

A Trial of Vascular Regeneration by Autologous Bone Marrow Cells

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Outcome of acute radiation injury due to a massive systemic irradiation to human body is generally fatal due to multi-organ failure. Allogeneic bone marrow transplantation has been not infrequently applied in purpose of overcoming bone marrow failure, but results were rather poor due to multi-organ damage other than bone marrow.

We have started a trial of vascular regeneration with autologous bone marrow cells to establish a theoretical basis for overcoming this multi-organ failure where systemic vascular endothelial damage resides as a common pathology.

We have inoculated autologous bone marrow cells into the lower extremities in two patients with Burger disease who were already amputated for one leg due to severe ischemia. More than 800 ml of bone marrow were aspirated from the pelvic bone and a mononuclear cell fraction rich of stem cells was isolated by leukapheresis. Each of 2×10^8 cells were injected deep into muscles of the lower leg at more than 50 sites.

Recovery from the ischemia was remarkably prompt characterized by disappearance of leg pain by walking and elevation of oxygen concentration measured through the skin. Finally cine-angiography revealed a marked regeneration of the vascular system in the lower leg after 6 months in the first case and remarkable recovery of the skin temperature in the second case.

This successful vascular regeneration by autologous bone marrow cells provides a theoretical basis for the treatment of endothelial damage due to massive irradiation in addition to the previous observation of endothelial regeneration by allogeneic bone marrow cell transplantation in a case of Tokai-mura accident in Japan.

Although the rescue of multi-organ damage due to radiation is far more difficult than our endothelial regeneration by bone marrow cells, we believe that regeneration medicine will be an essential modality for victims with severe systemic radiation injury.

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