Targeted Therapy: The New Lease on Life for Acute Promyelocytic Leukemia, and Beyond

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Leukemia, a group of hematological malignancies characterized by abnormal proliferation, decreased apoptosis, and blocked differentiation of hematopoietic stem/progenitor cells, is a disease involving dynamic change in the genome. Chromosomal translocation and point mutation are the major mechanisms in leukemia, which lead to production of oncogenes with dominant gain of function and tumor suppressor genes with recessive loss of function. Targeted therapy refers to treatment strategies perturbing the molecules critical for leukemia pathogenesis. The t(15;17) which generates PML-RAR, t(8;21) that produces AML1-ETO, and t(9;22) which generates BCR-ABL are the three most frequently seen chromosomal translocations in myeloid leukemia. The past two to three decades have witnessed tremendous success in development of targeted therapies for acute and chronic myeloid leukemia caused by the three fusion proteins. Here, we review the therapeutic efficacies and the mechanisms of action of targeted therapies for myeloid leukemia and show how this strategy significantly improve the clinical outcome of patients and even turn acute promyelocytic leukemia from highly fatal to highly curable.