Celltac

Fully Automated Hematology Analyzer

Celltac
Clinical Data Book

Reviewed by

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Fighting Disease with Electronics
NIHON KOHDEN

Introduction

There has been remarkable progress in recent medical technology, including automation and systematization in laboratory testing. Many test results can be obtained in a short time by automated measurement devices.

However, hematology involves morphological examination which is difficult to automate. Furthermore, the knowledge and experience of the clinical laboratory technician significantly affects the quality of test results. It is desirable for the technician to continuously improve their morphology examination skills.

Also, automated hematology analyzers are often used in screening in morphological examination. The automated hematology analyzers provide numerical test results as well as information from histograms and scattergrams.

This Clinical Data Book was written to help the technician interpret the measurement data obtained by the Celltac hematology analyzer. This guidebook provides easy to understand explanations of measurement principles, flag information, histograms, and scattergrams. It also shows cell photographs and morphological findings for many typical cases. This guidebook can be useful as basic education material and for help in recognizing abnormal test results.

We hope this guidebook will be helpful in the daily work in clinical laboratories and contribute to more efficient workflow.

Contents

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1.

Analysis of the 5-part Differential of WBC by Celltac Hematology Analyzers

1.1 Principle of flow cytometry of Celltac hematology analyzers

Nihon Kohden Celltac hematology analyzers differentiate WBC into 5 types (neutrophils, eosinophils, basophils, monocytes, and lymphocytes) using a method for detecting scattered laser light (flow cytometry) in which a red semiconductor laser irradiates the WBC and the scattered light is detected and analyzed. From this, 3 types of information is obtained: cell size, cell complexity, and cell granularity.

Two Fresnel lens outside the flow cell detect the scattered laser light in three directions: forward small angle light scatter (FSS), forward large angle light scatter (FLS), and side angle light scatter (SDS). The intensity of each of the three light scatter parameters is also detected. FSS indicates cell size, FLS indicates cell complexity, and SDS indicates cell granularity (Fig. 1). By 3-D analysis of these three scatter values, cells can be clearly differentiated into five populations.

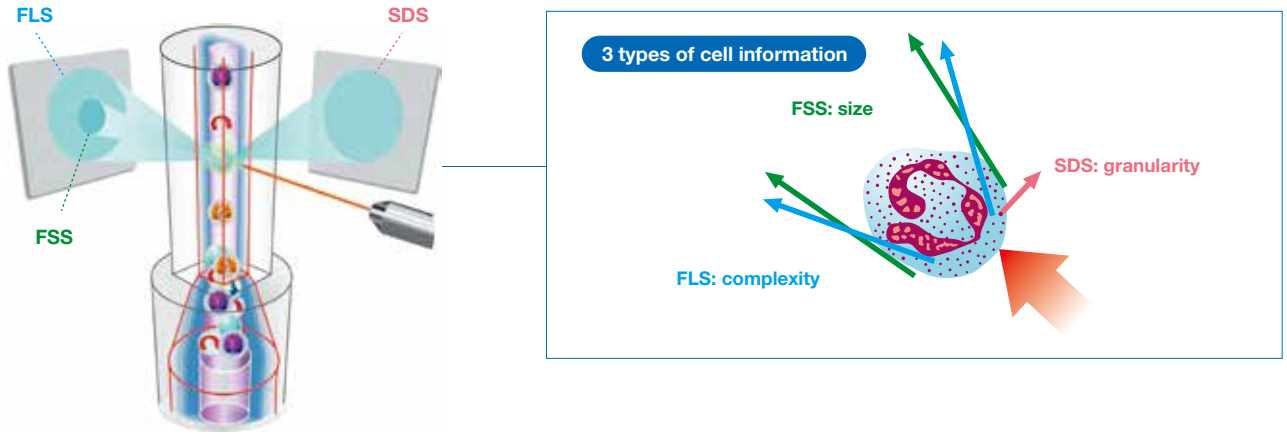


Fig. 1 Flow cell with Fresnel lenses

High precision differentiation of WBC by low cost non-staining method

The 5-part differential of WBC by the Celltac hematology analyzer identifies the morphological characteristics while maintaining the in vivo condition of the cells from the peripheral blood sample as much as possible. Thus, cell information from conditions almost similar to the in vivo condition can be obtained. A simultaneous analysis of WBC with a single channel using flow cytometry enables a quantitative analysis of relative cells in a common environment. Thus, the 5-part differential of WBC can be performed with high precision and only a small amount of reagents.

1.2 5-part differential of WBC by scattergrams

A scattergram is a diagram in which data for each cell type are plotted as 3-dimensional coordinates as shown in Fig. 2. These three dimensions represent the three types of information on cell morphology (size, complexity, and granularity) which is obtained from the intensity of scattered light. Compared with two-dimensional analysis, use of three-dimensional coordinates more clearly classifies each cell population and enables more precise measurement. The distribution map of each cell type is displayed on three types of scattergrams (Fig. 3).

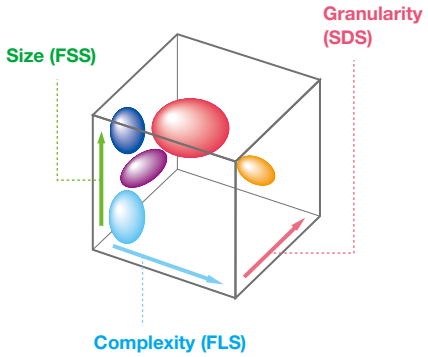


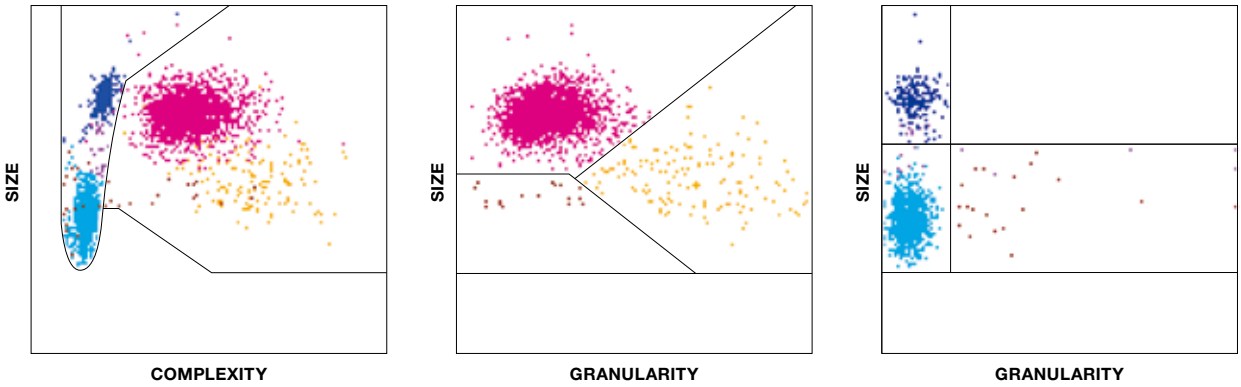
Fig. 2 Three-dimensional representation of the 3 scattergrams

Three scattergrams

❶ **MAIN scattergram**: Differentiates lymphocytes/monocytes + basophils/neutrophils + eosinophils (Size-Complexity)

❷ **NE-EO scattergram**: Differentiates neutrophils/eosinophils (Size-Granularity)

❸ **MO-BA scattergram**: Differentiates monocytes/basophils (Size-Granularity)



❶ MAIN scattergram ❷ NE-EO scattergram ❸ MO-BA scattergram

Fig. 3 Typical scattergrams of a normal sample

Scattergram related to the reference information at the time of microscopic analysis

The three types of information on cell morphology (size, complexity, and granularity) that are obtained from the Celltac hematology analyzer are the same as the criteria for microscopic analysis. This means that the Celltac hematology analyzer scattergram data can be easily interpreted. By observing the scattergrams each cell population, we can estimate the presence or absence of morphological abnormalities.

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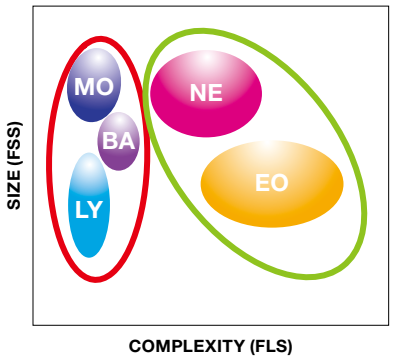
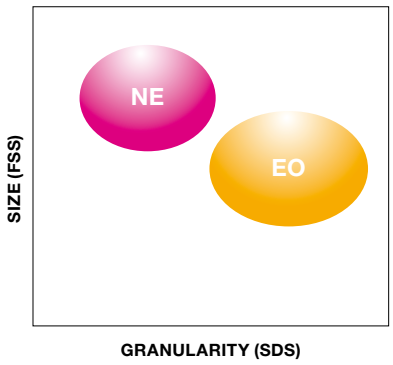
❶ MAIN scattergram



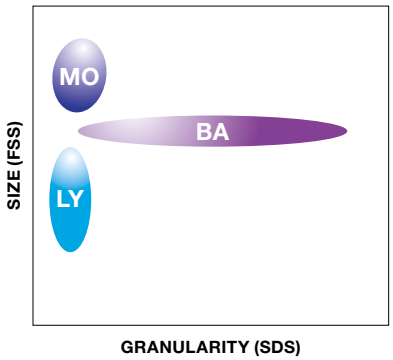
The MAIN scattergram combines size (FSS) and complexity (FLS). This scattergram has two distributed subpopulations that are usually divided into an LY + MO + BA area (◯) on the left side and an NE + EO area (◯) on the right side. The LY + MO + BA area contains lymphocytes (LY) and monocytes (MO) with low FLS intensity (low complexity) and the NE + EO area contains two subpopulations of neutrophils (NE) and eosinophils (EO) with high FLS intensity (high complexity). Basophils (BA) are plotted on an area with a slightly higher complexity than that of the MO area. Although basophils usually have segmented granulocytes, BA seems to have a low FS intensity since it has highly water-soluble granules.

❷ NE-EO scattergram



The NE-EO scattergram combines size (FSS) and granularity (SDS). This scattergram has subpopulations of neutrophils (NE) and eosinophils (EO) whose distribution overlaps on the MAIN scattergram. NE and EO are distinguished by differences in their morphology.

❸ MO-BA scattergram



The MO-BA scattergram combines size (FSS) and granularity (SDS). This scattergram has subpopulations of monocytes (MO) and basophils (BA) whose distribution overlaps on the MAIN scattergram. MO and BA are distinguished by differences in their morphology.

KEY

Size = **FSS**
Complexity = **FLS**
Granularity = **SDS**

LY Lymphocytes
MO Monocytes
NE Neutrophils
EO Eosinophils
BA Basophils

1.3 Flags and symbol marks

The WBC 5-part differential of the Celltac hematology analyzer displays various flags and symbol marks to show the result of its high-precision screening. This section lists the messages and their meaning.

Flags for abnormal values

The following flags are displayed on the measurement results when the relevant parameters are outside the normal range of reference values. It is recommended to conduct a microscopic analysis to confirm abnormalities.

Flag		Flag criteria (factory default settings)
WBC	Leukocytosis	WBC > 18 × $10^3/\mu L$
	Leukopenia	WBC < 2.5 × $10^3/\mu L$
	Neutrophilia	NE > 11 × $10^3/\mu L$
	Neutropenia	NE < 1.0 × $10^3/\mu L$
	Lymphocytosis	LY > 4.0 × $10^3/\mu L$
	Limphopenia	LY < 0.8 × $10^3/\mu L$
	Monocytosis	MO > 1.0 × $10^3/\mu L$
	Eosinophilia	EO > 0.7 × $10^3/\mu L$
	Basophilia	BA > 0.2 × $10^3/\mu L$
RBC	Erythrocytosis	RBC > 6.5 × $10^6/\mu L$
	Anemia	HGB < 10.0 g/dL
	Anisocytosis	RDW > 20%
	Microcytosis	MCV < 70 fL
	Macrocytosis	MCV > 110 fL
	Hypochromia	MCHC < 29.0 g/dL
	Abnormal MCHC	MCHC ≤ 28.0 g/dL MCHC ≥ 38.0 g/dL
PLT	Thrombocytosis	PLT > 600 × $10^3/\mu L$
	Thrombocytopenia	PLT < 60 × $10^3/\mu L$

*These criteria can be changed except for abnormal erythrocyte indices. To set the criteria, refer to the instruction manual of the hematology analyzer.

Flags for morphological abnormalities

The Celltac hematology analyzer displays a flag in the individual area of the relevant scattergram when an abnormality in cell distribution is detected (Fig. 4).

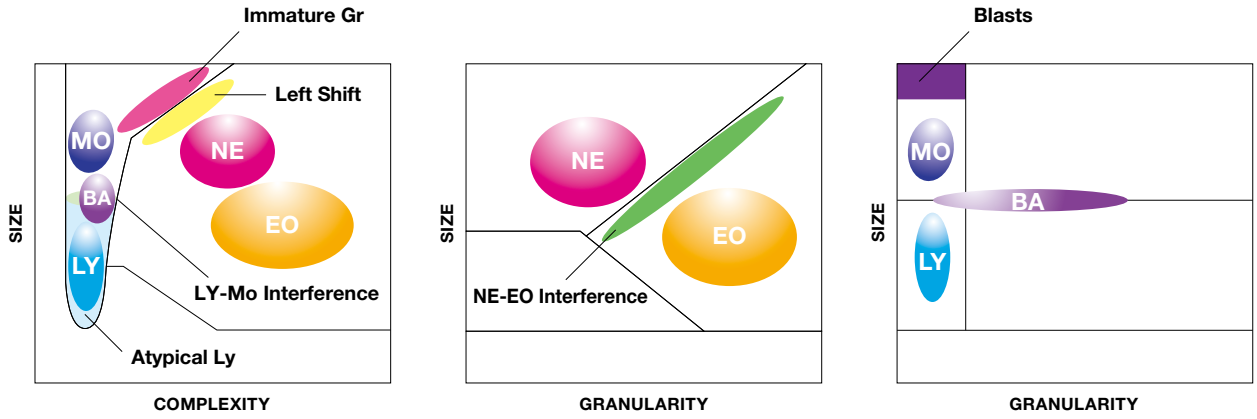


Fig. 4 Flag display areas

Flag	Meaning
Blasts	Blast cells are suspected.
Immature Gr	Immature granulocytes are suspected.
Left Shift	Left shift of neutrophils is suspected.
Atypical Ly	Atypical lymphocytes are suspected.
Ly-Mo Interference	LY plots and MO plots overlap on the MAIN scattergram.
Ne-Eo Interference	NE plots and EO plots overlap on the NE-EO scattergram.

Messages for abnormalities

The following messages also indicate distribution abnormalities in the scattergrams or histograms.

Flag	Criteria for Detection of the Message
Plt Clumps	Platelet clumps are suspected.
Small Nucleated Cell	The difference in WBC count from the optical system and the electrical system exceeds a specified level.
Poor Hemolyzation	The number of detected erythrocyte ghosts in a histogram of WBC exceeds the specified level.
PLT-RBC Interference	Histograms of platelets and erythrocytes cannot be clearly separated.

Symbol marks

When the following symbol marks are displayed on the side of the numerical data, low reliability of data is suspected due to abnormal measurement or mechanical error. Please take appropriate measures by considering each factor.

Symbol mark type	Possible cause	Recommended measures
*	Interfering substances or abnormal cells are suspected.	Do a microscopic analysis.
C	Platelet clumps are suspected.	Do a microscopic analysis.
!	Poor hemolyzation is suspected, or abnormal erythrocyte indices are present.	Do a microscopic analysis.
?	Detection of abnormal temperature or dirt on the measuring part	Perform washing operations.
H	Above the upper limit of reference value	Follow the protocol of your laboratory.
L	Below the lower limit of reference value	Follow the protocol of your laboratory.

Caution

1. The above flags and symbol marks indicate only the presence of abnormal cells or abnormal measurements. The flags and symbol marks do not identify the type or disease of the abnormal cells.
2. When there is a flag and a “*” appears on the side of a value, low reliability of data is suspected. If this occurs, we recommend doing a microscopic analysis. Do not use the data from the hematology analyzer for clinical evaluation.

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2.

Scattergrams and Blood Cell Morphology

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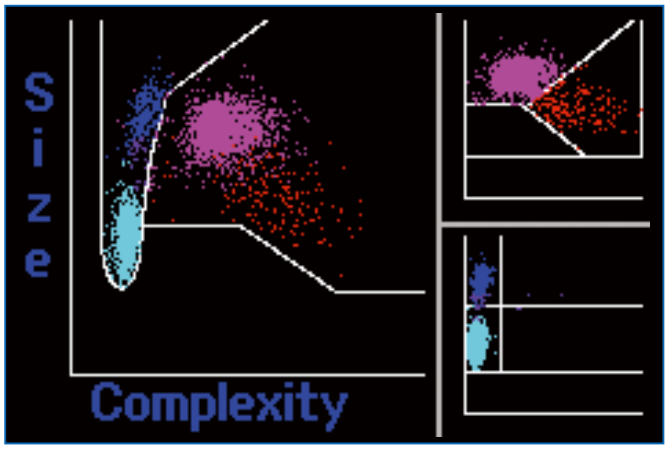
2.1 Normal samples and sample layouts

Celltac data

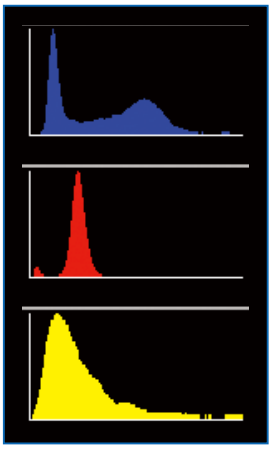
Numerical results

WBC	6.2	10^3/µL	
NE	3.2	[52.2	%]
LY	2.2	[34.9	%]
MO	0.5	[7.2	%]
EO	0.3	[4.5	%]
BA	0.1	[1.2	%]
RBC	4.73	10^6/µL	
HGB	14.2	g/dL	
HCT	42.4	%	
MCV	89.6	fL	
MCH	30.0	pg	
MCHC	33.5	g/dL	
RDW-CV	14.6	%	
RDW-SD	52.3	fL	
PLT	259	10^3/µL	
PCT	0.19	%	
MPV	7.5	fL	
PDW	18.2	%	

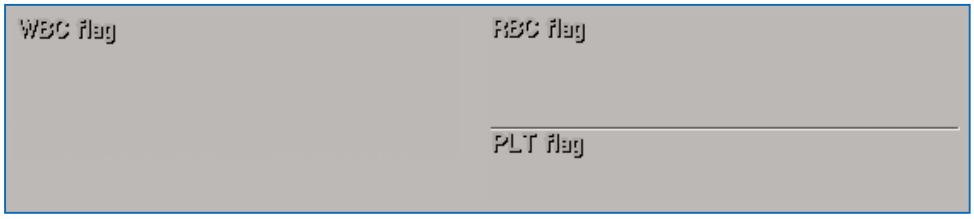
Scattergrams



Histograms



Flags



Explanation of scattergrams/histograms

Scattergrams and histograms will be explained in this space.

Microscopic analysis

Blast
Promyelocyte
Myelocyte
Metamyelocyte
Band
Seg
Lymphocyte
Atypical Ly
Monocyte
Eosinophil
Basophil
Other
total
NRBC/100WBC
RBC/other findings

Specimen type (staining method)

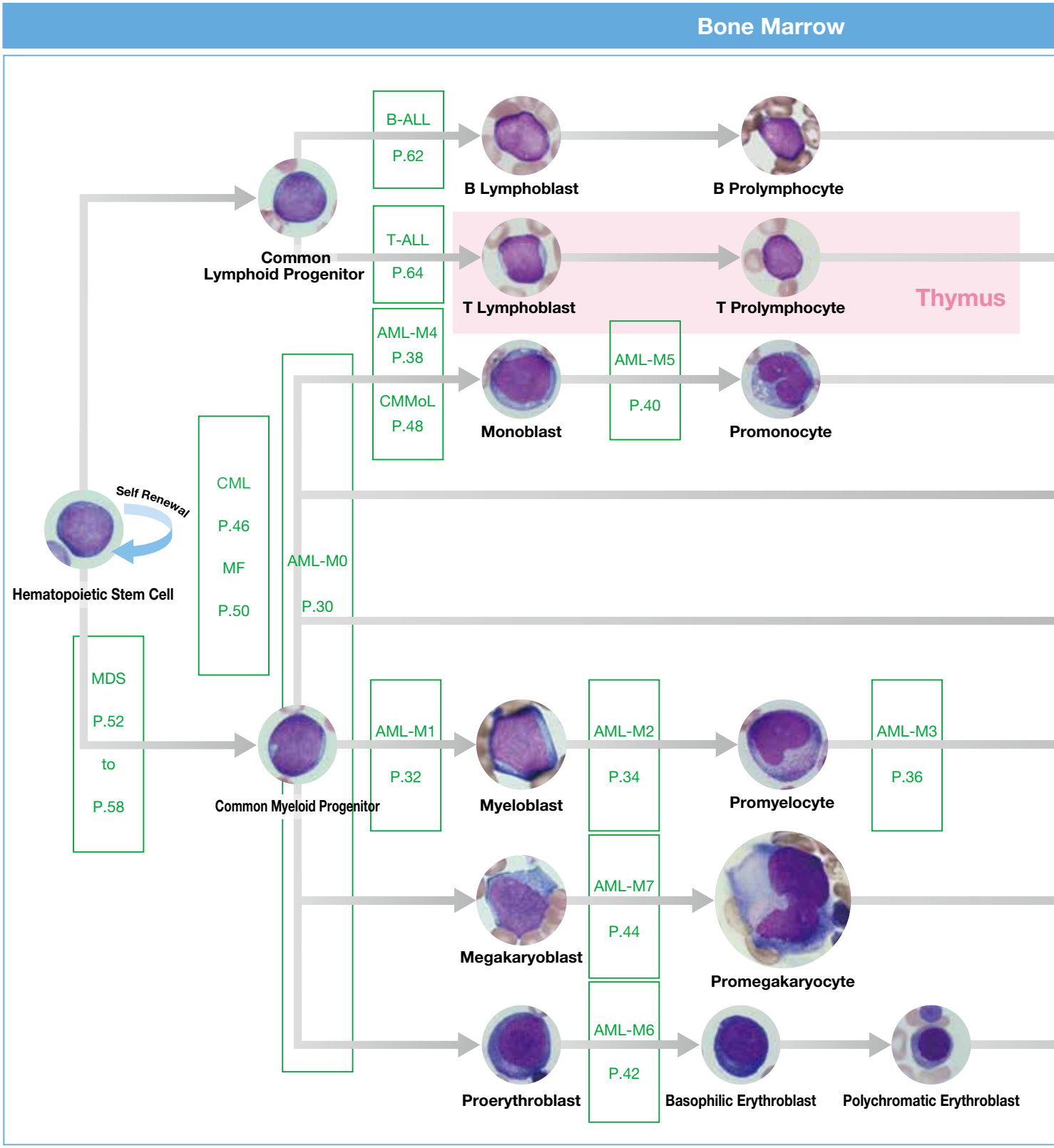
Magnification

Explanation of a case

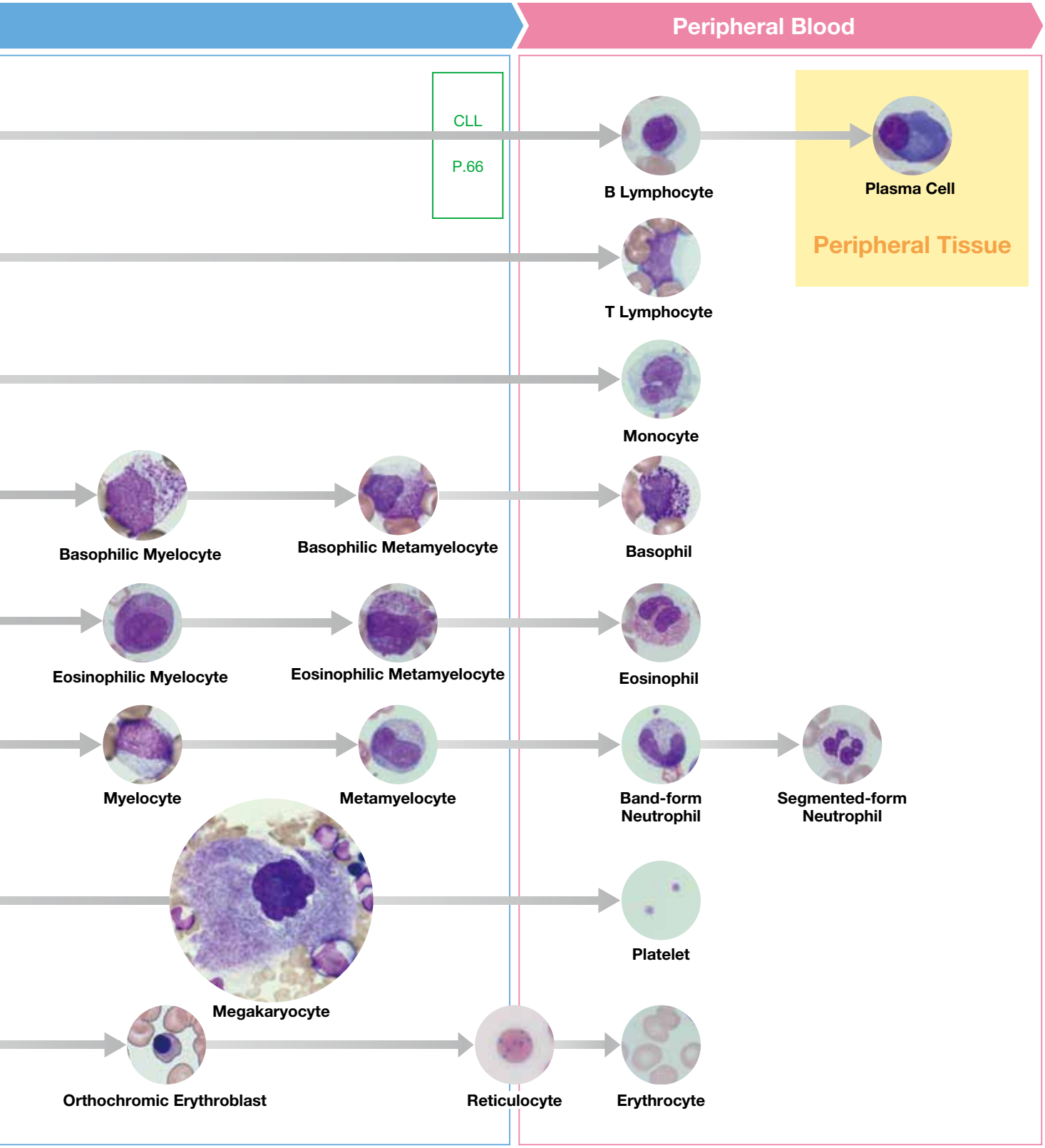
Explanation of results for one typical case

2.2 Differentiation and maturation of hematopoietic stem cells

Differentiation of hematopoietic stem cells and each blood cell is shown below. Leukemia, which occurs after hematopoietic stem cells proliferate to become neoplastic in a stage of their maturation, and cases of leukemia are also described.



*The stage of development of leukemia is an example and may not always be as described here.


Peripheral Blood
CLL
P.66
B Lymphocyte
Plasma Cell
Peripheral Tissue
T Lymphocyte
Monocyte
Basophilic Myelocyte
Basophilic Metamyelocyte
Basophil
Eosinophilic Myelocyte
Eosinophilic Metamyelocyte
Eosinophil
Myelocyte
Metamyelocyte
Band-form Neutrophil
Segmented-form Neutrophil
Platelet
Megakaryocyte
Orthochromic Erythroblast
Reticulocyte
Erythrocyte

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3.

Leukocytosis

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3.1 Neutrophilia

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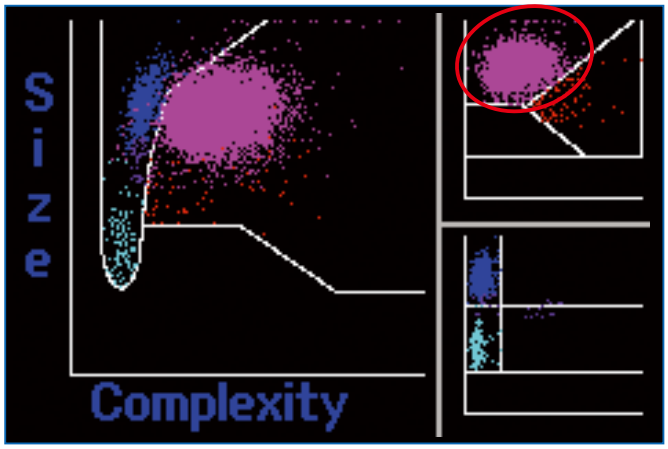
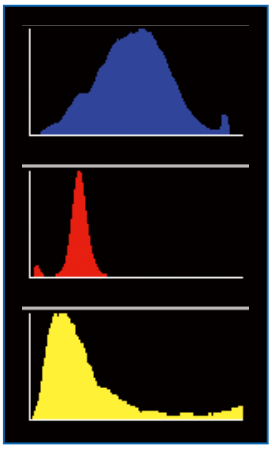
Numerical results

WBC	15.2H	$10^3/\mu L$	
NE	13.8H	[90.6H	%]
LY	0.2L	[1.5L	%]
MO	1.0H	[6.7	%]
EO	0.1	[0.8	%]
BA	0.1	[0.4	%]
RBC	5.10	$10^6/\mu L$	
HGB	15.4	g/dL	
HCT	46.1	%	
MCV	90.4	fL	
MCH	30.2	pg	
MCHC	33.4	g/dL	
RDW-CV	16.0H	%	
RDW-SD	57.9H	fL	
PLT	307	$10^3/\mu L$	
PCT	0.22	%	
MPV	7.2	fL	
PDW	17.2H	%	

Scattergrams



Histograms



Flags

WBC flag
Neutrophilia Lymphopenia
Monocytosis

RBC flag

PLT flag

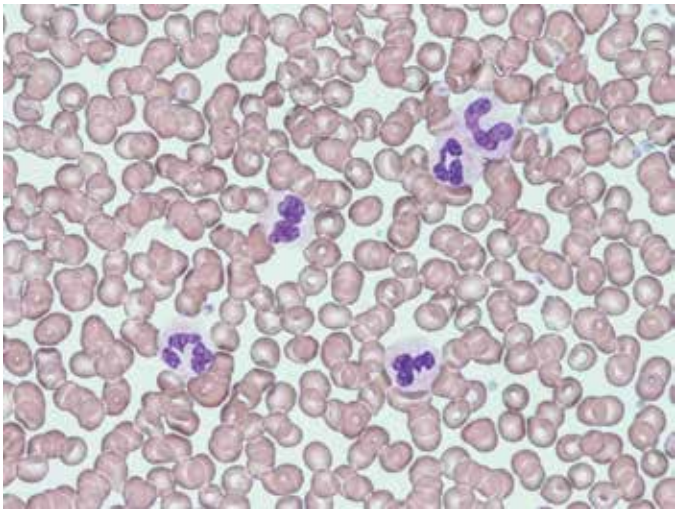
Explanation of scattergrams/histograms

Many plots appear in the NE area (◯) on the NE-EO scattergram, indicating neutrophilia. A flag of "Neutrophilia" is displayed.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	8.0%
Seg	80.0%
Lymphocyte	1.0%
Atypical Ly	
Monocyte	11.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



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Explanation of a case

Segmented neutrophils are increased. No abnormal findings such as dysplasia are noted.

