

Recent Developments in Wound Healing Therapy

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Introduction

Skin is the largest organ and it is the primary defense mechanism of our body. The global volume of skin scarcity has become the major health concern and accounts for about half of the world's annual expenditure in the healthcare sector. According to world health Organization, In United states alone 2.4-4.5 million people are injured every year and in India, around 1 million people are moderately or severely injured. In this scenario, Tissue grafting is not a viable treatment option, especially for larger injuries. Despite the abundance of wound healing products available on the market, there remains a significant number of wounds that either fail to heal or heal with scarring. There is, therefore, a clear need for the development of alternative wound therapies that promote healing and reduce scar formation. Studies suggest that cell based therapies have great potential for the treatment of wounds. Stem cell based therapy has become an attractive option for chronic wounds due to their ability to differentiate into different cell types resulting tissue regeneration and repair. Among the various stem cells available, Mesenchymal Stem cells are known to renew themselves and differentiate into various tissue- forming cell lineages, such as keratinocytes, fibroblasts, chondrocytes, adipocytes, osteocytes, endothelial cells, smooth muscle cells. Mesenchymal stem cells are non-hematopoietic cells that have fibroblasts like morphology. MSCs based therapy promotes wound healing by enhancing re-epithelialization, promoting granulation tissue formation, accelerating angiogenesis and reducing inflammation [1-4].

These promising results inspired the clinicians to use MSCs in clinical trials as a cell based therapy for chronic wound models. All these findings from preclinical and clinical studies demonstrate that MSCs could be a promising resource for regenerative therapy. Chen et al. have demonstrated that Bone marrow derived MSCs accelerated wound healing by stimulating anti- inflammatory cytokines, collagen deposition and inducing angiogenesis and proliferation. Overall, the findings from clinical and pre-clinical studies reveals that MSCs could be a promising approach for wound healing therapy. Stem cell based therapy have many limitations. One of the major challenges of stem cell based therapy is the low survival rate of stem cells after transplantation at the wound site and cell rejection at the transplantation site [5-8]. To overcome the limitations, scientists have come up with a new therapeutic approach based on stem cell secretome. Stem cells synthesizes and releases biologically active molecules such as growth factors, proteins, cytokines which play a key role in wound healing process. These secretome is interdependent and gets modulated in-vivo based on the physiological signals through circulating cells and proteins. Thus stem cell secretome can be targeted for better therapeutic applications and also removing limitation factors of cellular therapy. A recent study showed that topical administration of bone marrow derived MSC secretome to burn wound models resulted in fibroblasts proliferation and enhanced angiogenesis and accelerated wound closure [9-11]. The stem cell secretome has shown to alter the expression profiles of genes involved in re-epithelialisation, collagen deposition and angiogenesis in human 3D skin models. In

another study, cutaneous wounds of rats administrated with Adipose tissue derived stem cells secretome enhanced wound healing along with accelerated re-epithelialization. Thus, the administration of MSC secretome for severe cutaneous wound may lead to a promising therapeutic approach for wound healing [12].

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