

Physical Function and Quality of Life in Patients who had Undergone Allogeneic Hematopoietic Stem Cell Transplantation

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Introduction

Allogeneic hematopoietic stem-cell transplantation (allo-HSCT) has been increasingly used in the treatment of malignant and nonmalignant hematopoietic diseases [1]. Patients with malignant diseases that cannot be controlled by conventional means or in whom treatment failure is expected are candidates for allo-HSCT [2,3]. Allo-HSCT is a highly aggressive and demanding medical therapy that profoundly impacts quality of life (QOL), but has the potential for good clinical results and a longer life expectancy for patients with various hematological diseases.

Allo-HSCT requires a conditioning regimen of frequent high dose chemotherapy in combination with total body irradiation, followed by infusion of donor-harvested bone marrow or peripheral blood stem cells. This procedure results in a 2 to 4 week period of severe marrow suppression and high risk of infection. Patients must be isolated in a clean room for 4–6 weeks, leading to immobility that may result in muscle atrophy. Severe marrow suppression increases the risk of bleeding, infections, and anemia. Graft vs. host disease (GVHD) is a complication of HSCT that includes nausea, emesis, and diarrhea, resulting in weakness [4].

Our previous study investigated whether physical functioning and health-related QOL were reduced in patients before undergoing allo-HSCT. Our previous study showed: (1) reduced skeletal muscle strength, exercise tolerance, and health status in patients prior to HSCT compared with population norms; (2) QOL is associated with various confounding factors. In particular, we found an association between health-related QOL and fatigue, sex, and remission status; and (3) loss of physiological function is also associated with various confounding factors. We found an association between skeletal muscle strength and previous treatment with HSCT, and an association between exercise capacity, hemoglobin level, and remission status [5].

Also, in another study we demonstrated that: (1) roughly half the study participants had sarcopenia before they underwent allo-HSCT; and (2) the grip strength and knee extension strength as well as lean body mass and skeletal muscle was significantly decreased in patients with sarcopenia than those without. Furthermore, (3) patients with sarcopenia had significantly higher fatigue levels than patients without sarcopenia; (4) the QOL scores were significantly lower in patients with sarcopenia than in those without [6].

As explained above, HSCT patients already have decreased physical function and QOL before HSCT. Patients scheduled for HSCT may have physical weaknesses prior to transplant, which needs to be considered when planning an exercise regimen during and after transplantation. It may be better to initiate physical therapy and an

exercise regimen before transplantation rather than after transplantation.

Another study investigated whether allo-HSCT patients have decreased physical function and QOL 6–7 weeks after HSCT compared to that before HSCT [7,8]. These decreases were associated with sex differences [7] and differences in donor type [8]. Muscle strength decreases were associated with the total corticosteroid dose in allo-HSCT patients [9].

We also investigated balance function. Allo-HSCT patients have impaired balance after HSCT as well as a decline of physical function [10]. As mentioned above, allo-HSCT patients tend to have decreased physical function, including balance function and QOL, after HSCT. Therefore, physical therapy including resistance training and balance training are necessary to improve physical function for allo-HSCT patients.

However, in the clinical setting, allo-HSCT patients tend to have decreased physical function immediately following HSCT rather than several weeks after HSCT. However, to date, no studies have investigated muscle strength immediately after HSCT, and none have shown a difference in muscle weakness between the upper and lower limbs. Furthermore, physical activity often decreases during this period of cytopenia, with reported decreases in the total daily step count, compared to the daily step count before discharge [11]. Physical activity might be associated with physical function and QOL.

However, to date, no previous report has shown these relationships. It is important to investigate these relationships, and the results may provide insights into customized rehabilitation strategies for HSCT recipients. In the future, I hope this investigative report will be a stepping stone for moving toward improved physical function and QOL of allo-HSCT patients.

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