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THE OPTIMAL TIMING OF ADIPOSE DERIVED STEM CELLS INJECTION TO IMPROVE SKIN FLAP SURVIVAL IN A RAT MODEL

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Background: Skin flap surgery is a cornerstone in plastic surgery. However, flaps may encounter postoperative partial or complete necrosis. Different modalities have been used to enhance skin flap survival. Adipose-derived stem cells (ASCs) can promote angiogenesis and improve skin flap survival. We aimed to investigate the appropriate timing of ASC administration to get the maximal angiogenic effect and better skin flap survival in rat model.

Methods: Thirty-two male albino Wistar rats were used to study the role of ASCs on caudally based (2 × 8 cm) random pattern skin flap survival; the 32 male albino rats were equally divided into four groups according to timing of ASC injection. We applied the ASCs at three different timing, group A (local injection of ASCs along the flap axis simultaneously with flap elevation), group B (2 days preoperatively), and group C (7 days preoperatively). In the control group (group D), the flap was injected with phosphate buffered saline at the time of flap elevation. Skin flap survival was evaluated on the seventh postoperative day through percentage of flap survival, capillary density, and vascular endothelial growth factor (VEGF) expression.

Results: ASCs led to a statistically significant increase in skin flap viability when administered simultaneously with flap elevation or 2 days prior to flap elevation. This went along with significant increase in capillary density and VEGF expression. However, the ASCs had no effect on flap survival when injected 1 week prior to flap elevation.

Conclusion: We demonstrate that the skin flap viability can be enhanced by local ASC administration simultaneously with flap elevation or 2 days prior to flap elevation. Their beneficial effect is attributed to paracrine secretion VEGF which enhanced the skin flap vascularity. The angiogenic effect of ASCs can be maximized when the ASCs are injected at the time of flap elevation.