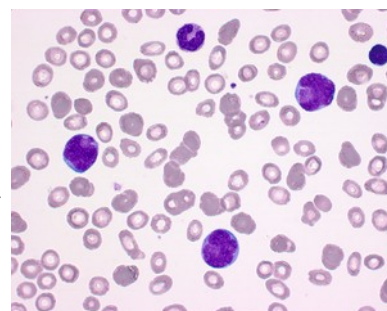


Case 8

A middle aged woman. She has been feeling weaker and more tired for two weeks. Her family doctor performed some lab test. and referred her to the hospital based on the results.



Parameter	Value	Abn	Reference interval
WBC	62.71 G/l	H	4–10 G/l
Neutrophil	%		40–70 %
Neutrophil (abs)	27.59 G/l	H	1.8–7.0 G/l
Lymphocyte	%		20–40 %
Monocyte	%		2–6 %
Eosinophil	%		0–5 %
Basophil	%		0–1 %
RBC	2.49 T/l	L	4.0–5.2 T/l
Hemoglobin	81 g/l	L	120–150 g/l
HCT	0.25	L	0.34–0.45
MCV	99.5 fl	H	80–99 fl
MCH	32.7 pg		27–34 pg
MCHC	328 g/l		315–360 g/l
RDW	18.3 %	H	11.5–15.0 %
Reticulocyte	1.0 %		0.5–2 %
Reticulocyte (abs)	25.0 G/l	L	30–100 G/l
PLT	77 G/l	L	150–400 G/l
MPV	12.1 fl		7.0–12.5 fl
Prothrombin	77 %		70–120 %
INR	1.13		0.85–1.20
aPTI	30.3 s		28–40 s
Fibrinogen	2.57 g/l		1.5–4.0 g/l
Glucose	5.8 mmol/l		4.1–5.9 mmol/l
Sodium	140 mmol/l		135–145 mmol/l
Potassium	3.8 mmol/l		3.5–5.1 mmol/l
BUN	5.5 mmol/l		3.5–7.0 mmol/l
Creatinine	70 µmol/l		40–130 µmol/l
eGFR	78.2 ml/min		> 60 ml/min
Se uric acid	565 µmol/l	H	150–400 µmol/l
Calcium	2.59 mmol/l		2.20–2.65 mmol/l
T. bilirubin	7.1 µmol/l		< 20 µmol/l
GOT	23 U/l		< 50 U/l
GPT	17 U/l		< 50 U/l
ALP	89 U/l		< 120 U/l
LDH	638 U/l	H	< 170 U/l
CRP	0.92 mg/l		< 8 mg/l

Peripheral blood flow cytometry:

There were 8% cells in the lymphoid gate. 3% in the monocytic. 30% in the granulocytic gate. 4% in the non-hemolysing erythroid and 52% in the blast gate on performing flow cytometry of the peripheral blood. The blast cells had low CD45. high CD33. medium CD117-HLA-DR-CD13. and partial CD34 expression. The ratio of cells with CD34-CD117 coexpression is 10%.

Bone marrow examination:

The bone marrow smears are hypercellular. There is an increased amount of blast cells with myeloid character in the smears. These blasts are 15–20 µm in size. they have round nuclei with a loose chromatin structure. with a narrow cytoplasmic rim of basophilic color. The blast cells are about 2/3 of all the cells. Additionally there are 5–10% more myeloid cells (mature segments and various other intermediate stages of maturation). Erythropoiesis is significantly suppressed. The megakaryocytes have typical morphology. but their number is reduced..

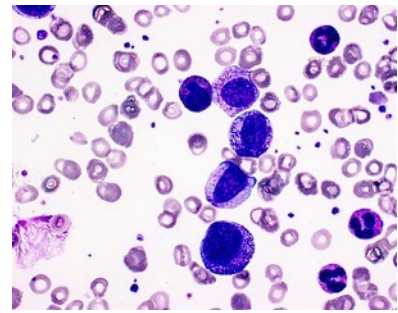
Flow cytometry: There were 3% cells in the lymphoid gate. 2% in the monocytic and 20% in the granulocytic gate on performing flow cytometry of the bone marrow. 68 % of the cells appeared in the blast gate. The blast cells had low CD45. high CD33. medium CD117 and partial CD34-HLA-DR expression.

