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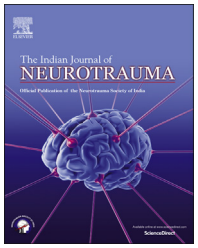

Case Report

Autologous bone marrow derived stem cell therapy in traumatic spinal cord injury: A case report and review of literature

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ABSTRACT

Spinal cord injury (SCI) is a devastating condition. It not only creates enormous physical and emotional cost to the victims but also causes a financial burden to the society at large. The treatment of SCI focuses on preventing further injury and enabling people to return to an active and productive life within limits of their disability. Recently there is great excitement about the possibility of generating neural progenitor cells from sources such as mesenchymal cells derived from skin, bone-marrow, or adipose tissue. Stem cell therapy in traumatic spinal cord injury is an on going area of research in many centres in India and abroad. We describe a case of traumatic spinal cord injury with complete paraplegia in an adult where we had infused autologous bone marrow derived stem cell to damaged cord during fixation procedure and review the literature.

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1. Introduction

Stem cell therapy is used currently as a novel strategy to overcome physical discontinuity and support axonal growth in experimental models of spinal cord injury.[1,2] The multifarious potential of cellular therapy support restoration of axonal connections, limits tissue damage and scarring, facilitates remyelination repair, and replaces and re-establishes lost neural tissue and its circuitry.[3] Autologous stem cells, that are safe and efficient, possess such potentials as to be considered an attractive alternative therapeutic regimen for regeneration of damaged axons and neurons following spinal cord injury. They also obviate the therapeutic bane of immune-suppression and adverse reactions, serve as a better option of therapy for injured spinal cord.[4] We report our case of traumatic spinal cord injury leading to complete paraplegia in an adult where we have infused autologous bone marrow derived stem cells into the damaged cord during spinal stabilization procedure and review the literature.

2. Case report

A 30 year old male was admitted to our institution with history of fall from a 20 feet height. He was a manual labourer by profession, working at a height of 20 feet, due to imbalance he fell to ground hitting his back. On examination he had grade-o power in both lower limb, sensory level at L1 and retention of urine. His neurological status was, ASIA (American Spinal Injury Association) Grade-A. Injection methylprednisolone was given according to National Acute Spinal Cord Injury Study (NASCIS) – 2 regimen as he came within 3 h of injury and he was catheterized. His X-ray lumbar spine revealed L1 burst fracture (Fig. 1A). Magnetic resonance imaging (MRI) of spine revealed burst fracture of L1 body and mild compression fracture of L2 with retropulsion of fracture fragment of L1 causing significant cord compression with cord oedema (Fig. 1B,C,D). Patient was planned for stabilization procedure. We also planned for stem cell therapy for this patient in the same sitting. First we took the permission from the ethical committee of the institute for this novel procedure. Then we informed the patient party about this new procedure and its pros and cons in detail. Once got the consent from the patient party, we informed the haematologist and the research officer in our institute to prepare the bone marrow derived stem cells for the patient. The haematologist aspirated the bone marrow from the iliac crest of the patient and the research officer collected the aspirated bone marrow in a heparinised bottle diluted in Dulbecco's phosphate buffered saline and transferred it to the lab for further processing.

3. Stem cell preparation

3.1. *Isolation and processing of human-bone-marrow–derived mononuclear cells*

One hundred to 120 mL of bone marrow was aspirated from the iliac crest of the patient in a heparinized (1 L/5000 U) bottle and diluted in Dulbecco's phosphate buffered saline (without calcium and magnesium) at a ratio of 1:2. The aspiration was layered on Ficoll (Ficoll–Paque PLUS, 1.077 g/L, Stem Cell technologies, Vancouver, BC, Canada V5Z 1B3), and centrifuged at 450*g* for 30 min. The mononuclear cell interface was carefully removed, and washed twice in Dulbecco's phosphate buffered saline at 400*g* for 10 min. The resultant pellet was added with RBC lysing solution (0.7% ammonium chloride) and incubated for 2 min. The lysing was arrested by adding 0.9%ice cold sodium chloride, and the cells were washed. The bone marrow derived cells were washed in Dulbecco's phosphate buffered saline until the lysing factors were removed, and finally, resuspended in required volume.

3.2. *FACS characterization of bone marrow derived cells*

One hundred microliter processed samples (1 × 106 cells/mL), 20 μL of CD34, and 20 μL of CD45 antibodies conjugated with phycoerythrin (PE) and fluorescein isothiocyanate (FITC) respectively (BD Biosciences, San Jose, CA, USA) were added and incubated for 15 min at room temperature in the dark. After incubation, 900 μL of phosphate buffered saline was added to the stained cells and mixed well. To this mixture, 5 μL of the 7-Amino Actinomycin D(7-AAD) dye was added, and

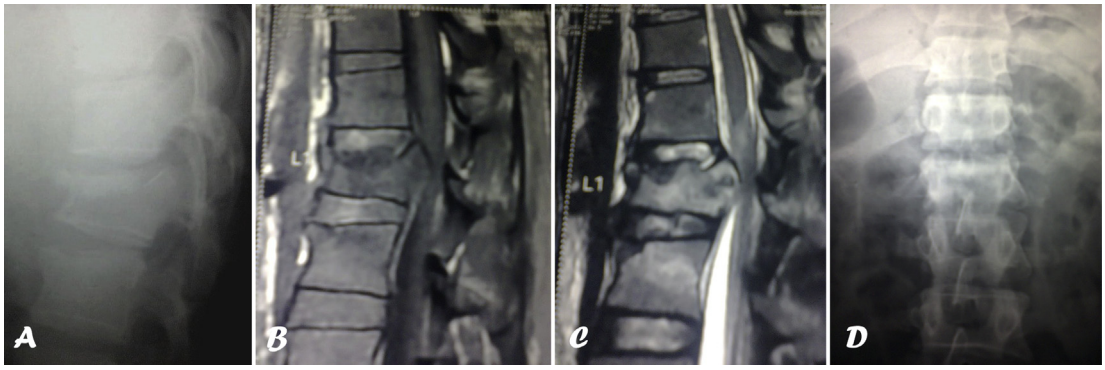

Fig. 1 – (A) plain X-ray lumbar spine lateral view showing burst fracture of L1 vertebra, MRI of LS spine, sagittal cuts T1 weighted image (B),T2 weighted image (C) and coronal cuts (D) showing burst fracture of L1 with retropulsion of fracture fragment causing compression of spinal cord and cord oedema.