Editorial

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Mesenchymal Stem Cell Therapy in Skin Wound Healing

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Editorial

I am honored to write this editorial for inaugural issue of the journal of Trauma & Acute Care and thank to this journal will provide a platform to publish high quality studies on treatment of diseases and associated psychology. I want to provide some perspective on the wound care of skin flap ischemia reperfusion injury (IRI) with mesenchymal stem cell (MSC) therapy.

Skin flap are routinely used by reconstructive surgeons for the functional and cosmetic repair of wounds and defects that are the result of burn injuries, trauma, or tumor ablation. A skin flap consists of 3 layered vascularized tissues 1) reticular dermis 2) subcutaneous tissue 3) the underlying fascia. Flap survival mainly depends on the blood supply through vessels of the dermal and sub dermal plexus [1]. In flap preparation, IRI always occurs when a free flap is transplanted from one area to another. During ischemia and reperfusion, reactive oxygen species (ROS) are produced [2]. ROS include oxygen ions, free radicals and peroxides and initiate IRI. They are derived from two different processes: the xanthine oxidase system in endothelium cells and the nicotinamide adenine dinucleotide phosphate (NADPH) oxidase system in neutrophils [3]. The ROS causes swelling of endothelium cells, vasoconstriction and increased capillary permeability. Except ROS, the other characteristics of IRI are massive influx of neutrophils, depletion of NO and apoptosis of cells.

Wound healing is an elaborate process involving complex interactions among cells, growth factors and extracellular matrix molecules to sequentially achieve hemostasis, cell proliferation, angiogenesis, re-epithelialization and remodeling of tissue [4]. Despite the success of wound healing following skin grafting from auto-graft, allograft and synthetic tissue, the resulting skin contains scar, infection, immune rejection, and frequently lacks the flexibility and elasticity of normal skin. The conventional treatment modalities for skin flap transplantation, especially for severe facial, head and neck burns offer little improvement in function and appearance, and they often leave patients significantly debilitated. These patients frequently become isolated socially and personally, and many of them suffer from psychological disorders and phobias.

Stem cells, with their unique properties to self-renew and undergo differentiation, are emerging as a promising therapy for wounds. Adult stem cells such as bone marrow-derived MSC and adipose-derived MSC are not restricted to the same extent by low availability and ethical concerns that restrict the use of embryonic stem cells, thus making them an ideal measurement for skin regeneration. MSC is relatively easy to obtain through in vitro culturing. Many preclinical studies have demonstrated that accelerated wound healing in cutaneous wound with both autogenously and exogenous MSC treatment via local or systemic delivery [6,7]. In clinical studies, all patients showed clinical improvement in their wounds within days following bone marrow aspirate or cultured MSC. Wounds showed a steady overall decrease in wound size without side effects associated with the delivery of MSC were noted [8,9]. The mechanism of enhance wound healing is that MSC secrets anti-inflammatory cytokines such as IL-10 and attenuate secretion of the proinflammatory cytokines [10]. These anti-inflammatory properties make MSC particularly beneficial to wounds by advancing the wound past a chronic inflammatory state into the next stage of healing. Furthermore, MSC secreted a variety of cytokines to promote dermal fibroblast proliferation, angiogenesis and collagen deposition [11].

Wound healing constitutes a complex process where different cells and molecules act in an orchestrating way. The physical and functional improvements lead to the resolution of psychosocial distress and a state of satisfaction and happiness that only patients may really understand. Adult MSC has shown as a promising therapy in skin wound where conventional treatments failed. In future, the mechanisms of MSC survival in the injury area and relationship to surrounding cells will need to be clarified.

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