Introduction

Applied spinal cord anatomy

Physiology and Pathophysiology of spinal cord injury

Stem cells

Therapeutic uses of Stem cells in spinal cord injury

Conclusion

Summary

References

Therapeutic Uses of Stem Cells for Spinal Cord Injuries.

By Ayman Mostafa Ibrahim.

Spinal cord injuries occurs at a rate of 30 to 40 per million population per year resulting in approximately 10,000 new cases each year so it, is considered a major medical problem worldwide and realistic goals of functional repair have only recently been acknowledged and using stem cells is now considered one of the golden and vital strategies, for that huge problem.

Adult C.N.S regeneration after injury is limited due to multiple factors including glial scaring, inhibitory factors, and lack of trophic support.

Stem cells have two unique features: first, their ability to self renewal and second their capacity to differentiate into multiple cell lines.

There are different types of stem cells within the human body:

- Embryonic stem cells.
- Adult stem cells.

Stem cells can be harvested by different methods from different sources e.g. peripheral blood, umbilical cord blood, or bone marrow.

Adult stem cells were preferred among stem cells types for treatment of SCI as they are autologus cells with no rejection hazards, can be obtained by safe outpatient procedure and show no risk of tumor formation (unlike embryonic stem cells).

It's reported that the stem cells whatever its source can be expanded in vitro by the aid of different cytokines combination in a simple culture system.

Stem cells therapeutic strategies for treatment of SCI can be classified into two approaches:

(I) The replenishment of lost neural cells.

(II) The induction of axonal regeneration.

There are many routes of stem cells administration in SCI such as intravenous, intralesional, and intrathecal by lumbar puncture but lumbar puncture is the most beneficial ones.

Manipulation of endogenous stem cells in site of SCI offers an inherently attractive advantage as it avoids the need for further trauma caused by cellular transplantation.

Many experimental works on the different types of stem cells was reported for repairing damaged spinal cord in animal models. Also there are many safe clinical trials on human beings and the results are encouraging and so hopefully and successfully without life threatening complications.

Indeed, many research works is needed to achieve good results for SCI treatment using stem cells to develop a definitive cure for these miserable patients.

Acknowledgement

First of all, all thanks to **ALLAH** for the inestimable blessings upon his slaves.

I would like to express my deepest gratitude and appreciation to **Prof. Dr. Rafeek Ahmed Sadek**, Professor of orthopedic surgery, faculty of medicine, Ain Shams University for his valuable supervision and generous support.

I would like to express my special thanks to **Dr. Ayman Abd El Azeez Bassiony**, lecturer of orthopedic surgery, faculty of medicine, Ain Shams University for his great support, and guidance.

I would also like to express my deep thanks to my **parents**, family, friends, my senior staff and colleagues in the orthopedic department for their help and support.

List of Abbreviations

ASIA.....American Spinal Injury Association

BBB..... Basso - Beattie - Bresnehan

BDNF.....Brain Derived Neurotrophic Factor

BM.....Bone Marrow

BMP.....Bone Morphogenetic Porotein

BMSCs.....Bone Marrow Stem Cells

BMT..... Bone Marrow Transplantation

BrdU.....Bromodeoxyuridne

CB.....Cord blood

CBT.....Cord blood Transplantation

CFU.....Colony Forming Unit

CFU-GM.....Granulocyte-Macrophage Colony-FormingUnits

GM-CSF.....Granulocyte-Macrophage Colony-Stimulating factor.

GVHD.....Graft Versus Host Disease

HGFs.....Hematopoietic Growth Factors

HLA.....Human Leucocytic Antigen

HSCs .....Hematopietic Stem Cells

HUC.....Human Umbilical Cord Blood

ICM.....Inner Cell Mass

IL.....Interleukin

INF.....Interferon

IVF.....In Vitro Fertilization

LP.....Lumbar Puncture

MAG.....Myelin Associated Glycoprotein

MHC.....Major Histocompatibility Complex

MNCs.....Mononuclear Cells

MPSCs.....Multipotent Stem Cells

MSCs.....Mesenchvmal Stem Cells

MSCs.....Marrow Stromal Cells

NSCs.....Neural Stem Cells

NT.....Neurotrophin

PBSC.....Peripheral Blood Stem Cell

PDGF.....Platelet Derived Growth Factor

PSC.....Pluripotent Stem Cell

SCa-1.....Stem Cell antigen-1

SCF (c-kit ligand).....Stem Cell Factor

SCI.....Spinal Cord Injuny

SCs.....Stem Cells

TRK.....Tyrosine Kinase

UCB.....Umbilical Cord Blood