Cytogenetics-bands: Analyzing the chromosomes in metaphase a translocation between chromosomes X and 11 was identified as a structural abnormality.

FISH: Using a CEPX/Y.MLL BAR probe on chromosomes in metaphase. one of the MLL signal (11q23) is localized on the X chromosome.

Case 9

A 72 year-old-man lost 5 kg of body weight in 2 months. He complains of having a temperature and sweating. He looks pale. There is no lymphadenopathy, however, his spleen is 8 cm below the ribs.



Parameter	Value	Abn	Reference interval
WBC	166.2 G/l	H	4–10 G/l
RBC	2.23 T/l	L	4.5–5.9 T/l
Hemoglobin	69 g/l	L	135–170 g/l
HCT	0.21	L	0.39–0.52
MCV	93.3 fl		80–99 fl
MCH	30.8 pg		27–34 pg
MCHC	330 g/l		315–360 g/l
RDW	20.0 %	H	11.5–15.0 %
PLT	359 G/l		150–400 G/l
MPV	9.6 fl		7.0–12.5 fl
Prothrombin	65 %	L	75–125 %
INR	1.23	H	0.85–1.20
aPTI	32.1 s		28–40 s
Fibrinogen	3.08 g/l		1.5–4.0 g/l
Glucose	4.9 mmol/l		4.1–5.9 mmol/l
Sodium	135 mmol/l		135–146 mmol/l
Potassium	3.8 mmol/l		3.5–5.1 mmol/l
Creatinine	97 µmol/l		40–130 µmol/l
eGFR	71.9 ml/min		> 60 ml/min
Se uric acid	762 µmol/l	H	150–400 µmol/l
T. bilirubin	12.1 µmol/l		< 20 µmol/l
GOT	13 U/l		< 50 U/l
GPT	7 U/l		< 50 U/l
ALP	138 U/l	H	< 120 U/l
LDH	628 U/l	H	< 170 U/l
CRP	7.25 mg/l		< 8 mg/l

Histology: The bone biopsy specimen contains about 10 marrow spaces, each having a cellularity of cca. 60%. The majority of the cells are relatively mature stages of the granulocytic series. There are relatively fewer cells belonging to the erythroid line, mostly normoblasts. There are fewer than normal megakaryocytes, with various, mostly typical morphology.

Cytology: The majority of the cells belong to the fully differentiating granulocytic series in the bone marrow. The blast ratio is 1%. There is an increased number of hypogranular cells in the intermediate stages. The mature cells have a slightly dysplastic morphology, however, the differentiation is complete. The ratio of erythroid cells is less than 5%.

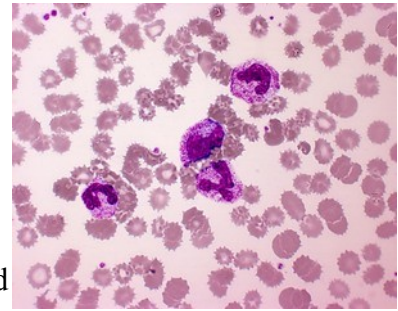
Flow cytometry: The distribution of the bone marrow cells is normal, no cells appeared in the blast gate.

Cytogenetics: Typical Philadelphia chromosomes were identified in the chromosomes analysed in metaphase.

Molecular genetics: The expression level of the major BCR-ABL1 fusion gene is >100 % in the specimen examined.

