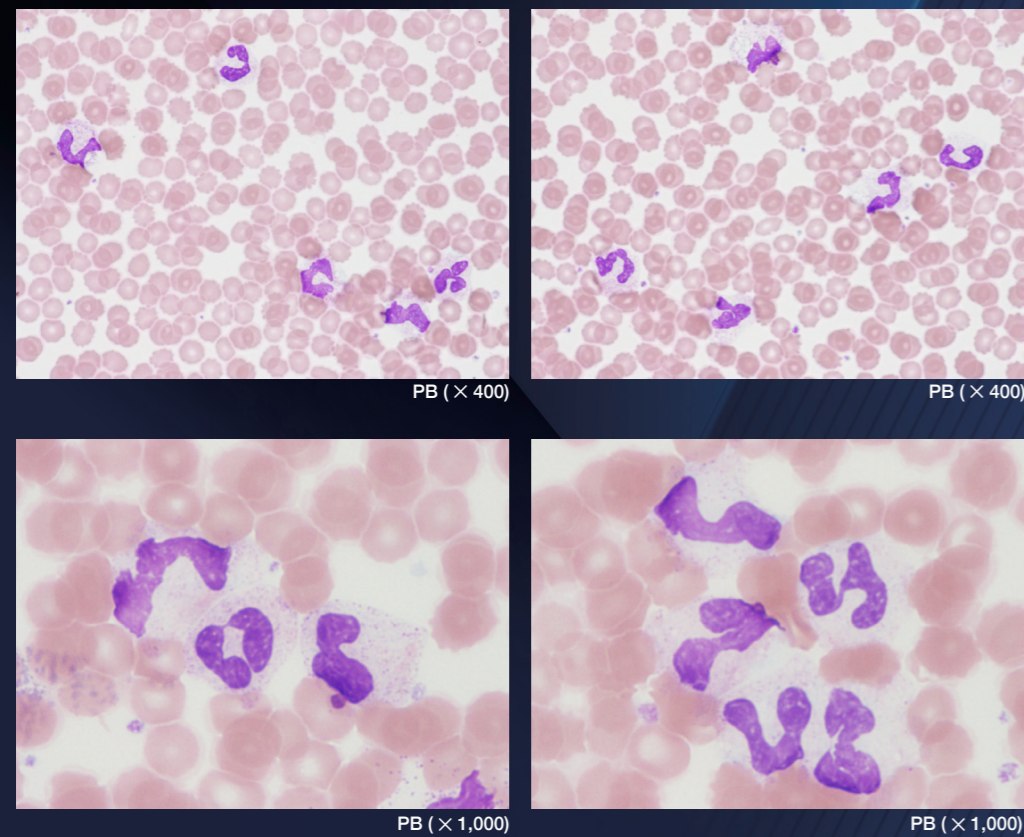Case 1

Neutrophilia

A woman in her 90s undergoing chemotherapy for diffuse large cell lymphoma.

Blood smear (May-Giemsa staining)

PB (×400)

PB (×400)
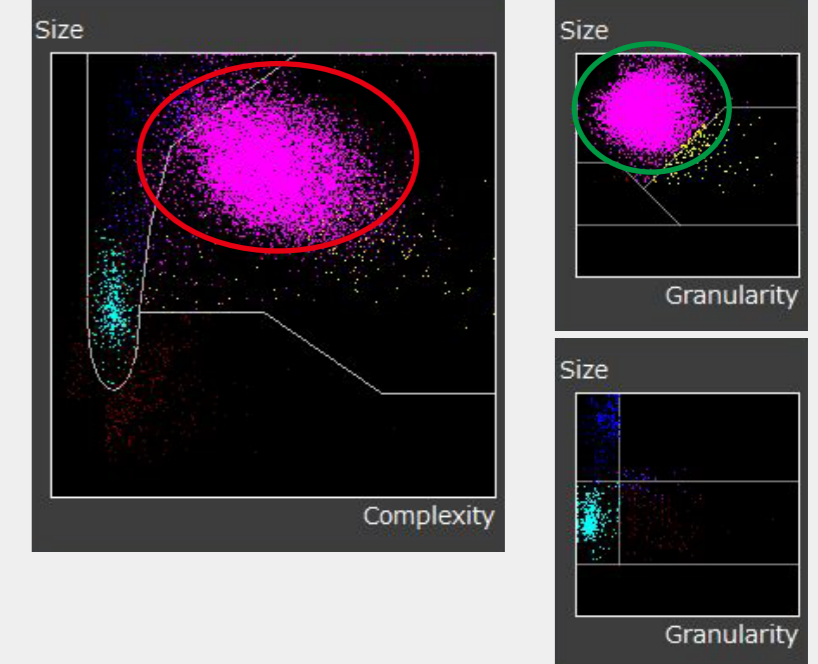
PB (×1,000)

