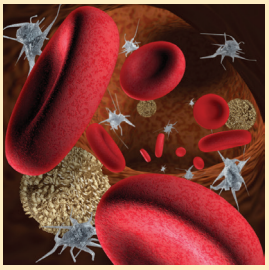
Article

Ruxolitinib: A New Treatment for Myelofibrosis

Emily W. Lowery, MSN, RN, OCN®, and Susan M. Schneider, PhD, AOCN®, FAAN



© iStockphoto.com/Raúl Vargas

Myelofibrosis (MF) is a blood cancer characterized by fibrotic bone marrow and altered hematopoiesis. Although the prevalence of MF is low, its severe symptoms have a significantly negative impact on patient quality of life, and its ability to transform into leukemia increases morbidity. Conventional drug therapies provide modest symptom palliation, but allogeneic stem cell transplantation has been the only treatment capable of affecting MF's natural history. Ruxolitinib (Jakafi®) is a new targeted therapy indicated to treat patients with intermediate- and high-risk MF. Although the research is conflicted regarding ruxolitinib's ability to affect survival or induce remission, studies show that it offers dramatic improvements in symptom management. However, ruxolitinib carries some potentially life-threatening adverse effects. This article reviews ruxolitinib, discusses its risks and benefits, and describes the vital role of oncology nurses in education, monitoring, and support.

Emily W. Lowery, MSN, RN, OCN®, is an oncology nurse practitioner and Susan M. Schneider, PhD, AOCN®, FAAN, is an associate professor and lead faculty in the Oncology Nursing Specialty, both in the School of Nursing at Duke University in Durham, NC. The authors take full responsibility for the content of the article. The authors did not receive honoraria for this work. The content of this article has been reviewed by independent peer reviewers to ensure that it is balanced, objective, and free from commercial bias. Mention of specific products and opinions related to those products does not indicate or imply endorsement by the *Clinical Journal of Oncology Nursing* or the Oncology Nursing Society. No financial relationships relevant to the content of this article have been disclosed by the authors, planners, independent peer reviewers, or editorial staff. Lowery can be reached at lowery.emily@gmail.com, with copy to editor at CJONEditor@ons.org. (Submitted April 2012. Revision submitted September 2012. Accepted for publication October 6, 2012.)

Digital Object Identifier:10.1188/13.CJON.312-318

Myelofibrosis (MF) is a type of myeloproliferative neoplasm, a group of diseases that result in overproduction of specific types of blood cells. Examples of other important myeloproliferative neoplasms are polycythemia vera (PV) and essential thrombocythemia (ET) (Gregory, Mesa, Hoffman, & Shammo, 2011). The pathogenesis of MF begins when the DNA of one hematopoietic progenitor cell (HPC) undergoes a mutation that perpetually "turns on" the hematopoiesis-signaling pathway (Anand et al., 2011). The mutated HPC undergoes clonal proliferation and perpetuates the mutation (Gregory et al., 2011). The cloned HPCs overproduce immature white blood cells and atypical megakaryocytes. Overproduction of megakaryocytes results in an overabundance of cytokines that overstimulate the bone marrow to lay down excess bone. This results in fibrotic bone marrow that is incapable of normal hematopoiesis (Gregory et al., 2011).

The estimated incidence of MF in the United States is 0.41 new cases per year per 100,000 individuals (Rollison et al., 2008). According to the World Health Organization Bone Marrow Features and the European Clinical, Molecular, and Pathological criteria for diagnosis and staging of primary MF, the diagnosis of primary MF is usually preceded by an elevated platelet count that is not caused by true ET, PV, chronic myelogenous leukemia, chronic myelomonocytic leukemia, or myelodysplastic syndrome (Michiels et al., 2007). In addition, absence of the Philadelphia chromosome and the presence of particular genetic mutations (JAK^{V617F} and MPL^{515}) are noted (Michiels et al., 2007).

Primary MF has three clinical stages—early, intermediate, and advanced—which are determined by a number of factors including platelet count, presence and degree of anemia, degree of splenomegaly, leuko-erythroblastosis, and the presence or absence of certain prognostic indicators such as age older than 70 years, severe constitutional symptoms, and cytogenetic abnormalities (Michiels et al., 2007). In addition, grading primary MF is based on the clinical staging and the number of risk factors with which patients present (Michiels et al., 2007).

Cervantes et al. (2009) organizes MF into four risk groups: low, intermediate-1, intermediate-2, and high. The risk groups correlate with the grading system described by Michiels et al. (2007) as they also are based on the number of risk factors that patients with MF demonstrate on presentation (Cervantes et al., 2009). However, Cervantes et al. (2009) and Tefferi (2011) both identified fewer risk factors than Michiels et al. (2007), including age older than 65 years, constitutional symptoms, hemoglobin less than 10 g/dl, white blood cell count greater than 25 x 10^9/L, and blood blasts greater than 1%. Patients with zero risk factors are in the low-risk group, those with one risk factor belong in the intermediate-1 group, those with two risk factors belong in the intermediate-2 risk group, and those with