Abnormalities of chromosome no. 1 related to blood dyscrasias: study of 10 cases.

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Abstract

Partial excess of chromosome 1 (q25-q32) was noted in malignant cells from all of 10 patients who had disorders such as non-African Burkitt’s lymphoma, adult T-cell leukemia, myelofibrosis, malignant lymphoma, chronic lymphocytic leukemia or chronic myelocytic leukemia in blast crisis. The break points on chromosome 1 were at centromere, q12, q21, q23, q25 and q32. Variations in the specific region of the long arm of chromosome 1, q25-q32, were thought to be important in the evolution of malignant cell proliferation.

KEYWORDS: chromosome no. 1, malignant lymphoma, leukemia, chromosome aberration.
ABNORMALITIES OF CHROMOSOME NO. 1 RELATED TO BLOOD DYSCRASIAS: STUDY OF 10 CASES

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Key words: chromosome no. 1, malignant lymphoma, leukemia, chromosome aberration.

Chromosomal abnormalities are occasionally found in human malignant tumors. When a nonrandom chromosomal abnormality is present, it may be useful in cancer research, such as the Philadelphia chromosome (Ph1) in chronic myelocytic leukemia. Nonrandom abnormalities of chromosome 1 have been reported mainly in myeloid cells in hematologic disorders (1, 2), and in uterine (3) and testicular cancers (4). The present report shows nonrandom, partial excess of the chromosome 1q in major lymphoproliferative disorders.

MATERIALS AND METHODS

Cell lines and primary cells derived from patients with hematologic disorders were studied by chromosome banding techniques. Ten cases with chromosomal abnormality affecting chromosome 1q were found in 25 cases examined during the period from January 1979 to December 1980. The hematologic disorders included two cases of non-African Burkitt’s lymphoma, two adult T-cell leukemia, one myelofibrosis, one chronic lymphocytic leukemia, one malignant lymphoma primarily in the brain and three chronic myelocytic leukemia in blastic crisis (Table 1). Cell lines of cases 1 and 7 were kindly provided by Dr. I. Miyoshi of the Department of Internal Medicine, Okayama University Medical School. Chromosome preparations were made by the air-dry method. Q- and G-banding methods (5, 6) were used for chromosome analysis. Identification of chromosomes and banded numbers was based on the nomenclature adopted at the Paris Conference (7).
RESULTS

Cytogenetic studies on 25 cases of hematologic disorders showed aberrations leading to partial excess of the long arm of chromosome 1 in 10 cases. The remaining 15 cases mainly involving acute lymphocytic leukemia had no aberrations of chromosome 1q, but showed random chromosomal aberrations. The partial karyotype of the 10 cases showing an excess of the long arm of chromosome 1 is given in Table 1. Two cases (Nos. 1 and 2) had reduplication of partial regions of the long arm of chromosome 1 (Fig. 1). Other two cases (Nos. 4 and 8) had an additional chromosome 1q. The remaining six cases (Nos. 3, 5, 6, 7, 9 and 10) had translocation affecting chromosome 1q. The region consisting of partial excess in each case is represented by a vertical line in Fig. 2. The bands 1q25-q32 were found to be common excess regions in all the cases. The break points on chromosome 1 were at centromere, q12, q21, q23, q25 and q32. The precise karyotypes of seven cases (Nos. 2, 3, 4, 7, 8, 9 and 10) have been reported in

<table>
<thead>
<tr>
<th>Case no.</th>
<th>Age/Sex</th>
<th>Material (Site of origin)</th>
<th>Diagnosis</th>
<th>Partial karyotypes</th>
<th>Ref. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6/M</td>
<td>Cell line (Ascites)</td>
<td>Burkitt's lymphoma</td>
<td>dir dup (1q) (pter-q32 : q12-q32 : q32-qter)/dir redup (1q) (pter-q32 : q12-q32 : q32-qter)</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>52/M</td>
<td>Primary (Jaw tumor and BM)</td>
<td>Burkitt's lymphoma</td>
<td>2dir dup (1q) (q21-q32)</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>45/M</td>
<td>Primary (PB)</td>
<td>ATL</td>
<td>−4, +der(4)t (1;4) (q25;p14 or 15)</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>29/M</td>
<td>Primary (PB)</td>
<td>ATL</td>
<td>+1q</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>53/M</td>
<td>Primary (PB)</td>
<td>Myelofibrosis</td>
<td>−12, +der(12)t (1;12) (q11;q24)</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>46/M</td>
<td>Primary (LN)</td>
<td>CLL</td>
<td>1q− , t (1;10) (q11;p15?), −12, +der(12)t (1;12) (q11;p12)</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td>22/M</td>
<td>Cell line (Brain tumor)</td>
<td>Malignant</td>
<td>−11, +der(11)t (1;11) (q23;q23)</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>77/M</td>
<td>Primary (BM)</td>
<td>CML (Blastic crisis)</td>
<td>+i (1q)</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>69/F</td>
<td>Primary (BM)</td>
<td>CML* (Blastic crisis)</td>
<td>−4, +der(4)t (1;4) (q23;q31)</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>44/M</td>
<td>Primary (PB)</td>
<td>CML* (Blastic crisis)</td>
<td>−6, +der(6)t (1;6) (q25;q25)</td>
<td>11</td>
</tr>
</tbody>
</table>

ATL: adult T-cell leukemia; CLL: chronic lymphocytic leukemia; CML: chronic myelocytic leukemia; PB: peripheral blood; BM: bone marrow; LN: lymph node.
*Terminated in lymphoblastic crisis.
other papers (8-11). A detailed report on karyotypes of the remaining three cases (Nos. 1, 5 and 6) will appear elsewhere.

Fig. 1. Abnormalities of the long arm of chromosome 1 in 10 cases (case Nos. 1 to 10). The case 1a and b represents a mosaic state. The 1q- (left) of case 6 may be due to deletions of internal (q12-q24) and distal (q32-ter) bands. The “i” (right) of case 8 stands for isochromosome, and “t” translocation.
DISCUSSION

Rowley (1) described the specific region of the long arm of chromosome 1 (q25-q32) presenting trisomic state in myeloid cells from all of 34 patients with various hematological disorders including acute leukemia, polycythemia vera and myelofibrosis. Of the present 10 cases with partial excess of chromosome 1q, 2 cases (Nos. 2 and 8) showed partial tetrasomy of the specific region (q25-q32) of the long arm of chromosome 1, 7 cases showed partial trisomy and one case showed a mosaic of partial trisomy (No. 1b) and tetrasomy (No. 1a). The cases were largely of lymphoproliferative malignancies, because even the two out of three cases of chronic myelocytic leukemia terminated in lymphoblastic crisis as proved by cell characteristics such as cell surface marker, TdT activity or response to anti-cancer chemotherapy. These studies indicate that involvement of the region (q25-q32) of chromosome 1 in translocation or duplication is shown not only in myeloid cells but also in lymphoid cells. Structural abnormalities involving chromosome 1 have been reported in several human cancers, such as testicular (4), ovarian (12), breast (13) and colon cancers (14), and malignant melanoma (15).

The above findings support the idea of Rowley (1) that partial excess of chromosome 1, q25-q32, is one mechanism associated with increased malignant potential in hematologic malignancies and in solid tumors. In order to confirm
the presence of the specific region (1q25-q32), we are studying further lymphoproliferative disorders.

REFERENCES