PB (×1,000)

Visual differential counts

Blast	0.0
Promyelo	0.0
Myelo	0.0
Meta	2.0
Band	43.0
Seg	53.0
Eosino	0.0
Baso	0.0
Mono	1.0
Lympho	1.0
At-Ly	0.0
NRBC	0.0
Other	0.0

Celltac Data

Numerical results

WBC	24.33	H	$10^3/\mu L$
RBC	4.40		$10^6/\mu L$
HGB	12.42		g/dL
HCT	37.2		%
MCV	84.5		fL
MCH	28.2		pg
MCHC	33.4		g/dL
RDW-CV	13.4		%
RDW-SD	45.3		fL
PLT	274.8		$10^3/\mu L$
PCT	0.21		%
MPV	7.8		fL
PDW	16.4		%
P-LCR	32.9		%
P-LCC	90.4		$10^3/\mu L$
NE	23.19	*	$10^3/\mu L$
LY	0.62	*	$10^3/\mu L$
MO	0.20	*	$10^3/\mu L$
EO	0.26	*	$10^3/\mu L$
BA	0.06	*	$10^3/\mu L$
NE%	95.32	*	%
LY%	2.54	*	%
MO%	0.84	*	%
EO%	1.05	*	%
BA%	0.25	*	%

Scattergrams
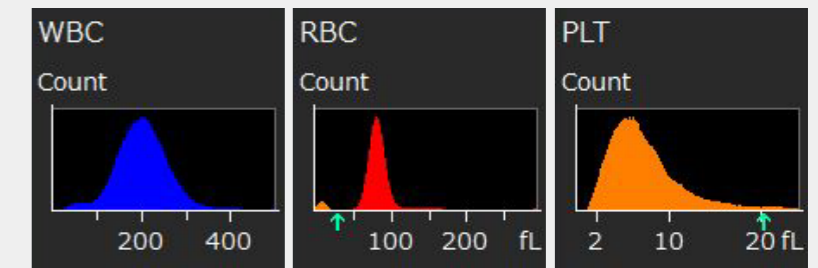
Size — Complexity

Size — Granularity

Size — Granularity

Histograms

WBC — Count — 200 400

RBC — Count — 100 200 fL

PLT — Count — 2 10 20 fL

Flags

Morphological Flags	Numerical Flags
Blast	Leukocytosis
Immature Granulocyte	Neutrophilia
Left Shift	Lymphopenia
Atypical Ly	
Ly-Mo Interference	

Explanation of case

A complete blood count revealed an elevated number of white blood cells. A visual white blood cell differential count showed elevated neutrophil levels with left shift, with 2.0 % metamyelocytes, 43.0 % band neutrophils, and 53.0 % segmented neutrophils. This is considered to have been due to the administration of G-CSF during chemotherapy. Smear samples indicated echinocytes. Could this have been due to the infusion? Many band neutrophils with some vacuoles were observed, but no toxic granules or Döhle bodies were identified.

