Hematopoietic Stem Cell Transplantation for Multiple Myeloma

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Objective: *To provide an overview of the hematopoietic stem cell transplantation (HSCT) process specific to patients with multiple myeloma (MM) and their caregivers.*

Data Sources: *Research studies, book chapters, websites, expert knowledge, and journal articles.*

Conclusion: *Although not curative, autologous HSCT is an important, manageable treatment modality, and continues to be a standard of care in MM for those patients who are eligible.*

Implications for Nursing Practice: *Although an area of specialty practice, an understanding of the HSCT process is important to broaden the knowledge of all nurses who care for patients with MM.*

Key Words: *multiple myeloma, hematopoietic stem cell transplantation, caregivers, treatment, resources.*

Over the last decade, many treatment options have become available for patients with multiple myeloma (MM). Within this era of novel therapies, the question is posed, "What role does high-dose chemotherapy (HDC) and hematopoietic stem cell transplant (HSCT) play?" Historically, transplant provided improved survival and quality of life. Although not a curative therapy, today, transplant improves overall survival (OS) and remains a standard of care for eligible patients. Nurses, in many different roles, are integral to patient care along the disease and treatment spectrum. In this article, we review the historical and current perspectives of HSCT for myeloma; the transplant process, resources available, caregiver concerns, and nursing implications for care.

Hematopoietic stem cell transplant (HSCT) refers to the transplantation of hematopoietic cells originating

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in the bone marrow following cytotoxic and immunosuppressive therapy for the treatment of malignant and non-malignant diseases. Autologous HSCT (autoHSCT) refers to the donor and recipient being of the same person whereas allogeneic HSCT (alloHSCT) refers to the donor being different than the recipient.[1] Across the United States and much of Europe, MM is the most common indication for autoHSCT.[2,3] The landscape of myeloma treatment has changed through the years with an increase in survival from autoHSCT and a variety of new treatment options for patients with myeloma. Nurses from all areas of practice may encounter patients with MM. Therefore, it is important for all nurses caring for MM patients to have a good understanding of the transplant process. All nurses can have a large impact on patients' expectant management, symptom control, caregiver support, and education. The envelope continues to be pushed in regards to patient eligibility, as transplant is being considered in much older adults and those with chronic, comorbid conditions.[4]

Historical Perspective of Transplantation in Myeloma

HSCT as a treatment modality has been utilized for decades. E. Donnall Thomas, often referred to as the "father of blood and marrow transplantation", initiated the process in the late 1950s.[1,5,6] Robert Kyle, often referred to as the "father of myeloma", and colleagues successfully performed a syngeneic HSCT (using an identical twin donor) for aplastic anemia in 1963, with both donor and recipient still living (well) and recognized as the longest living transplant recipient/donor.[7,8] HSCT was first introduced for multiple myeloma by McElwain and Powles.[9]

Barlogie and his team[10,11] continued the of use HDC with melphalan and bone marrow rescue for patients whose disease had become resistant to conventional chemotherapy (CC). They later expanded the treatment regimen to include radiotherapy.[10,11] The "Intergroupe Français du Myélome" (IFM) reported a prospective randomized trial comparing CC with HDC and autoHSCT, further demonstrating significantly improved response rates (RRs), and progression-free survival (PFS) and OS benefits for autoHSCT.[12] Conversely, a multicenter, phase III study (Southwest Oncology Group [SWOG] 93-21), originating in 1993 with the final report in 2006, did not show improved RR, PFS, and OS for autoHSCT compared to CC used at the time; however, they did demonstrate durable response in alloHSCT for those who survived the toxicity and treatment-related mortality (TRM). As a result of the high rates of TRM, but potential for durable response, it was recommended that alloHSCT be further evaluated as part of a clinical trial.[13] Again, in 2002, the IFM provided pivotal information through the IFM 95-02 randomized, prospective trial comparing melphalan 140 mg/m^2 plus 8 cGy of fractionated radiation to melphalan 200 mg/m^2. The higher dose of melphalan without radiation was found to have less toxicity with at least equal efficacy, thereby altering the conditioning regimen for myeloma patients undergoing autoHSCT.[14] Melphalan 200 mg/m^2 regimen remains the standard of care (SOC) today.

Alternate cellular options have been considered. Purged marrow to remove contaminated cells from the autologous product was tried but did not show improved responses or outcomes.[15] Use of a syngeneic, or identical sibling, cellular product does show lower relapse rates and improved PFS, but this option is not available to most patients.[16] Though there have been some data in support of alloHSCT for patients with MM with or without prior autologous transplant, this treatment is still controversial and the data are conflicting.[17-21] High TRM and morbidity from infection and graft-versus-host disease associated with alloHSCT without improved OS in earlier studies limited its application in MM.[3,22-24] There has been renewed interest in alloHSCT due to reduced-intensity conditioning regimens, evidence for graft-versus-myeloma benefit, and improved supportive care. However, there is a lack of supporting data that outcomes are improved, and TRM remains significant, especially in cytomegalovirus-seropositive donor/recipients. Therefore, the use of alloHSCT is recommended only for select groups participating in a clinical trial and the remainder of this discussion will focus on autoHSCT eligibility, process, and post-transplant management.[5,17,23,25]

Autologous Hematopoietic Cell Transplantation Process for Multiple Myeloma

The autoHSCT process can be considered in three phases – pretransplant, transplant to engraftment, and post-transplant (Fig. 1). Each phase has specialty considerations and will be discussed in detail in the follow section.[26-28]