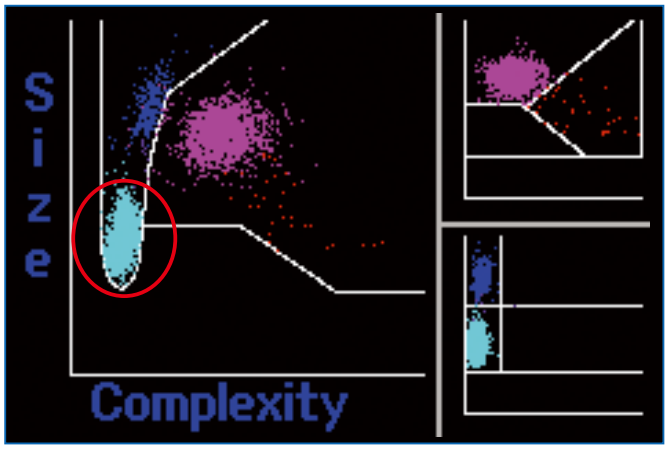
3.2 Lymphocytosis

Celltac data

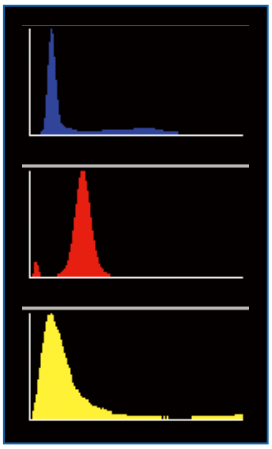
Numerical results

WBC	9.5H	$10^3/\mu L$	
NE	1.7	[17.9L	%]
LY	7.4H	[78.3H	%]
MO	0.3	[3.3	%]
EO	0.0	[0.4	%]
BA	0.0	[0.1	%]
RBC	2.86L	$10^6/\mu L$	
HGB	9.4L	g/dL	
HCT	28.4L	%	
MCV	99.3	fL	
MCH	32.9H	pg	
MCHC	33.1	g/dL	
RDW-CV	16.1H	%	
RDW-SD	63.9H	fL	
PLT	175	$10^3/\mu L$	
PCT	0.10L	%	
MPV	5.6L	fL	
PDW	17.6H	%	

Scattergrams



Histograms



Flags

WBC flag
Lymphocytosis

RBC flag
Anemia

PLT flag

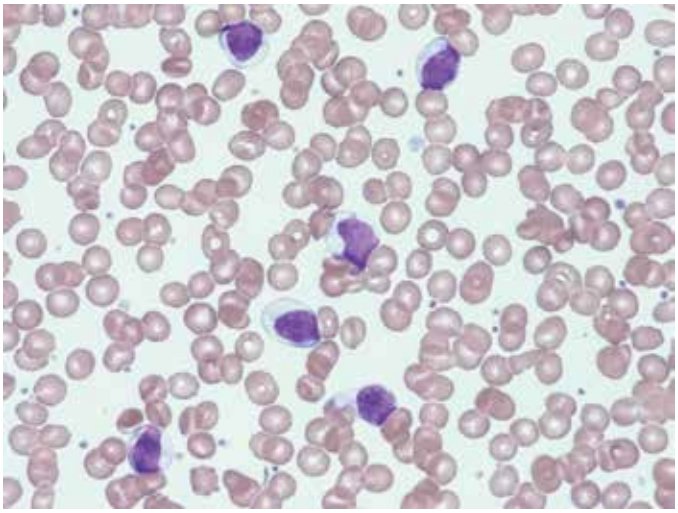
Explanation of scattergrams/histograms

Many plots appear in the LY area (○) on the MAIN scattergram, indicating lymphocytosis. A flag of "Lymphocytosis" is displayed.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	3.0%
Seg	17.0%
Lymphocyte	78.0%
Atypical Ly	
Monocyte	2.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



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Explanation of a case

Mature lymphocytes with a size of 12 to 15 μm, with an N/C ratio of 60% to 80%, and with a light blue cytoplasm are increased.

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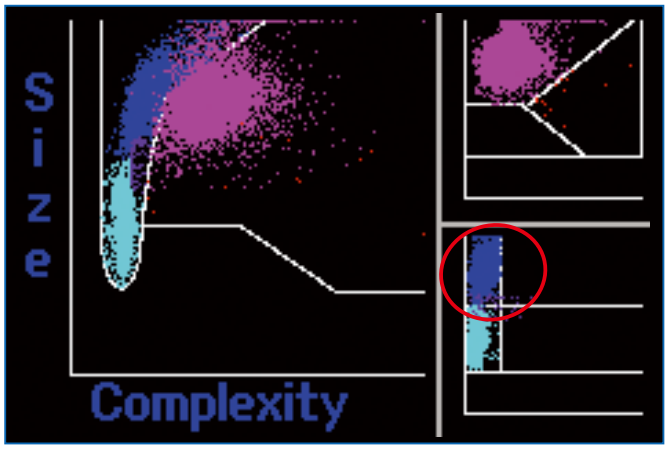
3.3 Monocytosis

Celltac data

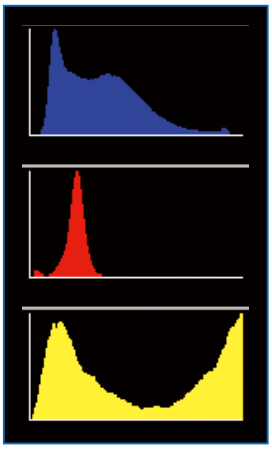
Numerical results

WBC	14.5H	$10^3/\mu L$	
NE	7.1*	[49.1*	%]
LY	2.8*	[19.4*	%]
MO	4.4*	[30.3*	%]
EO	0.0*	[0.1*	%]
BA	0.2*	[1.1*	%]
RBC	3.84	$10^6/\mu L$	
HGB	12.0	g/dL	
HCT	34.3	%	
MCV	89.3	fL	
MCH	31.3	pg	
MCHC	35.0	g/dL	
RDW-CV	18.5H	%	
RDW-SD	66.1H	fL	
PLT	110L	$10^3/\mu L$	
PCT	0.08L	%	
MPV	7.4	fL	
PDW	17.7H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Immature Gr Left Shift

Monocytosis

RBC flag

PLT flag

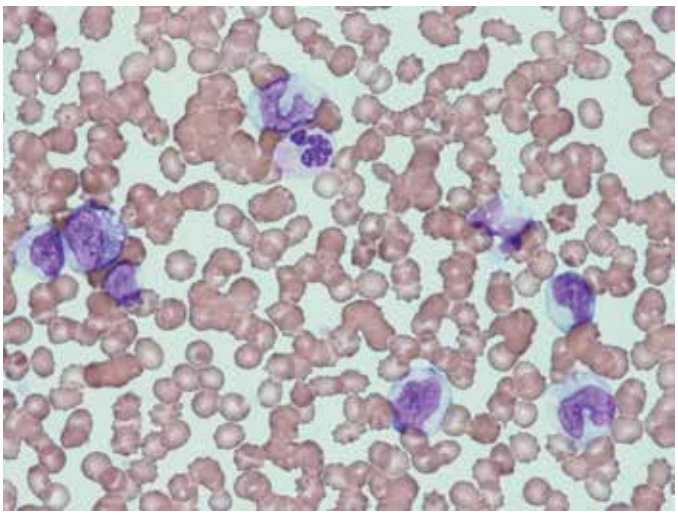
Explanation of scattergrams/histograms

Many plots appear in the MO area (◯) on the MO-BA scattergram, indicating monocytosis. A flag of "Monocytosis" is displayed.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	1.0%
Metamyelocyte	0.5%
Band	3.5%
Seg	53.0%
Lymphocyte	21.0%
Atypical Ly	
Monocyte	20.5%
Eosinophil	0.5%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



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Explanation of a case

Mature monocytes with a size of 15 to 20 μm, with a coarse nuclear reticulum, and with a gray cytoplasm having fine azurophilic granules are increased.

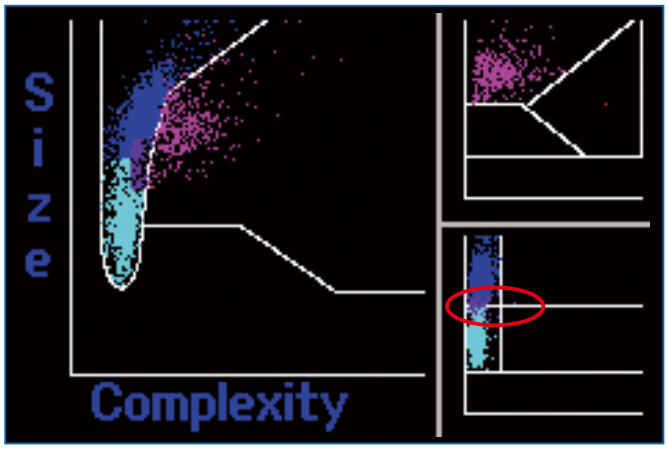
3.4 Basophilia

Celltac data

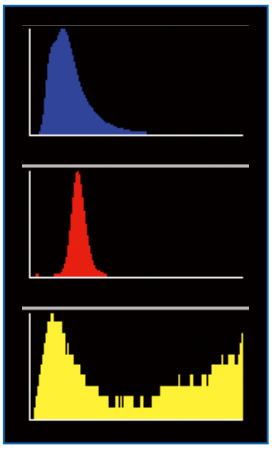
Numerical results

WBC	5.2	$10^3/\mu L$	
NE	0.7*	[12.6*	%]
LY	1.7*	[32.8*	%]
MO	2.5*	[47.8*	%]
EO	0.0*	[0.0*	%]
BA	0.4*	[6.8*	%]
RBC	2.23L	$10^6/\mu L$	
HGB	7.3L	g/dL	
HCT	21.2L	%	
MCV	95.1	fL	
MCH	32.7H	pg	
MCHC	34.4	g/dL	
RDW-CV	15.6H	%	
RDW-SD	59.3H	fL	
PLT	8*	$10^3/\mu L$	
PCT		%	
MPV		fL	
PDW		%	

Scattergrams



Histograms



Flags

WBC flag
Blasts Left Shift Neutropenia
Monocytosis Basophilia

RBC flag
Anemia

PLT flag
Thrombocytopenia

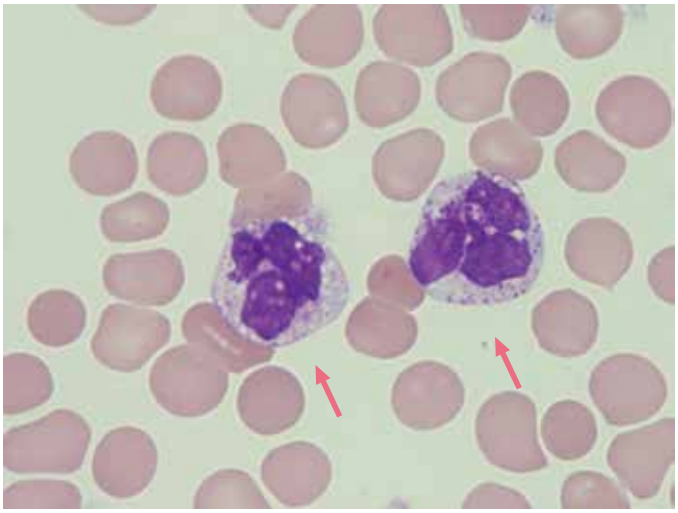
Explanation of scattergrams/histograms

Many plots appear in the BA area (◯) on the MO-BA scattergram, indicating basophilia. A flag of "Basophilia" is displayed.

Microscopic analysis

Blast	8.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	7.0%
Lymphocyte	24.0%
Atypical Ly	
Monocyte	51.0%
Eosinophil	4.0%
Basophil	6.0%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The cells shown by the arrows are basophils. Granules seem to be eluted at the time of staining of the sample. The basophils were counted as 6%.

Celltac

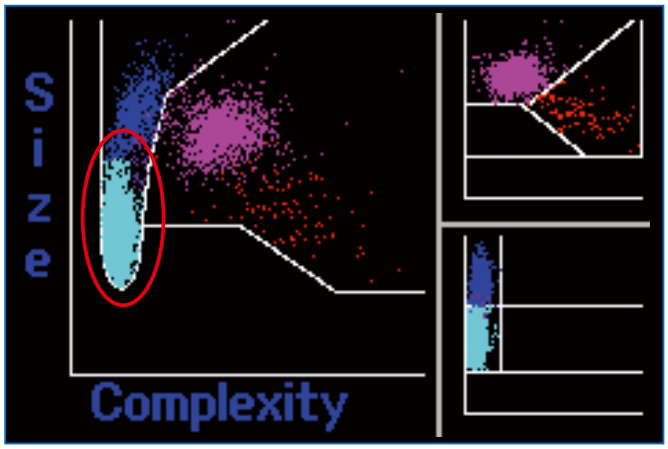
3.5 Atypical lymphocytes

Celltac data

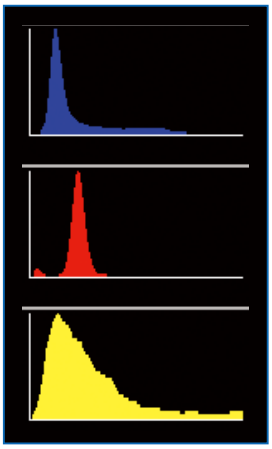
Numerical results

WBC	16.3*	$10^3/\mu L$	
NE	2.9	[17.8L	%]
LY	11.6*	[71.3*	%]
MO	1.5*	[8.9*	%]
EO	0.2	[1.3	%]
BA	0.1	[0.7	%]
RBC	5.38	$10^6/\mu L$	
HGB	16.4	g/dL	
HCT	48.6	%	
MCV	90.3	fL	
MCH	30.5	pg	
MCHC	33.7	g/dL	
RDW-CV	13.9	%	
RDW-SD	50.2H	fL	
PLT	236	$10^3/\mu L$	
PCT	0.19	%	
MPV	8.1	fL	
PDW	18.0H	%	

Scattergrams



Histograms



Flags

WBC flag

Atypical Ly Small Nucleated Cells

Lymphocytosis Monocytosis

RBC flag

PLT flag

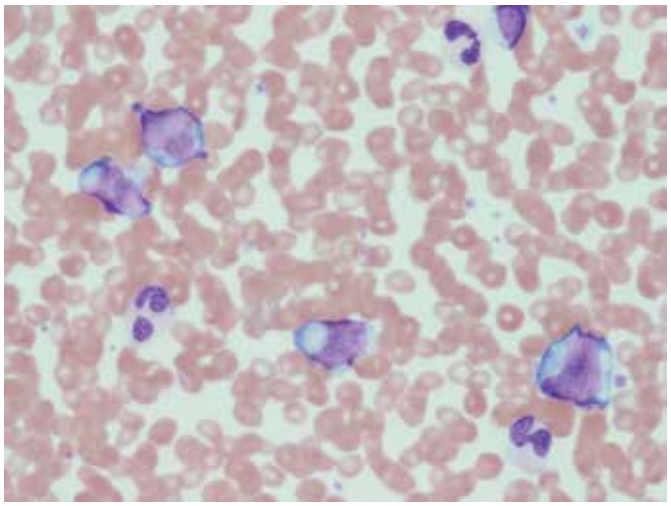
Explanation of scattergrams/histograms

The LY area on the MAIN scattergram shows an abnormal distribution that extends overall (◯), indicating atypical lymphocytes. A flag of "Atypical Ly" is displayed.

Microscopic analysis

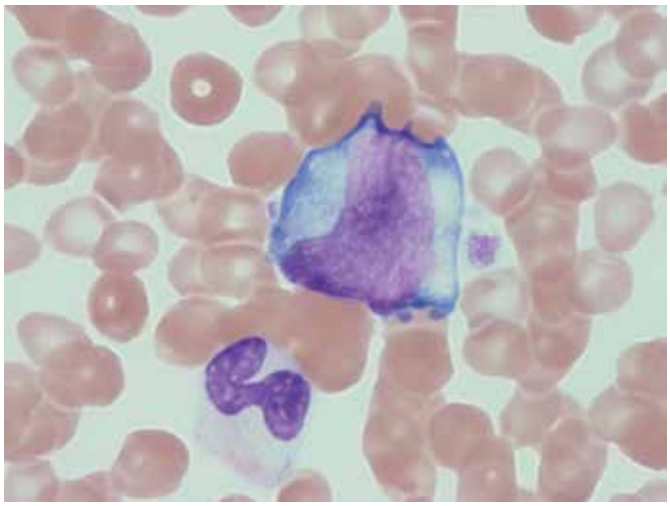
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	1.0%
Seg	11.0%
Lymphocyte	40.5%
Atypical Ly	41.5%
Monocyte	6.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The size of the cells varies from 16 to 25 μm. Reactive lymphocytes with an N/C ratio of 60% to 70%, with a coarse nuclear reticulum, and with a basophilic cytoplasm are increased.

Celltac

4.

Myeloid Abnormalities

4.1 Classification of acute leukemia

Classification of Acute Leukemia

The FAB classification published in 1976 is widely used for the classification of acute leukemia. However, recently the WHO classification, a new classification of tumors of hematopoietic and lymphoid tissues including leukemia, has become popular and clinical laboratories use both depending on the purpose. As a result, case records may use either of the following disease classifications.

- AML: Disease types are classified with the FAB classification, which is widely used.
- MDS: Disease types are classified with the WHO classification, which includes subclassifications.

WHO classification

MDS: Blast occupancy for the classification of disease types of MDS (adults) is shown below.

Disease type	Proportion of blasts	
	Peripheral blood	Bone marrow
RCUD	<1%	<5%
RA		
RN		
RT		
RARS	—	<5%
RCMD	<1%	<5%
RAEB-1	<5%	5-9%
RAEB-2	5-19%	10-19%
5q	<1%	<5%
MDS-U	≤1%	<5%

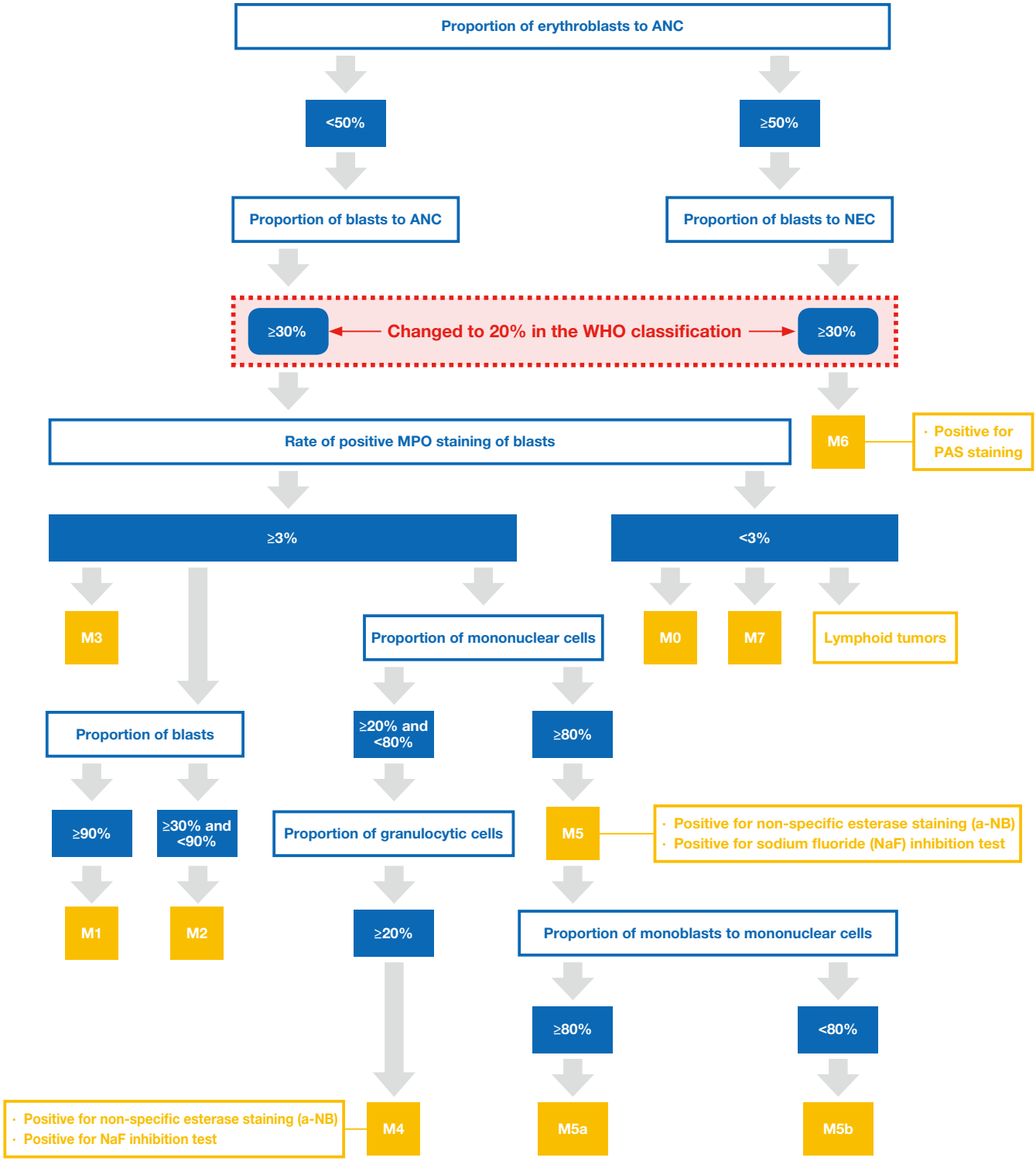
(Based on the fourth edition of the WHO classification 2008)

Definitions

- RCUD: Refractory cytopenias with unilineage dysplasia
- RA: Refractory anemia
- RN: Refractory neutropenia
- RT: Refractory thrombocytopenia
- RARS: Refractory anemia with ringed sideroblasts
- RCMD: Refractory cytopenia with multilineage dysplasia
- RAEB: Refractory anemia with excess blasts
- 5q: MDS associated with isolated del
- MDS-U: Myelodysplastic syndrome-unclassified

FAB classification

AML: Blast occupancy for the classification of disease types of AML is shown below.



Definitions

- ANC: all marrow nucleated cells
- NEC: non-erythroid cells

Celltac

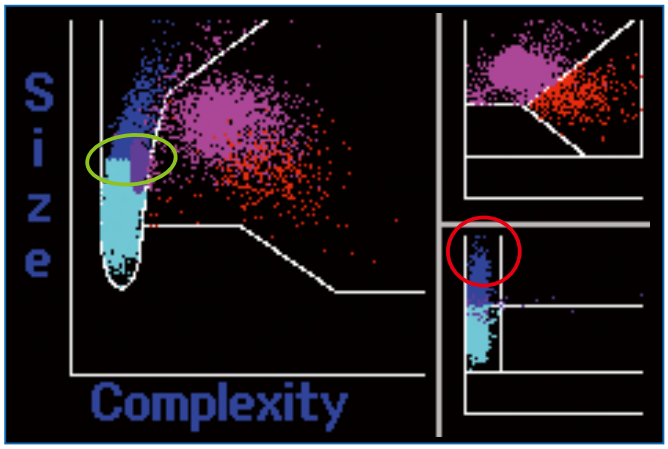
4.2 Acute myeloblastic leukemia, minimally differentiated (AML-M0)

Celltac data

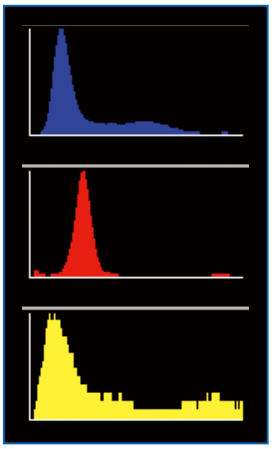
Numerical results

WBC	14.7H	$10^3/\mu L$	
NE	2.8*	[18.8*	%]
LY	9.2*	[62.8*	%]
MO	1.4*	[9.2*	%]
EO	0.5*	[3.1*	%]
BA	0.9*	[6.1*	%]
RBC	2.37L	$10^6/\mu L$	
HGB	7.8L	g/dL	
HCT	23.6L	%	
MCV	99.6	fL	
MCH	32.9H	pg	
MCHC	33.1	g/dL	
RDW-CV	17.3H	%	
RDW-SD	68.9H	fL	
PLT	53L	$10^3/\mu L$	
PCT	0.04L	%	
MPV	7.0	fL	
PDW	19.4H	%	

Scattergrams



Histograms



Flags

WBC flag
Blasts Atypical Ly
Ly-Mo Interference Lymphocytosis
Monocytosis Basophilia

RBC flag
Anemia

PLT flag
Thrombocytopenia

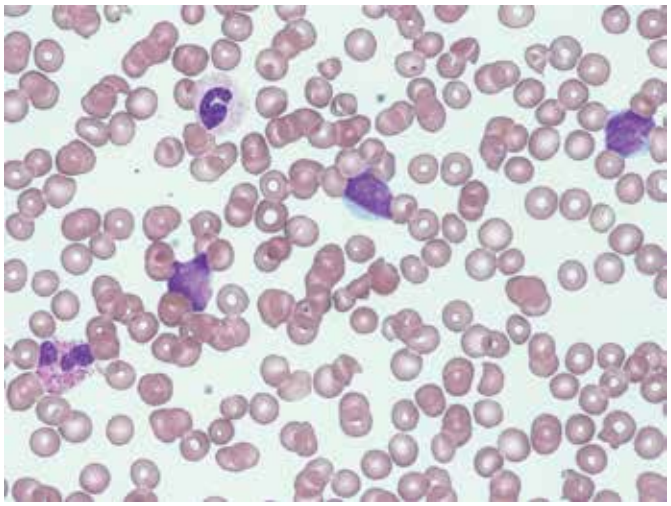
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots also appear in an area that shows a Blasts flag (○), indicating blasts. In addition, the boundary between LY and MO (○) is unclear on the MAIN scattergram, indicating blasts or abnormal mononuclear cells. Flags of “Blasts” and “LY-Mo Interference” are displayed.

Microscopic analysis

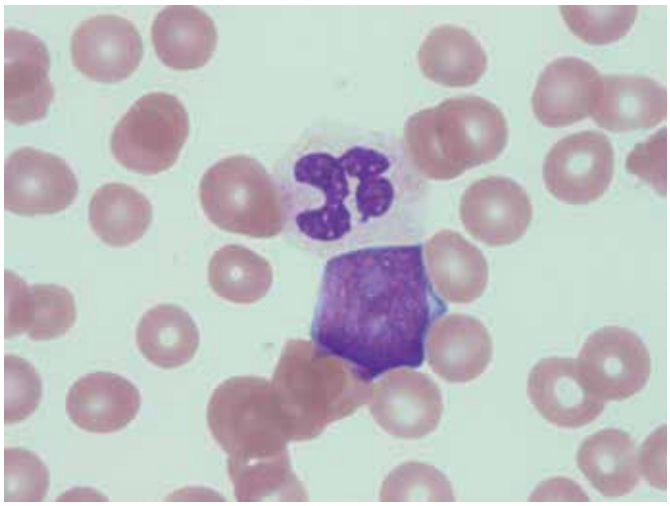
Blast	51.0%
Promyelocyte	
Myelocyte	1.0%
Metamyelocyte	
Band	4.0%
Seg	30.0%
Lymphocyte	8.0%
Atypical Ly	
Monocyte	1.0%
Eosinophil	5.0%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



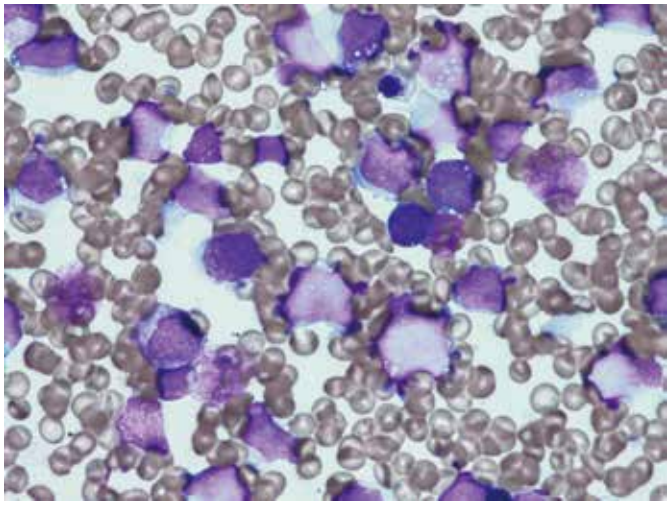
×400

Peripheral blood picture (May-Giemsa staining)



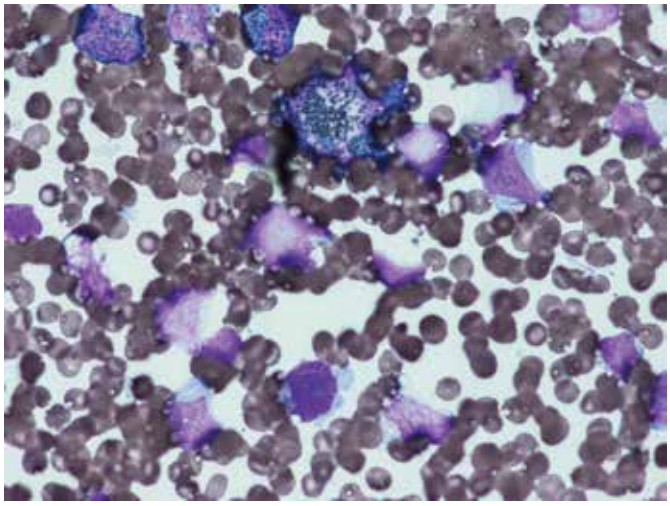
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 15 to 20 μm, with an N/C ratio of about 90%, with a fine nuclear reticulum, and with a nucleolus were counted as 51%. These blasts were negative for MPO staining.

In FCM, the cells were positive for CD34 and HLA-DR, positive for CD13 and CD33, which are granulocytic markers, and negative for CD3 and CD19, which are lymphoid markers. The cells were positive for cytoplasmic MPO.

For chromosomes, the cells had a normal karyotype (46, XY).