Explanation of scattergram / histogram

Many plots appear in the neutrophil area (○) on the MAIN scattergram, suggesting neutrophilia. A "neutrophilia" flag is displayed to indicate this. Additionally, in the NE-EO scattergram, the neutrophil plot shows a distribution that extends to the top (○), and the "immature Gr" and "left shift" flags are displayed, suggesting the appearance of immature granulocytes and an increase in band neutrophils.
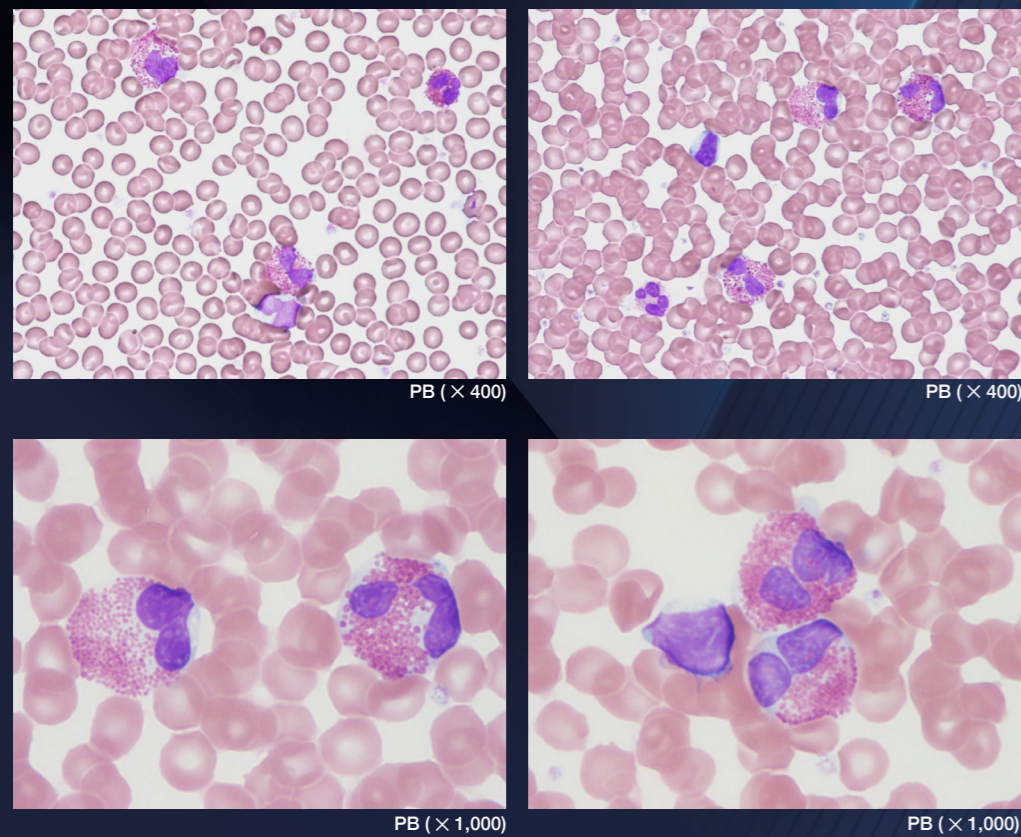
■ Data provision and supervision, Department of Clinical Laboratory, The University of Tokyo Hospital
Masahiro Jona

Case 2

Eosinophilia

A woman in her 50s visited the hospital for atopic dermatitis.

Blood smear (May-Giemsa staining)

PB (× 400)

PB (× 400)

PB (× 1,000)

PB (× 1,000)

Visual differential counts

Blast	0.0
Promyelo	0.0
Myelo	0.0
Meta	0.0
Band	0.0
Seg	24.0
Eosino	43.0
Baso	2.0
Mono	4.0
Lympho	27.0
At-Ly	0.0
NRBC	0.0
Other	0.0

Celltac Data

Numerical results

WBC	10.65	H	$10^3/\mu L$
RBC	4.19		$10^6/\mu L$
HGB	13.03		g/dL
HCT	37.7		%
MCV	90.0		fL
MCH	31.1		pg
MCHC	34.6		g/dL
RDW-CV	12.2		%
RDW-SD	43.9		fL
PLT	333.5		$10^3/\mu L$
PCT	0.32		%
MPV	9.5		fL
PDW	17.1		%
P-LCR	51.5		%
P-LCC	171.8	H	$10^3/\mu L$
NE	2.49	*	$10^3/\mu L$
LY	2.56		$10^3/\mu L$
MO	0.40		$10^3/\mu L$
EO	5.12	*	$10^3/\mu L$
BA	0.08		$10^3/\mu L$
NE%	23.37	*	%
LY%	24.05		%
MO%	3.74		%
EO%	48.08	*	%
BA%	0.76		%
RET	0.0335		$10^6/\mu L$
RET%	0.80		%
IRF	6.4		%
LFR	93.6		%
MFR	5.1		%
HFR	1.3		%

