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Amoeboid Movement Configuration and Mitotic Indices of Lymphoid Cells from Children with Acute Lymphoblastic Leukaemia

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Summary

Bone marrow smears from 21 untreated patients with ALL have been morphologically analysed. There was a positive correlation between the percentages of lymphoid cells with amoeboid movement configuration (AMC) and the mitotic indices. A high proportion of cells with AMC seems to indicate a more favourable prognosis in spite of differences in subsequent treatment. It is suggested that studies of the incidence of AMC may serve as a prognostic tool in ALL.

It is well documented that leukaemic blast cells have low mitotic indices (MI) and some recent investigations have shown that mitotic counts may give prognostic information in various forms of myeloid leukaemias (7, 8).

The aim of the present study was to describe the incidence of AMC in the lymphoid cells of the bone marrow smears from children with acute lymphoblastic leukaemia (ALL). Since it is rather laborious to calculate the MI in every single case of leukaemia, it may be justified to study the relation between AMC and MI, i.e. to investigate if it is possible to replace MI determinations by a parameter easier to aquire. It is also shown that the incidence of AMC may give information of prognostic significance.

Material and Methods

The investigations described below were performed immediately after the first admission.

Patients

During 1968-73 21 consecutive patients, 9 girls and 12 boys, aged 1–15, were examined. WBC 1,400–280,000. Twelve patients had WBC below 20,000. None of the patients had received steroids or cytostatics. Afterwards the children were treated with antimetabolites, corticosteroids and vinca alkaloids in combination of irradiation of the neural axis if necessary. Seven of the patients are still alive.

Bone marrow examination. The bone marrow smears were stained with May-Grünwald-Giemsa. Through examination of 1,000 nucleated cells the percentages of lymphoid cells were determined. AMC was defined as a ratio long cell axis/short cell axis $\geqslant 2$. 1,000 lymphoid cells were counted in each proband.

By counting 3.910–26,080 lymphoid cells the mitotic indices were calculated.

Statistics

Non-parametric statistics were used. The results are given as median and interquartile range. The Fisher exact probability test was used to assert significance of the results. The Spearman rank correlation test was corrected for ties.

Results

The lymphoid cells comprised 84–99% of all nucleated cells.

The median proportion of AMC was 7.8% (Q_1–Q_3 4.3–11.8) and the median MI was 0.47% (Q_1–Q_3 0.29–0.73).

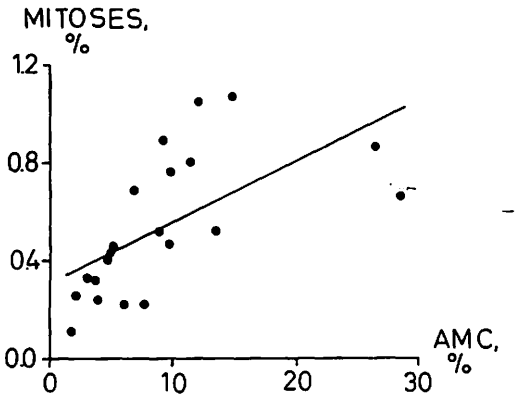

Fig. 1 The correlation between incidence of amoeboid movement configuration (AMC) and the mitotic index at the time of diagnosis in 21 patients with ALL, $y = 0.025x + 0.31$, $r_S = 0.79$, $p < 0.001$.

The AMC were correlated to the MI: $r_S = 0.79$, $p < 0.001$ (Fig. 1).

Only 3 out of 11 patients (27%) with AMC values below or equal to the median were alive two years after the diagnosis. In contrast 8 out of 10 patients with AMC values above the median have survived for more than two years. The difference is significant, $p < 0.05$.

If the AMC values are combined with data of the WBC, which are known to be of prognostic significance in acute leukaemias, the following results are obtained: None out of 6 patients with low AMC values combined with WBC values above 20,000 survived for more than 20 months. In contrast all out of 7 patients with high AMC values combined with WBC values below 20,000 were alive for at least 32 months. This difference is significant $p < 0.01$.

Discussion

It is desirable to get prognostic information as early as possible during the course of ALL. Thus cytologic studies have revealed at least 4 subgroups with different prognosis (2, 3). It is also wellknown that cases of ALL with chromosomal abnormalities have shorter survival times than patients with normal karyotypes (2). However no correlation between cytologic sub-classification and chromosome abnormalities has been established (2). Studies of the kinetic behaviour of human leukaemic cells with ^{3}H-thymidine labelling and calculations of MI have been fruitful in order to establish treatment schedules (1). There is a good correlation between the labelling indices and MI as expressions of the proliferative activity of the lymphoblasts in ALL (6). Neither cytologic studies nor calculations of the blast cell kinetics seem to be useful as routine procedures however.

In this paper there is a good correlation between AMC and MI. Only hypothesis for this relation can be made. The cells with AMC are actually moving (4, 5) and it is possible that these cells are in a stage immediately preceding the mitotic phase in the cell cyclus of the non-resting leukaemic blasts. There are only 21 ALL patients in this material so the prognostic conclusions ought to be temperate. The therapeutic attitude seem to have become more aggressive during the observation period but in spite of minor differences in treatment of the children some interesting results have been obtained. Thus determinations of AMC seem to give a prompt estimation of the mitotic activity of the leukaemic cells and high proportions of AMC cells in the bone marrow of ALL patients with normal WBC counts may be a favourable prognostic sign.

References

1 *Clarkson, B., A. Todo, M. Ogawa, T. Gee, J. Fried:* Consideration of the cell cycle in chemotherapy of acute leukemia. Recent Results in Cancer Research N. 36 – Springer Verlag, Berlin 1971

2 *Kessous, A., J. Corberand, A. Robert, P. Colombies:* Caracteres cytogenetiques des leucemies aigues de l'enfant. Lyon Medical 233 (1975) 253

3 *Mathé, G., Pouillart, M. Sterescu, J.L. Amiel, L. Schwarzenberg, M. Schneider, M. Hayat, F. de Vassal, C. Jasmin, M. Lafleur:* Subdivision of classical varieties of acute leukemia: correlation with prognosis and cure expectancy. Eur. J. Clin. Biol. Res. 16 (1971) 554

4 *Norberg, B., L. Rydgren, M. Stenstam:* Amoeboid movement configuration. A cell configuration

observed in tumor cells from 3 cases of bone marrow neoplasia. Scand. J. Haemat. 13 (1974) 294

5 *Norberg, B., L. Rydgren, N. Söderström:* Lymphocyte locomotion. Morphological criteria of the direction of lymphocyte movement. Lymphology 6 (1973) 187

6 *Saunders, E.F., B.C. Lampkin, A.M. Mauer:* Variation of proliferative activity in leukemic cell populations of patients with acute leukemia. J. Clin. Invest. 46 (1967) 1356

7 *Sjögren U.:* Prognostic values of mitotic studies in myeloid leukaemias. Acta med. scand. 199 (1976) 289

8 *Sjögren, U., L. Brandt, F. Mitelman:* Relation between life expectancy and composition of the bone marrow at diagnosis of chronic myeloid leukaemia. Scand. J. Haemat. 12 (1974) 369

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