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Perspective

An Overview on Bone Marrow Transplantation for a Therapeutic Option

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DESCRIPTION

Bone marrow is a semi-solid substance found in the spongy (sometimes called cancellous) areas of bones. Bone marrow is the principal location of new blood cell generation in birds and mammals (or hematopoiesis). Marrow adipose tissue, hematopoietic cells, and supporting stromal cells make up this tissue. In adults, bone marrow is mostly found in the ribs, vertebrae, sternum, and pelvic bones. In healthy adult humans, bone marrow accounts for about 5% of total body mass, therefore a guy weighing 73 kg (161 lbs) will have around 3.7 kg (8 lbs) of bone marrow. The human marrow produces about 500 billion blood cells every day, which enter the systemic circulation through permeable vascular sinusoids in the medullary cavity. In bone marrow, many sorts of hematopoietic cells, comprising myeloid and lymphoid lineages, are generated; however, lymphoid cells should migrate to other lymphoid organs (such as the thymus) to develop. Bone marrow transplantation could be used to cure different bone marrow disorders, including cancers like leukemia.

Bone marrow is home to a variety of stem cells. Hematopoietic stem cells in the bone marrow can give rise to hematopoietic lineage cells, while mesenchymal stem cells can give rise to bone, adipose, and cartilage tissue when isolated from the original culture of bone marrow stroma. Not only leukemias and other many illnesses involving bone marrow elements, such as severe combined immunodeficiency states, osteoporosis, certain hereditary disorders, and, more recently, solid malignancies, are treated with bone marrow transplantation. A 19-year-old female with gold-induced aplasia who received ABO-matched marrow transfused intravenously from her sibling was the first recorded case. It functions as a haemopoietic tissue in the human body, producing around 500 billion blood cells each day that join the systemic circulation via permeable vascular sinusoids within the medullary cavity. Hematopoietic stem cells, found in bone marrow, give rise to all types of blood cells, including red blood cells, white blood cells, and platelets, which are present in circulation. Aplastic anemia, leukemia, malignancies like multiple myeloma, and infections like tuberculosis can all cause a reduction in the generation of blood cells and platelets due to pathological abnormalities of the bone marrow. Radiation and chemotherapy can both harm bone marrows by killing haemopoietic stem cells, resulting in a variety of immune-related illnesses. Bone marrow transplantation therapy is a treatment option for a variety of bone marrow illnesses, including cancers like leukemia. Furthermore, bone marrow stem cells have been effectively converted into functional neural cells, which could be used to treat diseases like inflammatory bowel disease.

The bone marrow is one of the most susceptible tissues to radiation because it is constantly proliferating. Attempts to transplant marrow were first made in the 1950s as a result of radiation mishaps. The major disaster at Chernobyl has brought the acute medical effects of high dose radiation exposure and the possible involvement of allogeneic bone marrow transplantation in its therapy to the forefront. The prognosis for those exposed is exceedingly poor due to thermal injury from extremely high temperatures as well as impairment to various organ systems from high radiation doses. Leukemias are neoplastic illnesses of the bone marrow stem cells that prevent normal marrow constituents from multiplying because to their unregulated growth. This results in a large number of largely nonfunctional circulating and *in situ* bone marrow cells, which can cause life-threatening bleeding and infection. Approximately half of infants with "null cell" (early pre-B cell) Acute Lymphocytic Leukemia (ALL) have a five-year survival rate and are likely cured; the remainder patients are doomed to die of their disease using current chemotherapeutic regimens.

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