Introduction

The spinal cord possesses a complex architecture , composed of neurons , oligodendrocytes and astrocytes .The carful arrangement of the different tracts of the spinal cord allows for a variety of information to be transmitted throughout the body(***Apostolova et al.,2006).***

Traumatic spinal cord injury (SCI) affects many people, including young people, and can result in severe damage, leading to loss of motor and sensory function caudal to the level of injury, by severing descending and ascending fiber tracts ***(Okano et al., 2007).***

The traumatic lesion of spinal cord is followed by the degeneration of astroglia, oligodendroglia and neurons in and around the lesion site. The outcome of this sequence of events is the formation of the glial scar, a cavity surrounded by reactive glia, In addition, lesioned axons in the injured area are often demyelinated that represents an obvious obstacle to axonal regrowth. It has been recently shown that factors responsible for this characteristic are the myelin associated neurite outgrowth inhibitor Nogo A, the myelin-associated glycoprotein, the proteoglycans brevican and versican v2 and several potentially repulsive inhibitory axonal guidance molecules***(Garbossa et al ., 2006)***.

A variety of cell types have been evaluated in the context of spinal cord injury including embryonic stem cells wheather human or mouse embryonic stem cells, neural stem cells, bone marrow stromal cells and mature cells which may be schwann cells, olfactory ensheathing cells or fibroblasts. Embryonic stem cells (ESCs) can be **Totipotent** (be able to generate all cell types in an organism except the placenta), **Pluripotent** (the ability to yield mature cell types from all different germ layers), or **Mulitpotent**(be able to give rise to all cells within an organ)***(willerth and sakiyama 2008)***.

Stem cells differ from other kinds of cells in the body. All stem cells have three general properties regardless of their source, they are capable of dividing and renewing themselves for long period, they are unspecialized and they can give rise to specialized cell types***(Kooy and weiss 2000).***

Peripheral blood stem cells are collected by Aphaeresis, a process in which the donor is connected to a special cell separation machine via a needle inserted in the vein. Blood is taken from one vein and is circulated though the machine which removes the stem cells and returns the remaining blood and plasma back to the donor through another needle inserted into the opposite arm. Several sessions may be required to collect enough stem cells to ensure a chance of successful engraftment in the recipient. The Apheresis procedure is painless but does require several hours.***(Humpherys et al., 2001).***

The majority of studies use a variety of injection methods for delivery of cellular therapeutics the most common method of cell grafting involves injecting cells to deliver them into and around the site of injury. Many studies inject cells rostrally or caudally from the injury site to achieve better levels of survival. Direct injection into the injury site often produces poor results in terms of cell survival due to the harsh environment in the lesion ***(willerth and sakiyama 2008)***.

Role of stem cell transplantation has been proposed as a strategy for CNS and spinal cord injury repair. Neural stem cells (NSCs) are capable of differentiating into neurons in the brain and spinal cord. Recently, three groups demonstrated that genetically engineering NSCs with axonal growth gene or neuroprotective factor genes, such as neurotrophin NGF and BDNF could exhibit spinal cord repair. They isolated and cultured the neural stem cells and then modified these cells with lentivirus mediated neurotrophin. These experiments provide a clear indication that modifying NSC with NT3 can make NSC act as a source of neurotrophic factors, and improve functional outcome in spinal cord injury via neuroregeneration***(Phillips and Tang 2007)***.