were found.
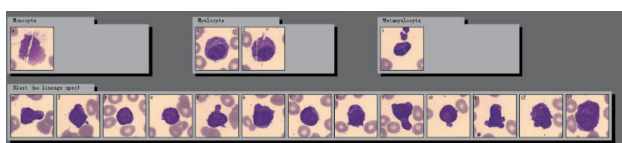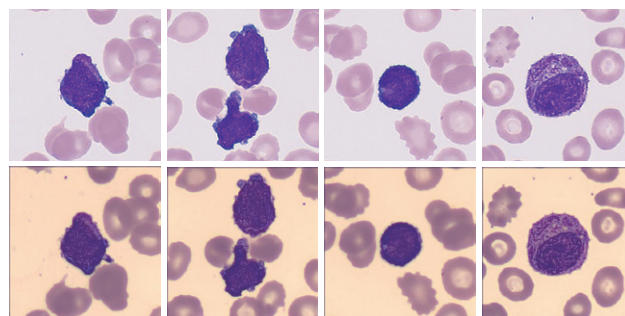
White blood cell	Cell count	Percentage %
• Unidentified	19	9.5
• Band neutrophil	-	-
• Segmented neutrophil	4	2.0
• Eosinophil	-	-
• Basophil	30	15.0
• Lymphocyte	127	63.5
• Monocyte	1	0.5
• Promyelocyte	-	-
• Myelocyte	2	1.0
• Metamyelocyte	1	0.5
Immature eosinophil	-	-
Immature basophil	-	-
Promonocyte	-	-
Prolymphocyte	-	-
• Blast(no lineage spec)	13	6.5
• Lymphocyte,variant form	-	-
• Plasma cell	3	1.5
Large granular lymphocyte	-	-

The pre-classification result by the current digital cell morphology system

"My god! Look at this!" One technician exclaimed. He read the same slide on the hospital's trial digital cell morphology system from Mindray, where he found a more critical signal. In addition to high numbers of blast cells, a new cell type "Abnormal promyelocyte" appeared on the screen, with a percentage as high as 33.5%!

The abnormal promyelocytes on the trial digital cell morphology system from Mindray.

Many typical characteristics had been found in these cells, such as the abondent purple-red auer rods, the orange-red cytoplasm particles like sunset clouds, and two leaf-like nuclei. The laboratory immediately decided to report the cirital values to the clinical department.

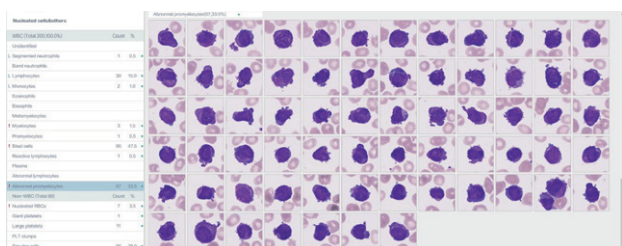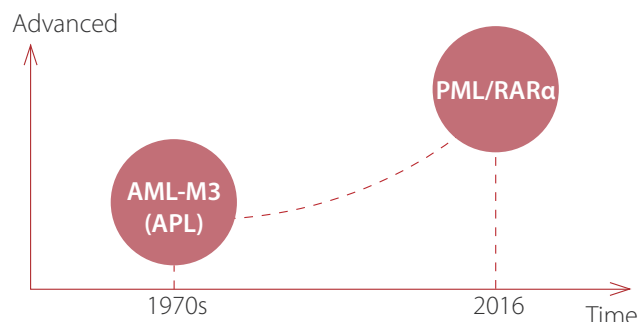The typical abnormal promyelocytes on both digital cell morphology systems

The patient was quickly treated with all-trans retinoic acid (ATRA) + arsenic program, and then fluorescence in situ hybridization (FISH) confirmed a chromosome translocation of t(15;17) (q22;q12) forming the fusion gene PML/RARα.

More pairs on both systems (from the same slide):

About PML/RARα

In the 1970s, a group of French, American, and British leukemia experts divided AML into subtypes, M0 through M7, based on the type of cell where the leukemia develops and how mature those cells are.Acute promyelocytic

leukemia (APL) is the subtype AML-M3 using the French-American-British (FAB) classification. By taking into account many of the factors that are now known to affect prognosis, the World Health Organization (WHO) system updated the classification of AML in 2016. APL with the PML- RARα fusion gene was independently listed, as PML/RARα is the central leukemia-inducing lesion in APL. It is directly targeted by all trans retinoic acid (ATRA) and by arsenic, with both compounds able to induce complete remissions (CRs).

Clinically, it is critical that APL is distinguished from other AML subtypes quickly, because of:

> Its life-threatening bleeding disorders in case of delay in the proper treatment

> Its achievement of CRs in about 90% of APL patients upon ATRA treatment

> Its induction of CRs in 75–90% of APL patients upon exposure to low-dose arsenic trioxide

However, the low incidence of PML/RARα and the rapid deterioration of the disease mean that rapid diagnosis and the timely and successful treatment of patients are still huge challenges facing medical professionals today.

Conclusion

Although there are a variety of digital cell morphology systems with automatic cell classification on the market, there are still problems with insufficient recognition ability and low levels of efficiency. It takes a lot of manpower to check and confirm abnormalities on the cell image, and even check the smear under the microscope again.

Mindray provides reliable hematology solutions that can deliver efficient, accurate information about the true conditions of patients, helping health professionals, especially morphology experts, to find abnormalities, identify emergencies, as well as treat and cure patients fast.

References

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[3] Puccetti, E., Ruthardt, M. Acute promyelocytic leukemia: PML/RARα and the leukemic stem cell.Leukemia18,1169–1175 (2004). https://doi.org/10.1038/sj.leu.2403367

[4] ARBER et al, The 2016 revision to the World Health Organization classification of myeloid neoplasms and acute leukemia, Blood (2016) 127 (20): 2391–2405.https://doi.org/10.1182/blood-2016-03-6435 44

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