Flags

Morphological Flags	Numerical Flags
Ne-Eo Interference	Eosinophilia

Scattergrams

Size — Complexity

Size — Granularity

Size — Granularity

Histograms

WBC — Count — 200 400

RBC — Count — 100 200 fL

PLT — Count — 2 10 20 fL

RET Scattergrams

RNP FL525/FSC — FL650/FSC

FL525 Scattergram FSC — FL525

FL650 Scattergram FSC — FL650

Explanation of case

A complete blood count revealed an elevated number of white blood cells. A visual white blood cell differential count indicated 43.0 % eosinophils. No other abnormal findings were observed. Gene mutations related to eosinophilia, such as BCR::ABL, PDGFRA, PDGFRB, and FGFR1, were negative. Hence, eosinophilia due to atopic dermatitis, were considered. Smear samples showed an increase in mature eosinophils, which were approximately 16 µm in size and twice the size of the red blood cells.
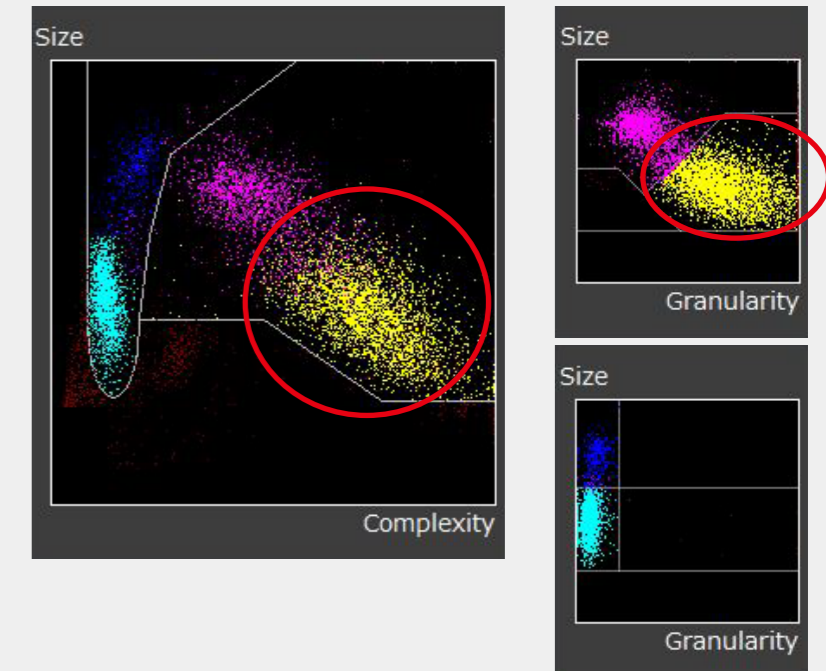
Explanation of scattergram / histogram

Many eosinophil plots can be observed in the MAIN scattergram and NE-EO scattergram, suggesting eosinophilia (○). A "eosinophilia" flag is displayed to indicate this.

■ Data provision and supervision, Department of Clinical Laboratory, The University of Tokyo Hospital
Masahiro Jona

Case 3

Basophilia

A woman in her 50s undergoing follow-up observation for polycythemia vera (*JAK2* V617F positive) without treatment.

Blood smear (May-Giemsa staining)

PB (×400)

PB (×400)

PB (×1,000)