Celltac

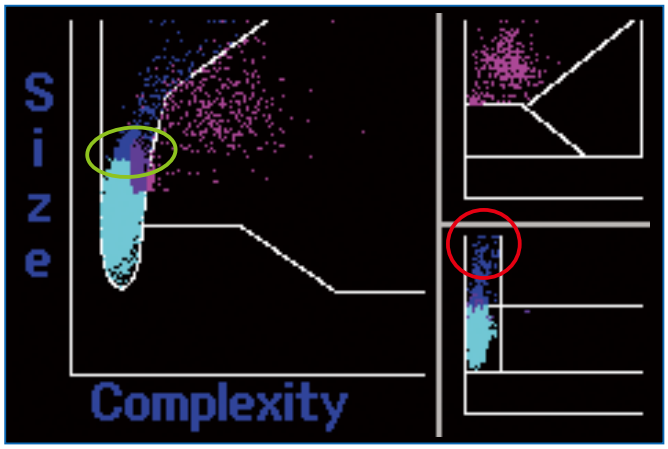
4.3 Acute myeloblastic leukemia, without maturation (AML-M1)

Celltac data

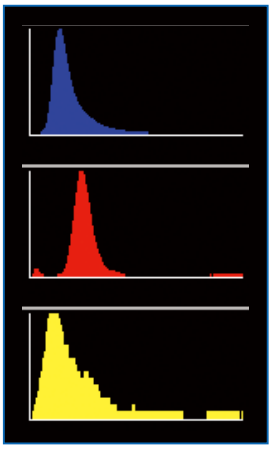
Numerical results

WBC	61.4 C	$10^3/\mu L$	
NE	2.0 *	[3.3 *	%]
LY	54.0 *	[88.0 *	%]
MO	1.9 *	[3.1 *	%]
EO	0.0 *	[0.0 *	%]
BA	3.4 *	[5.6 *	%]
RBC	2.29 L	$10^6/\mu L$	
HGB	7.7 L	g/dL	
HCT	24.0 L	%	
MCV	105 H	fL	
MCH	33.6 H	pg	
MCHC	32.1	g/dL	
RDW-CV	18.8 H	%	
RDW-SD	78.8 H	fL	
PLT	66 C	$10^3/\mu L$	
PCT	0.05 C	%	
MPV	7.0 C	fL	
PDW	19.8 C	%	

Scattergrams



Histograms



Flags

WBC flag
Blasts Atypical Ly
Small Nucleated Cells
Ly-Mo Interference Leukocytosis ...

RBC flag
Anemia

PLT flag
PLT Clumps

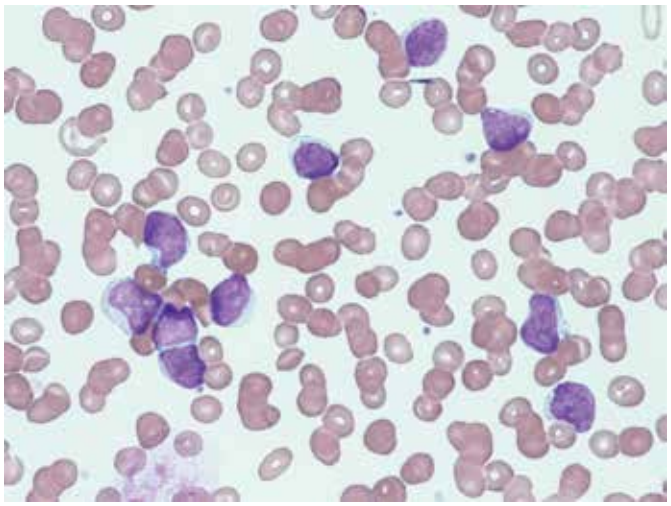
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. In addition, on the MAIN scattergram, the boundary between LY and MO (○) is unclear, and most plots appear in the LY area, indicating many blasts or abnormal mononuclear cells. Flags of "Blasts" and "LY-Mo Interference" are displayed.

Microscopic analysis

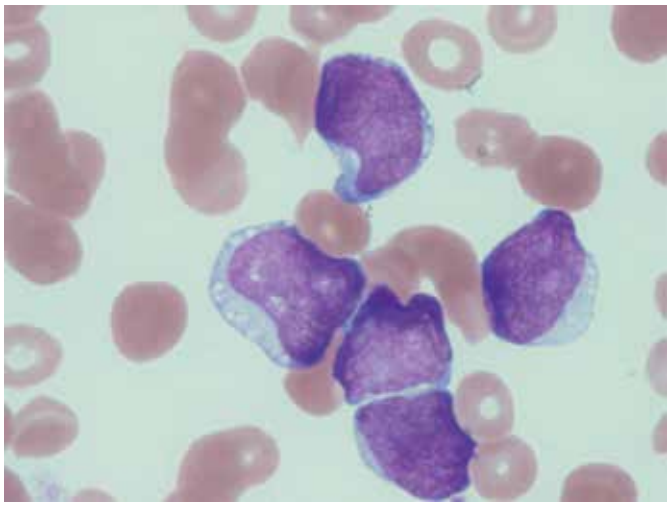
Blast	94.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	5.0%
Lymphocyte	1.0%
Atypical Ly	
Monocyte	
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	0.5
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



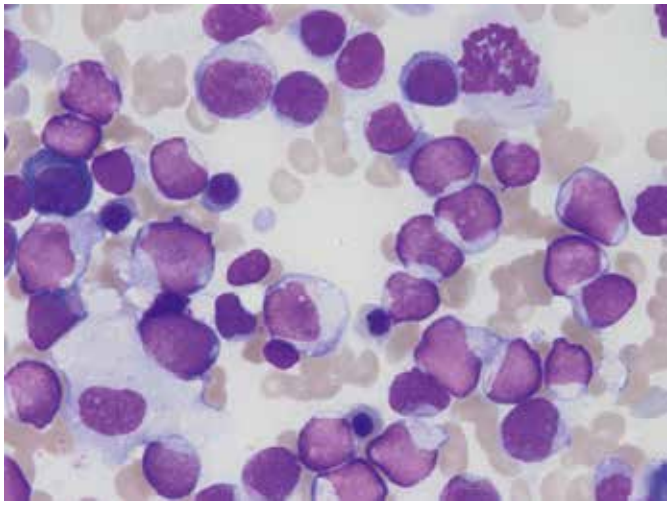
×400

Peripheral blood picture (May-Giemsa staining)



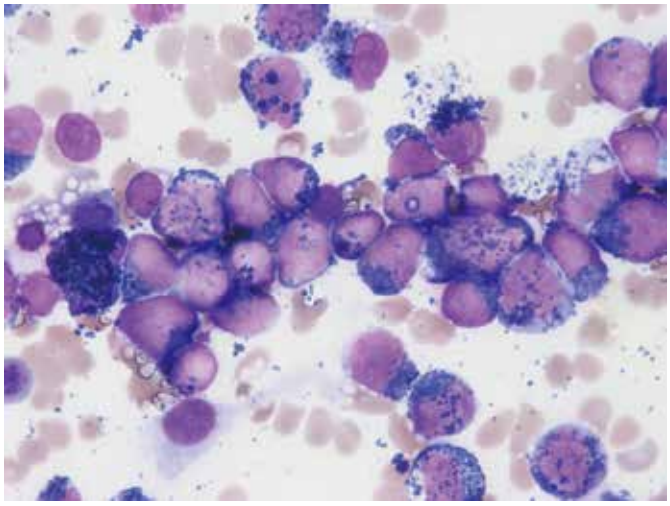
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 15 to 18 μm, with an N/C ratio of 80% to 90%, with a fine nuclear reticulum, and with one to three nucleoli were counted as 94%. These blasts were positive for MPO staining.

A bone marrow examination showed that the proportion of blasts to ANC was 90% or more.

In FCM, the cells were positive for CD34 and HLA-DR, positive for CD13 and CD33, which are granulocytic markers, and negative for CD3 and CD19, which are lymphoid markers.

For chromosomes, the cells had a normal karyotype (46, XX).

Celltac

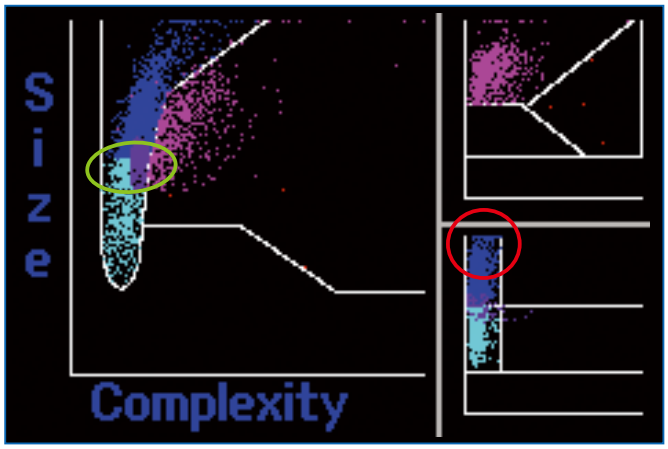
4.4 Acute myeloblastic leukemia, with granulocytic maturation (AML-M2)

Celltac data

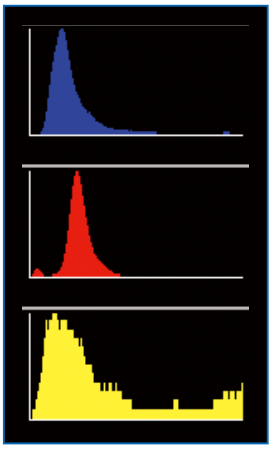
Numerical results

WBC	4.6	$10^3/\mu L$	
NE	0.9*	[19.2*	%]
LY	0.8*	[16.7*	%]
MO	2.4*	[51.2*	%]
EO	0.0*	[0.1*	%]
BA	0.6*	[12.8*	%]
RBC	2.43 L	$10^6/\mu L$	
HGB	7.5 L	g/dL	
HCT	23.5 L	%	
MCV	96.7	fL	
MCH	30.9	pg	
MCHC	31.9	g/dL	
RDW-CV	20.5 H	%	
RDW-SD	79.3 H	fL	
PLT	63 L	$10^3/\mu L$	
PCT	0.05 L	%	
MPV	7.6	fL	
PDW	18.6 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Left Shift Atypical Ly
Ly-Mo Interference Neutropenia
Lymphopenia Monocytosis Basophilia

RBC flag

Anemia Anisocytosis

PLT flag

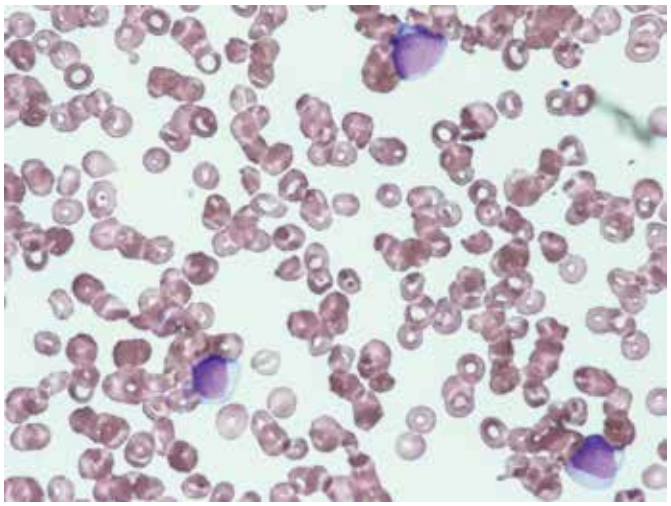
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots also appear in an area that shows a Blasts flag (○), indicating blasts. In addition, the boundary between LY and MO (○) is unclear on the MAIN scattergram, indicating blasts or abnormal mononuclear cells. Flags of “Blasts” and “LY-Mo Interference” are displayed.

Microscopic analysis

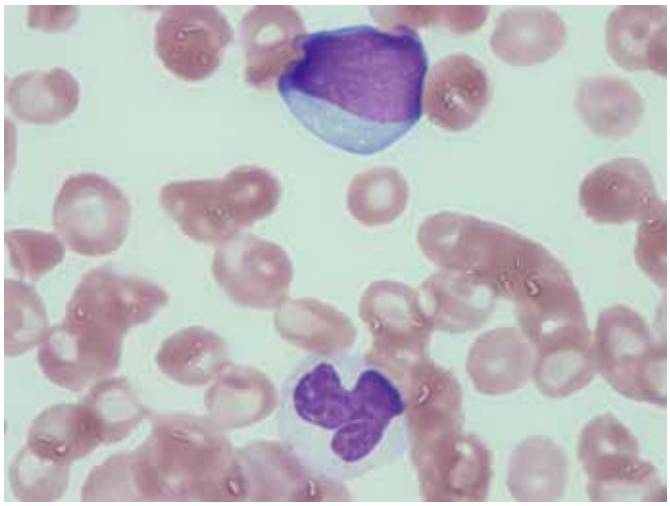
Blast	49.0%
Promyelocyte	
Myelocyte	1.0%
Metamyelocyte	4.5%
Band	9.5%
Seg	18.0%
Lymphocyte	16.0%
Atypical Ly	
Monocyte	1.0%
Eosinophil	0.5%
Basophil	0.5%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



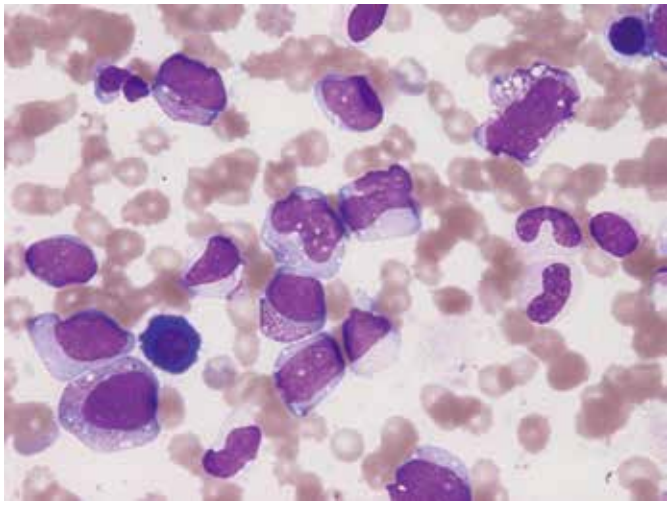
×400

Peripheral blood picture (May-Giemsa staining)



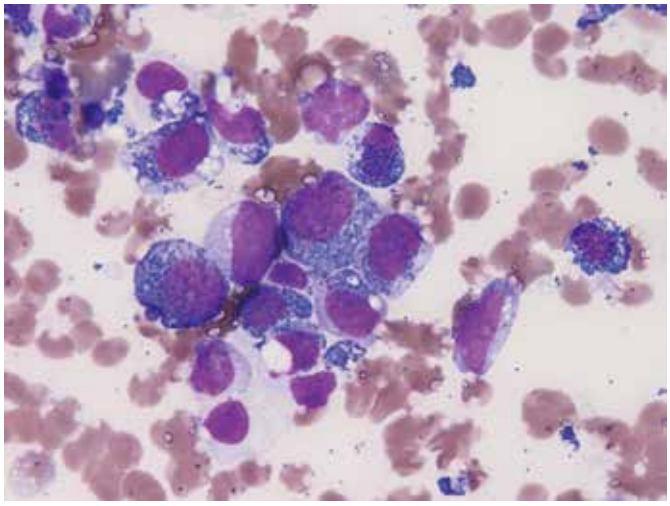
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 16 to 20 μm, with an N/C ratio of 60% to 80%, with a fine nuclear reticulum, with a nucleolus, and with a basophilic cytoplasm were counted as 49%. These blasts were positive for MPO staining.

A bone marrow examination showed that the proportion of blasts to ANC was 40%, the proportion of mature neutrophils was 30%, and the proportion of monocytes was less than 20%.

In FCM, the cells were positive for CD34 and HLA-DR, positive for CD13 and CD33, which are granulocytic markers, and negative for CD3 and CD19, which are lymphoid markers.

For chromosomes, the cells had a normal karyotype (46, XY).

Celltac

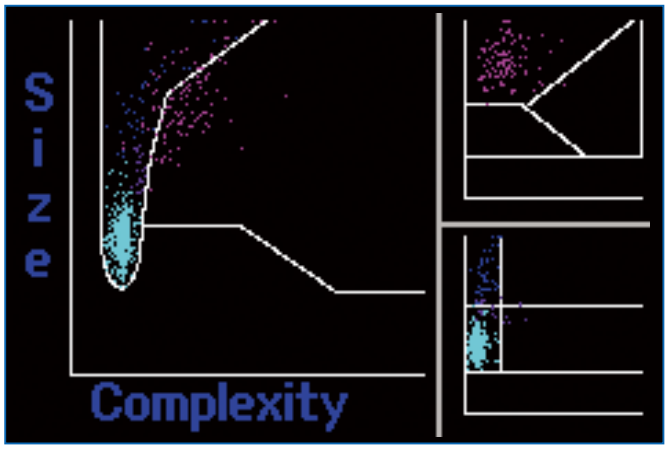
4.5 Acute promyelocytic leukemia (AML-M3: APL)

Celltac data

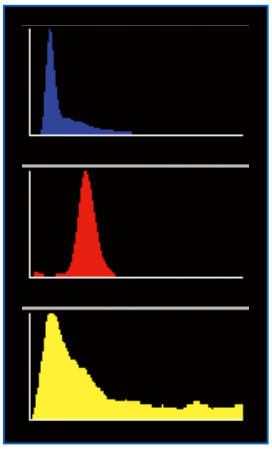
Numerical results

WBC	1.0 L	$10^3/\mu L$	
NE	0.2 *	[17.2 *	%]
LY	0.7 *	[73.6 *	%]
MO	0.1 *	[5.8 *	%]
EO	0.0 *	[0.0 *	%]
BA	0.0 *	[3.4 *	%]
RBC	2.57 L	$10^6/\mu L$	
HGB	9.7 L	g/dL	
HCT	28.0 L	%	
MCV	109 H	fL	
MCH	37.7 H	pg	
MCHC	34.6	g/dL	
RDW-CV	15.7 H	%	
RDW-SD	68.4 H	fL	
PLT	48 *	$10^3/\mu L$	
PCT	0.04 L	%	
MPV	7.7	fL	
PDW	20.3 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Immature Gr Atypical Ly
Ly-Mo Interference Leukopenia
Neutropenia Lymphopenia

RBC flag

Anemia

PLT flag

Thrombocytopenia

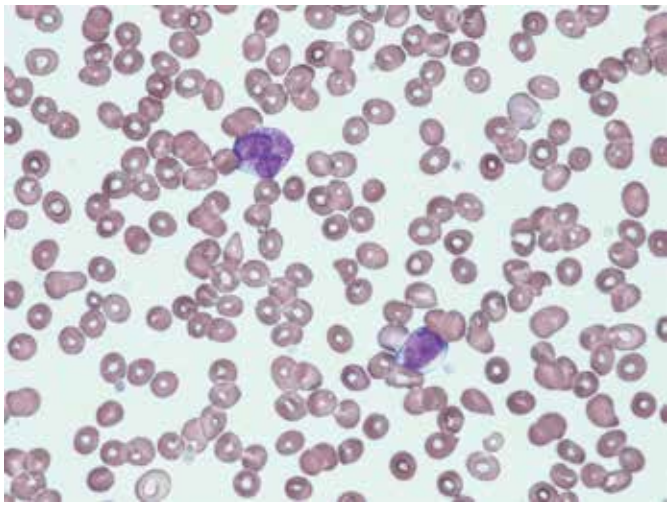
Explanation of scattergrams/histograms

Although small plots appear on the scattergram in association with decreased WBC counts, flags of “Blasts” “Immature Gr” and “LY-Mo Interference” are displayed, indicating blasts and immature myeloid cells.

Microscopic analysis

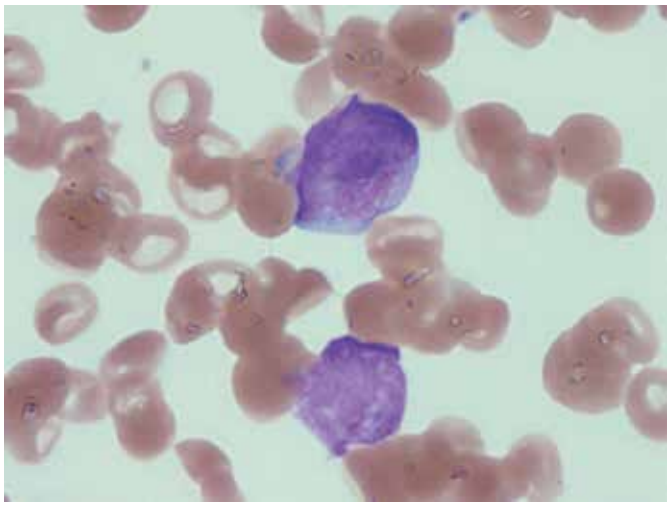
Blast	4.5%
Promyelocyte	6.5%
Myelocyte	3.0%
Metamyelocyte	1.5%
Band	2.5%
Seg	7.0%
Lymphocyte	73.0%
Atypical Ly	
Monocyte	1.5%
Eosinophil	0.5%
Basophil	
Other	
total	
NRBC/100WBC	4.0
RBC/other findings	Auer+

Peripheral blood picture (May-Giemsa staining)



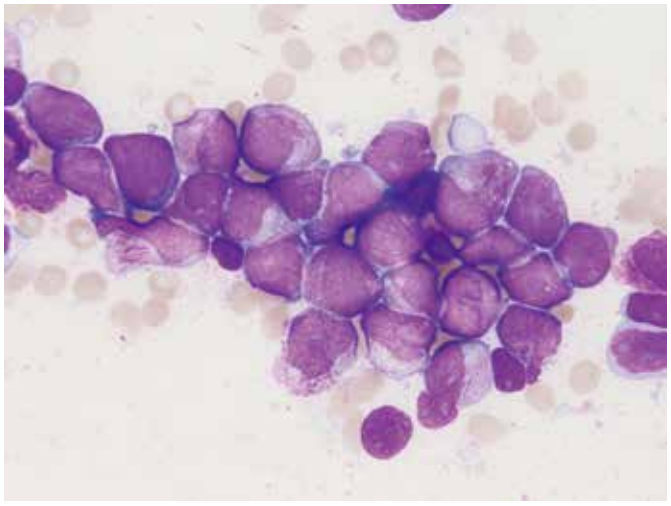
×400

Peripheral blood picture (May-Giemsa staining)



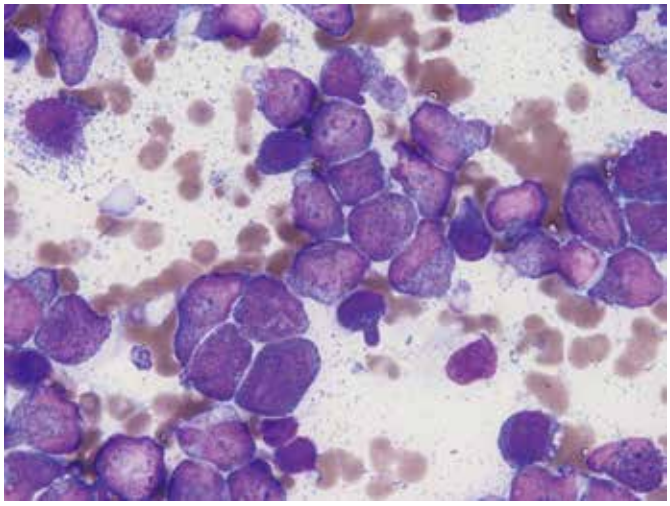
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of case

The size of a cell is 16 to 20 μm, the nuclear shape is array-like, and the cytoplasm has large azurophilic granules. Some cells also have Auer rods and Fagott cells (cells having a bundle of Auer rods). These blasts were strongly positive for MPO staining.
A bone marrow examination showed many cells similar to those in peripheral blood, a genetic test showed a *PML-RARA* chimeric gene, and a chromosome examination showed chromosomal translocations t (15;17) and (q22;q12).

Celltac

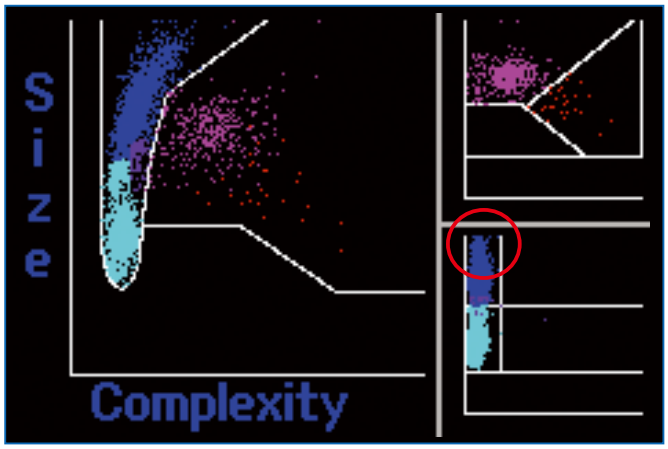
4.6 Acute myelomonocytic leukemia (AML-M4)

Celltac data

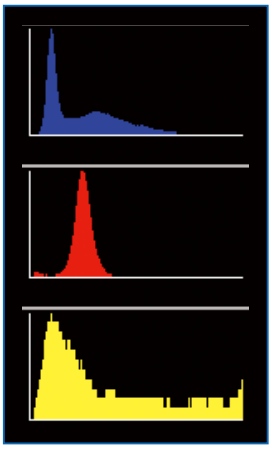
Numerical results

WBC	5.0	$10^3/\mu L$	
NE	0.4*	[7.8*	%]
LY	2.6*	[52.1*	%]
MO	1.9*	[37.3*	%]
EO	0.0*	[0.6*	%]
BA	0.1*	[2.2*	%]
RBC	3.38L	$10^6/\mu L$	
HGB	11.3L	g/dL	
HCT	33.5	%	
MCV	99.1	fL	
MCH	33.4H	pg	
MCHC	33.7	g/dL	
RDW-CV	16.5H	%	
RDW-SD	65.4H	fL	
PLT	56L	$10^3/\mu L$	
PCT	0.04L	%	
MPV	8.0	fL	
PDW	19.5H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Left Shift Neutropenia

Monocytosis

RBC flag

PLT flag

Thrombocytopenia

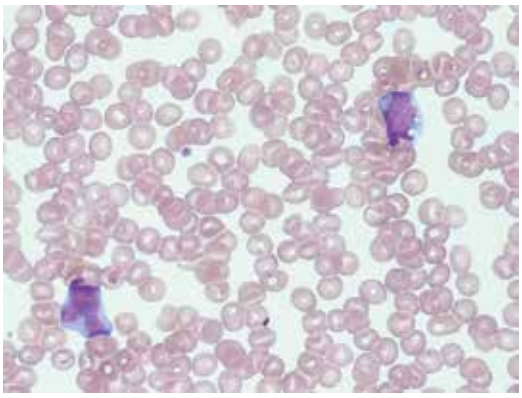
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. A flag of “Blasts” is displayed. A flag of “Monocytosis” is also displayed, indicating effects of large abnormal cells.

Microscopic analysis

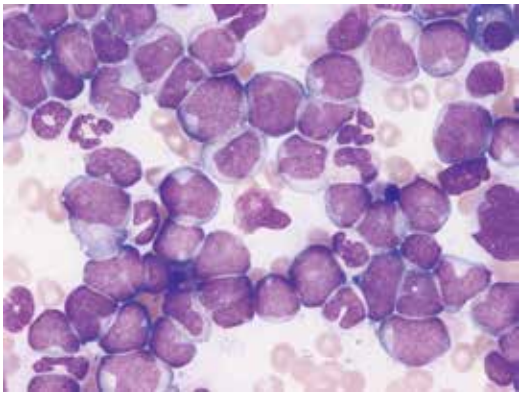
Blast	38.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	13.5%
Lymphocyte	48.0%
Atypical Ly	
Monocyte	
Eosinophil	0.5%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



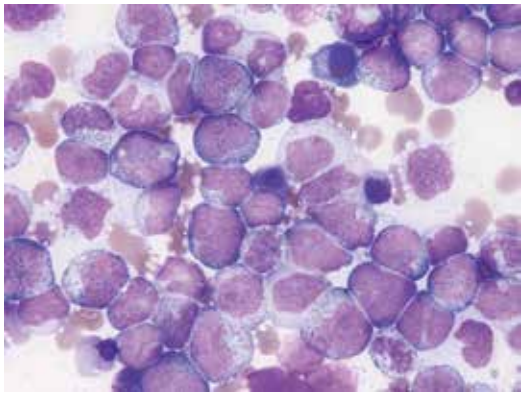
×400

Bone marrow picture (May-Giemsa staining)



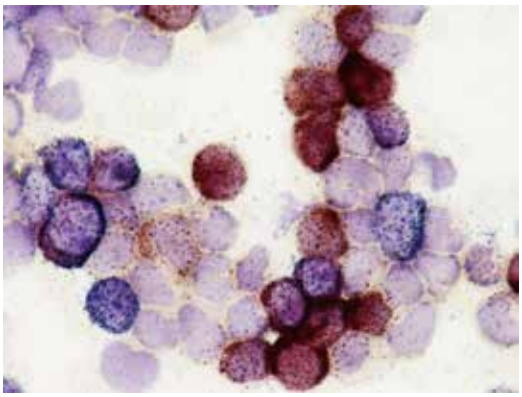
×400

Bone marrow picture (peroxidase staining)



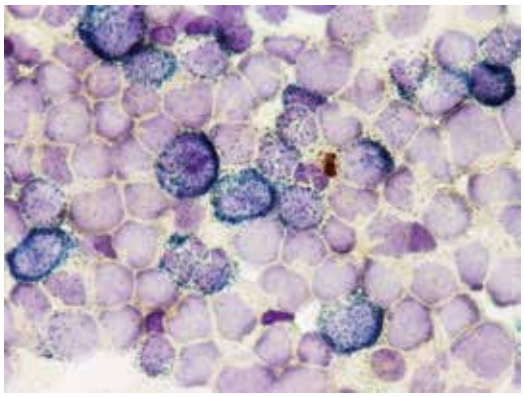
×400

Bone marrow picture (esterase α-NB/AS-D staining)



×400

Bone marrow picture (esterase α-NB/AS-D/NaF inhibition test)



×400

Explanation of a case

Blasts with a size of 18 to 25 μm, with an N/C ratio of about 80%, and with a fine nuclear reticulum were counted as 38%. These blasts were positive for MPO staining.

A bone marrow examination showed that the proportion of blasts to ANC was 35% and the proportion of monocytic cells was 20% or more. In cytochemical staining, about 30% of cells were positive for non-specific esterase staining (α-NB), which demonstrates monocytic cells, by being stained dark brown, and about 30% of cells were positive for specific esterase staining (ASD chloroacetate), which demonstrates granulocytic cells, by being stained blue. The positive cells stained dark brown were negative for an inhibition test of NaF. In FCM, about 40% of cells were positive for CD34 and HLA-DR, and for CD13 and CD33, which are granulocytic markers, and about 30% of cells were positive for CD11c and CD64.

A chromosome examination showed chromosomal translocations t (11;19) (q23;p13.1).

