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LETTER TO THE EDITOR

Trisomy 11: prevalence among 22 403 unique patient cytogenetic studies and clinical correlates

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Trisomy 11 is a rare cytogenetic abnormality and is yet reported to be one of the most frequent autosomal trisomies in acute myeloid leukemia (AML).[1] In a Cancer and Leukemia Group B study, isolated trisomy 11 was identified in 13 cases (0.9%) among 1496 consecutive adult patients with AML.[2] The majority of the patients with isolated trisomy 11 were older than 60 years and 46% achieved a complete remission after induction chemotherapy.[2] However, only one patient remained in first complete remission after undergoing allogeneic bone marrow transplantation. In a recent *Leukemia* paper, Wang *et al.*[3] identified 42 cases (0.008%) with trisomy 11 among ~5000 patients with myelodysplastic syndrome (MDS) or MDS with myeloproliferative features. Seventeen of the 42 patients (median age, 75 years) had trisomy 11 as a sole abnormality ($n=10$) or together with one or two additional abnormalities. Specific diagnoses in these 17 patients were refractory anemia with excess of blasts (RAEB)-2 in 8 patients, RAEB-1 in 5, refractory cytopenia with multilineage dysplasia in 1, therapy-related MDS in 1 and chronic myelomonocytic leukemia-2 in 1; bone marrow was not available for review in the remaining 1 patient. The authors compared their trisomy 11 MDS patients

Table 1 Cytogenetic, clinicopathological and outcome data in 19 patients with trisomy 11

Diagnosis at the time of trisomy 11 detection[a]	*Karyotype*	*Age (years)/sex*	*Previous exposure to chemotherapy or radiotherapy (interval between exposure and detection of trisomy 11)*	*Time from detection of trisomy 11 to last follow-up or death (months)*	*Status at last follow-up*
AML, n = 14					
AML with maturation	47,XY,+11[15]/46,XY[5]	67/M	None	19	Dead
AML with maturation	47,XY,+11[15]/46,XY[5]	75/M	Radiotherapy after cystectomy for transitional carcinoma of bladder (6 years)	12	Dead
AML with maturation	47,XX,+11[20]	66/F	None	13	Dead
AML with maturation	47,XY,+11[9]/46,XY[11]	76/M	None	5	Dead
AML with maturation	47,XX,+11[20]	77/F	Radiotherapy after total hysterectomy for endometrial stromal sarcoma (11 years)	3	Dead
AML with maturation	47,XX,+11[3]/48,XX,+11,+13[1]/46,XX[16]	68/F	None	5.5	Dead
AML with maturation	47,XY,+11[2]/46,XY,del(20)(q11.2)[1]/48,XY,+4,+8[1]/46,XY[26]	72/M	None	16	Dead
AML with maturation	47,XX,+11[11]/46,XX[9]	69/F	Therapy for breast cancer after mastectomy: adriamycin and cyclophosphamide (8 years)	2	Dead
AML with maturation	47,XY,+11[9]/46,XY[11]	64/M	None	18	Alive
Acute myelomonocytic leukemia	47,XY,+11[8]/46,XY[12]	58/M	None	14	NA
AML with maturation evolved from PMF	47,XX,+11[15]/46,XX[5]	78/F	Hydroxyurea for PMF (2 years)	2	Dead
Relapsed AML with maturation	47,XY,+11[17]/46,XY,del(9)(q13q22)[3]	74/M	Induction therapy: cytarabine, 6-thioguanine; maintenance therapy: cytarabine, vincristine, 6-thioguanine, daunorubicin, dexamethasone (14 years)	0.25	Dead
Relapsed AML with maturation	47,XX,+11[4]/46,XX[26]	51/F	Induction therapy: daunorubicin, cytarabine and 6-thioguanine; consolidation therapy: etoposide and cytarabine for 3 courses (2 years)	11	Dead
Relapsed AML with maturation	47,XX,+11[8]/46,XX[7]	74/F	Induction therapy: adriamycin and cytarabine (14 years)	3	Dead
MDS, n = 5					
RAEB-2	47,XY,+11,idic(Y)(q11.1)[6]/46,XY[14]	72/M	None	24	Dead
RAEB-2	47,XY,+11[20]	86/M	None	13	Dead
RAEB-2	47,XY,+11[3]/47,XY,+8[2]/46,XY[25]	65/M	None	16	Dead
RAEB-1	47,XY,+11[4]/47,XY,+9[2]/46,XY[24]	64/M	None	6	NA
RAEB-1	47,XY,+11[2]/46,XY,der(1)t(1;11)(p36.3;q13)[2]/46,XY[36]	68/M	None	12	Dead

