ABSTRACT: Mesenchymal stem cells represent a population of undifferentiated multipotent cells that can self-renew and differentiate. In this study, a total number of 60 male albino rats two-month-old were used in this study, weighing approximately 150-180g. Rats were randomly divided into two groups, each containing thirty animals (n=30). Group (I) assigned as non-diabetic rats while group (II) assigned as diabetic rats. After one-week adaptation, diabetes was induced in rats groups (IIa, IIb, IIc), using (IP) injection of Streptozotocin (STZ). Induction of injury was established for all rat groups after 5 days from STZ injection. Stem Cells Isolation from rats were applied to groups number Ib and IIb, while plasma rich platelet isolation was applied to groups number Ic and IIc. Stem Cells and PRP injections were carried out right after wounding. 5 µl of each treatment type was applied by direct injection into the wound. At day 3, 6, 9 and 12 post-wounding. At every time point, the rate of wound contraction was higher in rats of group I as compared with group II (P < 0.05). Furthermore, the wound area was smaller in group Ic compared to that in groups Ib, IIb and IIc (P< 0.05). These results suggested that PRP treatment accelerated delayed wound healing in diabetic rats. The findings of histopathology showed that the granulation tissue was thicker in groups Ib, Ic, IIb and IIc compared to that in groups IIa. Reepithelialization around the wound edge was the predominant process during the late stage of wound healing. These findings suggested that more stem cells and PRP therapy did promote the formation of granulation tissue. To investigate the possible mechanism involved in the accelerated wound healing, we examined the expression level of angiogenic factor, VEGF in the wound tissues by real-time PCR.

Key words: Stem cells, wound healing, diabetes mellitus, platelet-rich plasma.

INTRODUCTION

The incidence of diabetes mellitus is growing and reaching epidemic proportions worldwide. The total number of diabetics is estimated to rise from 171 million in 2000 to 366 million in 2030 (Wild et al, 2004). An important point to know about a diabetic patient wound is that it heals slowly and can worsen rapidly. Numerous studies have indicated that stem cells may contribute for regeneration of many tissues (Pittenger, 1999). These cells are characterized by their capacity for self-renewal and multipotent (Szkudelski, 2001). Their therapeutic potential is largely due to their ability to secrete pro-regenerative cytokines and growth factors, making them an attractive option for the treatment of chronic wounds (Knighton et al, 1990). Platelets play a central role in hemostasis and wound healing by release of secretory proteins on platelet activation, platelet activation which directly or indirectly influences virtually all aspects of the wound healing cascade (Knighton et al, 1990). A new strategy to promote the wound-repair cascade known as platelet-rich plasma (PRP), plasma rich in growth factors (PRGF) is a relatively new approach considered clinically useful in various fields of medicine (i.e., dermatology, dentistry, ophthalmology, cosmetic surgery and traumatology) (Nurden et al, 2008). In the present work, we tried to investigate whether mesenchymal stem cells obtained from peripheral blood and platelet-rich plasma has effectiveness in the enhancement of delayed wound healing in rats. And compare the efficacy of the two different methods (MSCs and PRP) on wound healing process (Vinik et al, 2001). The effect of treatments has been assessed in terms of their role in public health.

MATERIALS AND METHODS

Induction of injury

The process of induction of injury was established for all rat groups, the induction of injury was applied after 5 days from STZ injection. Procedure started by