Filgrastim and Pegfilgrastim Use in Patients With Neutropenia

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Myelosuppression, the reduction of platelets and red and white blood cells, is the most common side effect of chemotherapy. Filgrastim and pegfilgrastim are used to assist recovery in patients with low white blood cell counts. This article explores the dosing, efficacy, cost, and clinical considerations of filgrastim and pegfilgrastim in neutropenia care. Increased knowledge of the medications may contribute to positive patient outcomes. As the price of hospitalization increases, prophylactic dosing of filgrastim and pegfilgrastim becomes more cost effective. In addition, clinical outcomes are improved through a reduction in length of hospital stays and the need for IV antibiotic administration.

Myelosuppression, defined as the "inhibition of bone marrow to function" (Venes, 2001, p. 1346), is the most common side effect of cancer chemotherapy (Polovich, White, & Kelleher, 2005). In myelosuppression, the body becomes unable or has reduced ability to produce red blood cells, platelets, and white blood cells. Healthy bone marrow produces 60–400 x 10^7 neutrophils per day. Neutrophils live 7–12 hours; when the bone marrow cannot produce enough neutrophils to replace those destroyed by myelosuppression, neutropenia likely will occur (Polovich et al.). A patient is neutropenic if his or her absolute neutrophil count (ANC) is 1,000/mm^3 or lower (normal range = 1,500–7,500/mm^3) and is extremely neutropenic if the ANC drops below 500/mm^3 (Moses, 2008; Polovich et al.). Neutropenia reduces a patient's ability to fight infection, with the only common sign being a fever of 38.3°C or higher; lower ANC and longer durations of neutropenic state increase the risk for infection (National Comprehensive Cancer Network [NCCN], 2009). Additional risk factors include malignancy of any part of the hematologic system, advanced cancer, alimentary tract–mucosal compromise, asplenia, high-dose corticosteroid therapy, older age, and poor functional status (NCCN, 2008). This article explores the use of colony-stimulating factors (CSFs) in the treatment of neutropenia, particularly filgrastim (Neupogen®) and pegfilgrastim (Neulasta®), both manufactured by Amgen Inc.

Pharmacodynamics

Filgrastim and pegfilgrastim have identical effects on the body (Holmes, O'Shaughnessy, et al., 2002). Both CSFs act on the precursors to blood-producing cells in the bone marrow by binding to receptors on the surface of the cells (Amgen Inc., 2007a, 2007b). CSFs promote the division of hematopoietic cells and the production of functioning neutrophils (see Figure 1). Although filgrastim and pegfilgrastim only act on cells that result in neutrophils, not the germ lines of other cells, no information definitively states whether CSFs will or will not promote cancer cell growth.

At a Glance

- Filgrastim and pegfilgrastim are colony-stimulating factors that shorten time to neutropenic recovery in patients receiving myelosuppressive chemotherapy.
- Treatment benefits of filgrastim and pegfilgrastim include the prevention of neutropenic fever, the ability to adhere to chemotherapy schedules, and fewer hospital stays.
- Although filgrastim and pegfilgrastim have a high retail value, the rising price of hospital stays may outweigh their cost.

Pharmacokinetics

Filgrastim is absorbed completely and is excreted through the kidneys, with a half-life of about 3.5 hours (Turkoski, Lance, & Bonfiglio, 2007). Pegfilgrastim is the same medication but is cleared by neutrophils instead of the kidneys; as a result, pegfilgrastim remains in the system longer (Holmes, Jones, et al., 2002). Pegfilgrastim cannot be cleared by the kidneys because the molecule has been pegylated, meaning that a polyethylene glycol molecule has been attached to the original filgrastim molecule. The process

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Digital Object Identifier:10.1188/09.CJON.324-328