

Leukaemia Section

Mini Review

Monosomal karyotype (MK) in myeloid malignancies

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Published in Atlas Database: April 2011

Online updated version : <http://AtlasGeneticsOncology.org/Anomalies/MonoKaryoID1574.html>
DOI: 10.4267/2042/46038

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Identity

Note

Monosomal karyotype is defined as the presence of at least 2 autosomal monosomies or a single autosomal monosomy associated with at least one structural abnormality.

Clinics and pathology

Disease

Acute myeloid leukemia (AML), myelodysplastic syndrome (MDS), primary myelofibrosis (PMF)

Epidemiology

In AML, the frequency of monosomal karyotype increases with age: 4% in patients ≤ 30 years; 6-10% in patients ≤ 60 years and 13-20% above 60 years.

The frequency of MK cases is significantly higher in t-AML compared with de novo AML (24% vs 10%).

In MDS, MK frequency among patients with a complex karyotype is 83%. In children with advanced MDS MK frequency is 15%.

In PMF patients, MK is present in 42% of complex karyotype cases.

Clinics

Monosomal karyotype is associated with prior chemotherapy or history of abnormal blood counts (Estey, 2010).

Prognosis

Very poor prognosis, worse with advanced age.

In comparison with non-MK patients, AML, MDS and PMF patients with a monosomal karyotype have lower overall survival rates. In MDS and PMF, the risk of leukemic transformation is higher in MK patients than in patients with non-MK complex karyotypes.

In MK-AML, overall survival at 4 years after diagnosis is 3-4% (vs 26-27% for non-CBF, non-MK AML patients) and event-free survival 2%. Overall survival decreases with advancing age: 17-40% for patients ≤ 30 years, 3-4% ≤ 60 years and 1% in patients older than 60 years. Complete remission rate is generally low, and also worse in older groups (24-52% under 60 years and 13-34% in patients older than 60 years).

In adult MDS patients with MK, 2-year survival is 6% (vs 23% for complex karyotype without monosomies) and 1-year leukemia risk is 32% (vs 14% for complex karyotype without monosomies). In advanced childhood MDS, the presence of a MK does not seem to be an independent adverse prognostic factor.

In PMF, the median survival for MK patients is 6 months, 2-year survival rate is 17% and 2-year leukemic transformation rate is 29% (vs 24 months, 51% and 8,3% in complex karyotype without monosomies).

As with most prognostic factors, the significance of monosomal karyotype seems to depend on the treatment strategy (Itzykson et al., 2011; Löwenberg et al., 2011).

Cytogenetics

Note

Monosomal karyotype group does not include AML with t(15;17)(q22;q21) or CBF abnormalities (t(8;21)(q22;q22); inv(16)(p13q22)/t(16;16)(p13;q22)); monosomies of sex chromosomes (-X,-Y) are excluded due to apparent lack of negative prognostic effect.

Cytogenetics morphological

Two or more autosomal monosomies or one autosomal monosomy associated with at least one structural abnormality.

The most frequent autosomal monosomies in MK involve the chromosomes 7, 5, 17 and 18.

Genes involved and proteins

Note

Genes involved are unknown.

References

Breems DA, Van Putten WL, De Greef GE, Van Zelder-Bhola SL, Gerssen-Schoorl KB, Mellink CH, Nieuwint A, Jotterand M, Hagemeyer A, Beverloo HB, Löwenberg B. Monosomal karyotype in acute myeloid leukemia: a better indicator of poor prognosis than a complex karyotype. *J Clin Oncol*. 2008 Oct 10;26(29):4791-7

Estey E. High cytogenetic or molecular genetic risk acute myeloid leukemia. *Hematology Am Soc Hematol Educ Program*. 2010;2010:474-80

Göhring G, Michalova K, Beverloo HB, Betts D, Harbott J, Haas OA, Kerndrup G, Sainati L, Bergstraesser E, Hasle H, Stary J, Trebo M, van den Heuvel-Eibrink MM, Zecca M, van Wering ER, Fischer A, Noellke P, Strahm B, Locatelli F, Niemeyer CM, Schlegelberger B. Complex karyotype newly defined: the strongest prognostic factor in advanced childhood myelodysplastic syndrome. *Blood*. 2010 Nov 11;116(19):3766-9

Grimwade D, Hills RK, Moorman AV, Walker H, Chatters S, Goldstone AH, Wheatley K, Harrison CJ, Burnett AK.

Refinement of cytogenetic classification in acute myeloid leukemia: determination of prognostic significance of rare recurring chromosomal abnormalities among 5876 younger adult patients treated in the United Kingdom Medical Research Council trials. *Blood*. 2010 Jul 22;116(3):354-65

Medeiros BC, Othus M, Fang M, Roulston D, Appelbaum FR. Prognostic impact of monosomal karyotype in young adult and elderly acute myeloid leukemia: the Southwest Oncology Group (SWOG) experience. *Blood*. 2010 Sep 30;116(13):2224-8

Breems DA, Löwenberg B. Acute myeloid leukemia with monosomal karyotype at the far end of the unfavorable prognostic spectrum. *Haematologica*. 2011 Apr;96(4):491-3

Itzykson R, Thépot S, Eclache V, Quesnel B, Dreyfus F, Beyne-Rauzy O, Turlure P, Vey N, Recher C, Boehler S, Gardin C, Adès L, Fenaux P. Prognostic significance of monosomal karyotype in higher risk myelodysplastic syndrome treated with azacitidine. *Leukemia*. 2011 Jul;25(7):1207-9

Kayser S, Döhner K, Krauter J, Köhne CH, Horst HA, Held G, von Lilienfeld-Toal M, Wilhelm S, Kündgen A, Götze K, Rummel M, Nachbaur D, Schlegelberger B, Göhring G, Späth D, Morlok C, Zucknick M, Ganser A, Döhner H, Schlenk RF. The impact of therapy-related acute myeloid leukemia (AML) on outcome in 2853 adult patients with newly diagnosed AML. *Blood*. 2011 Feb 17;117(7):2137-45

Löwenberg B, Pabst T, Vellenga E, van Putten W, Schouten HC, Graux C, Ferrant A, Sonneveld P, Biemond BJ, Gratwohl A, de Greef GE, Verdonck LF, Schaafsma MR, Gregor M, Theobald M, Schanz U, Maertens J, Ossenkoppele GJ. Cytarabine dose for acute myeloid leukemia. *N Engl J Med*. 2011 Mar 17;364(11):1027-36

Patnaik MM, Hanson CA, Hodnefield JM, Knudson R, Van Dyke DL, Tefferi A. Monosomal karyotype in myelodysplastic syndromes, with or without monosomy 7 or 5, is prognostically worse than an otherwise complex karyotype. *Leukemia*. 2011 Feb;25(2):266-70

Vaidya R, Caramazza D, Begna KH, Gangat N, Van Dyke DL, Hanson CA, Pardani A, Tefferi A. Monosomal karyotype in primary myelofibrosis is detrimental to both overall and leukemia-free survival. *Blood*. 2011 May 26;117(21):5612-5

This article should be referenced as such:

Perdigão J, Gomes da Silva M. Monosomal karyotype (MK) in myeloid malignancies. *Atlas Genet Cytogenet Oncol Haematol*. 2011; 15(10):890-891.
