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Pancreatic protection elicited by platelet-rich plasma and cinnamon combination in a rat model of type 1 diabetes: is it a new era in islet cell regeneration and insulin signalling genes?

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Introduction. Diabetes mellitus (DM) is a serious, chronic metabolic disorder commonly complicated by diabetic foot ulcers with delayed healing. Metformin was found to have a wound healing effect through several mechanisms. The current study investigated the effect of both bone marrow-derived mesenchymal stem cells (BM-MSCs) and metformin, considered alone or combined, on the healing of an experimentally induced cutaneous wound injury in streptozotocin-induced diabetic rats.

Material and methods. Forty adult male albino rats were used. Diabetes was induced by single intravenous (IV) injection of streptozotocin (STZ). Next, two circular full thickness skin wounds were created on the back of the animals, then randomly assigned into 4 groups, ten rats each. BM-MSCs were isolated from albino rats, 8 weeks of age and labeled by PKH26 before intradermal injection into rats of Group III and IV. Groups I (diabetic positive control), II (metformin-treated, 250 mg/kg/d), III (treated with 2×10^6 BM-MSCs), and IV (wounded rats treated both with metformin and BM-MSCs cells). Healing was assessed 3, 7, 14, and 21 days post wound induction through frequent measuring of wound diameters. Skin biopsies were obtained at the end of the experiment.

Results. Gross evaluation of the physical healing of the wounds was done. Skin biopsies from the wound areas were processed for hematoxylin and eosin (H&E), Masson's trichrome staining and immunohistochemical staining for CD31. The results showed better wound healing in the combined therapy group (IV) as compared to monotherapy groups.

Conclusions. Although both metformin and BM-MSCs were effective in the healing of experimentally induced skin wounds in diabetic rats, the combination of both agents appears to be a better synergistic option for the treatment of diabetic wound injuries.

Keywords: Cinnamon, platelet-rich plasma, islet regeneration, IR, IRS-1, PI3k gene expression, ultrastructure, rat