

CONTINUING MEDICAL EDUCATION ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

Hematology-Cell Morphology – Case 27

10% to 15% of acute lymphoblastic leukemia (ALL)

- Lymphoblast predominance most of which has a moderate quantity of cytoplasm and well visible nucleoli. They often assume the characteristics of an undifferentiated leukemia
- Mash of periodic acid-Schiff (PAS) positive material in the cytoplasm. In many cases there is acid phosphatase positive staining
- Cytogenetics: The same findings as in L1.

Increase of a different degree of white blood cells (WBC) (normal, increased or decreased in relation with the neutrophil severity and blasts passage in the peripheral blood), but the differential leukocyte type is abnormal: [Low neutrophil percentage (persistent neutropenia) and fluctuating (usually increased) blast percentage]. Normochromic, normocytic anemia with decreased reticulocytes number. Thrombocytopenia (in proportion with severity of bone marrow insufficiency).

Diagnosis may be easy (anemia + thrombocytopenia + leucocytosis with circulating blasts in the peripheral blood) or uncertain usually with the existence of bone marrow failure (e.g. isolated thrombocytopenia) without the presence of blast cells in the peripheral blood (diagnosis by bone marrow examination).

Myelogramme: Usually the bone marrow smears are hyper cellular, with a high bone marrow infiltration by blast cells of the same morphological features (50% to 90%) and a small percentage of erythroid, granulocytic and megakaryocytic series cells. It is necessary that the blasts in the bone marrow should surpass at a rate of 30% in order to establish a diagnosis of acute leukemia; the bone marrow smears are rarely poor (focal development of blasts or the presence of fibrosis which constitutes bone marrow biopsy necessary). The myelogram determines the cytological type of leukemia (morphology, histochemistry, immunophenotype of lymphoblasts) with synchronous genetic tests.

Morphologically the L1 type blasts are of the same size with a round or oval nucleus with coarse homogeneous chromatin appearance and regular network, containing one and rarely more non-well visible nucleoli and hyper basophilic a granular cytoplasm rarely with vacuoles formation (abnormal glucogen accumulation). In atypical cases, blasts may be of larger size with low nuclear/cytoplasmic ratio, of irregular shape or cleaved nucleus and absent or not well visible nucleoli (figures 1 to 14).

PAS staining: Increased amount of cytoplasmic glucogen content (large mash PAS positive around the nucleus), non-specific finding (ALL cases are similar with negative PAS reaction, many acute myeloid leukemia [AML] cases with PAS positive blasts). Together with the morphologic and immunological criteria, the characteristic PAS staining may be diagnostical. **Acid phosphatase staining:** T-blasts with cleaved nucleus present a polar positivity (Golgi apparatus area). In atypical lymphoblasts, with azurophilic granulation, the peroxidase (figures 15, and 16), specific esterase,

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J.V. Asimakopoulos,
L. Papageorgiou,
J. Drandakis,
I. Vasilopoulos,
D. Kopsaftopoulou,
A. Piperidou,
A. Machairas,
A. Georgopoulou,
A. Karapaschalidis,
M.A. Lefaki,
A. Liaskas,
C. Zerzi,
E. Plata,
P. Tsaftaridis,
M.P. Siakantaris,
T.P. Vassilakopoulos,
M.K. Angelopoulou,
J. Meletis

School of Medicine, National and
Kapodistrian University of Athens,
"Laiko" General Hospital, Athens, Greece