Celltac

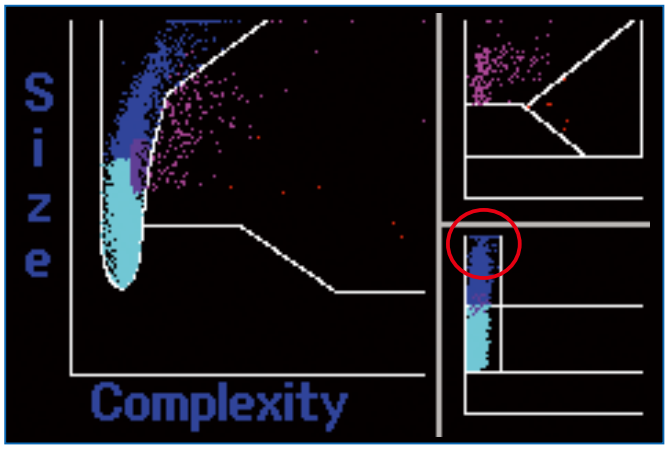
4.7 Acute monocytic leukemia (AML-M5b)

Celltac data

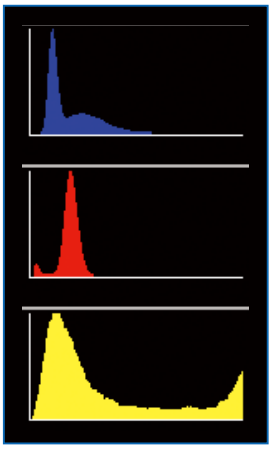
Numerical results

WBC	9.9H	$10^3/\mu L$	
NE	0.3*	[2.8*	%]
LY	6.6*	[66.3*	%]
MO	2.5*	[25.5*	%]
EO	0.0*	[0.1*	%]
BA	0.5*	[5.3*	%]
RBC	3.78	$10^6/\mu L$	
HGB	9.5L	g/dL	
HCT	29.6L	%	
MCV	78.3L	fL	
MCH	25.1L	pg	
MCHC	32.1	g/dL	
RDW-CV	16.2H	%	
RDW-SD	50.7H	fL	
PLT	274	$10^3/\mu L$	
PCT	0.19	%	
MPV	7.0	fL	
PDW	19.2H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Neutropenia Lymphocytosis
Monocytosis Basophilia

RBC flag

Anemia

PLT flag

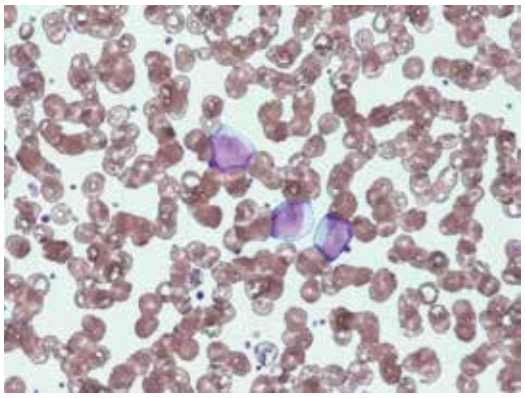
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots also appear in an area that shows a Blasts flag (○), indicating blasts. A flag of "Blasts" is displayed. A flag of "Monocytosis" is also displayed, indicating large abnormal cells.

Microscopic analysis

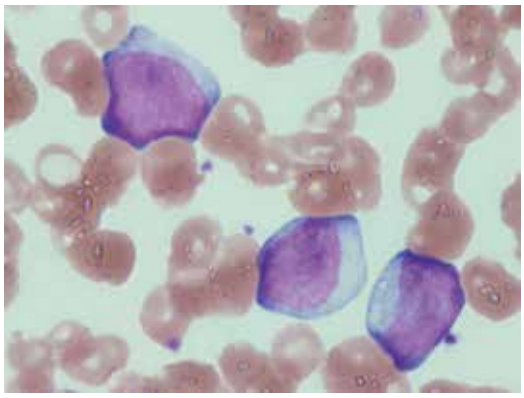
Blast	27.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	0.5%
Band	0.5%
Seg	1.0%
Lymphocyte	67.0%
Atypical Ly	0.5%
Monocyte	3.5%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	Auer+

Peripheral blood picture (May-Giemsa staining)



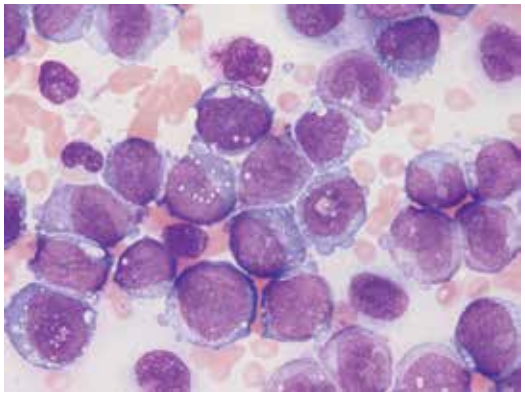
×400

Peripheral blood picture (May-Giemsa staining)



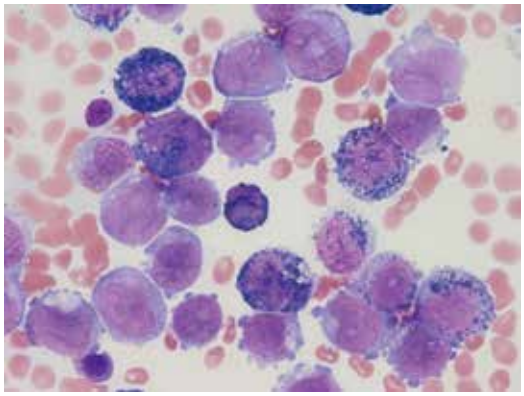
×1000

Bone marrow picture (May-Giemsa staining)



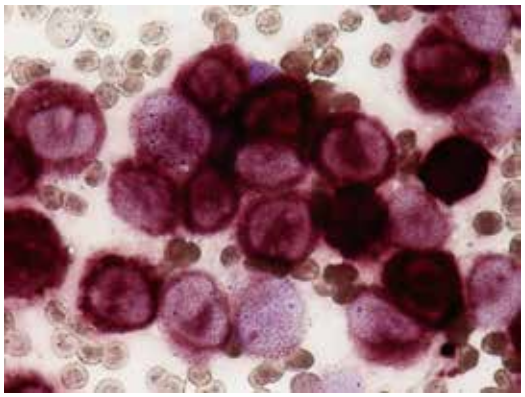
×400

Bone marrow picture (peroxidase staining)



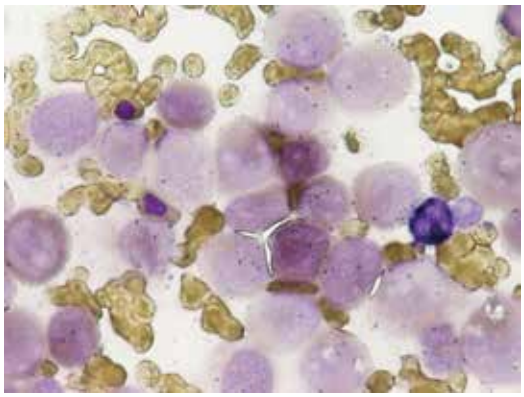
×400

Bone marrow picture (esterase *α*-NB/AS-D staining)



×400

Bone marrow picture (esterase *α*-NB/AS-D/NaF inhibition test)



×400

Explanation of a case

Blasts with a size of 20 to 25 μm, with an N/C ratio of 60% to 80%, with a fine nuclear reticulum, with a nucleolus, and with a basophilic cytoplasm were counted as 27%.

In a bone marrow examination, large immature cells with a round or round-like nuclear shape and large cells with an irregular nuclear shape similar to those in peripheral blood were observed in a total of about 90% of ANC. Some of these cells were positive for MPO staining (3% or more of the cells were positive). In cytochemical staining, most cells were positive for non-specific esterase staining (*α*-NB), which demonstrates monocytic cells, by being stained dark brown, and the positive cells stained dark brown were negative for an inhibition test of NaF.

In FCM, the cells were positive for CD56 and HLA-DR, positive for CD13 and CD33, which are granulocytic markers, and also positive for CD11c and CD64. A chromosome examination showed abnormal chromosomes +5 and +8.

Celltac

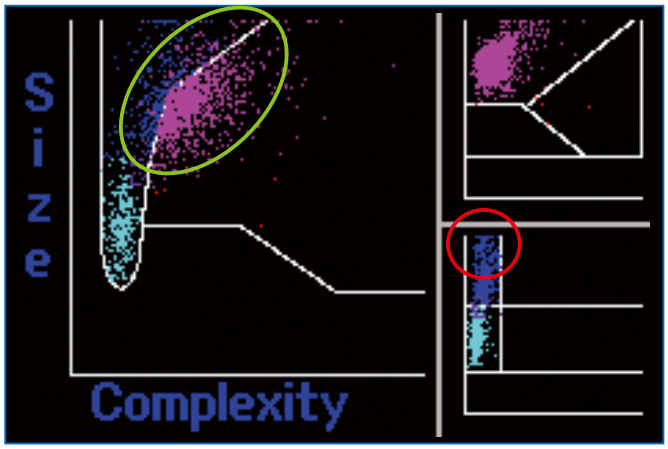
4.8 Acute erythroid leukemia (AML-M6)

Celltac data

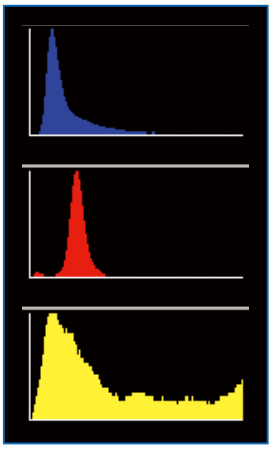
Numerical results

WBC	3.0 L	$10^3/\mu L$	
NE	1.8 *	[61.6 *	%]
LY	0.6 *	[19.1 *	%]
MO	0.5 *	[17.2 *	%]
EO	0.0 *	[0.2 *	%]
BA	0.1 *	[1.9 *	%]
RBC	2.27 L	$10^6/\mu L$	
HGB	7.2 L	g/dL	
HCT	20.9 L	%	
MCV	92.1	fL	
MCH	31.7	pg	
MCHC	34.4	g/dL	
RDW-CV	15.9 H	%	
RDW-SD	58.6 H	fL	
PLT	34 *	$10^3/\mu L$	
PCT	0.03 L	%	
MPV	8.2	fL	
PDW	19.6 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Immature Gr Left Shift
Atypical Ly Ly-Mo Interference
Lymphopenia

RBC flag

Anemia

PLT flag

Thrombocytopenia

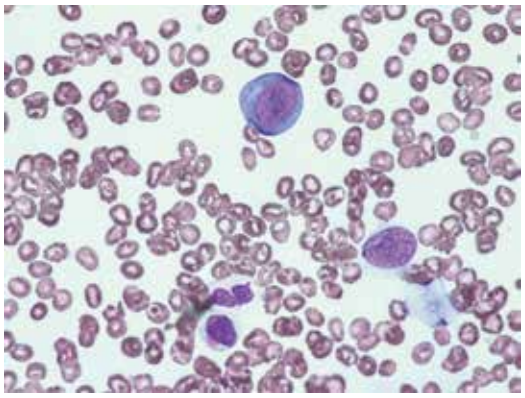
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. A flag of "Blasts" is displayed. The NE area on the MAIN scattergram shifts to the upper left with plots adjacent to the MO area (○), and flags of "Immature Gr" and "Left Shift" are displayed, indicating immature myeloid cells.

Microscopic analysis

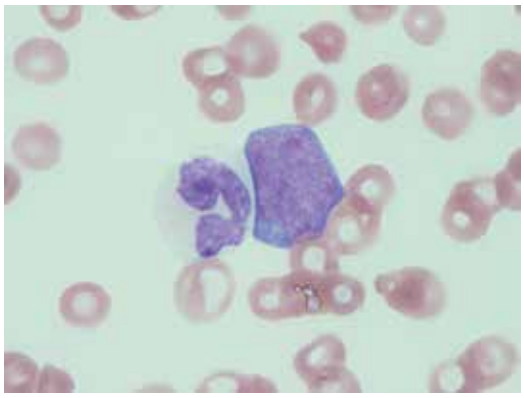
Blast	4.0%
Promyelocyte	
Myelocyte	8.0%
Metamyelocyte	5.0%
Band	34.0%
Seg	30.0%
Lymphocyte	15.0%
Atypical Ly	
Monocyte	4.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	24.0
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



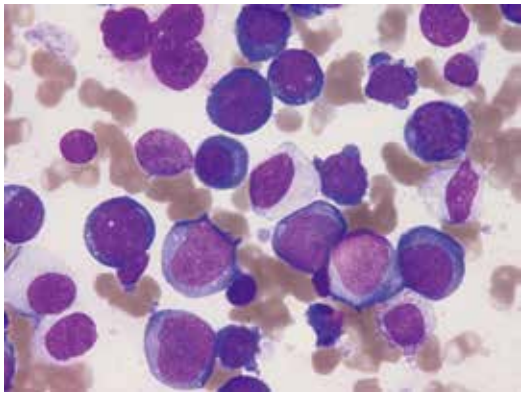
×400

Peripheral blood picture (May-Giemsa staining)



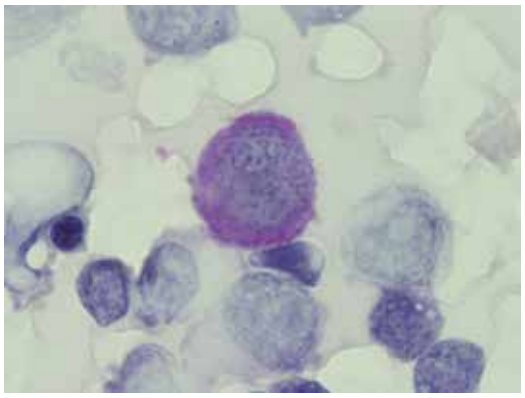
×1000

Bone marrow picture (May-Giemsa staining)



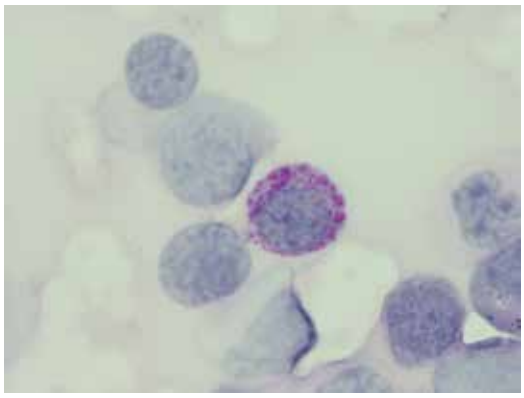
×400

Bone marrow picture (PAS staining)



×1000

Bone marrow picture (PAS staining)



×1000

Explanation of a case

Blasts with a size of 16 to 22 μm, with an N/C ratio of 80% to 90%, with a fine nuclear reticulum, with a nucleolus, and with a basophilic cytoplasm were counted as 4%.

A bone marrow examination showed that the proportion of erythroblasts was 54.4% and the proportion of blasts was 12.4% to ANC and 35.5% to NEC. Some erythroblasts were positive for PAS staining.

In FCM, the blasts were positive for CD7, CD34, and HLA-DR, and positive for CD13 and CD33, which are granulocytic markers.

A chromosome examination showed chromosomal aberrations t (1;9) (p34.1;q34) and add (17) (p11.2).

Celltac

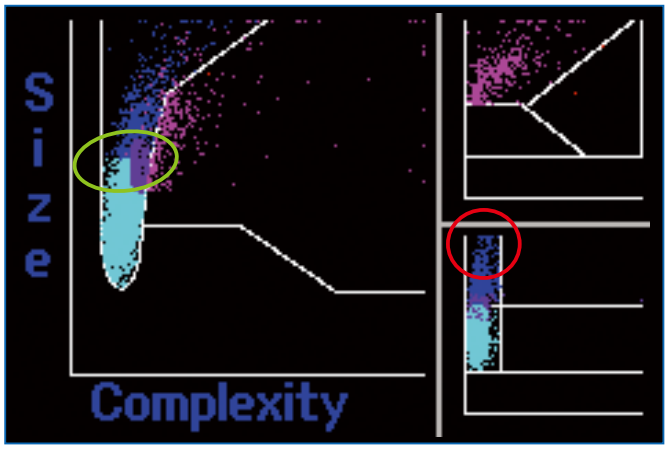
4.9 Acute megakaryoblastic leukemia (AML-M7)

Celltac data

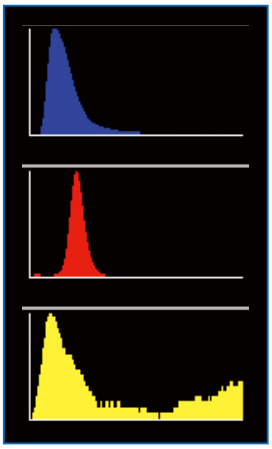
Numerical results

WBC	6.4	$10^3/\mu L$	
NE	0.4*	[6.6*	%]
LY	4.9*	[76.4*	%]
MO	0.6*	[9.3*	%]
EO	0.0*	[0.0*	%]
BA	0.5*	[7.7*	%]
RBC	2.09 L	$10^6/\mu L$	
HGB	6.3 L	g/dL	
HCT	19.0 L	%	
MCV	90.9	fL	
MCH	30.1	pg	
MCHC	33.2	g/dL	
RDW-CV	16.9 H	%	
RDW-SD	61.4 H	fL	
PLT	17*	$10^3/\mu L$	
PCT	0.01 L	%	
MPV	7.2	fL	
PDW	20.0 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Atypical Ly

Ly-Mo Interference Neutropenia

Lymphocytosis Basophilia

RBC flag

Anemia

PLT flag

Thrombocytopenia

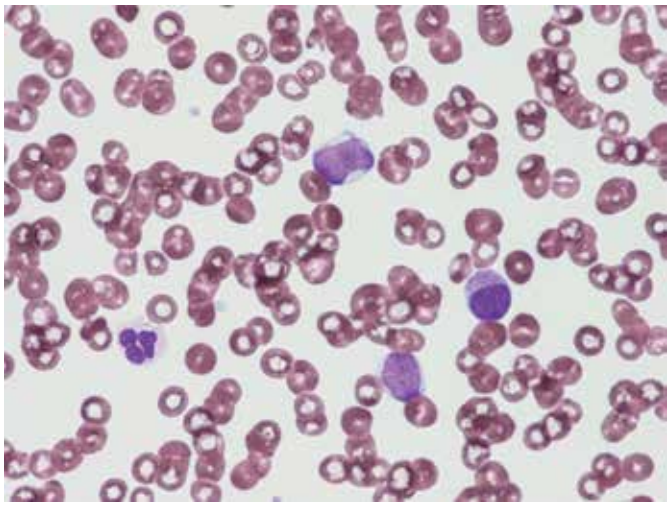
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. In addition, the boundary between LY and MO (○) is unclear on the MAIN scattergram, indicating blasts or abnormal mononuclear cells. Flags of “Blasts” and “LY-Mo Interference” are displayed.

Microscopic analysis

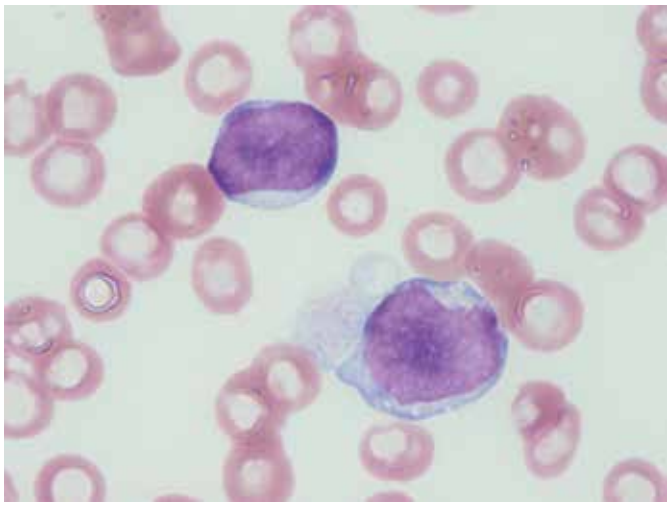
Blast	80.0%
Promyelocyte	
Myelocyte	1.0%
Metamyelocyte	2.0%
Band	1.0%
Seg	5.0%
Lymphocyte	4.0%
Atypical Ly	
Monocyte	7.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



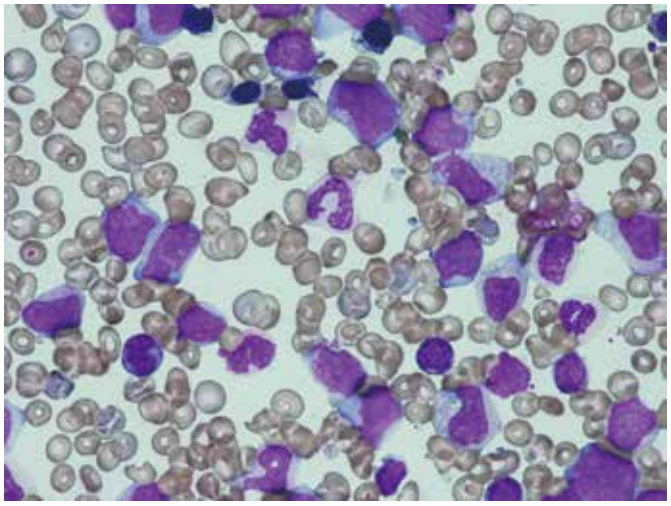
×400

Peripheral blood picture (May-Giemsa staining)



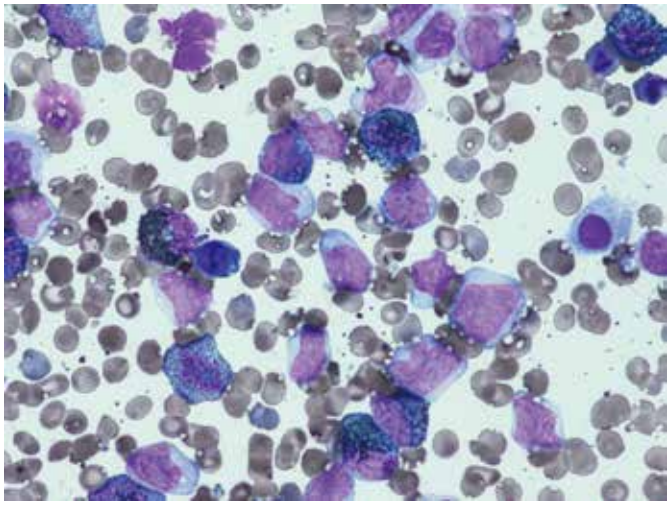
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 16 to 20 μm, with an N/C ratio of 80% to 90%, with a fine nuclear reticulum, and with a nucleolus were counted as 80%. These blasts were negative for MPO staining.

A bone marrow examination showed many blasts similar to those in peripheral blood.

In FCM, the cells were positive for CD7, CD34, and HLA-DR, positive for CD13 and CD33, which are granulocytic markers, and also positive for CD41a, which is a megakaryocytic marker. The cells were negative for CD3 and CD19, which are lymphoid markers. With respect to chromosomes, the cells had a normal karyotype (46, XX).

Celltac

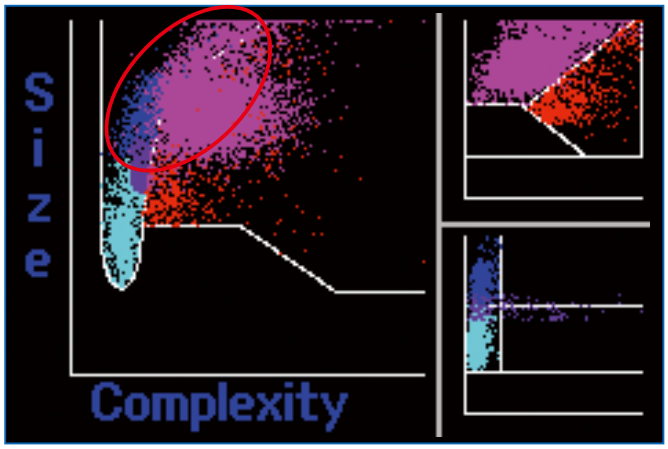
4.10 Chronic myelogenous leukemia (CML)

Celltac data

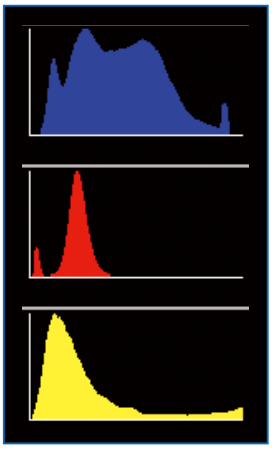
Numerical results

WBC	31.1 H	$10^3/\mu L$	
NE	22.6 *	[72.6 *	%]
LY	3.8	[12.2 L	%]
MO	1.7 *	[5.6 *	%]
EO	1.8 H	[5.9	%]
BA	1.2 *	[3.7 *	%]
RBC	4.66 *	$10^6/\mu L$	
HGB	13.8	g/dL	
HCT	42.4	%	
MCV	91.0	fL	
MCH	29.6	pg	
MCHC	32.5	g/dL	
RDW-CV	19.1 H	%	
RDW-SD	69.5 H	fL	
PLT	608 *	$10^3/\mu L$	
PCT	0.41 H	%	
MPV	6.8 L	fL	
PDW	18.3 H	%	

Scattergrams



Histograms



Flags

WBC flag

Immature Gr Left Shift Leukocytosis
Neutrophilia Monocytosis Eosinophilia
Basophilia

RBC flag

PLT flag

PLT-RBC Interference ...

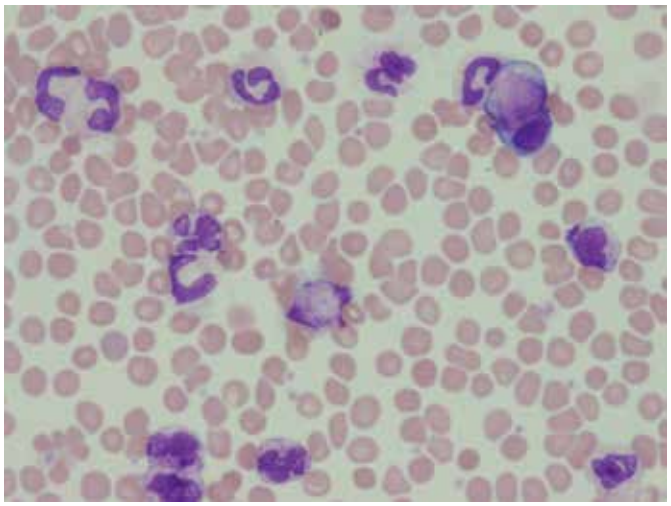
Explanation of scattergrams/histograms

The NE area on the MAIN scattergram extends to the upper left, and plots appear also in an area that shows a flag of Immature Gr (◯), indicating immature granulocytes. A flag of "Immature Gr" is displayed.

Microscopic analysis

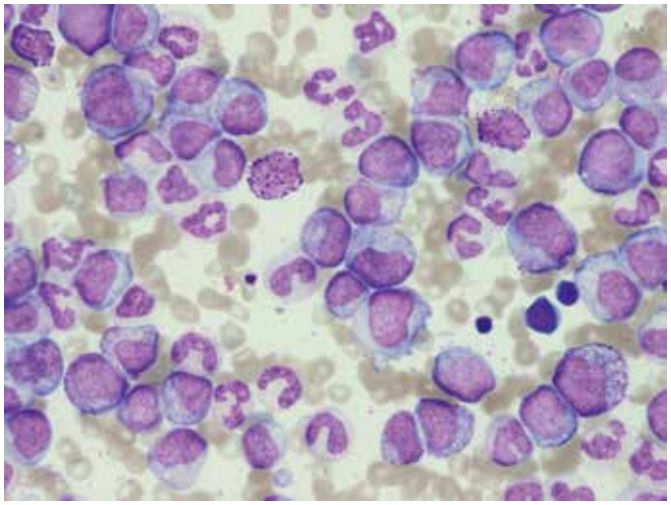
Blast	
Promyelocyte	
Myelocyte	11.0%
Metamyelocyte	4.0%
Band	2.5%
Seg	61.5%
Lymphocyte	7.5%
Atypical Ly	
Monocyte	8.0%
Eosinophil	1.0%
Basophil	4.5%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Bone marrow picture (May-Giemsa staining)



×400

Explanation of a case

The peripheral blood picture shows increased cells at each maturation stage from myeloblasts (0% in 100 counts) to segmented neutrophils. Basophil counts are also increased.

A bone marrow examination showed an increased M/E ratio and increased basophils in association with hyperplasia of granulocytic cells. A genetic test showed a *BCR-ABL1* chimeric gene, and a chromosome examination showed a chromosomal translocation t (9;22) (q34;q11.2).

Celltac

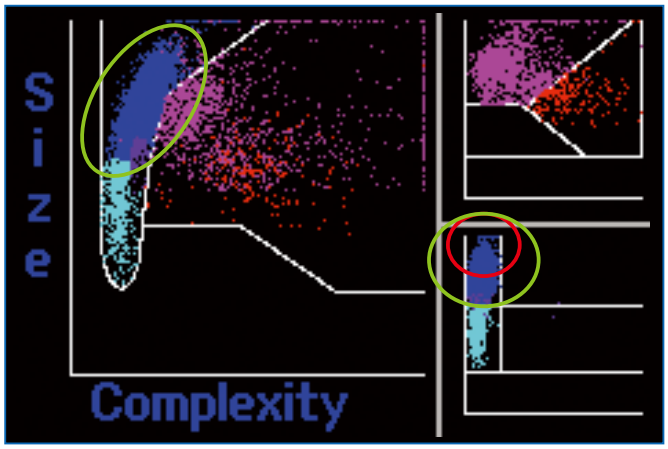
4.11 Chronic myelomonocytic leukemia (CMMoL)

Celltac data

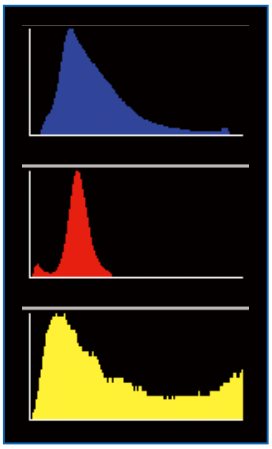
Numerical results

WBC	45.2H	$10^3/\mu L$	
NE	5.9*	[13.1*	%]
LY	3.1*	[6.8*	%]
MO	33.9*	[74.9*	%]
EO	1.0*	[2.1*	%]
BA	1.4*	[3.1*	%]
RBC	3.12*	$10^6/\mu L$	
HGB	9.0L	g/dL	
HCT	28.6L	%	
MCV	91.7	fL	
MCH	28.8	pg	
MCHC	31.5	g/dL	
RDW-CV	22.3H	%	
RDW-SD	81.8H	fL	
PLT	178*	$10^3/\mu L$	
PCT	0.16	%	
MPV	8.9	fL	
PDW	18.0H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Left Shift Atypical Ly
Ly-Mo Interference Leukocytosis
Monocytosis Eosinophilia Basophilia

RBC flag

Anemia Anisocytosis

PLT flag

PLT-RBC Interference

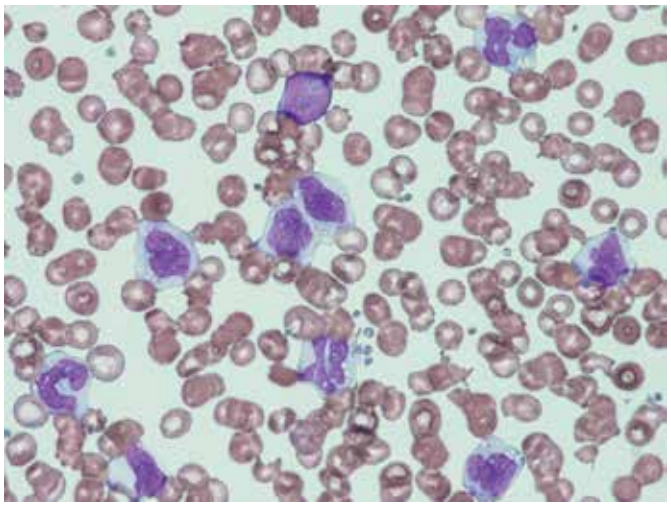
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. A flag of "Blasts" is displayed. Many plots appear in the MO area (○), and a flag of "Monocytosis" is also displayed, indicating monocytosis or large abnormal cells.

