Revista Brasileira de Hematologia e Hemoterapia
Brazilian Journal of Hematology and Hemotherapy

www.rbhh.org

Scientific Comment

Body composition assessment in hematopoietic stem cell transplantation☆

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Nutritional status is an important factor influencing outcomes in persons undergoing hematopoietic stem cell transplantation (HSCT). While quantitative measurements such as body mass index (BMI) and weight change and serum markers such as albumin are commonly used in the pre- and post-transplant evaluations, these parameters in isolation give an incomplete understanding of overall health status. A more comprehensive evaluation of body composition and its relation to functional status pre- and post-transplant would facilitate the implementation of interventions aimed to improve outcomes in transplant recipients.

Prior studies of allogeneic transplant recipients have identified low BMI, low body weight, or weight loss during transplant as measurements of nutritional status correlating with inferior clinical outcomes.[1] Low pre-transplant BMI <18.5 kg/m^2 has been associated with worse survival, higher treatment-related mortality and in some instances higher risk of disease relapse.[2] Other studies indicate that the majority of transplant recipients experience 5–10% decreases in pre-transplant BMI or body weight after transplant,[3] likely attributed to acute toxicities of transplant conditioning regimens or complications such as graft-versus-host disease. While such studies are limited by observational or retrospective study design, the available data indicates that malnutrition before and after transplant is associated with adverse outcomes.

Few studies have analyzed body composition and its association with transplant outcomes. Body composition refers to the relative percentages of fat, muscle, water, and bone in the human body. As such, information on body composition in addition to parameters such as BMI and albumin may offer a more complete picture of the physical status before and after transplant. Various methods are available for measuring body composition; however, the most appropriate or meaningful test in a particular clinical setting is largely unknown. For example, in a longitudinal study of pediatric patients who received allogeneic HSCT for hematologic malignancies, BMI and lean body mass (LBM) as measured by whole body dual-energy X-ray absorptiometry (DXA) declined significantly over time after allogeneic HSCT.[4] However, in the same study, body fat percentage remained at the population level, emphasizing the need to consider multiple parameters when assessing the nutritional status of transplant recipients. Fat-free mass has been correlated with better functional capacity as assessed by objective measures such as the six-minute walk test and pulmonary function studies.[2] Low arm muscle area measured pre-HSCT has been associated with 180-day mortality post-transplant.[5] Other studies have evaluated upper-limb muscle strength, air-displacement plethysmorgraphy and bioelectrical impedance analysis (BIA) with standardized phase angle in long-term follow-up of allo-HSCT recipients[6–8]; however, such studies require further validation and standardization in

DOI of original article: http://dx.doi.org/10.1016/j.bjhh.2017.06.004.
☆ See paper by Silva et al. on pages 318–24.
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https://doi.org/10.1016/j.bjhh.2017.08.003

larger numbers of patients in disease- and age-specific settings.

In this issue of the *Revista Brasileira de Hematologia e Hemoterapia*, da Silva et al. present data from a cross-sectional study evaluating a diverse set of body composition parameters in Fanconi Anemia patients aged 2–40 years, most of whom underwent HSCT.[9] The authors assessed BMI, referenced according to age in children and adolescents, and LBM of transplant recipients at various lengths of follow-up (0.5–27 years). They also analyzed a variety of complimentary assessment tools: triceps skin fold (TSF), arm circumference (AC), arm muscle area (AMA), and BIA with a standardized calculation for phase angle. The authors found muscle mass depletion based on AMA in at least half of all subjects. In addition, underweight compared to the reference population was a frequent finding in adults but not in children and adolescents, and short stature was common in children and adolescents. LBM and phase angle measurement based on BIA was similar across all age groups.

While this is primarily a descriptive study, the authors should be commended for their comprehensive approach to body composition measurements in this population, in which endocrine issues may persist many years post-transplant. Establishing a reference of body composition in disease-specific and age-specific populations before and after transplant is greatly needed. To work towards a better understanding of body composition parameters more predictive of clinical outcomes is an important endeavor. In the future, interventions directed at modifying such parameters – including nutritional, behavioral, and exercise interventions – will likely yield more success in survivorship, return to work and other activities indicative of a productive life after transplant.

Conflicts of interest

The author declares no conflicts of interest.

REFERENCES

1. Fuji S, Takano K, Mori T, Eto T, Taniguchi S, Ohashi K, et al. Impact of pretransplant body mass index on the clinical outcome after allogeneic hematopoietic SCT. Bone Marrow Transplant. 2014;49(12):1505–12.
2. Baumgartner A, Bargetzi A, Zueger N, Bargetzi M, Medinger M, Bounoure L, et al. Revisiting nutritional support for allogeneic hematologic stem cell transplantation – a systematic review. Bone Marrow Transplant. 2017;52(4):506–13.
3. Urbain P, Birlinger J, Lambert C, Finke J, Bertz H, Biesalski HK. Longitudinal follow-up of nutritional status and its influencing factors in adults undergoing allogeneic hematopoietic cell transplantation. Bone Marrow Transplant. 2013;48(3):446–51.
4. Inaba H, Yang J, Kaste SC, Hartford CM, Motosue MS, Chemaitilly W, et al. Longitudinal changes in body mass and composition in survivors of childhood hematologic malignancies after allogeneic hematopoietic stem-cell transplantation. J Clin Oncol. 2012;30(32):3991–7.
5. Thomaz AC, Silverio CI, Campos DJ, Kieuteka EE, Rabito EI, Funke VA, et al. Pre-transplant arm muscle area: a simple measure to identify patients at risk. Support Care Cancer. 2015;23(11):3385–91.
6. Brotelle T, Lemal R, Cabrespine A, Combal C, Hermet E, Ravinet A, et al. Prevalence of malnutrition in adult patients previously treated with allogeneic hematopoietic stem-cell transplantation. Clin Nutr. 2017. pii:S0261-5614(17)30107-3.
7. Hung YC, Bauer JD, Horsely P, Ward LC, Bashford J, Isenring EA. Body composition following stem cell transplant: comparison of bioimpedance and air-displacement plethysmography. Nutrition. 2014;30(9):1000–6.
8. Farias CL, Campos DJ, Bonfin CM, Vilela RM. Phase angle from BIA as a prognostic and nutritional status tool for children and adolescents undergoing hematopoietic stem cell transplantation. Clin Nutr. 2013;32(3):420–5.
9. Silva PP, Schmit D, Bonfim C, Campos DJ, Rabito EI, Vilela R. Body composition of Fanconi Anemia patients submitted or not submitted to hematopoietic stem cell transplant. Rev Bras Hematol Hemoter. 2017;39(4):318–24.