Leukemia

Ikehara, J Leuk 2014, 2:2
http://dx.doi.org/10.4172/2329-6917.1000136

Short Communication Open Access

Advances in Leukemia Treatment with Bone Marrow Transplantation

Susumu Ikehara*

Susumu Ikehara, Department of Stem Cell Disorders, Kansai Medical University, Hirakata City, Osaka 570-1010, Japan

Bone Marrow Transplantation (BMT) is a useful strategy for the treatment of leukemia, severe combined immune deficiency, enzyme deficiencies, autoimmune disease, and osteoporosis [1-3]. Furthermore, BMT plays an important role in the induction of immune tolerance in organ transplantation [4]. Bone marrow is a spongy tissue, and is made up of Hematopietic Stem Cells (HSCs), Mesenchymal Stem Cells (MSCs), and various blood cells. HSCs differentiate into common myeloid- and lymphoid-precursor cells and then terminally differentiate into erythrocytes, monocytes, platelets, neutrophils, dendritic cells and other cells. MSCs can differentiate into not only mesoderm derived-cells such as adipocytes, osteoblasts, and osteoclasts, but also endoderm- and ectoderm-derived cells [5]. Intra-Bone Marrow-BMT (IBM-BMT) has been proven to be the best strategy for allogeneic BMT as it results in the rapid recovery of hemopoietic function and the restoration of T cell functions since it can replace not only HSCs but also MSCs [6]. We have reported that IBM-BMT plays an important role in therapies for various diseases in animal models such as those of rheumatoid arthritis, Alzheimer's disease and diabetes [7-10]. Moreover, IBM-BMT has induced persistent donor-specific tolerance, and enables the use of reduced radiation doses as conditioning regimens in organ transplantation [11,12].

Leukemia is a kind of HSC disorder in which various stages of incomplete mature cells accumulate. Allogeneic BMT is an effective immunotherapy for childhood leukemia. One report has demonstrated that BMT can be used to treat all subtypes of pediatric leukemia and provides consensus guidelines for the transplantation of acute leukemia [13]. We have found that allogeneic IBM-BMT plus adult Thymus Transplantation (TT) significantly increased numbers of $CD8^+$ T cells that infiltrated the tumors and apoptotic tumor cells, and preserved strong graft-versus-tumor effects [14]. EL-4 cells are derived from the thymoma of mice, and can induce the mimicking of leukemia in mice. We recently reported that IBM-BMT plus adult TT prevented the growth of leukemia as a result of the improved mitogen responses to both T and B cells, and significantly increased IL-2 production, and the number of donor-derived T cells [15]. Our results indicate that allogeneic IBM-BMT plus TT can induce a strong graft-versus-leukemia effect with mild graft-versus-host disease, suggesting it may be a viable strategy for the treatment of leukemia in humans.

References

1. Grunebaum E, Mazzolari E, Porta F, Dallera D, Atkinson A, et al. (2006) Bone marrow transplantation for severe combined immune deficiency. JAMA 295: 508-518.
2. Sykes M, Nikolic B (2005) Treatment of severe autoimmune disease by stem-cell transplantation. Nature 435: 620-627.
3. Takada K, Inaba M, Ichioka N, Ueda Y, Taira M, et al. (2006) Treatment of senile osteoporosis in SAMP6 mice by intra-bone marrow injection of allogeneic bone marrow cells. Stem Cells 24: 399-405.
4. Pilat N, Hock K, Wekerle T (2012) Mixed chimerism through donor bone marrow transplantation: a tolerogenic cell therapy for application in organ transplantation. Curr Opin Organ Transplant 17: 63-70.
5. Li M, Ikehara S (2013) Bone-marrow-derived mesenchymal stem cells for organ repair. Stem Cells Int 2013: 132642.
6. Ikehara S (2011) A novel BMT technique for treatment of various currently intractable diseases. Best Pract Res Clin Haematol 24: 477-483.
7. Kushida T, Ueda Y, Umeda M, Oe K, Okamoto N, et al. (2009) Allogeneic intra-bone marrow transplantation prevents rheumatoid arthritis in SKG/Jcl mice. J Autoimmun 32: 216-222.
8. Li M, Abraham NG, Vanella L, Zhang Y, Inaba M, et al. (2010) Successful modulation of type 2 diabetes in db/db mice with intra-bone marrow--bone marrow transplantation plus concurrent thymic transplantation. J Autoimmun 35: 414-423.
9. Hasegawa-Ishii S, Shimada A, Inaba M, Li M, Shi M, et al. (2013) Selective localization of bone marrow-derived ramified cells in the brain adjacent to the attachments of choroid plexus. Brain Behav Immun 29: 82-97.
10. Li M, Inaba M, Guo K, Abraham NG, Ikehara S (2009) Amelioration of cognitive ability in senescence-accelerated mouse prone 8 (SAMP8) by intra-bone marrow-bone marrow transplantation. Neurosci Lett 465: 36-40.
11. Guo K1, Inaba M, Li M, An J, Cui W, et al. (2008) Long-term donor-specific tolerance in rat cardiac allografts by intrabone marrow injection of donor bone marrow cells. Transplantation 85: 93-101.
12. Kaneda H, Adachi Y, Saito Y, Ikebukuro K, Machida H, et al. (2005) Long-term observation after simultaneous lung and intra-bone marrow-bone marrow transplantation. J Heart Lung Transplant 24: 1415-1423.
13. Oliansky DM, Rizzo JD, Aplan PD, Arceci RJ, Leone L, et al. (2007) The role of cytotoxic therapy with hematopoietic stem cell transplantation in the therapy of acute myeloid leukemia in children: an evidence-based review. Biol Blood Marrow Transplant 13: 1-25.
14. Miyake T, Hosaka N, Cui W, Nishida T, Takaki T et al. (2009) Adult thymus transplantation with allogeneic intra-bone marrow-bone marrow transplantation from same donor induces high thymopoiesis, mild graft-versus-host reaction and strong graft-versus-tumour effects. Immunology 126: 552-64.
15. Zhang Y, Hosaka N, Cui Y, Shi M, Li M, et al. (2012) Effects of intrabone marrow-bone marrow transplantation plus adult thymus transplantation on survival of mice bearing leukemia. Stem Cells Dev 21: 1441-1448.

***Corresponding author:** Susumu Ikehara, Department of Stem Cell Disorders, Kansai Medical University, Hirakata City, Osaka 570-1010, Japan, Tel: 81-72-804-2450; Fax: 81-72-804-2454; E-mail: ikehara@takii.kmu.ac.jp

Received February 06, 2014; **Accepted** April 25, 2014; **Published** May 10, 2014

Citation: Ikehara S (2014) Advances in Leukemia Treatment with Bone Marrow Transplantation. J Leuk 2: 136. doi:10.4172/2329-6917.1000136