Microscopic analysis

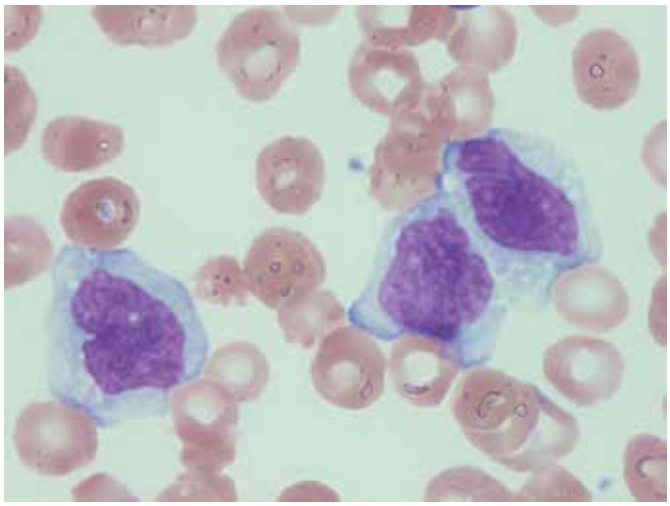
Blast	3.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	0.5%
Seg	4.5%
Lymphocyte	3.0%
Atypical Ly	
Monocyte	85.0%
Eosinophil	4.0%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



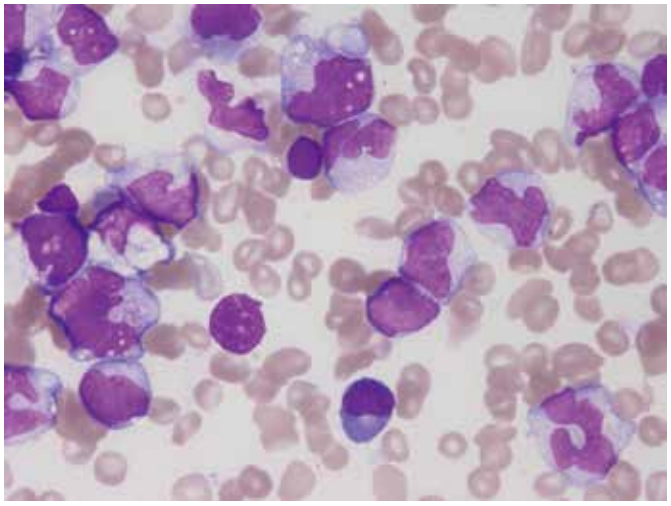
×400

Peripheral blood picture (May-Giemsa staining)



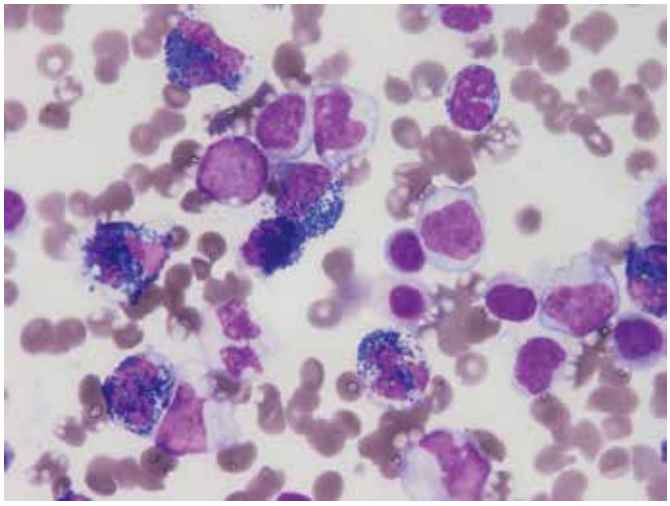
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Mature monocytes with a size of 20 to 25 μm, with an N/C ratio of 50% to 60%, with a coarse nuclear reticulum, and with a gray cytoplasm having fine granules were counted as 85%.

A bone marrow examination showed increased monocytes similar to those in peripheral blood. The cells were weakly positive to negative for MPO staining.

In FCM, the cells were positive for CD13 and CD33, which are granulocytic markers, positive for CD14 and CD64, which are monocytic markers, and positive for CD4 and HLA-DR.

A chromosome examination showed that the cells had a normal karyotype (46, XY).

Celltac

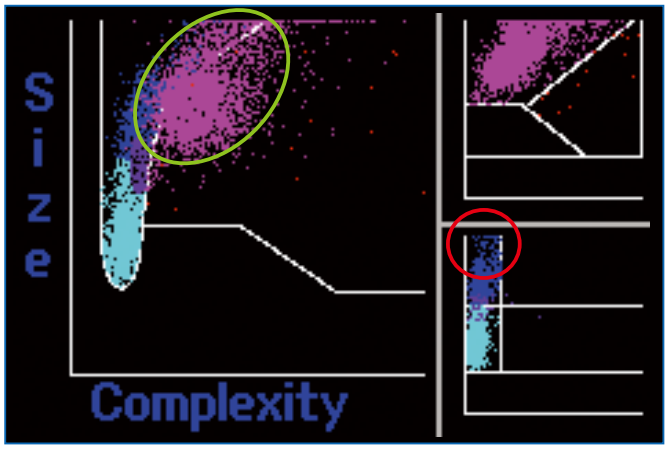
4.12 Primary myelofibrosis (MF)

Celltac data

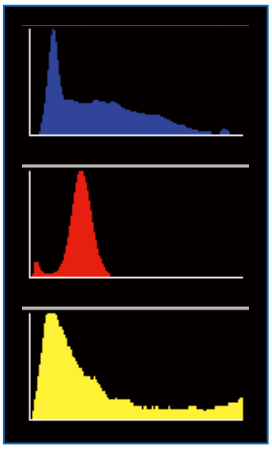
Numerical results

WBC	8.3	$10^3/\mu L$	
NE	4.6*	[55.6*	%]
LY	2.6*	[31.4*	%]
MO	0.8*	[9.6*	%]
EO	0.0*	[0.3*	%]
BA	0.3*	[3.1*	%]
RBC	2.86L	$10^6/\mu L$	
HGB	8.7L	g/dL	
HCT	27.1L	%	
MCV	94.8	fL	
MCH	30.4	pg	
MCHC	32.1	g/dL	
RDW-CV	21.6H	%	
RDW-SD	81.9H	fL	
PLT	192	$10^3/\mu L$	
PCT	0.15L	%	
MPV	7.7	fL	
PDW	20.2H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Immature Gr Left Shift
Atypical Ly Ly-Mo Interference
Basophilia

RBC flag

Anemia Anisocytosis

PLT flag

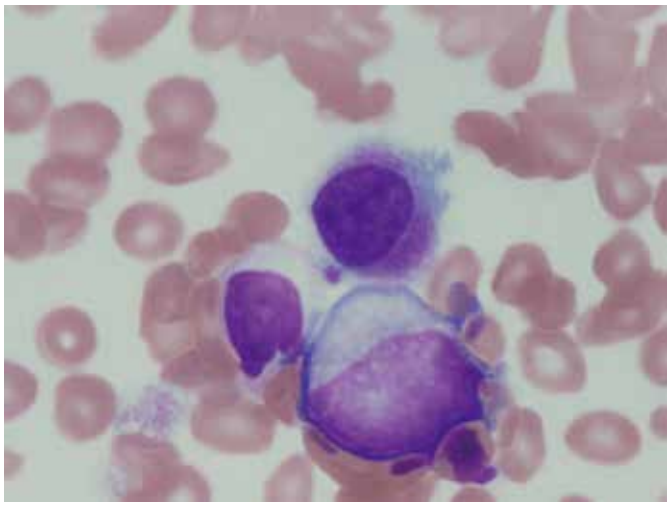
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. In addition, the NE area on the MAIN scattergram extends to the upper left, and plots appear also in an area that shows a flag of Immature Gr (○), indicating immature granulocytes. Flags of "Blasts" and "Immature Gr" are displayed.

Microscopic analysis

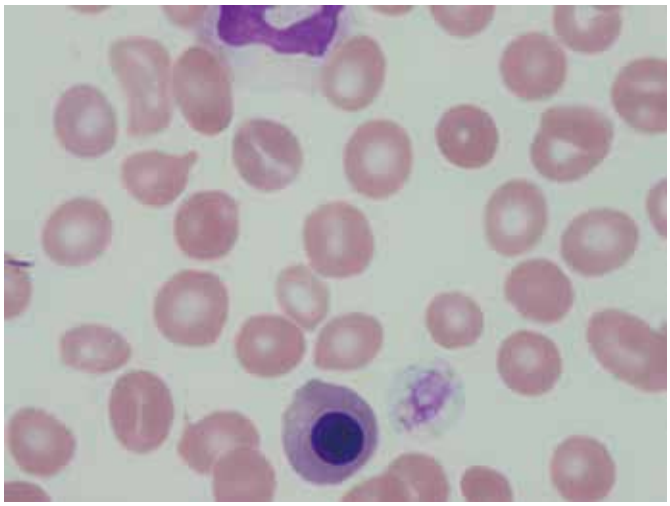
Blast	6.5%
Promyelocyte	
Myelocyte	16.5%
Metamyelocyte	3.0%
Band	19.5%
Seg	17.5%
Lymphocyte	28.5%
Atypical Ly	
Monocyte	5.0%
Eosinophil	
Basophil	3.5%
Other	
total	
NRBC/100WBC	1.0
Megakaryocyte/100WBC	2.0

Peripheral blood picture (May-Giemsa staining)



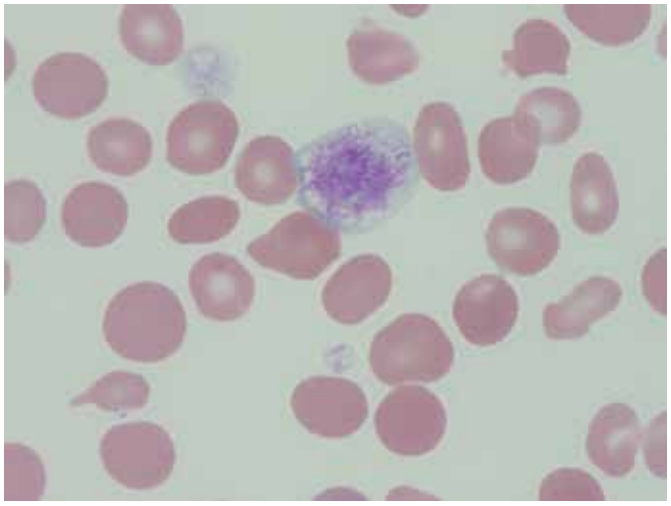
×1000

Peripheral blood picture (May-Giemsa staining)



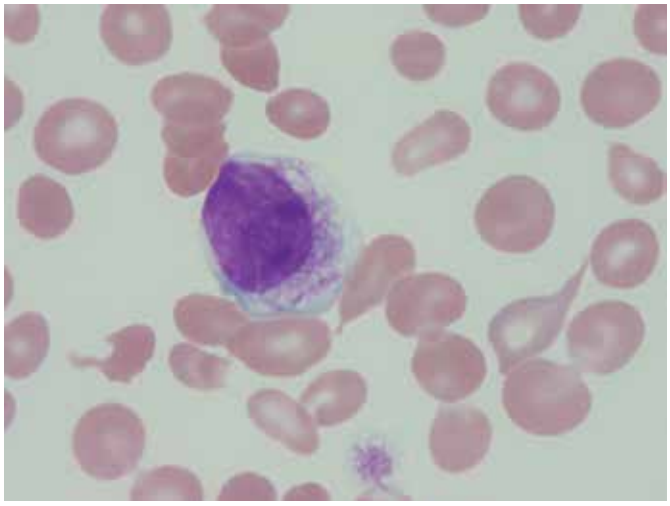
×1000

Peripheral blood picture (May-Giemsa staining)



×1000

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The peripheral blood picture shows leukoerythroblastosis in which cells at each maturation stage of neutrophilic cells from myeloblasts to segmented neutrophils and erythroblasts were observed. Giant platelets and teardrop cells were also observed. A genetic test showed a *JAK2* V617F mutation.

Celltac

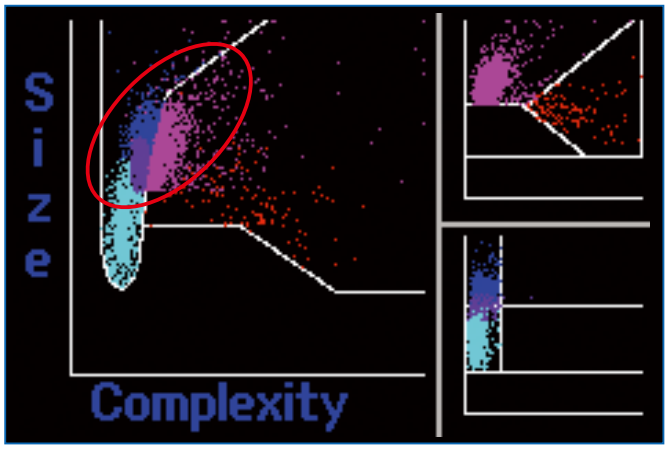
4.13 Myelodysplastic syndrome (MDS: RCMD with ringed sideroblasts)

Celltac data

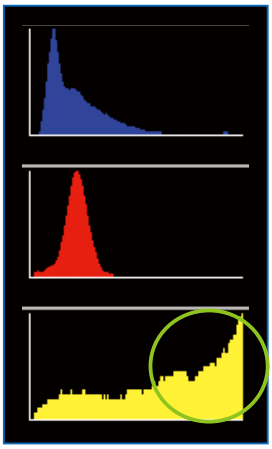
Numerical results

WBC	4.9	$10^3/\mu L$	
NE	1.9*	[39.2*	%]
LY	1.6*	[33.4*	%]
MO	0.6*	[12.6*	%]
EO	0.2*	[3.2*	%]
BA	0.6*	[11.6*	%]
RBC	2.66*	$10^6/\mu L$	
HGB	7.5L	g/dL	
HCT	24.1L	%	
MCV	90.6	fL	
MCH	28.2	pg	
MCHC	31.1	g/dL	
RDW-CV	25.3H	%	
RDW-SD	91.7H	fL	
PLT	53*	$10^3/\mu L$	
PCT	0.05L	%	
MPV	10.1	fL	
PDW	14.8L	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Left Shift Ly-Mo Interference
Basophilia

RBC flag

Anemia Anisocytosis

PLT flag

PLT-RBC Interference ...

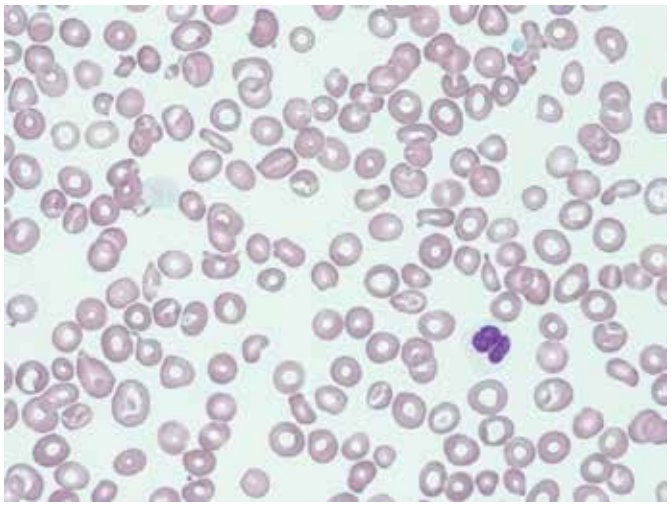
Explanation of scattergrams/histograms

On the MAIN scattergram, the NE area, the MO area, and the BA area show inseparable plots (○), indicating morphological abnormalities in granulocytic cells. The PLT histogram shows a population on the right side, unlike a normal pattern (○). A flag of "PLT-RBC Interference" is displayed, indicating the presence of poikilocytes or giant platelets.

Microscopic analysis

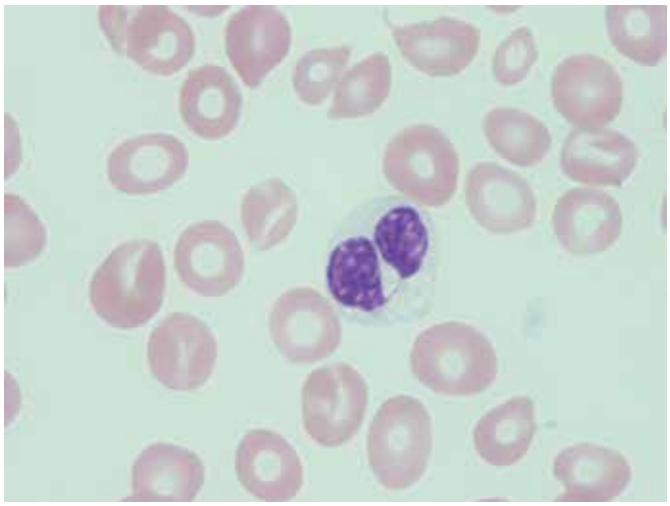
Blast	
Promyelocyte	
Myelocyte	3.0%
Metamyelocyte	3.0%
Band	22.0%
Seg	28.0%
Lymphocyte	24.0%
Atypical Ly	
Monocyte	6.0%
Eosinophil	7.0%
Basophil	7.0%
Other	
total	
NRBC/100WBC	4.0
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



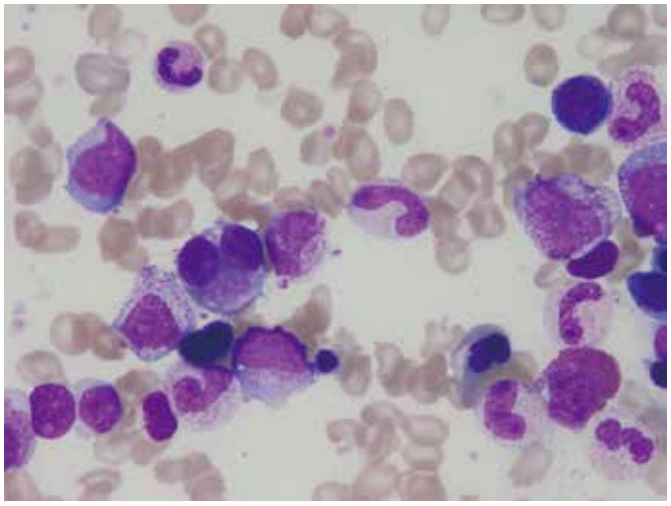
×400

Peripheral blood picture (May-Giemsa staining)



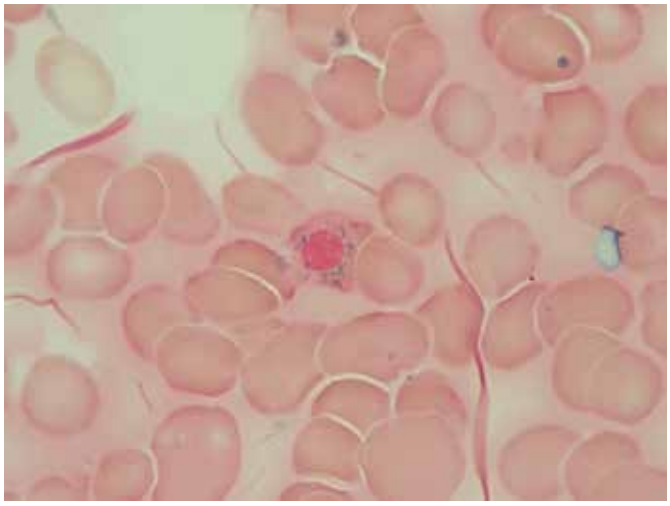
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (Fe staining)



×1000

Explanation of a case

The peripheral blood picture showed neutrophils with pseudo-Pelger nuclear anomaly due to degranulation. Giant platelets with a larger size than that of erythrocytes were also observed.

A bone marrow examination showed that the proportion of blasts was less than 5%; that degranulation and pseudo-Pelger nuclear anomaly were observed in granulocytic cells; that multiple nuclei, irregular nucleus, megaloblastic change, and ringed sideroblasts (33/100 counts) were observed in erythroblastic cells; and that separated multinucleated megakaryocytes were observed in megakaryocytic cells. A chromosome examination showed a chromosomal aberration del (11) (q23).

Celltac

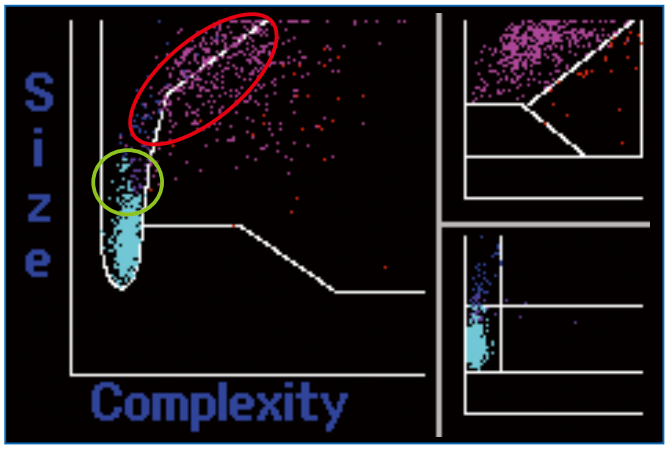
4.14 Myelodysplastic syndrome (MDS: RAEB-1)

Celltac data

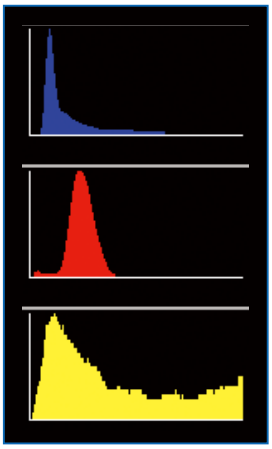
Numerical results

WBC	1.7 L	10^3/μL	
NE	0.6 *	[33.1 *	%]
LY	1.0 *	[59.8 *	%]
MO	0.1 *	[2.9 *	%]
EO	0.0 *	[1.9 *	%]
BA	0.0 *	[2.3 *	%]
RBC	2.16 L	10^6/μL	
HGB	7.3 L	g/dL	
HCT	22.1 L	%	
MCV	102 H	fL	
MCH	33.8 H	pg	
MCHC	33.0	g/dL	
RDW-CV	21.4 H	%	
RDW-SD	87.6 H	fL	
PLT	32 *	10^3/μL	
PCT	0.03 L	%	
MPV	8.6	fL	
PDW	19.4 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts, Immature Gr, Atypical Ly, Ly-Mo Interference, Leukopenia, Neutropenia

RBC flag

Anemia, Anisocytosis

PLT flag

Thrombocytopenia

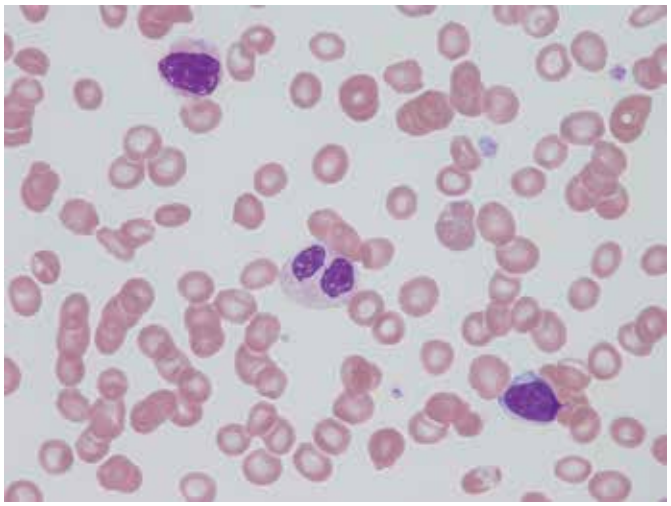
Explanation of scattergrams/histograms

On the MAIN scattergram, the MO area is adjacent to the NE area (○), and a flag of "Immature Gr" is displayed, indicating immature myeloid cells. In addition, a boundary between LY and MO (○) is unclear on the MAIN scattergram, indicating abnormal mononuclear cells. Flags of "Atypical Ly" and "LY-Mo Interference" are displayed.

Microscopic analysis

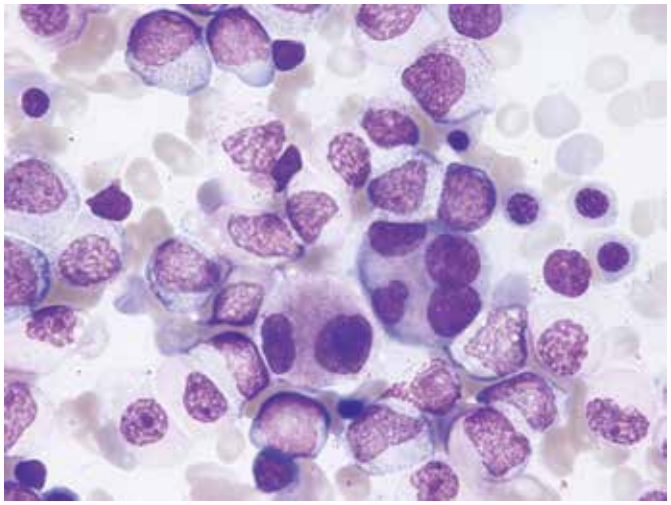
Blast	2.0%
Promyelocyte	
Myelocyte	15.0%
Metamyelocyte	2.0%
Band	7.0%
Seg	10.0%
Lymphocyte	59.0%
Atypical Ly	1.0%
Monocyte	3.0%
Eosinophil	1.0%
Basophil	
Other	
total	
NRBC/100WBC	1.0
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



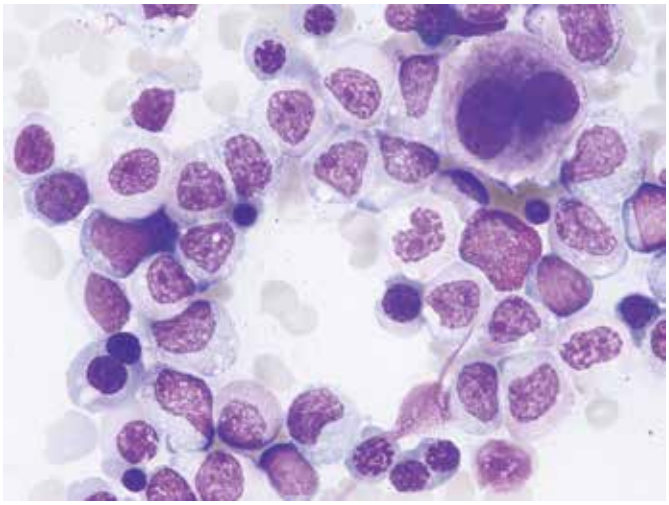
×400

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (May-Giemsa staining)



×400

Explanation of a case

In the peripheral blood picture, blasts with a size of 18 μm, with an N/C ratio of about 90%, and with a fine nuclear reticulum were counted as 2%. Neutrophils showed pseudo-Pelger nuclear anomaly.

In the bone marrow picture, blasts with a size of 16 to 20 μm, with an N/C ratio of about 60% to 80%, and with a fine nuclear reticulum were counted as 6%. Granulocytic cells showed pseudo-Pelger nuclear anomaly and degranulation. Erythroblastic cells showed dysplasia of multiple nuclei and irregular nucleus. Megakaryocytic cells showed separated multinucleated megakaryocytes.

The case was diagnosed as MDS RAEB-1 since the proportion of blasts in peripheral blood was 2% and the proportion of erythroblasts and blasts in bone marrow was less than 50% and 6%, respectively.

Celltac

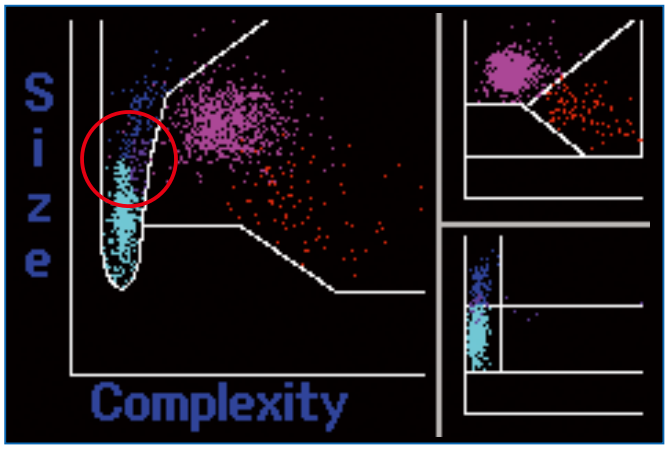
4.15 Myelodysplastic syndrome (MDS: RAEB-2)

Celltac data

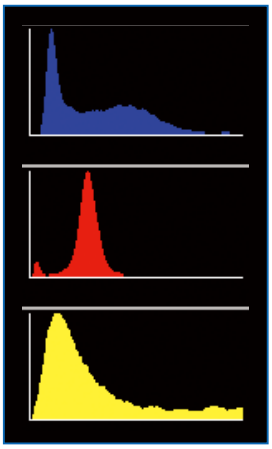
Numerical results

WBC	2.4	L	$10^3/\mu L$
NE	1.2*	[51.7*	%]
LY	0.8*	[34.4*	%]
MO	0.1*	[6.0*	%]
EO	0.1*	[5.3*	%]
BA	0.1*	[2.6*	%]
RBC	2.21	L	$10^6/\mu L$
HGB	8.5	L	g/dL
HCT	24.6	L	%
MCV	111	H	fL
MCH	38.5	H	pg
MCHC	34.6		g/dL
RDW-CV	18.3	H	%
RDW-SD	81.5	H	fL
PLT	147	L	$10^3/\mu L$
PCT	0.12	L	%
MPV	7.9		fL
PDW	18.4	H	%

Scattergrams



Histograms



Flags

WBC flag

Blasts Atypical Ly

Ly-Mo Interference Leukopenia

RBC flag

Anemia Macrocytosis

PLT flag

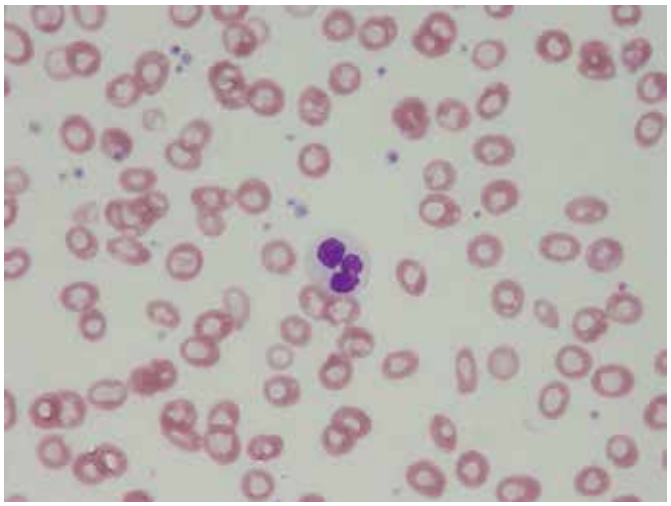
Explanation of scattergrams/histograms

A boundary between LY and MO is unclear (○) on the MAIN scattergram, and a flag of "Blasts" is displayed, indicating blasts or abnormal mononuclear cells. A flag of "LY-Mo Interference" is displayed.

