Cord Cells and Regenerative Medicine

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Abstract- Regenerative medicine, a promising new interdisciplinary field, combines engineering and life sciences principles to promote healing. It can restore damaged and diseased tissues as well as whole organs. Tissue engineering, cell therapies, medical devices, and artificial organs are some of the tools that can be used in regenerative medicine. The goal is not to treat symptoms with medications and procedures but to replace damaged tissues and organs. [1] This presentation will discuss the various methods of regenerative medicine, with a special focus on stem/cord cells in regenerative medicines.

Index Terms- Cord blood, mesenchymal stem cells, spinal cord injury, stem cells, multipotent.

I. Introduction

Regenerative medicine, a branch of medical science that deals with the functional restoration of tissues and/or organs in patients with severe injuries and chronic diseases, is the most recent and rapidly growing branch of medical science. [2,3]
Organ donation is not able to meet the growing transplantation needs of elderly and diseased populations. Stem cells, which have the ability to divide indefinitely and can be transdifferentiated into other types of cells, are being explored as an alternative. [4,5]

II. TYPES OF STEM CELLS:

Stem cells can be classified into four types based on their trans differentiation potential:

- Unipotent
- Multipotent
- Pluripotent
- Totipotent.

Stem cells can be used in regenerative applications :

- Embryonic stem cells (ESCs)
- Tissue specific progenitor stem cells (TSPSCs)
- Mesenchymal stem cells (MSCs)
- Umbilical cord stem cells (UCSCs)
- Bone marrow stem cells (BMSCs)
- Induced pluripotent stem cells (IPSCs)

III. ORIGIN OF STEM CELLS:

Although stem cells can be obtained from either bone marrow or umbilical blood, umbilical blood is easier to obtain and contains ten times as many stem cells than bone marrow. [6,7] Cord blood stem cells are less likely to carry infectious diseases than adult stem cells and are twice as likely to be rejected.

IV. CONDITIONS FOR WHICH STEM CELLS ARE USED:

1. Leukemias
2. Hodgkin’s lymphoma
3. Neuroblastoma
4. Medulloblastoma
5. Anemias [8]
6. Inherited red cells abnormalities.
7. Inherited platelet abnormalities
8. Inherited immune system disorder.
9. Phagocyte disorders
10. Bone marrow cancers.
11. Inherited metabolic disorders.
12. Cartilage- hair hypoplasia
13. Gunther’s disease.
14. Systemic mastocytosis.

V. CHALLENGES OF USING STEM CELLS:

It is difficult to obtain enough cord blood to transplant an adult. Cord blood stem cells can also be slower to engraft. [9]
The versatility and durability of adult stem cells might not be the same as embryonic stem cells. It is possible that adult stem cells cannot be used to make all types of cells. They also have a higher chance of developing abnormalities from environmental hazards such as toxins or errors during replication. [10]

VI. CONCLUSION:

The spectacular progress in the field of stem cells research represents great scope of stem cells regenerative therapeutics. In the near future we will be able to produce wide array of tissues, organoid and organs from adult stem cells. There may also be new pharmaceutical compounds, that can alternate tissue specific stem cells, promote stem cells to migrate to the side of tissue injury and promote their differentiation to tissue specific cells.

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