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A NOVEL CD7×FLT3-ITD RISK STRATIFICATION MODEL FOR PREDICTING POST-TRANSPLANT OUTCOMES IN ACUTE MYELOID LEUKEMIA

Background/Aim. Acute myeloid leukemia (AML) is a heterogeneous malignancy with high relapse risk after allogeneic hematopoietic stem cell transplantation (allo-HSCT). Although molecular and immunophenotypic biomarkers are widely used for risk assessment, their individual prognostic value is limited. This study evaluated integrated leukemia-associated immunophenotype (LAIP) and molecular profiling, focusing on the CD7 expression and FLT3-ITD status. **Methods.** This study included 17 adults with AML who underwent allo-HSCT. The bone marrow samples were analyzed by multiparameter flow cytometry and molecular methods (allele-specific PCR and/or next-generation sequencing) for FLT3-ITD/TKD, NPM1, DNMT3A, WT1, RUNX1, IDH1/2, TET2, SF3B1, and other mutations. Clinical outcomes, measurable residual disease (MRD), molecular response, relapse, and survival were assessed. A four-tier risk model was developed: Score 0 (CD7-/FLT3-), Score 1 (CD7-/FLT3+), Score 2 (CD7+/FLT3-), and Score 3 (CD7+/FLT3+). **Results.** The most frequent abnormalities were DNMT3A (41.2%), FLT3-ITD (29.4%), RUNX1 (29.4%), and NPM1 (23.5%). Patients with primitive-myeloid-aberrant LAIP showed the greatest molecular complexity and poorest outcomes. The persistence of FLT3-ITD, NPM1, or DNMT3A after transplantation was associated with relapse and death, whereas the complete molecular clearance correlated with sustained remission. The CD7×FLT3-ITD model showed a clear overall risk gradient: no adverse outcomes occurred in Score 0 (0/4) or Score 1 (0/2), compared with 38% (3/8) in Score 2 and 100% (3/3) in Score 3. FLT3-ITD alone did not predict poor outcome in CD7-negative patients, whereas the CD7+/FLT3-ITD+ phenotype identified a uniformly unfavorable clinical subgroup. Among CD7-positive patients, a higher mutational burden, persistence of molecular markers, lack of complete molecular response by 60 days after allo-HSCT, and emergence of *de novo* mutations were associated with relapse and death. **Conclusions.** Integration of LAIP and molecular profiling improves post-transplant risk assessment in AML. We propose a novel CD7×FLT3-ITD four-tier stratification model showing that CD7 modifies FLT3-ITD prognostic impact. The CD7+/FLT3-ITD+ phenotype defines a very-high-risk subgroup characterized by persistent molecular disease, clonal evolution, and poor outcome. These findings support combined immunophenotypic and molecular monitoring for personalized post-transplant surveillance and validation in larger prospective cohorts.

Keywords: acute myeloid leukemia; allogeneic hematopoietic stem cell transplantation; CD7; FLT3-ITD; measurable residual disease; risk stratification.

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