

Stem Cell Treatment for Multiple Sclerosis

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INTRODUCTION

Significance of sperm genetic health

Multiple sclerosis (MS) is a disease in which your immune system assaults the fatty tissue (myelin) that protects nerve fibres in your brain and spinal cord. Nerve signals are disrupted when myelin is destroyed, resulting in a variety of symptoms such as numbness and weakness.

Current MS disease-modifying medications lessen relapses or "flare-ups" of symptoms while also slowing the disease's natural development.

Stem cell therapies may hold more promise because they can put patients into long-term remission and/or restore the disease's damage.

This article will go through the dangers, advantages, and studies behind two different types of stem cell treatments that are currently being utilised or investigated in MS treatment. Autologous hematopoietic stem cell transplant and mesenchymal stem cell transplant are two of the treatments available.

What is Stem Cell Therapy for MS?

A stem cell is a single cell that has the ability to divide and reproduce while also having the ability to differentiate into specialised cell types such as nerve or blood cells. Any treatment that uses stem cells to alleviate or treat a problem is known as stem cell therapy.

Hematopoietic Stem Cell Therapy using Autologous Hematopoietic Cells (aHSCT)

Autologous hematopoietic stem cell treatment (aHSCT) is a type of bone marrow transplant that uses hematopoietic (blood-forming) stem cells derived from the patient's own body to "reset" the immune system [1].

What cells can Hematopoietic Stem Cells form?

Red blood cells, white blood cells, and platelets are all produced by hematopoietic stem cells.

The basic purpose of aHSCT is to replace a hyperactive immune system with a new, healthy one in a patient. This treatment is most effective in patients with relapsing-remitting MS, in which the disease remains active and aggressive despite the administration of

numerous disease-modifying medicines. 1

Because aHSCTs for MS patients are still considered experimental, clinicians follow slightly modified methods while performing them [2].

The basic steps of aHSCT are as follows:

Preparation: You will be given medication to aid in the production of blood-forming stem cells in your body. You may also be given medicine to aid the movement of stem cells from the bone marrow into the bloodstream.

Collection: Blood-forming stem cells are taken from your bloodstream and frozen in a lab.

Suppression: Chemotherapy is given to you in the hospital over several days to suppress your immune system.

Transplant: The frozen blood-forming stem cells are thawed and reintroduced into your bloodstream.

Rebuild: Your immune system begins to rebuild itself as the transplanted stem cells migrate from your bloodstream to your bone marrow [3].

Mesenchymal stem cell transplant

Mesenchymal stem cells can be found in a variety of body tissues, including bone marrow, skin, and adipose tissue.

These cells are thought to have regenerative qualities, assisting the tissue's natural repair process in the event that it is damaged. They may also aid in the reduction of inflammation and the protection of nerves.

Isolating stem cells from a patient's fat, skin, or bone marrow is the initial step in a mesenchymal stem cell transplant. The cells are then replicated in a lab or treated with particular substances before being reintroduced into the body through various procedures (e.g., injecting them into the bloodstream or through the spinal canal).

When the cells are reintroduced into your body, they may help to quiet your immune system and promote the healing of damaged myelin in your brain and spinal cord.

Myelin repair in progressive MS

Promoting myelin repair in MS patients may be a particularly beneficial therapy option for those with progressing MS. These

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people have few or no "relapses," yet their symptoms gradually increase and they grow increasingly handicapped over time [4].

Risks and benefits

Autologous hematopoietic stem cell transplantation in MS has repeatedly been demonstrated to be effective in research investigations. Over time, the procedure's safety has also increased.

Over 700 transplant patients from 15 distinct trials were examined in one meta-analysis. After combining all of the data, the researchers discovered that two years after the transplant, 83 percent of the patients showed no signs of disease activity [5].

In a research published in 2021, 71 percent of people with relapsing-remitting MS and 57 percent of people with progressive MS reported no worsening of disability 10 years following their transplant.

When the immune system is weakened, patients are vulnerable to potentially life-threatening bacterial, viral, and fungal infections, which constitute a danger of undergoing aHSCT.

Furthermore, a transplant is both costly and time-consuming. Patients are frequently admitted to the hospital for three weeks and may have painful chemotherapy side effects.

Mesenchymal stem cell transplantation research is still in its early stages. Although there are current and finished clinical trials in humans, the majority of investigations have been conducted on animals. Preliminary findings appear to indicate that this therapy is both safe and beneficial.

16 individuals with main progressive or secondary progressive MS were given three injections of mesenchymal stem cells into their spinal canal every two months in a phase 2 clinical research. The stem cells had been given substances that would aid nerve cell growth and survival.

Mobility, finger dexterity, and cognitive and visual impairment were all improved in some of the study participants. The most common negative effects from the lumbar punctures were headache and back pain. The study found no deaths or treatment-associated adverse events related to MS worsening.

To properly assess if mesenchymal stem cell transplants are safe and successful, larger and longer-term studies, as well as research involving control groups, are required.

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