INDIAN STEMCELL STUDY GROUP ASSOCIATION (ISCSG)
(An All India Registered Association)
Reg. No- LUC/07484/2018-19

Optimization of Stem Cells for Clinical Practice

Aim

To explain the importance of optimizing progeniter cells for clinical practice for better clinical outcome

Introduction

Current clinical applications of stem cells highlight the problems encountered when moving from testimony of principle in the laboratory to widespread clinical practice.

There are different types these cells which have been identified and described. The increase in awareness of the importance of environmental factors, which are known to influence self-renewal and other aspects in regulating stem cell behavior, While some of the key genetic and epigenetic factors that determine stem cell properties have been identified, it is important to classify the environmental signals that control stem cell expansion, differentiation and control those signals to optimize delivery of stem cells therapy.

Success of stem cell transplantation or transfusion is partially limited by low retention or engraftment of the delivered cells. A clinically applicable method for defined quantification of cell retention would enable optimization of cell delivery.

Factors considered for optimization

There are five major points to be considered for optimizing the cells in stem cell therapy for a better clinical outcome:

1. The source of stem cells or cytokines,
2. Method used for the process,
3. Quantifying the cells at the end of process,
4. Qualifying the cells, and
5. Recommended cell dose.

Before beginning the process, the selected source of stem cells for application should be pre-qualified for the desired cells. This will ensure the recovery of recommended cell dose of the end product.
A standardized protocol, that is, a validated device or method should be followed for the said process.
Another decisive area is the validation of processed cells. However, due to financial constraints this area is lagging behind from the standardized protocol.

Office Secretariat
Apley Orthopaedic Centre, 1/9, Vastu Khand, Gomti Nagar, Lucknow 226010

Sources of stem cells and targeted ailments

The major sources of stem cells in the industries are:

1. Bone Marrow
2. PBSC
3. cGMP products in addition to Platelet Rich Plasma

Bone marrow (BM):

A good source of stem cells with the acceptable ranges of different types

1. Mononucleated cell concentration which contains lymphocyte and monocyte and markers for CD34, CD133, CD271, CD14, CD56, and other T cells and B cells.
2. The volume of BM collected based on the requirement of cell dose and the concentrated end volume.

Peripheral blood stem cells:

These can be obtained by a simple mobilization procedure for 5 days with Filgrastim (GCSF) followed by PBSC collection by Apheresis machine.

The target cells are mostly CD34, CD3.CD19, CD56, and CD14 which are more useful in hematological malignancy or non-malignancy disease transplant programs.

cGMP products (except for embryo and fetal progenitor cells):

Mesenchymal cells

1. Bone marrow
2. Dental Pulp
3. Cord tissue
4. Adipose tissue

Culture-expanded mesenchymal cells (MSCs)-like cells derived from marrow, cord tissue, bone marrow, dental pulp and adipose tissue from either autologous or allogenic sources are being studied in clinical trials across the world.

Targeted ailments

The ailments targeted with this cell pharmaceutical platform fall roughly into two categories:

1. Immune/inflammatory and
2. Tissue repair/restoration.

Quality control of MSC-based cell products for research & applications include donor selection, choice of culture media, pooled master cell stocks, immuno phenotype, tumorigenicity, testing of immune suppressive potentials, cryopreservation and dry shipping module for delivery.

Conclusion

Selection of stem cells and its potency for a clinical practice in regenerative medicine has not been recognized but proven on clinical evidence source and this should be identified and implemented. Multicentre study with appropriate protocol for a large data should be standardized . Optimization of cell process and the cell dose could lead to safe delivery of these Progeniter cells.

Dr Nedun Chezian
Consultant Scientist ,Regenerative Science