Microscopic analysis

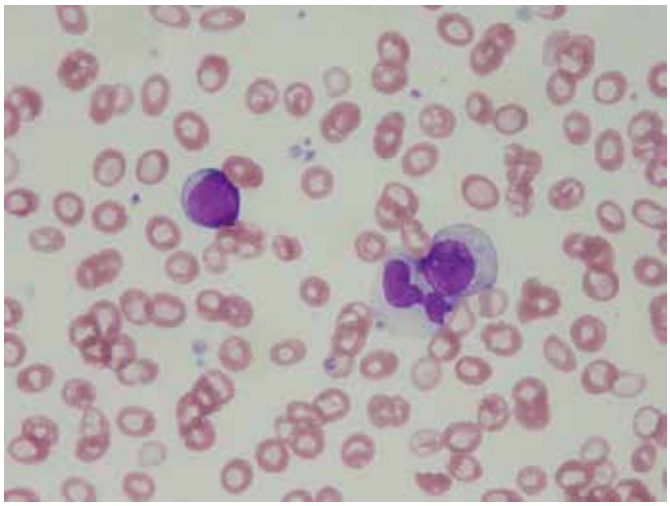
Blast	6.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	1.0%
Seg	68.0%
Lymphocyte	17.0%
Atypical Ly	
Monocyte	2.0%
Eosinophil	4.0%
Basophil	2.0%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



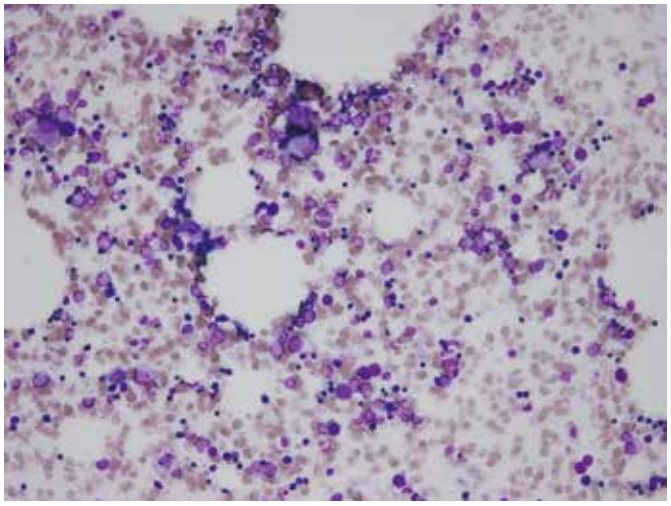
×400

Peripheral blood picture (May-Giemsa staining)



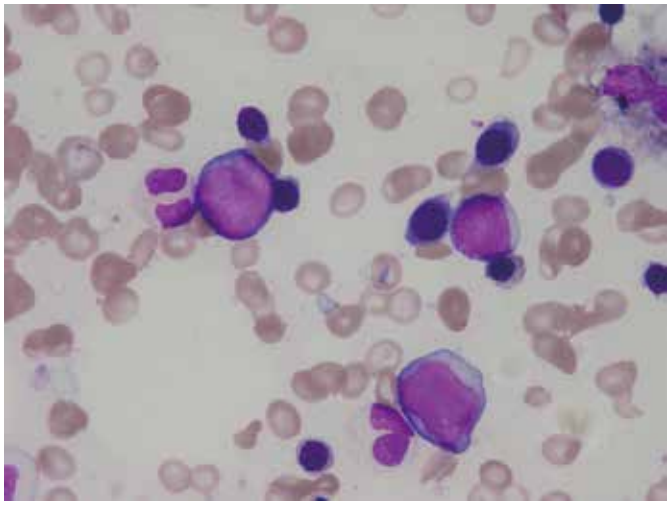
×400

Bone marrow picture (May-Giemsa staining)



×100

Bone marrow picture (May-Giemsa staining)



×400

Explanation of a case

In the peripheral blood picture, blasts with a size of 16 μm, with an N/C ratio of about 90%, and with a fine nuclear reticulum were counted as 6%. Neutrophils showed dysplasia of degranulation.

In the bone marrow picture, blasts with a size of 16 to 25 μm, with an N/C ratio of about 80% to 90%, and with a fine nuclear reticulum were counted as 12%. Granulocytic cells showed pseudo-Pelger nuclear anomaly and degranulation. Erythroblastic cells showed dysplasia of irregular nucleus.

The case was diagnosed as MDS RAEB-2 since the proportion of blasts in peripheral blood was 6% and the proportion of erythroblasts and blasts in bone marrow was less than 50% and 12%, respectively.

Celltac

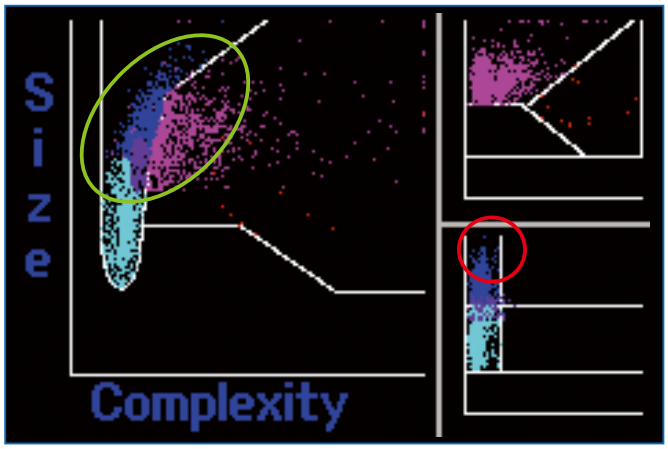
4.16 Myelodysplastic syndrome (MDS: RAEB-2 with ringed sideroblasts)

Celltac data

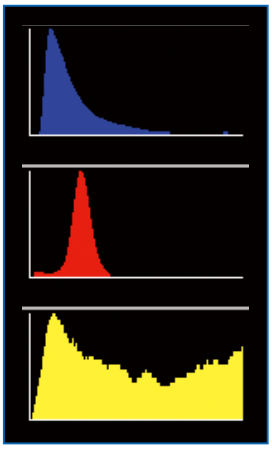
Numerical results

WBC	3.6 L	$10^3/\mu L$	
NE	1.3 *	[34.9 *	%]
LY	1.1 *	[30.9 *	%]
MO	0.8 *	[22.6 *	%]
EO	0.0 *	[0.5 *	%]
BA	0.4 *	[11.1 *	%]
RBC	1.98 L	$10^6/\mu L$	
HGB	6.7 L	g/dL	
HCT	19.7 L	%	
MCV	99.5	fL	
MCH	33.8 H	pg	
MCHC	34.0	g/dL	
RDW-CV	19.0 H	%	
RDW-SD	75.6 H	fL	
PLT	42 *	$10^3/\mu L$	
PCT	0.04 L	%	
MPV	9.5	fL	
PDW	18.1 H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Left Shift Atypical Ly
Ly-Mo Interference Basophilia

RBC flag

Anemia

PLT flag

Thrombocytopenia

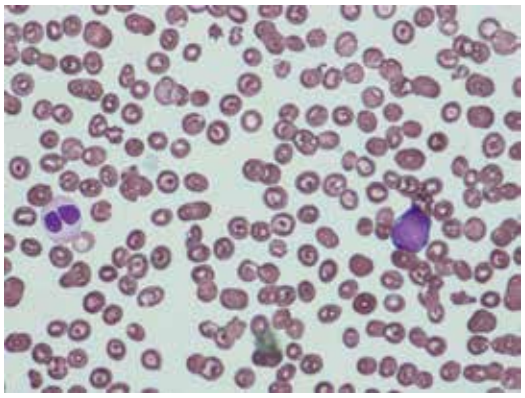
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. A flag of "Blasts" is displayed. In addition, on the MAIN scattergram, the NE area shifts to the upper left and is adjacent to the MO area (○), indicating morphological abnormalities in neutrophilic cells.

Microscopic analysis

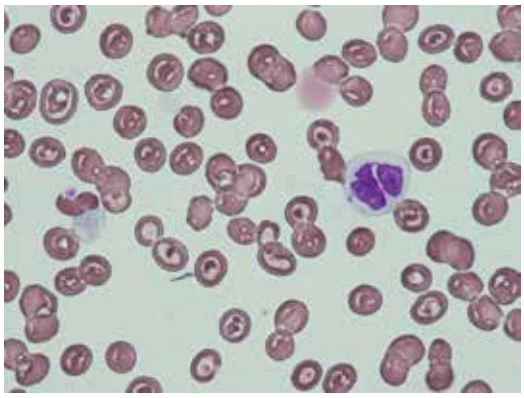
Blast	11.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	5.0%
Band	16.0%
Seg	22.0%
Lymphocyte	22.0%
Atypical Ly	
Monocyte	4.0%
Eosinophil	20.0%
Basophil	
Other	
total	
NRBC/100WBC	1.0
Megakaryocyte/100WBC	2.0

Peripheral blood picture (May-Giemsa staining)



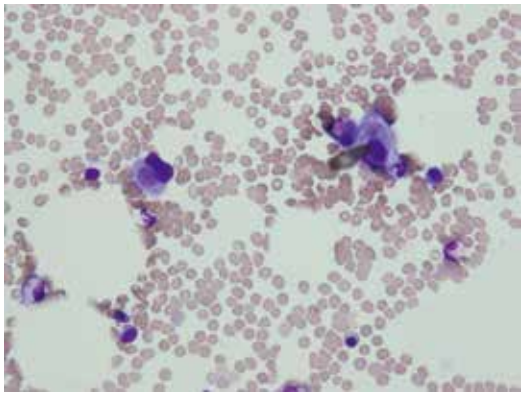
×400

Peripheral blood picture (May-Giemsa staining)



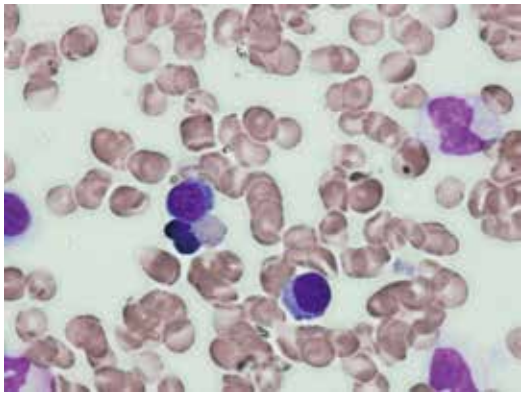
×400

Bone marrow picture (May-Giemsa staining)



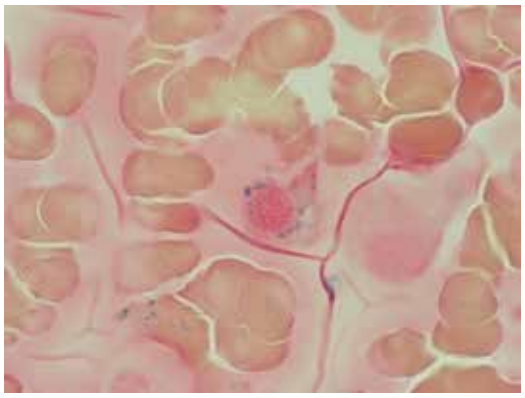
×200

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (Fe staining)



×1000

Explanation of a case

In the peripheral blood picture, blasts with a size of 20 μm, with an N/C ratio of about 90%, and with a fine nuclear reticulum were counted as 11%. Neutrophils showed pseudo-Pelger nuclear anomaly.

In the bone marrow picture, hypoplasia was observed, but blasts similar to those in peripheral blood were counted as 15%. Granulocytic cells showed pseudo-Pelger nuclear anomaly and degranulation. Erythroblastic cells showed multiple nuclei, and ringed sideroblasts were counted as 25% by Fe staining. Megakaryocytic cells showed separated multinucleated megakaryocytes.

The case was diagnosed as MDS RAEB-2 (with ringed sideroblasts) since the proportion of blasts in peripheral blood was 11% and the proportion of erythroblasts and blasts in bone marrow was less than 50% and 15%, respectively.

Celltac

5.

Lymphoid Abnormalities

Celltac

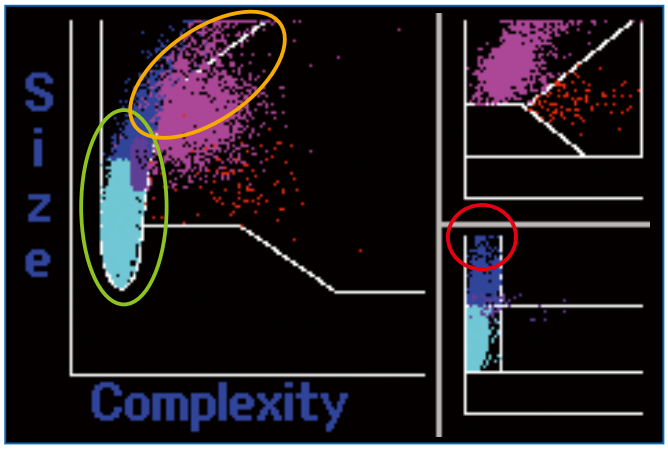
5.1 B lymphoblastic leukemia/lymphoma (B-ALL)

Celltac data

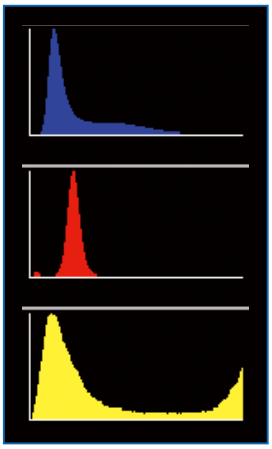
Numerical results

WBC	28.2*	$10^3/\mu L$	
NE	7.4*	[26.3*	%]
LY	17.4*	[61.9*	%]
MO	2.2*	[7.7*	%]
EO	0.3*	[0.9*	%]
BA	0.9*	[3.2*	%]
RBC	6.15H	$10^6/\mu L$	
HGB	16.7	g/dL	
HCT	50.3	%	
MCV	81.8	fL	
MCH	27.2L	pg	
MCHC	33.2	g/dL	
RDW-CV	15.1H	%	
RDW-SD	49.4H	fL	
PLT	128L	$10^3/\mu L$	
PCT	0.09L	%	
MPV	6.9L	fL	
PDW	19.8H	%	

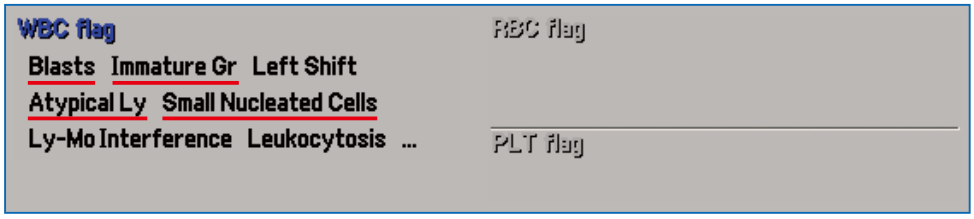
Scattergrams



Histograms



Flags



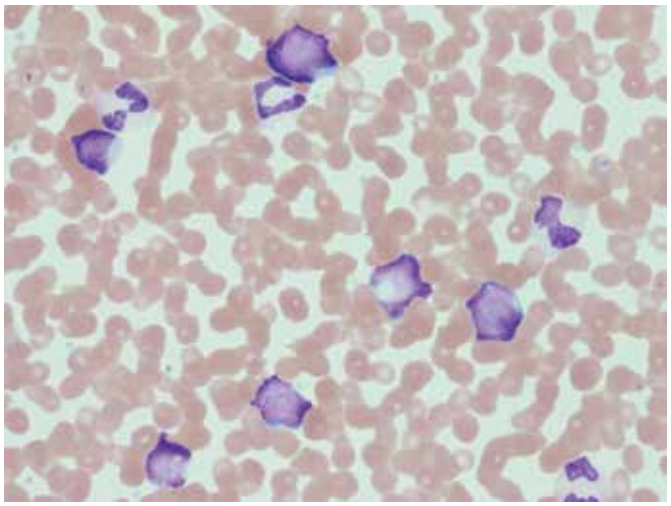
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram shows an abnormal distribution that extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating blasts. In addition, a boundary between LY and MO is unclear on the MAIN scattergram, and the LY area shows an abnormal distribution that extends overall (○), indicating abnormal mononuclear cells. Flags of "Blasts" "Atypical Ly" and "Small Nucleated Cell" are displayed. Furthermore, the NE area on the MAIN scattergram extends to the upper left, and plots appear also in an area that shows an Immature Gr flag (○), also indicating immature granulocytes. A flag of "Immature Gr" is displayed.

Microscopic analysis

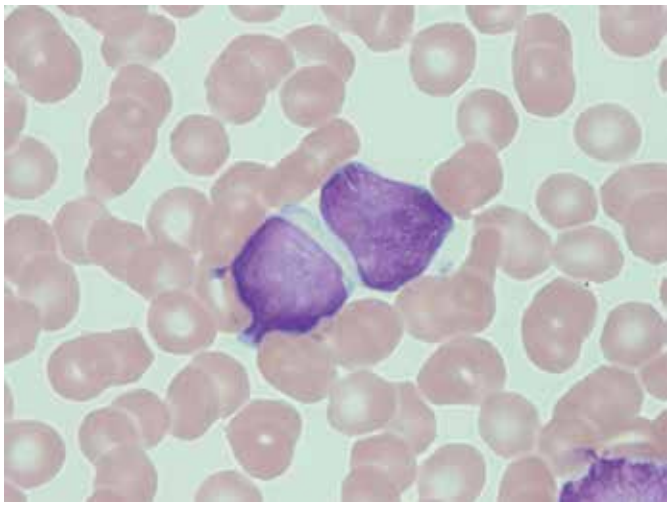
Blast	51.0%
Promyelocyte	
Myelocyte	1.5%
Metamyelocyte	4.5%
Band	5.5%
Seg	22.0%
Lymphocyte	13.0%
Atypical Ly	
Monocyte	1.5%
Eosinophil	1.0%
Basophil	
Other	
total	
NRBC/100WBC	0.5
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



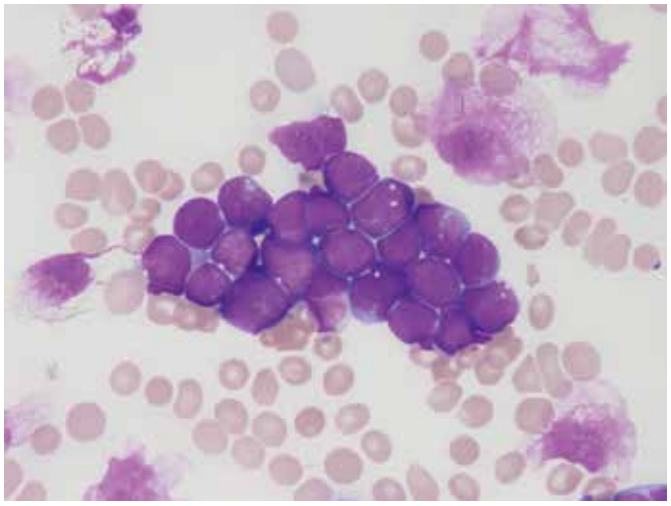
×400

Peripheral blood picture (May-Giemsa staining)



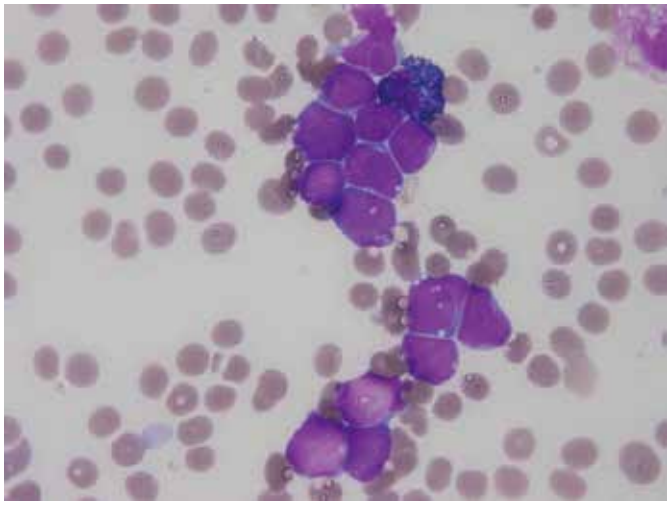
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 15 to 20 μm, with an N/C ratio of 80% to 90%, and with a fine nuclear reticulum were counted as 51%. These blasts were negative for MPO staining.

A bone marrow examination showed many cells similar to those in peripheral blood. These cells were negative for MPO and PAS staining, respectively.

In FCM, the cells were strongly positive for CD19, which is a B-lymphoid marker, positive for CD10 and cytoplasmic CD79a, positive for CD34 and HLA-DR, negative for CD3, which is a T-lymphoid marker, and negative for CD13 and CD33, which are myeloid markers. A chromosome examination showed that the cells had a normal karyotype (46, XY).

Celltac

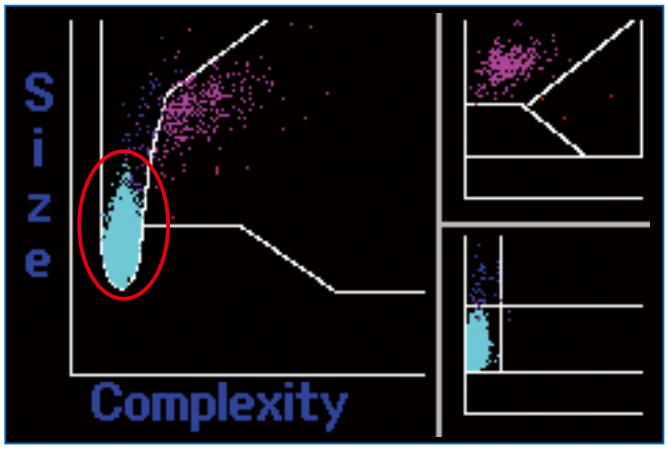
5.2 T lymphoblastic leukemia/lymphoma (T-ALL)

Celltac data

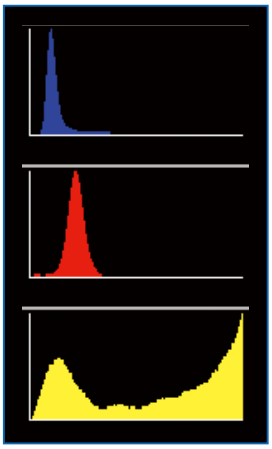
Numerical results

WBC	9.4 *	10^3/μL	
NE	0.6 L	[6.3 L	%]
LY	8.7 *	[92.5 *	%]
MO	0.1 *	[0.7 *	%]
EO	0.0	[0.1	%]
BA	0.0	[0.4	%]
RBC	3.24 *	10^6/μL	
HGB	9.7 L	g/dL	
HCT	28.4 L	%	
MCV	87.7	fL	
MCH	29.9	pg	
MCHC	34.2	g/dL	
RDW-CV	19.2 H	%	
RDW-SD	67.4 H	fL	
PLT	35 *	10^3/μL	
PCT	0.03 L	%	
MPV	8.7	fL	
PDW	20.2 H	%	

Scattergrams



Histograms



Flags

WBC flag
Atypical Ly Small Nucleated Cells
Neutropenia Lymphocytosis

RBC flag
Anemia

PLT flag
PLT-RBC Interference ...

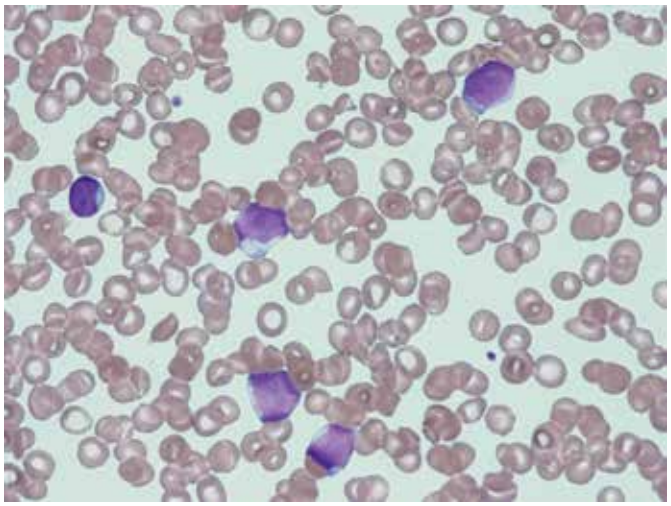
Explanation of scattergrams/histograms

On the MAIN scattergram, the LY area shows an abnormal distribution (◯), and a flag of "Atypical Ly" is displayed. However, unlike a scattergram with general atypical lymphocytes, the LY area shows a distribution that is concentrated in the lower part, and a flag of "Small Nucleated Cell" is displayed, indicating a single abnormal lymphoid cell.

Microscopic analysis

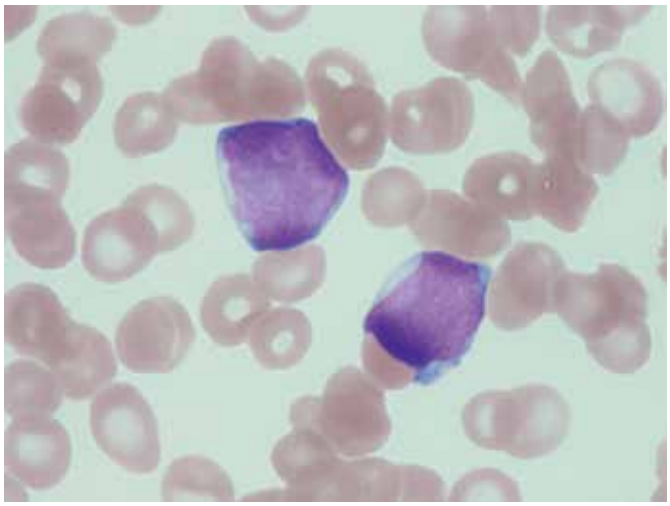
Blast	82.0%
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	8.0%
Lymphocyte	10.0%
Atypical Ly	
Monocyte	
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



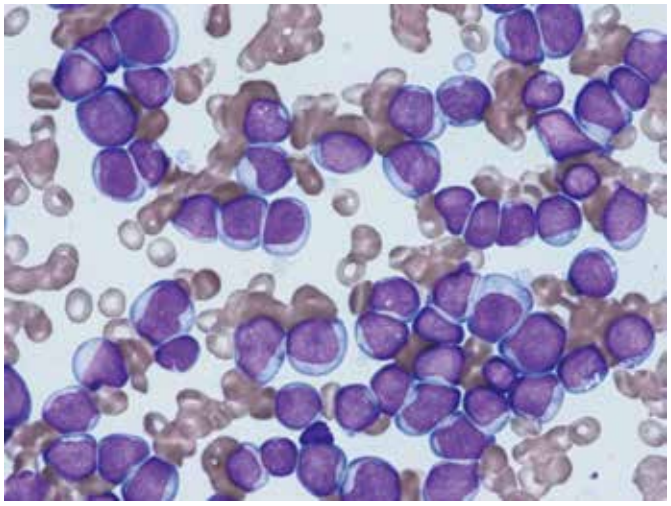
×400

Peripheral blood picture (May-Giemsa staining)



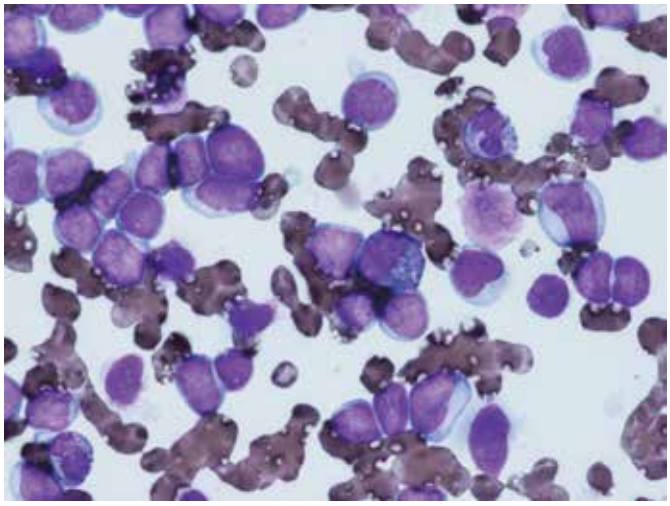
×1000

Bone marrow picture (May-Giemsa staining)



×400

Bone marrow picture (peroxidase staining)



×400

Explanation of a case

Blasts with a size of 15 to 20 μm, with an N/C ratio of 80% to 90%, with a fine nuclear reticulum, and with one to two nucleoli were counted as 82%. These blasts were negative for MPO staining.

A bone marrow examination showed increased blasts similar to those in peripheral blood.

In FCM, the cells were positive for CD7, which is a T-lymphoid marker, positive for cytoplasmic CD3, positive for CD34 and HLA-DR, and positive for CD13 and CD33, which are myeloid markers. The cells were negative for CD19, which is a B-lymphoid marker, and for cytoplasmic MPO. A chromosome examination showed that the cells had a normal karyotype (46, XX).