PB (×1,000)
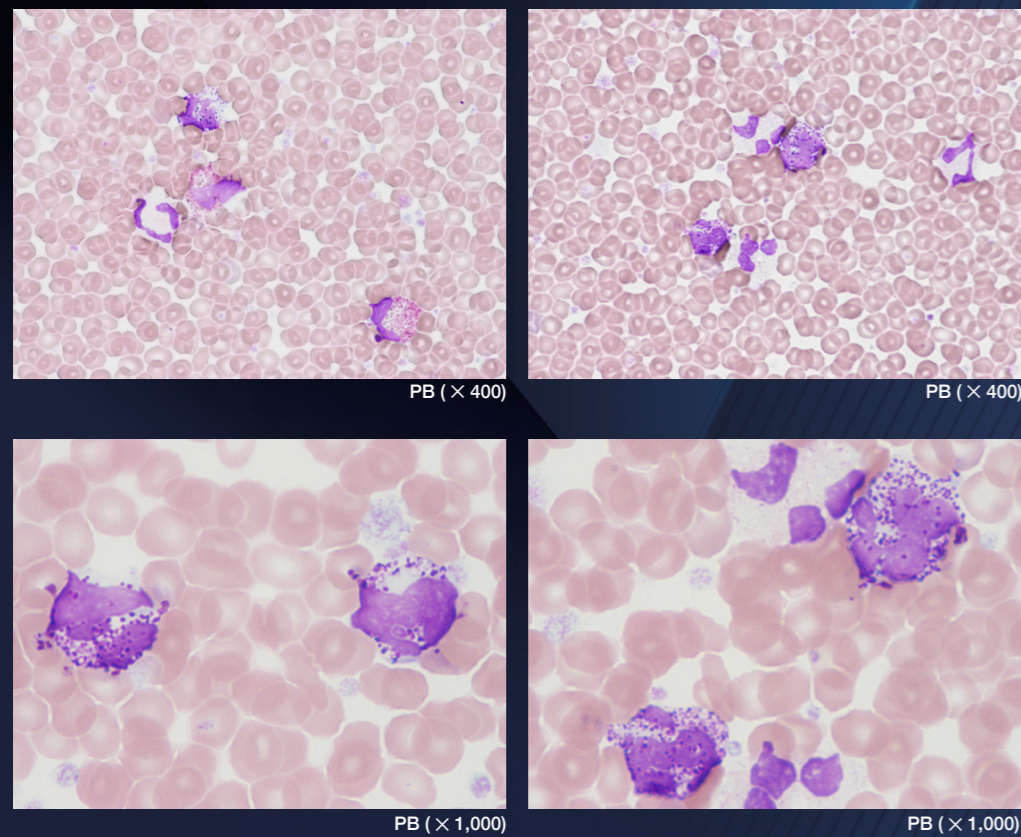
Visual differential counts

Blast	0.0
Promyelo	0.0
Myelo	0.0
Meta	0.0
Band	1.5
Seg	81.5
Eosino	5.5
Baso	3.0
Mono	1.5
Lympho	7.0
At-Ly	0.0
NRBC	0.0
Other	0.0

Celltac Data

Numerical results

WBC	34.07	H	$10^3/\mu L$
RBC	7.41	H	$10^6/\mu L$
HGB	15.03		g/dL
HCT	49.0		%
MCV	66.1	L	fL
MCH	20.3	L	pg
MCHC	30.7	L	g/dL
RDW-CV	17.6	H	%
RDW-SD	46.5		fL
PLT	849.9	H	$10^3/\mu L$
PCT	0.71	H	%
MPV	8.4		fL
PDW	20.1	H	%
P-LCR	38.8		%
P-LCC	329.8	H	$10^3/\mu L$
NE	25.47	*	$10^3/\mu L$
LY	2.75	*	$10^3/\mu L$
MO	1.50	*	$10^3/\mu L$
EO	3.11	*	$10^3/\mu L$
BA	1.24	*	$10^3/\mu L$
NE%	74.73	*	%
LY%	8.08	*	%
MO%	4.41	*	%
EO%	9.14	*	%
BA%	3.64	*	%
RET	0.1252		$10^6/\mu L$
RET%	1.69		%
IRF	14.1		%
LFR	85.9	L	%
MFR	9.2		%
HFR	4.9	H	%

Flags

Morphological Flags	Numerical Flags
Blast	Leukocytosis
Immature Granulocyte	Neutrophilia
Left Shift	Monocytosis
Ne-Eo Interference	Eosinophilia
	Basophilia
	Erythrocytosis
	Microcytosis
	Thrombocytosis