Abbreviations: AML, acute myeloid leukemia; MDS, myelodysplastic syndrome; NA, not available; PMF, primary myelofibrosis; RAEB, refractory anemia with excess of blasts.
[a]According to 2008 WHO classification.

with historical controls and found their survival to be similar to that of high-risk MDS patients. Accordingly, they concluded that trisomy 11 should be considered a high-risk cytogenetic abnormality in MDS.

In the current study, we sought to clarify the prevalence of trisomy 11 in an unselected series of cytogenetic studies performed at the Mayo Clinic over the last 20 years and describe their clinical and pathological features. Between January 1988 and December 2008, unique patient cytogenetic studies were performed in 22 403 adults (age $\geqslant$18 years). Among them, we identified 19 patients ($\sim$0.08%) with abnormalities that included trisomy 11; WHO (World Health Organization)-defined[4] clinical diagnosis at the first sighting of trisomy 11 was AML in 14 patients and MDS in 5 (Table 1). Among the former, 10 cases constituted *de novo* AML and 4 constituted relapsed or secondary AML. Among the five MDS patients, three had RAEB-2 and two had RAEB-1. Trisomy 11 occurred as a sole abnormality in 10 patients with AML, but in only one patient with MDS (RAEB-2).

The median age at detection of trisomy 11 in AML was 71 years and in MDS was 67 years (range, 64–86). Median (range) values in AML included 8.7 g/100 ml (6.5–11.8) for hemoglobin, 6×10^9/l (1.2–123) for leukocytes and 96×10^9/l (12–444) for platelets. The corresponding values in MDS were 9.2 g/100 ml (8.1–11.3), 1.8×10^9/l (1.1–3.2) and 129×10^9/l (78–199), respectively. Approximately 50% of the AML patients were exposed to either cytotoxic or radiation therapy before the detection of trisomy 11 (Table 1). AML transformation was documented in one patient with RAEB-2 after 23 months of follow-up. In all the patients with relapsed AML and in one patient with post-myelofibrosis AML, trisomy 11 was not detected at the time of the initial diagnosis of AML or myelofibrosis. As outlined in Table 1, the overall outcome after detection of trisomy 11 was dismal although three AML patients achieved complete remission with induction chemotherapy. One patient with RAEB-2 was treated with 5-azacitidine for three cycles without response. The median survival after detection of trisomy 11 was 15 months for AML and 13 months for MDS.

The current study confirms the rarity of trisomy 11 and its association with high-risk myeloid malignancies, primarily AML. Despite our large series of over 22 000 unique patient cytogenetic studies, we identified only five patients with MDS and none belonged to the low or intermediate-1 risk category.[5] Furthermore, both our study and those of others indicate that patients with trisomy 11 are older and a substantial proportion has had previous exposure to chemotherapy or radiation treatment. These observations, combined with the fact that internal tandem duplication of the *MLL* and *FLT3* genes frequently accompany trisomy 11,[6] makes it difficult to assign an independent prognostic weight to trisomy 11. Therefore, although it is reasonable to conclude that trisomy 11 clusters with AML and higher-risk MDS, it is both scientifically inaccurate and practically extraneous to suggest its formal categorization as a 'poor' outcome karyotype in MDS.[3]

Conflict of interest

The authors declare no conflict of interest.

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