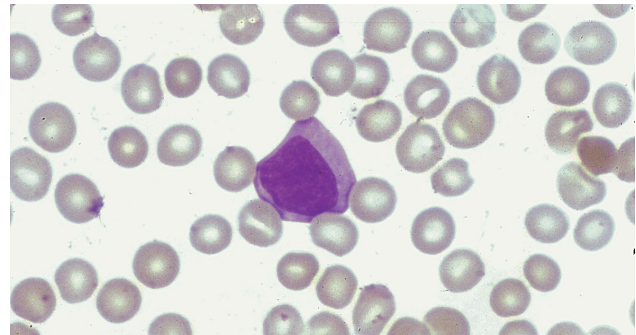


Figure 2

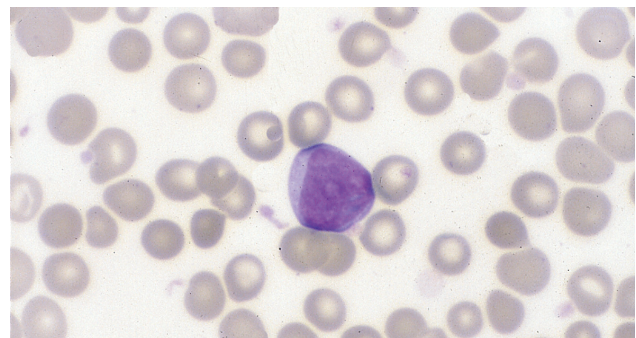


Figure 1

non-specific esterase and Sudan black B staining are negative (rare ALL cases presenting Sudan black B positive blasts).