Scattergrams

Size / Complexity

Size / Granularity

Size / Granularity

Histograms

WBC Count — 200 400

RBC Count — 100 200 fL

PLT Count — 2 10 20 fL

RET Scattergrams

RNP FL525/FSC — FL650/FSC

FL525 Scattergram FSC — FL525

FL650 Scattergram FSC — FL650

Explanation of case

A complete blood count revealed an elevated number of white blood cells, red blood cells, and platelets. A visual white blood cell differential count showed an increase in basophils to 3.0 %. This was considered to be due to the disease. Smear samples indicated an increase in mature basophils. Basophil granules are water-soluble, so some basophils have fewer granules. Observations of scattered large platelets were made.
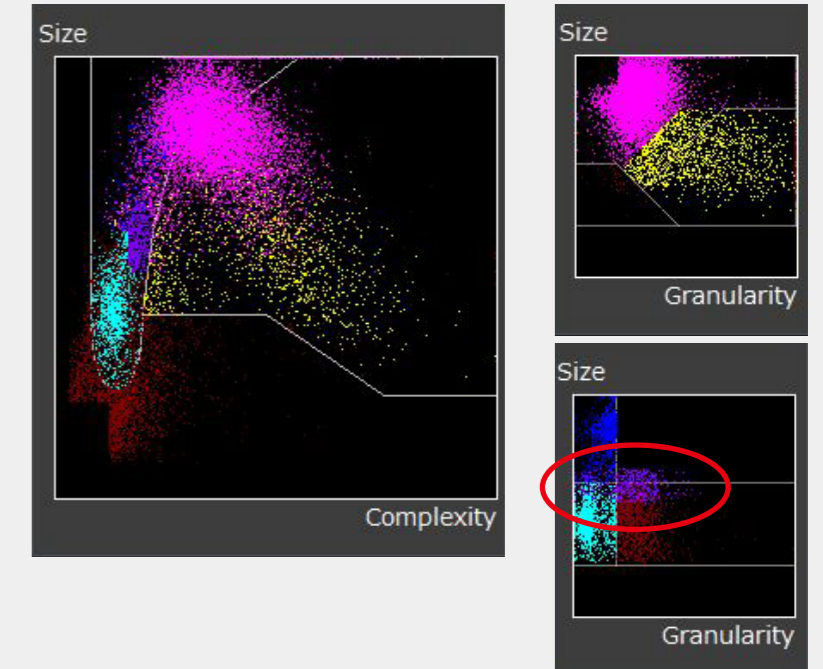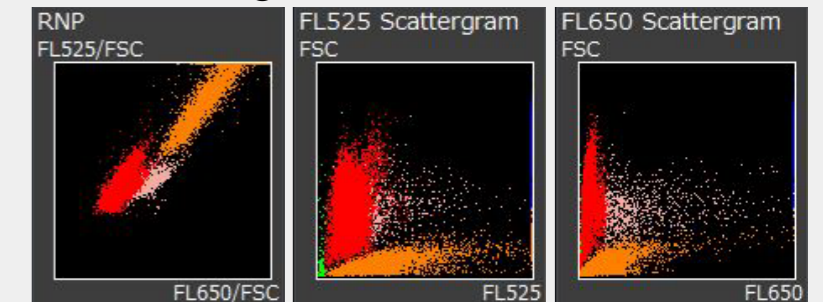
## Explanation of scattergram / histogram

Many plots observed in the basophil region (○) on the MO-BA scattergram, suggesting basophilia. A "basophilia" flag is displayed to indicate this.

Case 4

AML, myelodysplasia related(AML-MR)

A woman in her 70s visited the hospital with essential thrombocythemia (*CALR* mutation positive). HU (hydroxyurea) was prescribed, and 10 years later, blast cells were observed.
A diagnosis of MDS-IB1 was made, together with follow-up observations.

Blood smear (May-Giemsa staining)

PB (×400)

PB (×400)

PB (×1,000)

PB (×1,000)

PB (×1,000)

