Obesity Impairs Wound Healing and Neovasculogenesis.

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Introduction: Obesity impaired wound healing is a timely and important topic. Sixty-six percent of Americans are overweight or obese, accounting for approximately 33 million overweight and obese surgical patients annually across all surgical specialties. Surgeons anecdotally appreciate wound healing complications among obese patients, such as infection, delayed closure, dehiscence and seroma, however, little basic science research has been conducted to investigate the mechanisms behind these impairments. We hypothetized that obesity-related wound healing is impaired through a vasculogenic mechanism.

Methods: We created 6-mm circular, full-thickness stented wounds on non-diabetic, obese mice (TallyHo/JngJ, n=30) and non-obese controls mice (SWR/J, n=30). Wound healing was assessed photometrically on days 0, 7, 10, 14 and until wound closure. Wound were harvested at each time point for ELISA, RT-PCR and immunohistochemistry analysis. Blood was drawn following a previously established protocol and murine peripheral endothelial progenitor cells (EPCs) counts were quantified with FACS analysis at day 0, 7, 14 and 21.

Results: Obese mice wound healing was significantly delayed (23±2.5 days vs 14±1.5 days). EPC numbers were significantly decreased in the obese group during the acute ischemic timeframe (7-14 days). CD 31 staining showed significant decreased new blood vessel formation (276.3 ± per LPF vs. 453.7 ± per LPF) among the obese mice (p<0.05). RT-PCR and Elisa analysis showed a significant decrease of angiogenic factors (e.g VEGF, HIF-1 and SDF-1) and anti-apoptotic genes (e.g. Bcl-2) at all timepoints compare to controls (p<0.05). Preliminary analysis of p53 and reactive oxygen species levels in obese wounds showed increased levels compare to controls (p<0.05).

Conclusions: Our data suggest that obese delayed wound healing is related to a vasculogenic impairment involving EPCs. Important angiogenic factors, such as SDF, suggest an signal impairment for the mobilization of EPCs.

Figures

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