Case 10

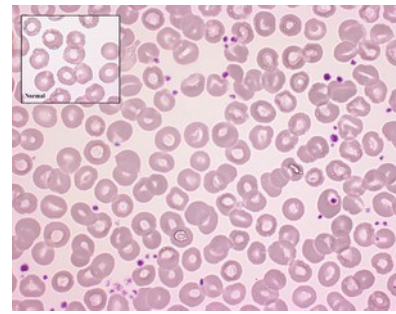
An 85-year-old woman has been treated with several antibiotics due to a respiratory infection for the last few weeks. She is having a diarrhea as well, that is getting gradually worse and worse. She has watery, greenish and mucous stools. At the time of admission she is in a severe condition due to her fever, abdominal pain and meteorism. Clostridium difficile antigen and toxin are positive in her fecal sample.



Parameter	Value	Abn	Reference interval
WBC	50.09 G/l	H	4–10 G/l
Neutrophil	94.3 %	H	40–70 %
Neutrophil (abs)	47.22 G/l	H	1.8–7.0 %
Lymphocyte	1.8 %	L	20–40 %
Monocyte	3.7 %		2–6 %
Eosinophil	0.1 %		0–5 %
Basophil	0.1 %		0–1 %
RBC	4.35 T/l		4.0–5.2 T/l
Hemoglobin	123 g/l		120–150 g/l
HCT	0.36		0.34–0.45
MCV	83.7 fl		80–99 fl
MCH	28.3 pg		27–34 pg
MCHC	338 g/l		315–360 g/l
RDW	15.0 %		11.5–15.0 %
PLT	401 G/l	H	150–400 G/l
MPV	10.6 fl		7.0–12.5 fl
CRP	347.80 mg/l	H	< 8 mg/l
Procalcitonin	13.90 µg/l	H	< 0.50 µg/l

Case 11

A 56-year-old woman is referred to the hospital by the family doctor due to having “too thick blood”. She is a heavy smoker. She has a plethoric complexion and acrocyanosis. Her spleen is 6 cm below the ribs. SatO₂: 95%



Parameter	Value	Abn	Reference interval
WBC	23.43 G/l	H	4–10 G/l
Neutrophil	91.5 %	H	40–70 %
Neutrophil (abs)	21.42 G/l	H	1.8–7.0 G/l
Lymphocyte	6.7 %	L	20–40 %
Monocyte	1.5 %	L	2–6 %
Eosinophil	0.1 %		0–5 %
Basophil	0.2 %		0–2 %
RBC	7.98 T/l	H	4.0–5.2 T/l
Hemoglobin	235 g/l	H	120–150 g/l
HCT	0.70	H	0.34–0.45
MCV	88 fl		80–99 fl
MCH	29 pg		27–34 pg
MCHC	334 g/l		315–360 g/l
RDW	14.3 %		12–18 %
Reticulocyte	1.4 %		0.5–2 %
Reticulocyte (abs)	110.8 G/l	H	30–100 G/l
PLT	947 G/l	H	150–400 G/l
MPV	9.6 fl		7.0–12.5 fl
LDH	657 U/l	H	< 170 U/l
Se uric acid	631 μmol/l	H	150–400 μmol/l
ESR	1 mm/h		< 20 mm/h

Case 12

A 69-year-old woman has been monitored at out hematologic ambulance for 3 years because of an accidentally discovered, abnormal CBC result. She has a negative cardiovascular anamnesis. She takes 100 mg aspirin daily.

Parameter	Value	Abn	Reference interval
WBC	7.37 G/l		4–10 G/l
Neutrophil	62.1 %		40–70 %
Neutrophil (abs)	4.58 G/l		1.8–7.0 G/l
Lymphocyte	27.3 %		20–40 %
Monocyte	8.6 %	H	2–6 %
Eosinophil	1.7 %		0–5 %
Basophil	0.3 %		0–1 %
RBC	4.83 T/l		4.0–5.2 T/l
Hemoglobin	138 g/l		120–150 g/l
HCT	0.42		0.34–0.45
MCV	87.2 fl		80–99 fl
MCH	28.5 pg		27–34 pg
MCHC	327 g/l		315–360 g/l
RDW	15.3 %	H	11.5–15.0 %
PLT	791 G/l	H	150–400 G/l
MPV	8.1 fl		7.0–12.5 fl
LDH	207 U/l	H	< 170 U/l
CRP	1.2 mg/l		< 8 mg/l