PB (×1,000)
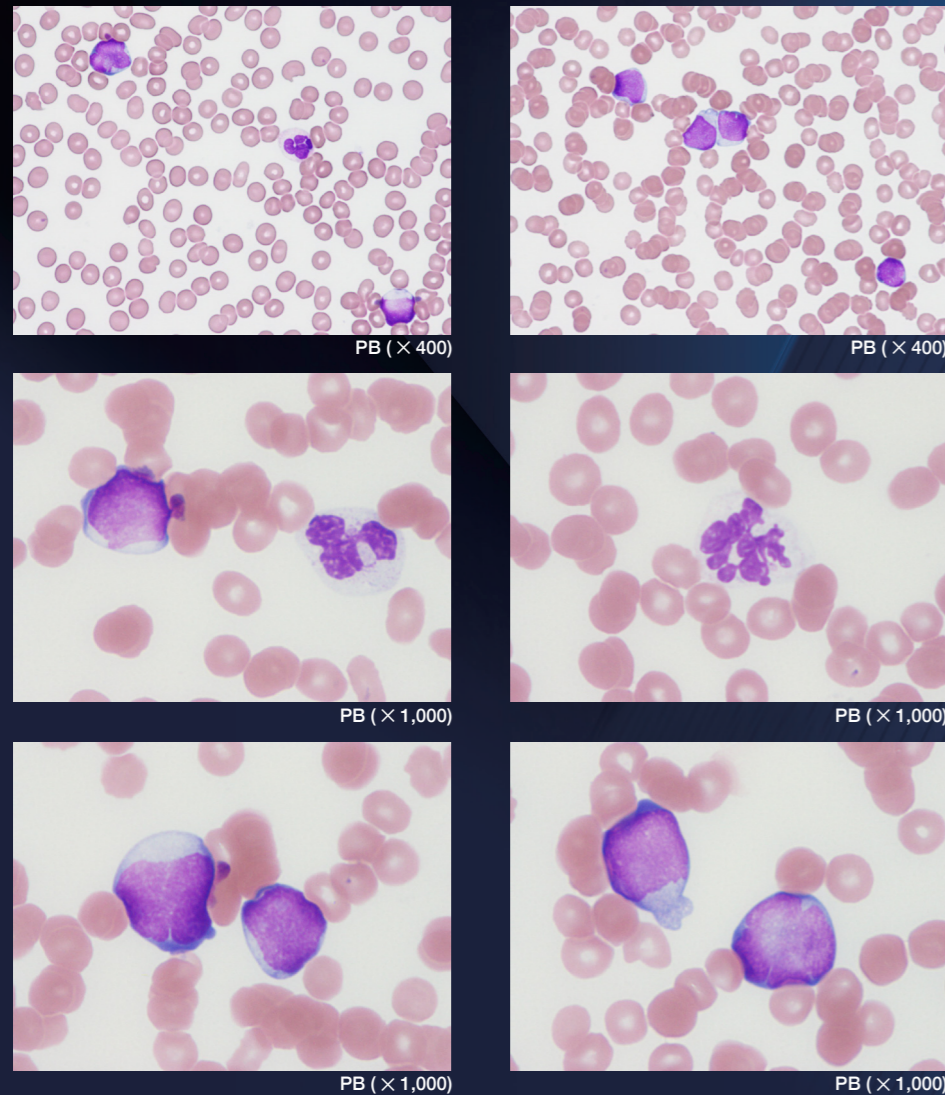
Visual differential counts

Blast	78.0
Promyelo	0.0
Myelo	0.0
Meta	1.0
Band	1.0
Seg	11.0
Eosino	0.0
Baso	0.0
Mono	1.0
Lympho	8.0
At-Ly	0.0
NRBC	0.0
Other	0.0