Celltac

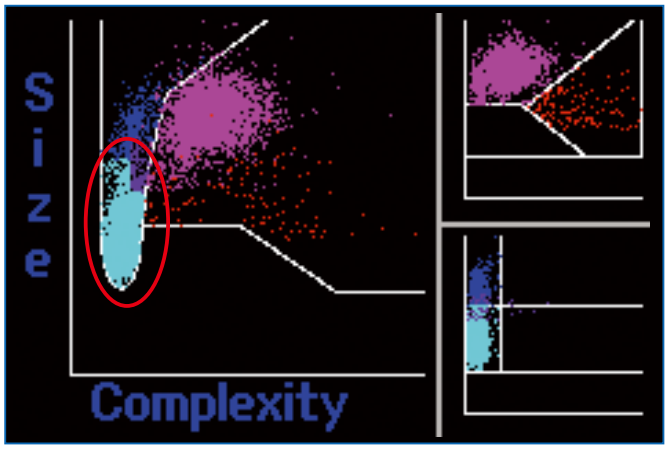
5.3 Chronic lymphoblastic leukemia (CLL)

Celltac data

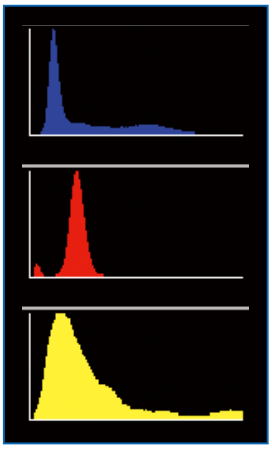
Numerical results

WBC	18.5*	10^3/μL	
NE	6.1	[33.2	%]
LY	11.3*	[60.9*	%]
MO	0.6*	[3.4*	%]
EO	0.2	[1.1	%]
BA	0.3H	[1.4	%]
RBC	4.50	10^6/μL	
HGB	13.0	g/dL	
HCT	39.6	%	
MCV	88.0	fL	
MCH	28.9	pg	
MCHC	32.8	g/dL	
RDW-CV	16.1H	%	
RDW-SD	56.7H	fL	
PLT	301	10^3/μL	
PCT	0.23	%	
MPV	7.7	fL	
PDW	17.6H	%	

Scattergrams



Histograms



Flags

WBC flag

Atypical Ly Small Nucleated Cells

Leukocytosis Lymphocytosis

Basophilia

RBC flag

PLT flag

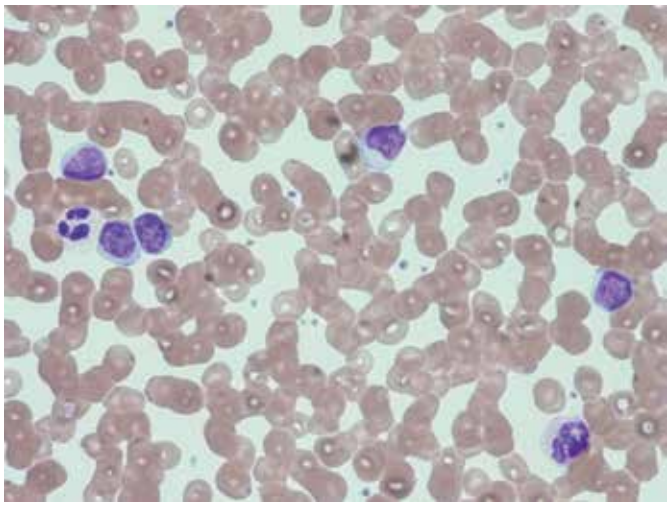
Explanation of scattergrams/histograms

The LY area on the MAIN scattergram shows an abnormal distribution that extends overall, and many plots also appear in an area that shows an Atypical Ly flag (○), indicating atypical lymphocytes. A flag of "Atypical Ly" is displayed. In addition, a flag of "Small Nucleated Cell" is displayed, indicating small abnormal lymphoid cells.

Microscopic analysis

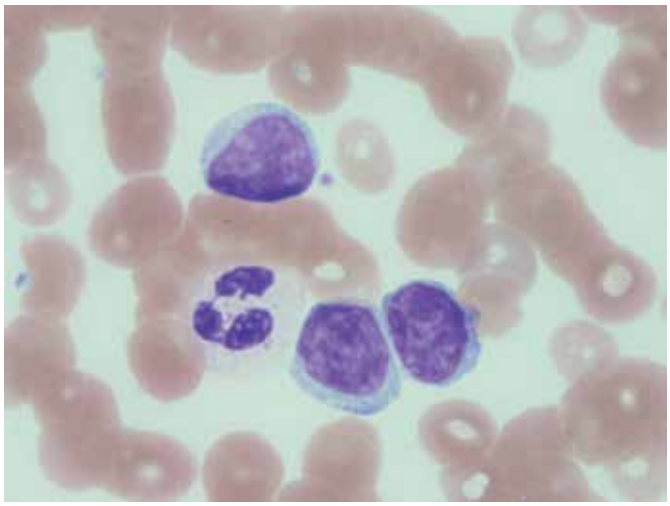
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	0.5%
Seg	33.5%
Lymphocyte	61.0%
Atypical Ly	
Monocyte	4.5%
Eosinophil	
Basophil	0.5%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

In the peripheral blood picture, mature lymphocytes with a size of 12 to 15 μm and with an N/C ratio of 80% to 90% were counted as 61%. These cells were positive for the cell surface markers CD5, CD19, CD20, and CD23 and were biased toward a cell surface immunoglobulin κ. From these findings, the case was diagnosed as chronic lymphoblastic leukemia.

Celltac

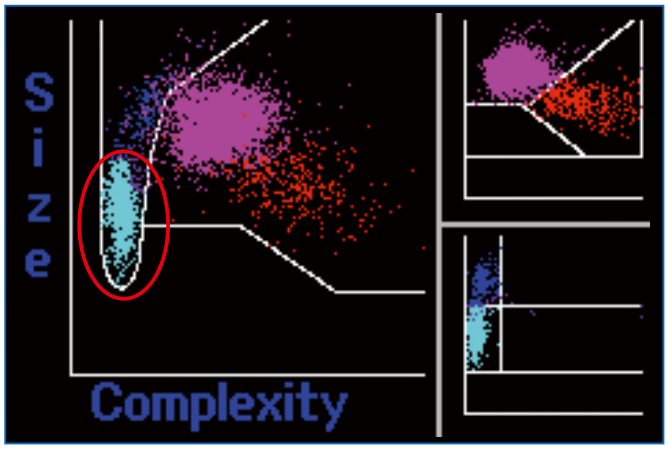
5.4 Sézary syndrome

Celltac data

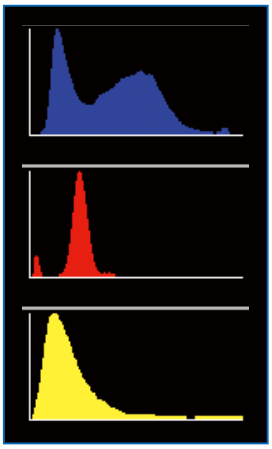
Numerical results

WBC	9.3H	$10^3/\mu L$	
NE	7.0*	[75.2*	%]
LY	1.5*	[15.8*	%]
MO	0.2*	[2.5*	%]
EO	0.5*	[5.6*	%]
BA	0.1*	[0.9*	%]
RBC	3.25L	$10^6/\mu L$	
HGB	10.5L	g/dL	
HCT	31.1L	%	
MCV	95.7	fL	
MCH	32.3H	pg	
MCHC	33.8	g/dL	
RDW-CV	15.2H	%	
RDW-SD	58.2H	fL	
PLT	348	$10^3/\mu L$	
PCT	0.22	%	
MPV	6.2L	fL	
PDW	17.3H	%	

Scattergrams



Histograms



Flags

WBC flag

Blasts Atypical Ly

Ly-Mo Interference

RBC flag

PLT flag

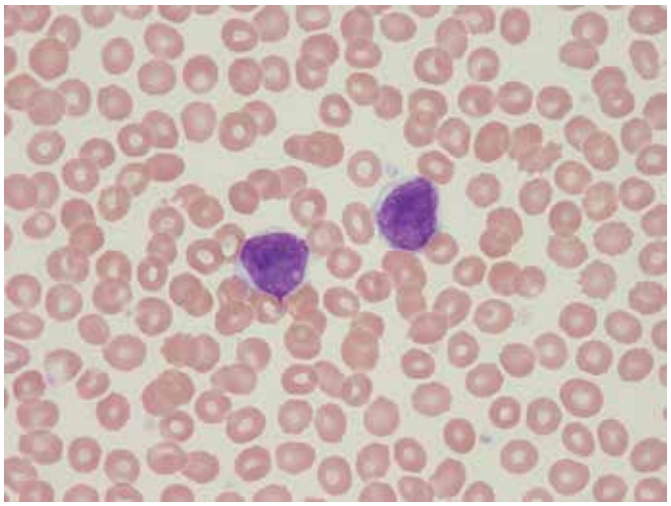
Explanation of scattergrams/histograms

On the MAIN scattergram, the LY area shows an abnormal distribution that extends to the upper part (○), and a flag of "Atypical Ly" is displayed. In addition, a flag of "Blasts" is displayed, indicating abnormal mononuclear cells.

Microscopic analysis

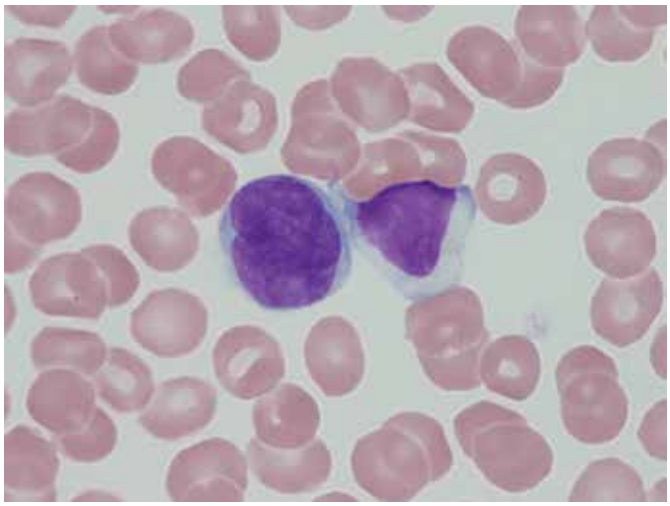
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	0.5%
Seg	62.0%
Lymphocyte	24.0%
Atypical Ly	
Monocyte	2.0%
Eosinophil	6.5%
Basophil	
Other (atypical cell)	5.0%
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



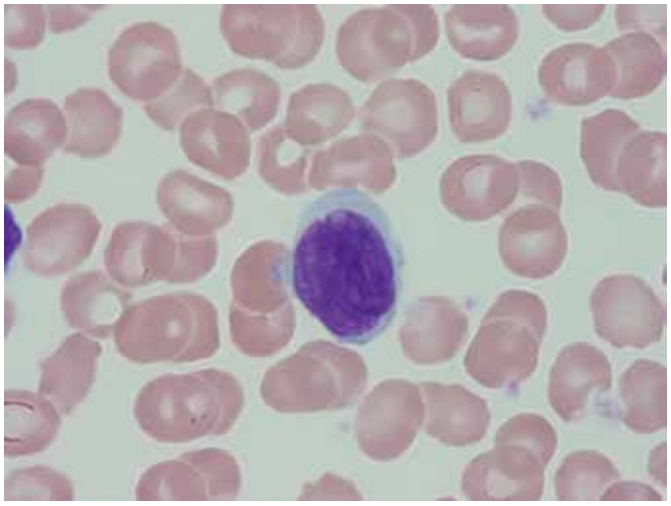
×400

Peripheral blood picture (May-Giemsa staining)



×1000

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

In the peripheral blood picture, mature lymphocytes with a size of 16 to 25 μm, with an N/C ratio of 80% to 90%, with a wrinkled, convoluted, and cleaved nucleus were counted as 5.0%.
These lymphocytes were positive for cell surface markers CD3, CD4, and CD7, showing traits of helper T-lymphocytes.
In an immunological test, the cells were negative for ATLA antibodies.

Celltac

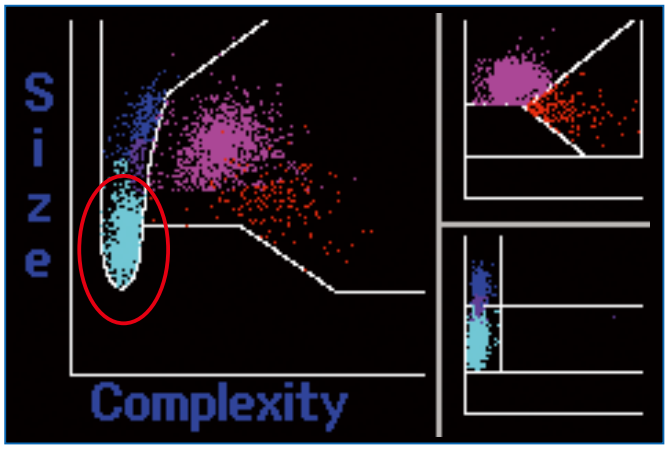
5.5 Follicular lymphoma

Celltac data

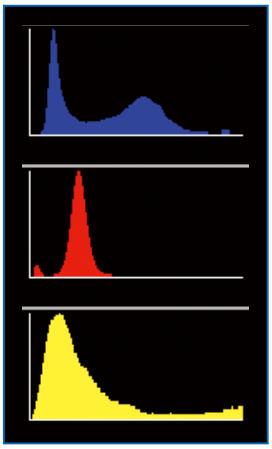
Numerical results

WBC	5.1 *	10^3/μL	
NE	2.2	[43.4	%]
LY	2.1 *	[41.9 *	%]
MO	0.3 *	[6.3 *	%]
EO	0.3	[5.8	%]
BA	0.1	[2.6H	%]
RBC	3.99	10^6/μL	
HGB	11.6L	g/dL	
HCT	36.5	%	
MCV	91.5	fL	
MCH	29.1	pg	
MCHC	31.8	g/dL	
RDW-CV	17.5H	%	
RDW-SD	64.1H	fL	
PLT	216	10^3/μL	
PCT	0.16	%	
MPV	7.3	fL	
PDW	17.8H	%	

Scattergrams



Histograms



Flags

WBC flag

Atypical Ly Small Nucleated Cells

RBC flag

PLT flag

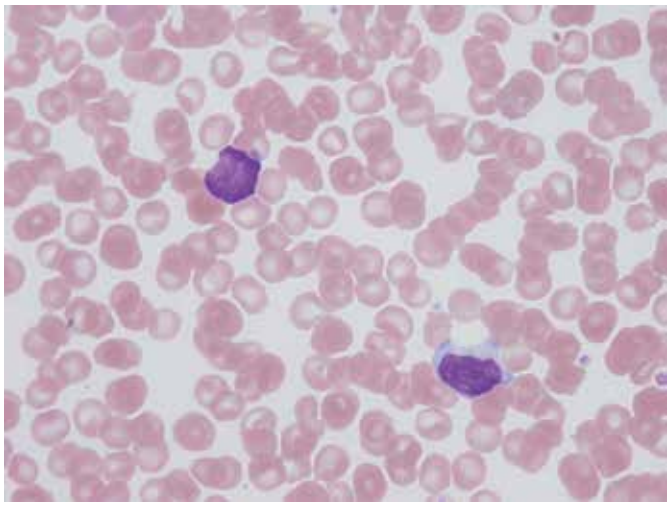
Explanation of scattergrams/histograms

The LY area on the MAIN scattergram shows an abnormal distribution that extends overall (○), and a flag of "Atypical Ly" is displayed. In addition, a flag of "Small Nucleated Cell" is displayed, indicating small abnormal lymphoid cells.

Microscopic analysis

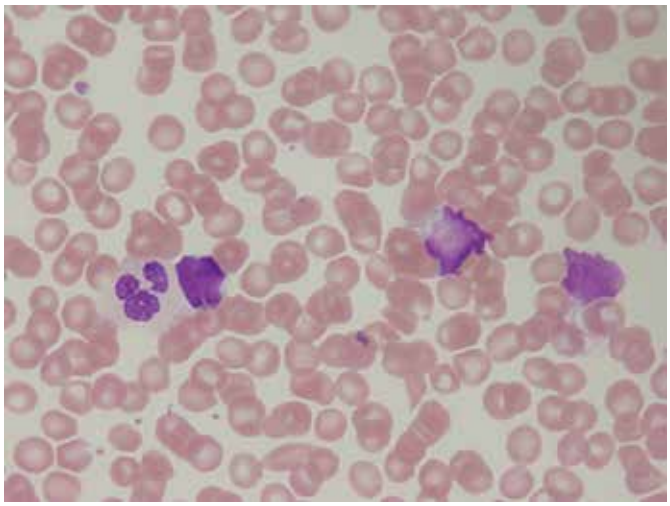
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	2.0%
Seg	40.0%
Lymphocyte	35.0%
Atypical Ly	
Monocyte	7.0%
Eosinophil	5.0%
Basophil	1.0%
Other (atypical cell)	10.0%
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



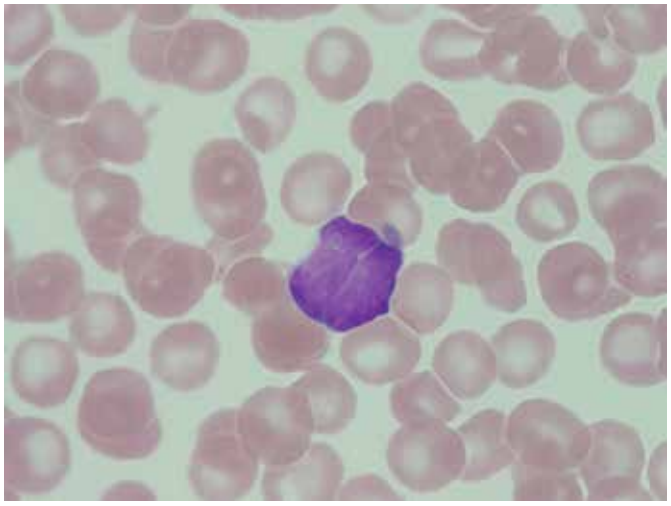
×400

Peripheral blood picture (May-Giemsa staining)



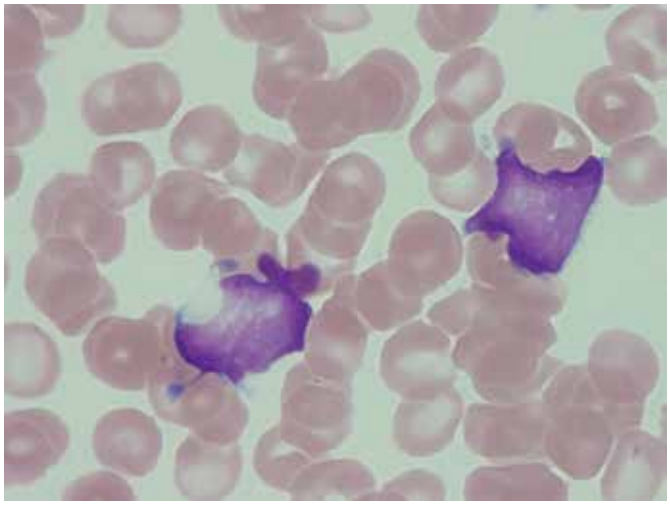
×400

Peripheral blood picture (May-Giemsa staining)



×1000

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

In the peripheral blood picture, lymphocytes with a size of 10 to 12 μm and with an N/C ratio of 90% to 95%, some of which have a cleaved central nucleus, were counted as 10.0%.

These lymphocytes were positive for the cell surface markers CD10, CD19, and CD20 and were biased toward a cell surface immunoglobulin κ. A FISH test showed *BCL2*-IgH fusion signals, and the case was diagnosed as follicular lymphoma.

Celltac

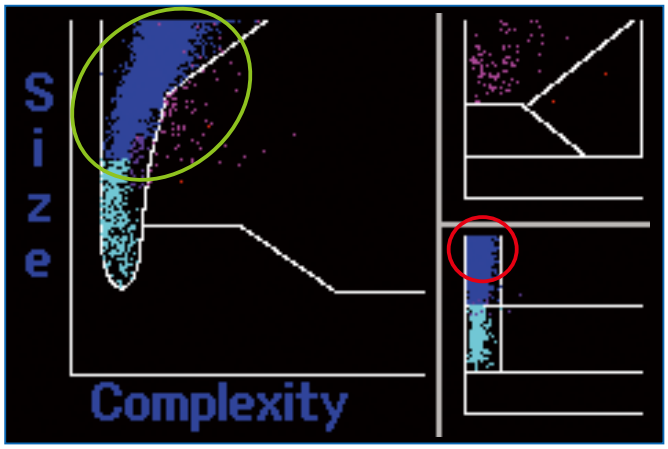
5.6 Burkitt lymphoma

Celltac data

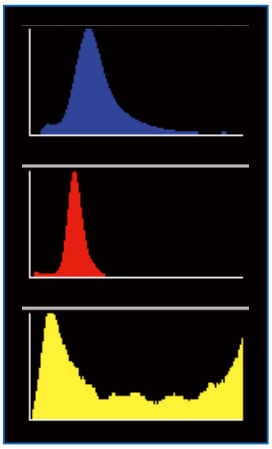
Numerical results

WBC	28.4 H	$10^3/\mu L$	
NE	0.3 *	[1.0 *	%]
LY	1.5 *	[5.3 *	%]
MO	26.5 *	[93.2 *	%]
EO	0.0 *	[0.0 *	%]
BA	0.1 *	[0.5 *	%]
RBC	2.71 *	$10^6/\mu L$	
HGB	8.3 L	g/dL	
HCT	24.1 L	%	
MCV	88.9	fL	
MCH	30.6	pg	
MCHC	34.4	g/dL	
RDW-CV	18.6 H	%	
RDW-SD	66.1 H	fL	
PLT	50 *	$10^3/\mu L$	
PCT	0.04 L	%	
MPV	8.6	fL	
PDW	20.7 H	%	

Scattergrams



Histograms



Flags

WBC flag
Blasts Left Shift Leukocytosis
Neutropenia Monocytosis

RBC flag
Anemia

PLT flag
PLT-RBC Interference ...

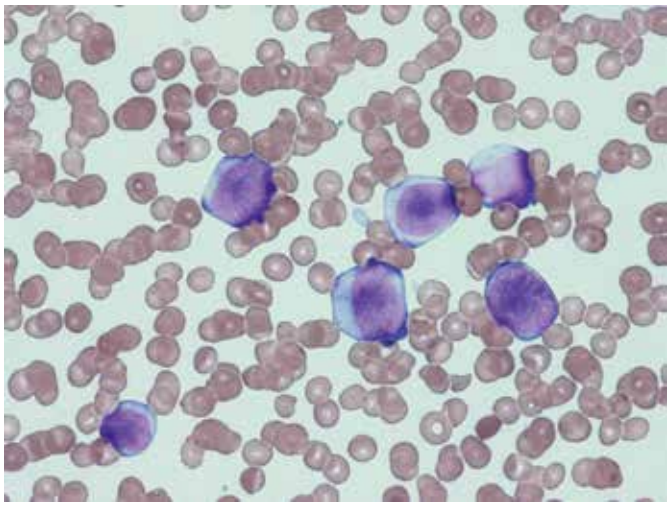
Explanation of scattergrams/histograms

The MO area on the MO-BA scattergram extends to the upper part, and plots appear also in an area that shows a Blasts flag (○), indicating many blasts. A flag of "Blasts" is displayed. In addition, the MO area on the MAIN scattergram shows an abnormal distribution that extends overall (○), indicating large abnormal cells.

Microscopic analysis

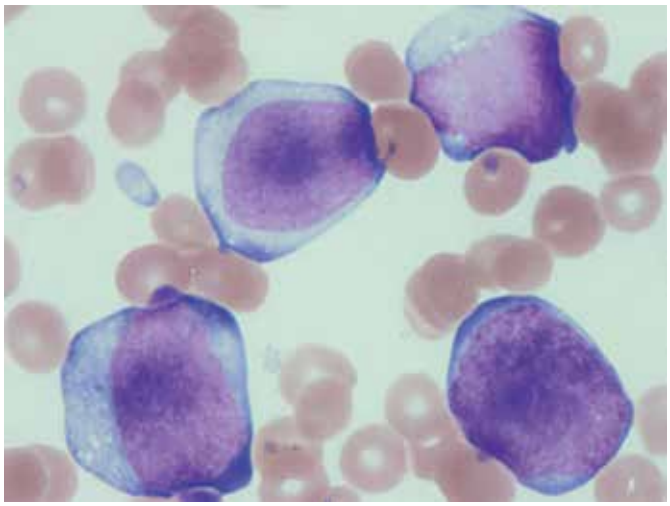
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	0.5%
Seg	0.5%
Lymphocyte	2.0%
Atypical Ly	
Monocyte	
Eosinophil	0.5%
Basophil	
Other (atypical cell)	96.5%
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

In the peripheral blood picture, large cells with a size of 25 to 30 μm, with an N/C ratio of 60% to 90%, with a fine or coarse nuclear reticulum, and with a basophilic cytoplasm were counted as 96.5%.

These lymphocytes were positive for the cell surface markers CD10, CD19, and CD20, and were biased toward a cell surface immunoglobulin λ.

A FISH test showed that the cells were positive for *MYC*-IgH fusion signals, and the case was diagnosed as Burkitt lymphoma.

Celltac

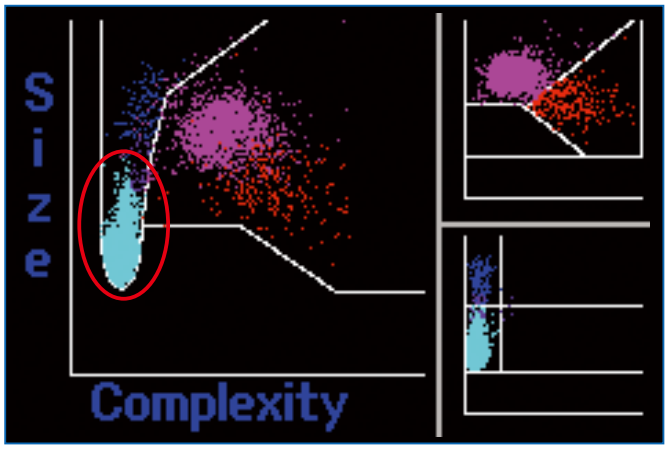
5.7 Large granular lymphocytes (under CML treatment)

Celltac data

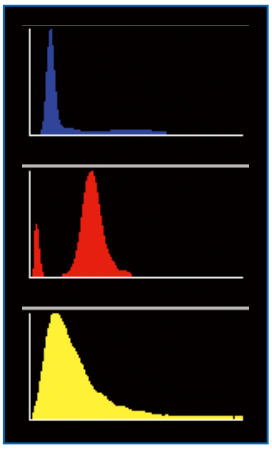
Numerical results

WBC	14.8*	$10^3/\mu L$	
NE	2.1	[13.9L	%]
LY	12.3*	[82.8*	%]
MO	0.2*	[1.0*	%]
EO	0.3	[2.0	%]
BA	0.0	[0.3	%]
RBC	1.89L	$10^6/\mu L$	
HGB	7.2L	g/dL	
HCT	21.9L	%	
MCV	116H	fL	
MCH	38.1H	pg	
MCHC	32.9	g/dL	
RDW-CV	17.9H	%	
RDW-SD	83.0H	fL	
PLT	394H	$10^3/\mu L$	
PCT	0.28	%	
MPV	7.1	fL	
PDW	17.8H	%	

Scattergrams



Histograms



Flags

WBC flag

Atypical Ly Small Nucleated Cells

Lymphocytosis

RBC flag

Anemia Macrocytosis

PLT flag

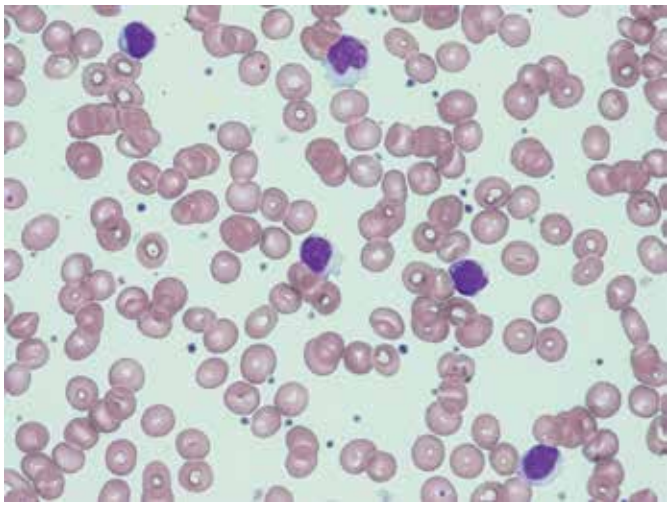
Explanation of scattergrams/histograms

On the MAIN scattergram, the LY area shows an abnormal distribution (◯), and a flag of "Atypical Ly" is displayed. However, unlike a scattergram with general atypical lymphocytes, the LY area shows a distribution that is concentrated in the lower part, and a flag of "Small Nucleated Cell" is displayed, indicating a single abnormal lymphoid cell.

Microscopic analysis

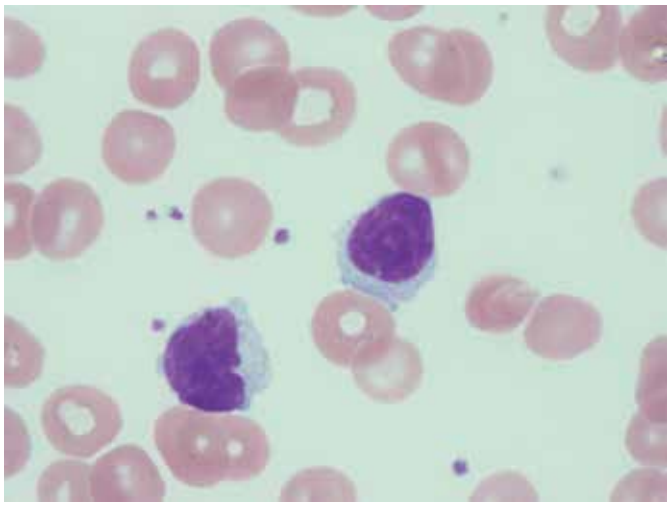
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	21.0%
Lymphocyte	75.0%
Atypical Ly	
Monocyte	1.0%
Eosinophil	3.0%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The case is under treatment of CML. In the peripheral blood picture, mature lymphocytes with a size of 12 to 15 μm, with an N/C ratio of about 70%, and with a light blue cytoplasm having small azurophil granules were observed in more than half of lymphocytes.

Celltac

6.

