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Short Communication

Long-Term Outcomes of Myeloablative and Non-Myeloablative Regimens

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DESCRIPTION

Allogeneic Haematopoietic Stem Cell Transplantation (HSCT) is a potentially curative treatment for a variety of hematological malignancies, including leukemia and lymphoma, as well as certain non-malignant disorders such as inherited bone marrow failure syndromes. However, one of the most critical and challenging aspects of HSCT is the conditioning regimen a pre-transplant treatment designed to prepare the recipient's body to accept the donor's stem cells while eradicating malignant cells. The intensity of this conditioning regimen, whether myeloablative or non-myeloablative, plays a important role in the success of the transplant and the patient's post-transplant recovery [1].

Conditioning regimens generally consist of chemotherapy, radiation therapy, or a combination of both. The primary goals are to:

- Eradicate the patient's disease, especially malignant cells that may lead to relapse.
- Immunosuppress the recipient to prevent graft rejection, facilitating engraftment of donor cells.
- Create a favorable microenvironment for donor stem cell proliferation and immune reconstitution.

Conditioning intensity refers to the dosage of chemotherapy and/or radiation used to achieve these objectives [2]. Intense conditioning regimens are often associated with higher rates of disease eradication, but they can also result in greater toxicity and higher mortality, particularly in older patients or those with comorbidities. As a result, clinicians must carefully balance these competing priorities when selecting the conditioning regimen.

Myeloablative *vs.* non-myeloablative conditioning

Traditionally, conditioning regimens were classified into two categories: Myeloablative Conditioning (MAC) and Non-Myeloablative Conditioning (NMAC).

Myeloablative Conditioning (MAC): This approach uses high doses of chemotherapy and/or radiation to completely eliminate the patient's bone marrow, essentially "wiping the slate clean." The goal is to destroy malignant cells while also suppressing the recipient's immune system to prevent graft rejection [3]. While this regimen often results in excellent disease control, it carries a risk of significant toxicity, including severe infections, organ damage, and prolonged immunosuppression [4]. In addition, patients with compromised organ function or older age may have difficulty tolerating MAC.

Non-Myeloablative Conditioning (NMAC): This regimen uses lower doses of chemotherapy or radiation. NMAC does not eliminate the patient's bone marrow entirely but relies more on the immune system's Graft-*Versus*-Host Disease (GVHD) effect to combat residual disease. By preserving some of the recipient's immune function, NMAC is associated with less toxicity and may be more suitable for older patients or those with significant comorbidities [5]. However, the risk of disease relapse is higher in NMAC patients due to the less aggressive pre-transplant conditioning.

Striking a balance

The shift toward reduced-intensity and NMAC regimens in recent years has led to better outcomes in older patients and those with comorbidities, but the challenge remains to achieve a balance between conditioning intensity and the risk of relapse [6,7]. The right choice of regimen is influenced by multiple factors, including the patient's age, disease type, performance status, and comorbid conditions.

For example, patients with acute leukemia often benefit from the higher intensity of myeloablative conditioning because of the aggressive nature of the disease and the higher risk of relapse. In contrast, patients with indolent lymphomas or non-malignant disorders might tolerate non-myeloablative regimens better and could still achieve successful engraftment and long-term disease control with less toxicity.

Personalizing conditioning regimens

As research continues into the nuances of conditioning regimens, there is increasing recognition of the need to personalize treatment [8]. Advances in genetic testing, biomarkers, and disease characterization allow for a more

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specific approach, whereby the conditioning intensity can be adjusted based on individual patient profiles.

One potential area of development is dose-adjusted conditioning, where the regimen is modified based on a patient's response to pre-transplant therapies, organ function, and overall health. For example, pharmacogenomic approaches might predict which patients will tolerate higher doses of chemotherapy or radiation better, while biomarkers of disease may help refine the aggressiveness of the conditioning regimen.

Additionally, newer strategies such as immune-based conditioning are improved. These approaches use agents that modulate the immune system (such as monoclonal antibodies or checkpoint inhibitors) to augment the immune response against the tumor and reduce the need for intense chemotherapy or radiation [9]. This is particularly exciting for high-risk patients who might otherwise be ineligible for standard conditioning regimens.