Celltac Data

Numerical results

WBC	11.60	H	$10^3/\mu L$
RBC	2.89	L	$10^6/\mu L$
HGB	8.65	L	g/dL
HCT	25.3	L	%
MCV	87.5		fL
MCH	29.9		pg
MCHC	34.2		g/dL
RDW-CV	12.8		%
RDW-SD	44.8		fL
PLT	20.7	*	$10^3/\mu L$
PCT	0.02	L	%
MPV	9.2		fL
PDW	20.4	H	%
P-LCR	50.4		%
P-LCC	10.4	L	$10^3/\mu L$
NE	0.80	*	$10^3/\mu L$
LY	4.89	*	$10^3/\mu L$
MO	5.33	*	$10^3/\mu L$
EO	0.00	*	$10^3/\mu L$
BA	0.58	*	$10^3/\mu L$
NE%	6.91	*	%
LY%	42.13	*	%
MO%	45.94	*	%
EO%	0.00	*	%
BA%	5.02	*	%
RET	0.0020	L	$10^6/\mu L$
RET%	0.07	L	%
IRF	14.3		%
LFR	85.7	L	%
MFR	14.3		%
HFR	0.0		%
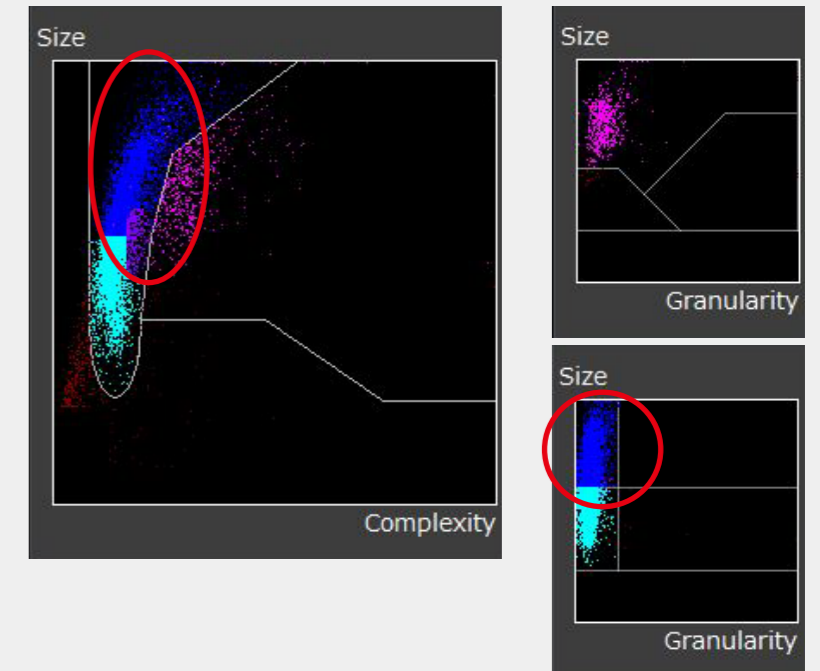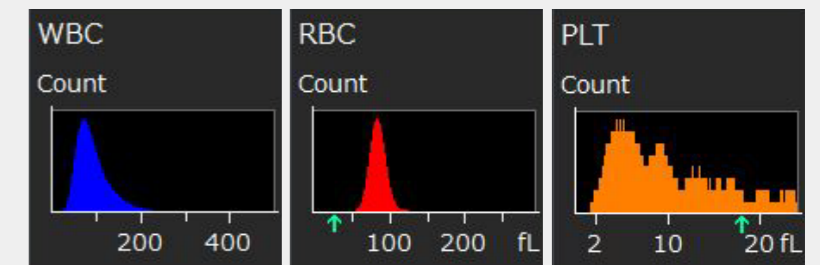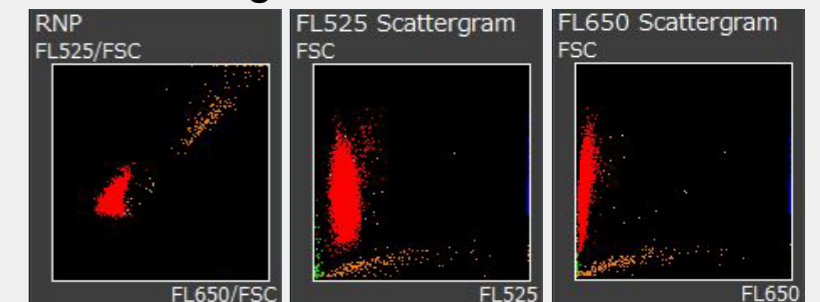
Flags

Morphological Flags	Numerical Flags
Blast	Neutropenia
Left Shift	Lymphocytosis
Atypical Ly	Monocytosis
Ly-Mo Interference	Basophilia
	Anemia
	Thrombocytopenia

Scattergrams

Size / Complexity

Size / Granularity

Size / Granularity

Histograms

WBC Count — 200 400

RBC Count — 100 200 fL

PLT Count — 2 10 20 fL

RET Scattergrams

RNP FL525/FSC — FL650/FSC

FL525 Scattergram FSC — FL525

FL650 Scattergram FSC — FL650

Explanation of case

A complete blood count revealed an elevated number of white blood cells, anemia, and thrombocytopenia. A visual white blood cell differential count revealed 78.0% blast cells. Dysplasia of degranulated neutrophils was also observed in the neutrophils. Due to the history of chemotherapy treatment, it was thought that the case involved a progression to treatment-related myeloid neoplasm (AML-MR). Smear samples showed a cell size of 15–20 μm, basophilic cytoplasm, delicate nuclear reticulum, nucleolus and blast cells with cleft nucleus. Degranulated neutrophils and hyper segmented neutrophils with degranulation were also observed.

Explanation of scattergram / histogram

Monocyte plots on the MAIN scattergram and MO-BA scattergram show an abnormal distribution extending to the top (O) and distributed even in the blast cell flag detection area, suggesting the appearance of blast cells. A "blast" flag is displayed to indicate this.

The reticulocyte plot is almost invisible in the RET scattergram, indicating a decrease in the number of reticulocytes.

■ Data provision and supervision, Department of Clinical Laboratory, The University of Tokyo Hospital
Masahiro Jona