Other Abnormalities (Erythroid Cells)

Celltac

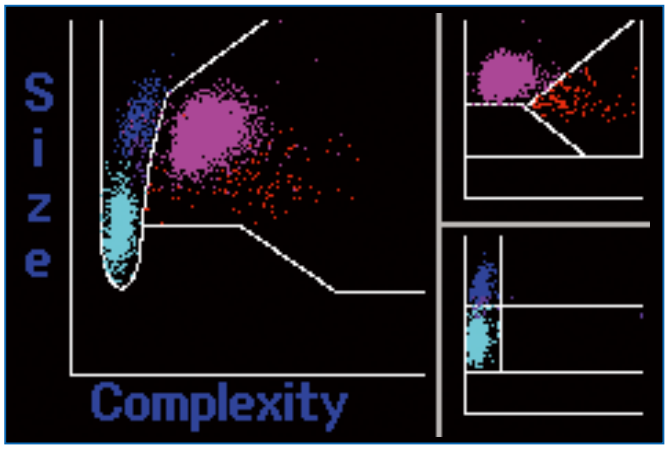
6.1 Rouleaux formation

Celltac data

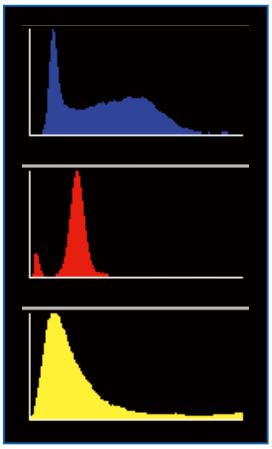
Numerical results

WBC	6.7	$10^3/\mu L$	
NE	4.5	[67.3	%]
LY	1.7	[25.0	%]
MO	0.3	[4.9	%]
EO	0.1	[2.1	%]
BA	0.1	[0.7	%]
RBC	2.58 L	$10^6/\mu L$	
HGB	7.4 L	g/dL	
HCT	23.1 L	%	
MCV	89.5	fL	
MCH	28.7	pg	
MCHC	32.0	g/dL	
RDW-CV	16.0 H	%	
RDW-SD	57.3 H	fL	
PLT	323	$10^3/\mu L$	
PCT	0.21	%	
MPV	6.6 L	fL	
PDW	18.4 H	%	

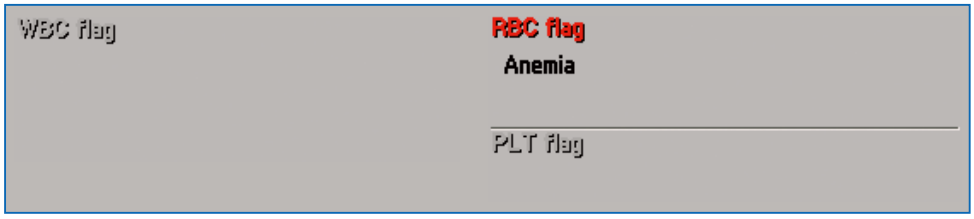
Scattergrams



Histograms



Flags



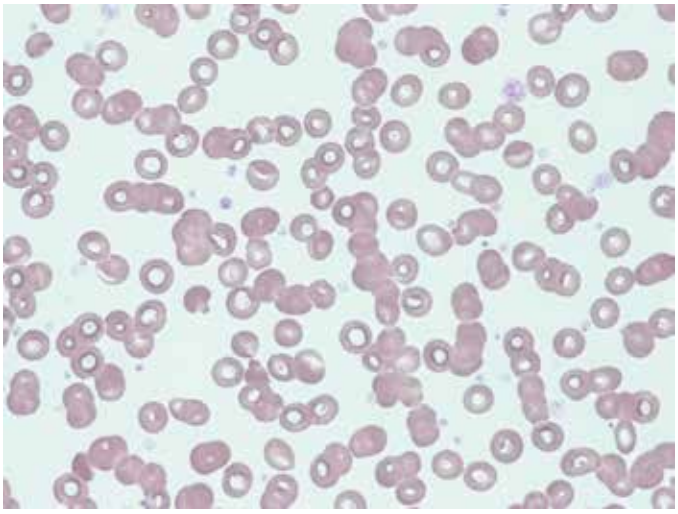
Explanation of scattergrams/histograms

This is a sample that showed rouleaux formation on a blood smear preparation, and the RBC histogram shows a normal pattern, indicating no effects of rouleaux formation. The reason for the no effects seems to be that the automated hematology analyzer measures erythrocytes by diluting blood 40,000 times and the erythrocytes become separated without keeping a state of rouleaux.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	4.0%
Seg	63.0%
Lymphocyte	21.0%
Atypical Ly	
Monocyte	6.0%
Eosinophil	5.0%
Basophil	1.0%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Explanation of a case

The case has 2800 mg/dL of serum IgG. Rouleaux formation in which erythrocytes are in a line is observed.

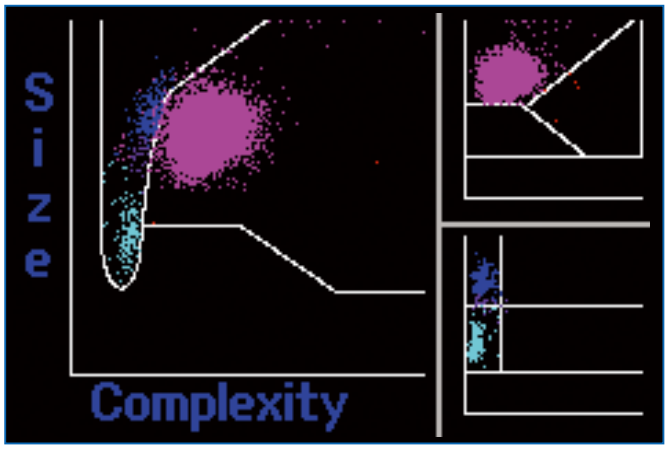
6.2 Schistocyte

Celltac data

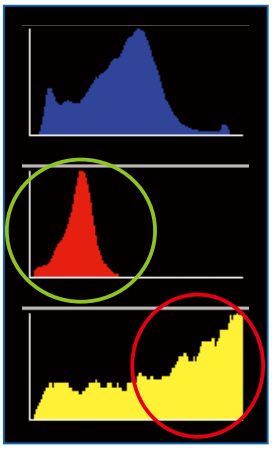
Numerical results

WBC	10.8H	$10^3/\mu L$	
NE	10.3H	[95.1H	%]
LY	0.3L	[2.3L	%]
MO	0.2	[2.2	%]
EO	0.0	[0.1	%]
BA	0.0	[0.3	%]
RBC	2.68*	$10^6/\mu L$	
HGB	8.0L	g/dL	
HCT	25.1L	%	
MCV	93.7	fL	
MCH	29.9	pg	
MCHC	31.9	g/dL	
RDW-CV	30.4H	%	
RDW-SD	114H	fL	
PLT	72*	$10^3/\mu L$	
PCT	0.06L	%	
MPV	8.2	fL	
PDW	14.5L	%	

Scattergrams



Histograms



Flags

WBC flag
Lymphopenia

RBC flag
Anemia Anisocytosis

PLT flag
PLT-RBC Interference

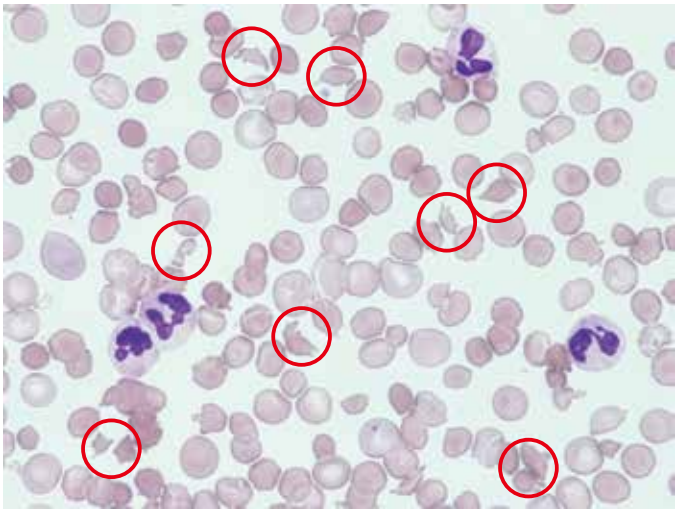
Explanation of scattergrams/histograms

The PLT histogram shows a peak on the right side (○), unlike a normal pattern. The RBC histogram shows a non-normal distribution (○), RDW is high, and flags of "Anisocytosis" and "PLT-RBC Interference" are displayed, indicating the presence of schistocytes or small erythrocytes.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	98.0%
Lymphocyte	1.0%
Atypical Ly	
Monocyte	1.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	4.0
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Explanation of a case

The erythrocytes and microspherocytes circled in red are schistocytes that were physically fragmented in the blood vessel.

Celltac

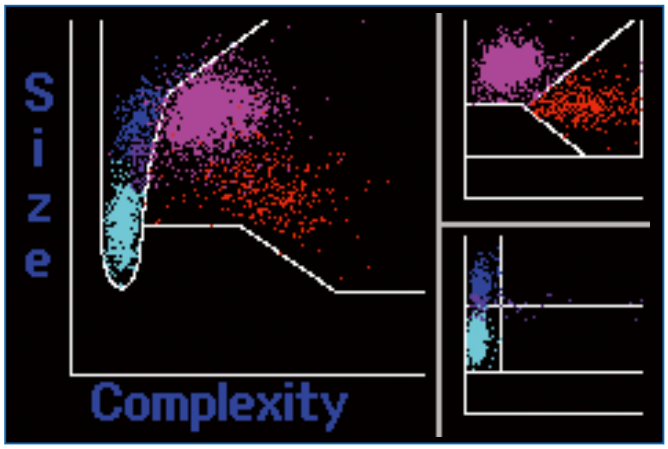
6.3 Iron deficiency anemia

Celltac data

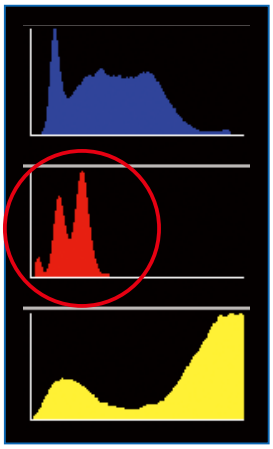
Numerical results

WBC	6.1	$10^3/\mu L$	
NE	3.8	[62.2	%]
LY	1.4	[22.4	%]
MO	0.4	[6.2	%]
EO	0.5	[7.3	%]
BA	0.1	[1.9	%]
RBC	4.56 *	$10^6/\mu L$	
HGB	11.2 L	g/dL	
HCT	36.0	%	
MCV	78.9 L	fL	
MCH	24.6 L	pg	
MCHC	31.1	g/dL	
RDW-CV	35.9 H	%	
RDW-SD	113 H	fL	
PLT	273 *	$10^3/\mu L$	
PCT	0.19	%	
MPV	7.0	fL	
PDW	14.7 L	%	

Scattergrams



Histograms



Flags

WBC flag

RBC flag
Anisocytosis

PLT flag
PLT-RBC Interference

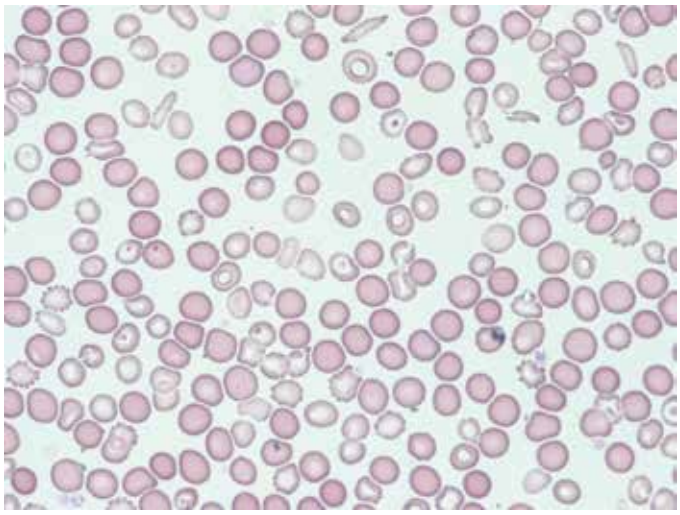
Explanation of scattergrams/histograms

The RBC histogram shows bimodal peaks (○), unlike a normal pattern, indicating the coexistence of normal erythrocytes and microcytic erythrocytes. A flag of "Anisocytosis" is displayed.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	1.0%
Seg	72.0%
Lymphocyte	15.0%
Atypical Ly	1.0%
Monocyte	6.0%
Eosinophil	5.0%
Basophil	
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Explanation of a case

The morphology of erythrocytes included anisocytosis, leptocytes, and target cells. Normal erythrocytes also exist, and anisochromia is observed, indicating a period of recovery from iron deficiency anemia.

Celltac

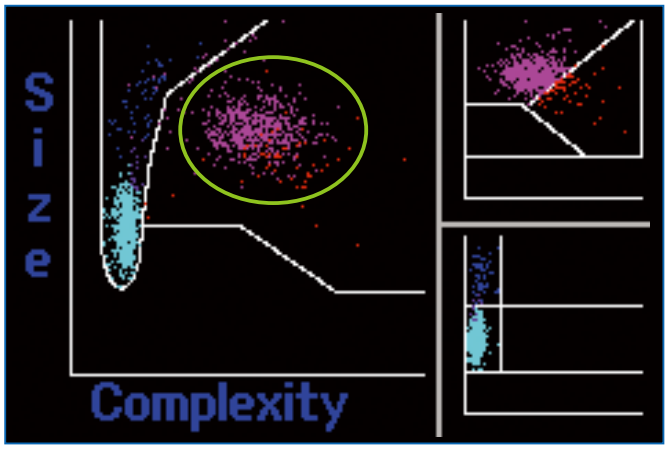
6.4 Megaloblastic anemia

Celltac data

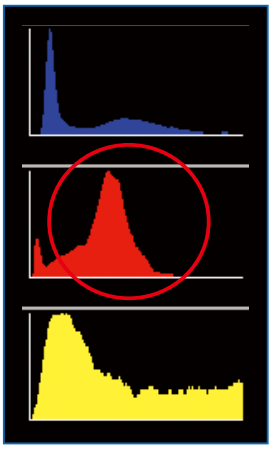
Numerical results

WBC	2.2 L	$10^3/\mu L$	
NE	0.8 L	[38.5	%]
LY	1.1	[51.8	%]
MO	0.1	[3.8	%]
EO	0.1	[4.6	%]
BA	0.0	[1.3	%]
RBC	0.89 L	$10^6/\mu L$	
HGB	4.4 L	g/dL	
HCT	13.1 L	%	
MCV	147 H	fL	
MCH	49.4 H	pg	
MCHC	33.6	g/dL	
RDW-CV	32.4 H	%	
RDW-SD	191 H	fL	
PLT	80 L	$10^3/\mu L$	
PCT	0.07 L	%	
MPV	8.8	fL	
PDW	18.9 H	%	

Scattergrams



Histograms



Flags

WBC flag

Leukopenia Neutropenia

RBC flag

Anemia Anisocytosis Macrocytosis

PLT flag

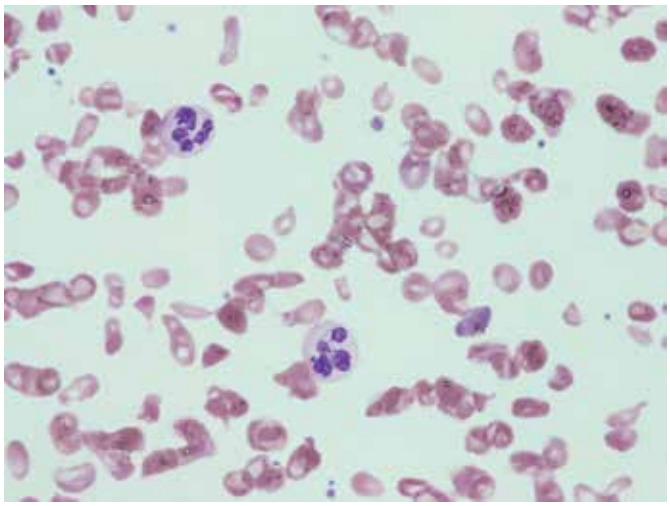
Explanation of scattergrams/histograms

The erythrocyte count was 0.89 × $10^6/\mu L$ and hemoglobin was 4.4 g/dL, which shows severe anemia, and MCV is also high, indicating macrocytic anemia. A flag of "Macrocytosis" is displayed. In addition, the RBC histogram shows a non-normal distribution (○), and RDW is high, indicating the presence of various poikilocytes. A flag of "Anisocytosis" is displayed. The NE area on the MAIN scattergram shows a distribution that extends to the right side overall (○), indicating hypersegmented neutrophils.

Microscopic analysis

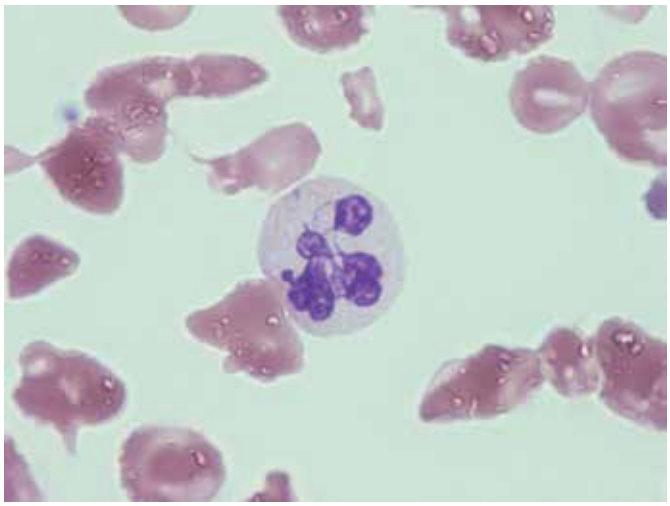
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	56.0%
Lymphocyte	42.0%
Atypical Ly	
Monocyte	2.0%
Eosinophil	
Basophil	
Other	
total	
NRBC/100WBC	3.0
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The morphology of erythrocytes included many poikilocytes. Some neutrophils showed hypersegmented neutrophils.
Folic acid: 38 ng/mL; VB12: <50 pg/mL

Celltac

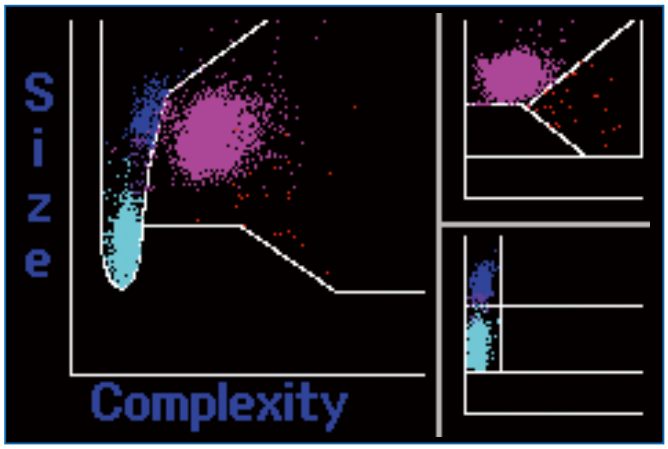
6.5 Thalassemia

Celltac data

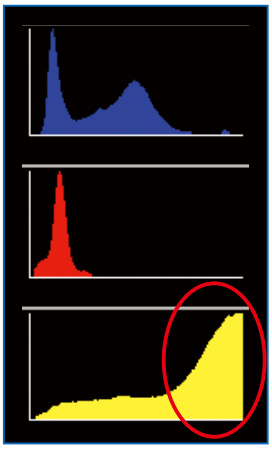
Numerical results

WBC	8.5	10^3/μL	
NE	5.6	[65.3	%]
LY	2.4	[28.0	%]
MO	0.5	[5.3	%]
EO	0.0	[0.5	%]
BA	0.1	[0.9	%]
RBC	6.81 *	10^6/μL	
HGB	12.0	g/dL	
HCT	38.4	%	
MCV	56.4 L	fL	
MCH	17.6 L	pg	
MCHC	31.3	g/dL	
RDW-CV	23.6 H	%	
RDW-SD	53.2 H	fL	
PLT	688 *	10^3/μL	
PCT	0.67 H	%	
MPV	9.7	fL	
PDW	12.5 L	%	

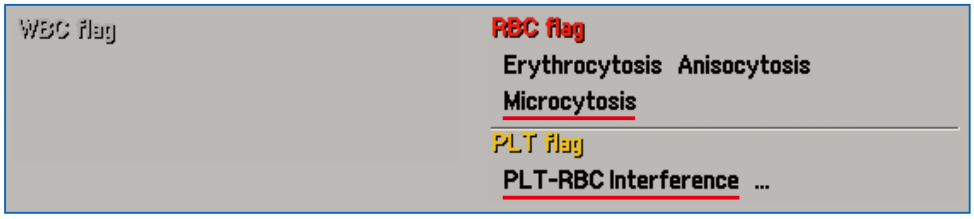
Scattergrams



Histograms



Flags



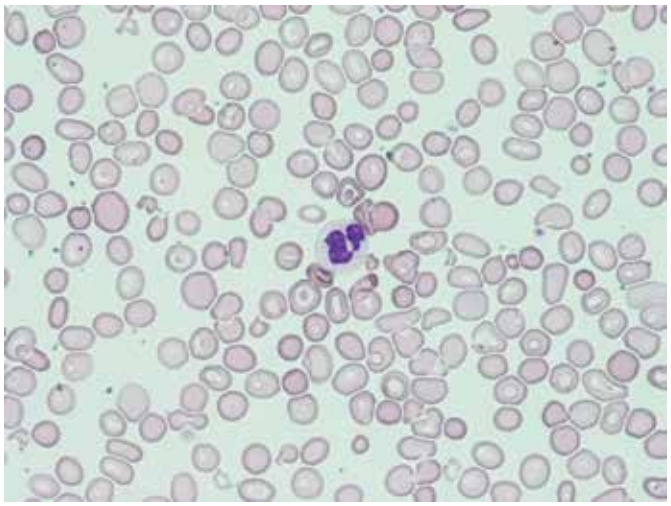
Explanation of scattergrams/histograms

Both MCV and MCH are low, indicating microcytic hypochromic anemia. A flag of "Microcytosis" is displayed. The PLT histogram shows a peak on the right side (○), unlike a normal pattern, and a flag of "PLT-RBC Interference" is displayed, indicating the presence of poikilocytes.

Microscopic analysis

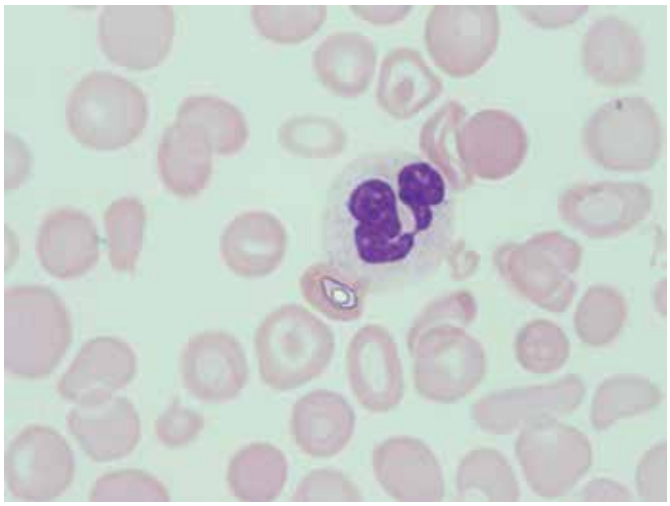
Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	1.0%
Seg	62.0%
Lymphocyte	31.0%
Atypical Ly	
Monocyte	4.0%
Eosinophil	1.0%
Basophil	1.0%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Peripheral blood picture (May-Giemsa staining)



×1000

Explanation of a case

The morphology of erythrocytes includes anisocytosis, leptocytes, and target cells.

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7.

Other Abnormalities (Platelets)

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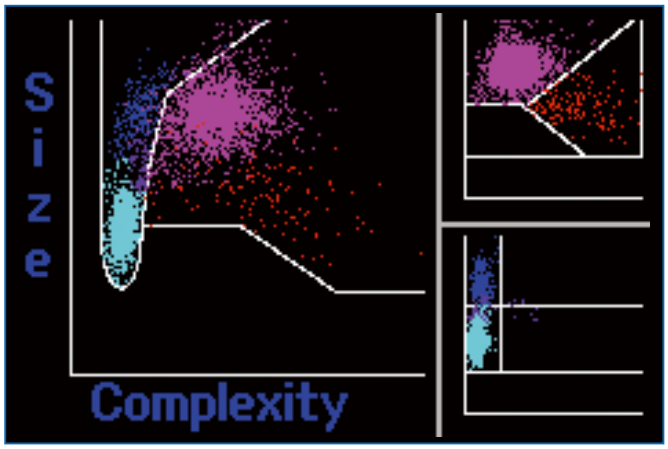
7.1 Essential thrombocythemia

Celltac data

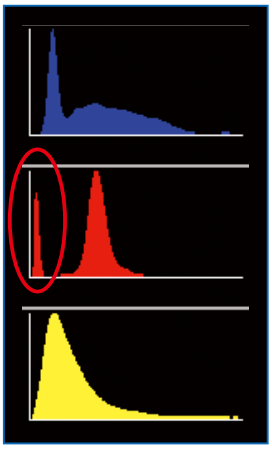
Numerical results

WBC	5.4	$10^3/\mu L$	
NE	2.6	[47.5	%]
LY	2.3	[41.8	%]
MO	0.3	[5.8	%]
EO	0.2	[3.0	%]
BA	0.1	[1.9	%]
RBC	2.85 L	$10^6/\mu L$	
HGB	12.5	g/dL	
HCT	36.3	%	
MCV	127 H	fL	
MCH	43.9 H	pg	
MCHC	34.4	g/dL	
RDW-CV	14.7 H	%	
RDW-SD	74.9 H	fL	
PLT	1006 H	$10^3/\mu L$	
PCT	0.66 H	%	
MPV	6.6 L	fL	
PDW	18.4 H	%	

Scattergrams



Histograms



Flags

WBC flag

RBC flag
Macrocytosis

PLT flag
Thrombocytosis

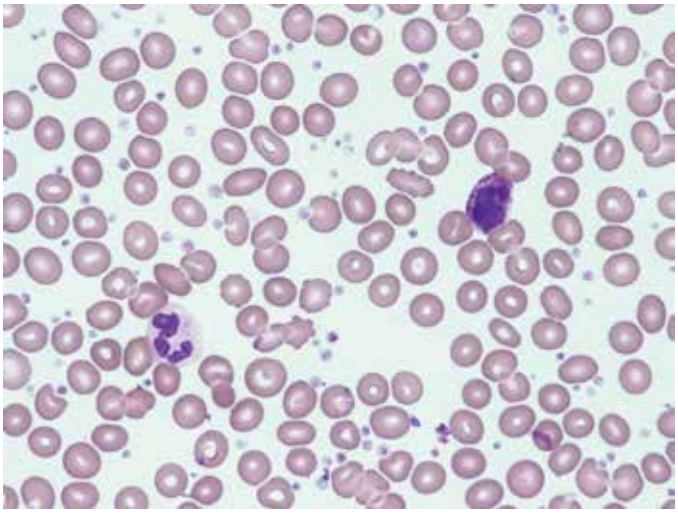
Explanation of scattergrams/histograms

The platelet count exceeds 1000 × $10^3/\mu L$, indicating thrombocytosis. A flag of "Thrombocytosis" is displayed. On the RBC histogram, a population of platelets appears on the left side (○), demonstrating a high platelet count.

Microscopic analysis

Blast	
Promyelocyte	
Myelocyte	
Metamyelocyte	
Band	
Seg	57.0%
Lymphocyte	30.0%
Atypical Ly	
Monocyte	8.0%
Eosinophil	3.0%
Basophil	2.0%
Other	
total	
NRBC/100WBC	
RBC/other findings	

Peripheral blood picture (May-Giemsa staining)



×400

Explanation of a case

Platelets with a normal size of about 2 to 4 μm are increased.

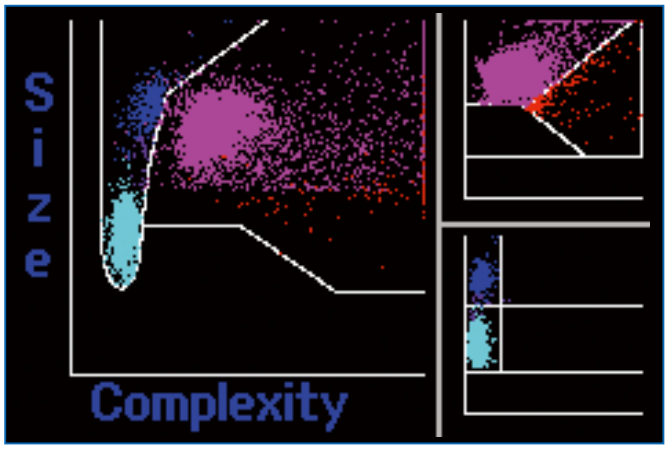
7.2 EDTA-dependent pseudothrombocytopenia

Celltac data

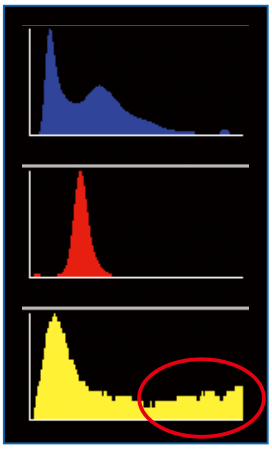
Numerical results

WBC	12.2 C	$10^3/\mu L$	
NE	8.5 H	[69.7	%]
LY	2.9	[23.4	%]
MO	0.6	[4.5	%]
EO	0.2	[2.0	%]
BA	0.1	[0.4	%]
RBC	3.96	$10^6/\mu L$	
HGB	13.3	g/dL	
HCT	39.3	%	
MCV	99.2	fL	
MCH	33.6 H	pg	
MCHC	33.8	g/dL	
RDW-CV	15.5 H	%	
RDW-SD	61.5 H	fL	
PLT	21 C	$10^3/\mu L$	
PCT	0.02 C	%	
MPV	7.8 C	fL	
PDW	20.9 C	%	

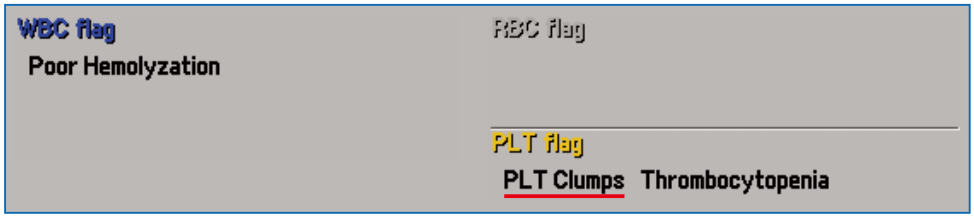
Scattergrams



Histograms



Flags



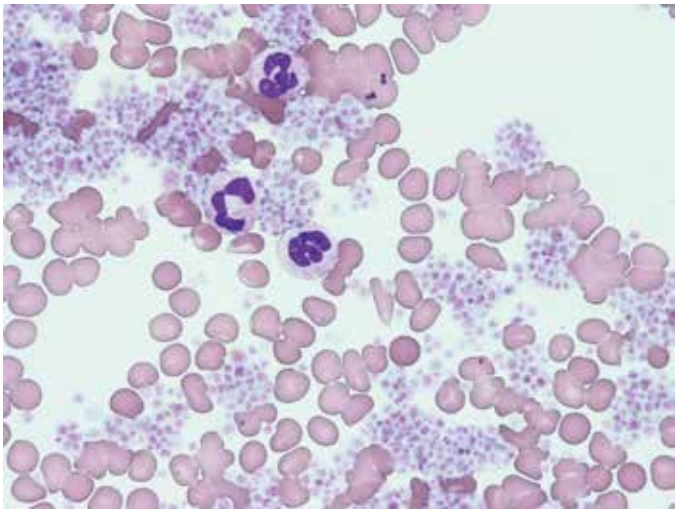
Explanation of scattergrams/histograms

The PLT histogram shows a population on the right side (○), unlike a normal pattern. A flag of "Plt Clumps" is displayed, indicating the presence of platelet clumps.

Microscopic analysis

NA

Peripheral blood picture (May-Giemsa staining)



×400

Explanation of a case

A picture of platelet clumps is observed. Since no fibrin deposition is observed, the case was considered to have EDTA-dependent pseudothrombocytopenia.

- The data in this Data Book were measured by a Celltac Es MEK-7300 hematology analyzer. Other data such as FCM, biochemistry, and chromosome examination were measured by other measurement devices.
- Due to differences in the condition of the device and samples, the measurement results in this Data Book may not always be reproduced.
- The Celltac Es MEK-7300 is a screening device, not a device for definitive diagnosis. Definitive diagnosis should be done by a physician or qualified individual.

Celltac Clinical Data Book, First edition, January 2017

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8224 **SP64-121** '17.02. SE. A.

Printed in Japan