Toxicity and long-term outcomes

Despite the advancements in conditioning regimens, toxicity remains a significant concern, particularly with myeloablative therapies. Patients who survive the transplant may experience long-term complications such as infertility, endocrine dysfunction, cardiovascular issues, and chronic GVHD. Non-myeloablative regimens tend to have a more favorable toxicity profile, but the risk of relapse, particularly for aggressive malignancies, is a key concern.

Furthermore, the shift towards reduced-intensity conditioning regimens has raised the question of whether these patients experience delayed relapse or poorer long-term survival rates compared to those who receive higher-intensity regimens [10]. While early data suggest that the risk of relapse can be mitigated with appropriate immune modulation and better supportive care, long-term follow-up studies will be essential to fully assess the trade-offs between conditioning intensity and overall survival.

CONCLUSION

Conditioning regimens are a cornerstone of the success of allogeneic haematopoietic stem cell transplantation. The intensity of the conditioning regimen whether myeloablative or non-myeloablative must be carefully balanced against the patient's disease, age, and overall health. While the trend has been toward reduced-intensity regimens to minimize toxicity, the challenge remains to find the optimal conditioning approach that maximizes both efficacy and safety for diverse patient populations. As research into personalized medicine and immune-based therapies advances, it is likely that we will see increasingly refined strategies that allow clinicians to specific conditioning to the individual, offering hope for better outcomes with fewer side effects.

REFRENCES

1. Moher D, Cook DJ, Eastwood S, Olkin I, Rennie D, Stroup DF. Improving the quality of reports of meta-analyses of randomised controlled trials: The QUOROM statement. Br J Surg. 1999;354 (9193):1896-1900.
2. Aliahmed HM, Karalius R, Valaika A, Grebelis A, Semėnienė P, Cypienė R. Efficacy of aortic valve replacement through full sternotomy and minimal invasion (ministernotomy). Medicina. 2018;54(2):26.
3. Ariyaratnam P, Loubani M, Griffin SC. Minimally invasive aortic valve replacement: Comparison of long-term outcomes. Asian Cardiovasc Thorac Ann. 2015;23(7):814-821.
4. Attia RQ, Raja SG. Surgical pericardial heart valves: 50 years of evolution. Int J Surg. 2021;94:106121.
5. Bakir I, Casselman FP, Wellens F, Jeanmart H, de Geest R, Degrieck I, et al. Minimally invasive *versus* standard approach aortic valve replacement: A study in 506 patients. Ann Thorac Surg. 2006;81(5):1599-1604.
6. Bang JH, Kim JW, Lee JW, Kim JB, Jung SH, Choo SJ, et al. Minimally invasive approaches *versus* conventional sternotomy for aortic valve replacement: A propensity score matching study. Korean J Thorac Cardiovasc Surg. 2012;45(2):80.
7. Borger MA, Moustafine V, Conradi L, Knosalla C, Richter M, Merk DR, et al. A randomized multicenter trial of minimally invasive rapid deployment *versus* conventional full sternotomy aortic valve replacement. Ann Thorac Surg. 2015;99(1):17-25.
8. Byrne JG, Aranki SF, Couper GS, Adams DH, Allred EN, Cohn LH. Reoperative aortic valve replacement: Partial upper hemisternotomy *versus* conventional full sternotomy. J Thorac Cardiovasc Surg. 1999;118(6):991-997.
9. Calderon J, Richebe P, Guibaud JP, Coiffic A, Branchard O, Asselineau J, et al. Prospective randomized study of early pulmonary evaluation of patients scheduled for aortic valve surgery performed by ministernotomy or total median sternotomy. J Cardiothorac Vasc Anesth. 2009;23(6):795-801.
10. Chien S, Clark C, Maheshwari S, Koutsogiannidis CP, Zamvar V, Giordano V, et al. Benefits of rapid deployment aortic valve replacement with a mini upper sternotomy. J Cardiothorac Surg. 2020;15:1-6.