Figure 3

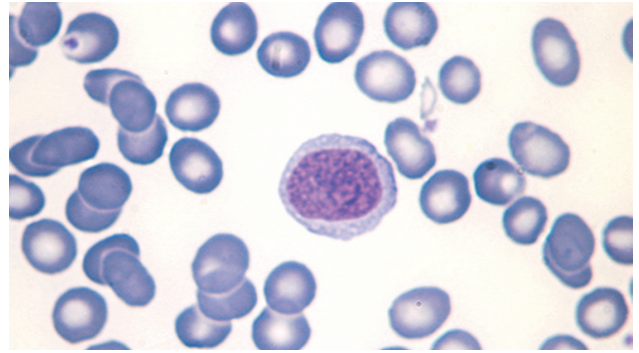


Figure 7

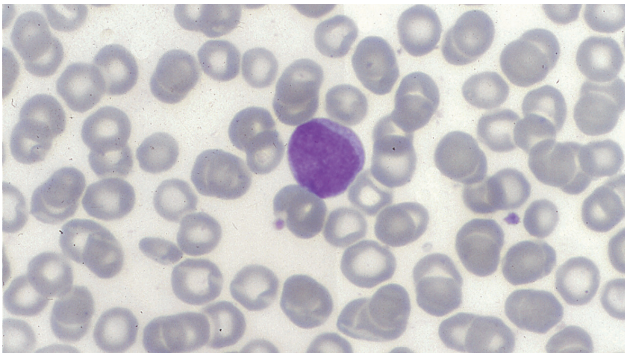


Figure 4

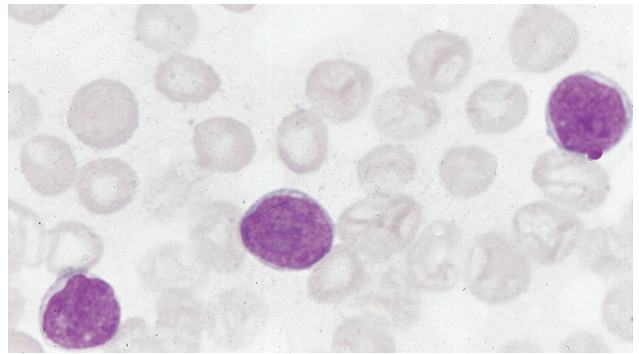


Figure 8

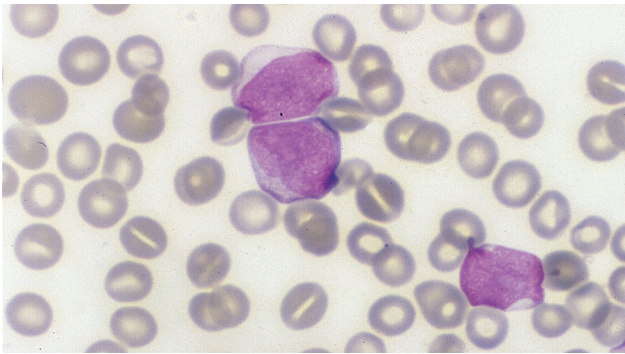


Figure 5

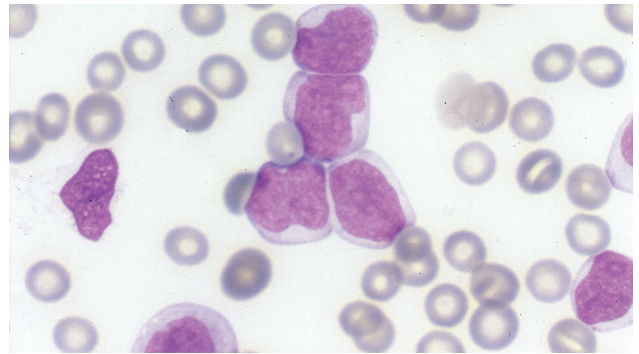


Figure 9

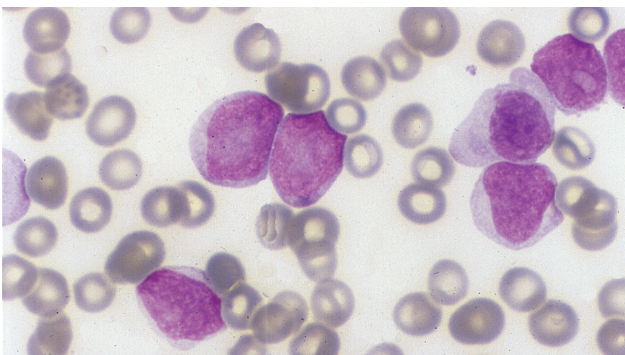


Figure 6

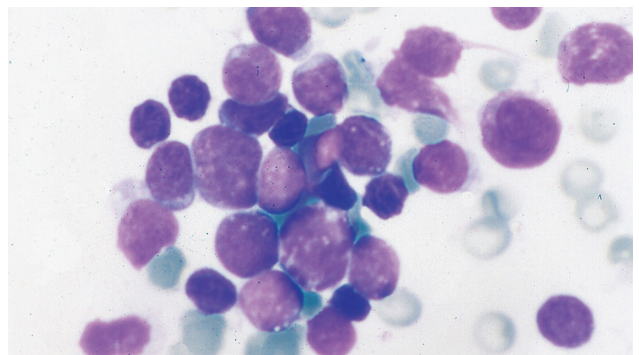


Figure 10

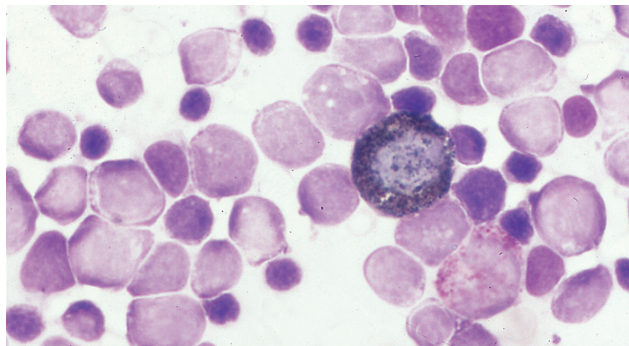


Figure 11

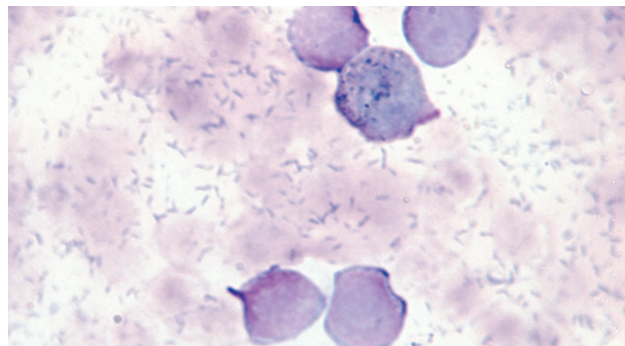


Figure 15

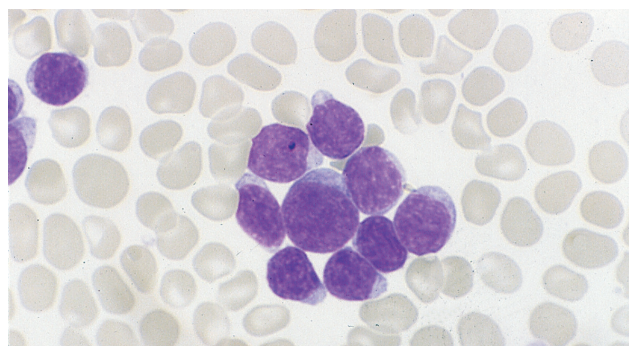


Figure 12

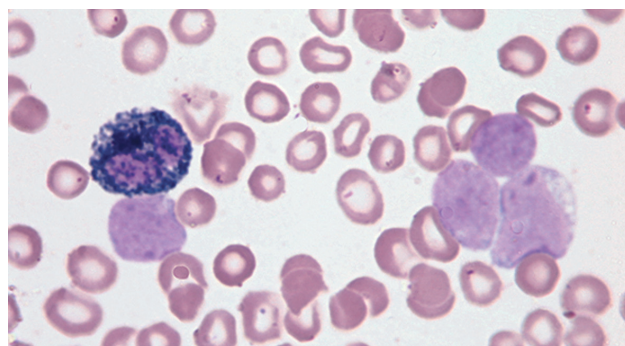


Figure 16

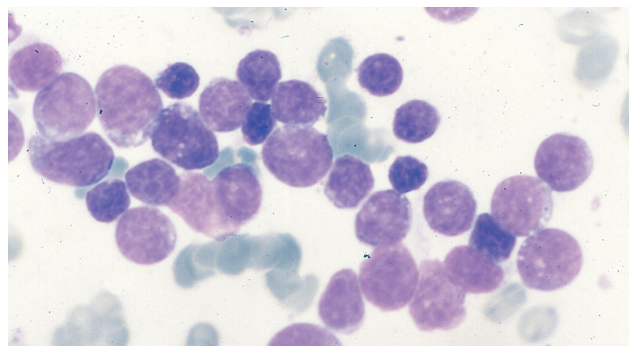


Figure 13

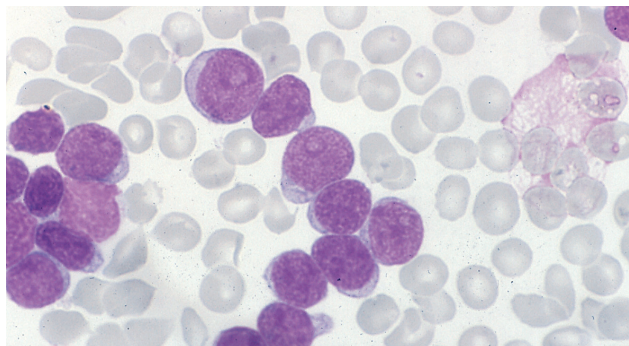


Figure 14

The L2 type blasts are larger than the L1, and of different size and shape with a low N/C ratio, coarse chromatin appearance, multiple, and well visible nucleoli, abundant with a fluctuating degree of basophilic a granular cytoplasm.

For the differentiation between L1 and L2 types the following blast characteristics in the bone marrow with the proportional scoring have been used:

- Nucleus/cytoplasmic ratio: High at least in 75% of cells +1, low at least in 25% of cells-1
- Nuclear outline: Irregular at least in 25% of cells-1
- Nucleoli characteristics: At least in 75% of cells no more than one small nucleolus+1, at least in 25% of cells one or more well visible nucleoli -1

Blast size: More than 50% of blasts having at least a double size of a small lymphocyte-1 score 0 to +2: L1, while score -1 to -4: L2.

References

1. MELETIS J. *Atlas of hematology*. 3rd ed. NireasPublInc, Athens, 2009:420–423, 428–434

Corresponding author:

J. Meletis, School of Medicine, National and Kapodistrian University of Athens, "Laiko" General Hospital, 115 27 Athens, Greece

e-mail: imeletis@med.uoa.gr

Cell type: Acute lymphoblastic leukemia (L1 type)

