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Presenter Information

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Keywords

scars, lipoaspirate, adipose, stem cells

Comments

Dylan Perry and Ava Chappell participated in this study as a medical student in the Senior Scholars research program at the University of Massachusetts Medical School.

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Lipoaspirate and Adipose Stem Cells as Potential Therapeutics for Chronic Scars

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Introduction: Burn injuries can lead to hypertrophic or keloid scars, causing pain and long lasting mobility issues. Current therapies are often unsatisfactory, costly, or morbid. Prior studies suggest adipose derived stem cells (ADSCs) and lipoaspirate can improve scar outcomes of acute thermal wounds. Clinical reports suggest lipoaspirate and ADSCs can improve chronic burn scar remodeling. However, this has not been extensively studied in animal models. We sought to determine if adipose tissue can improve chronic scar remodeling and to compare the effects of ADSCs and processed lipoaspirate.

Methods: 50 CD1 nu/nu athymic mice received a standardized deep partial-thickness thermal burn. Scars matured for 6 weeks. Photographs and perfusion measurements by hyperspectral imaging (HSI) were taken over the entire study. Lipoaspirate and ADSCs (SVF and ex-vivo culture with flow cytometry confirmation) were obtained from a discarded human pannus specimen. After 6 weeks, animals received a 0.6cc subcutaneous graft beneath the scar of either: human lipoaspirate processed with the Coleman technique, high-dose (10^6) hADSCs in Matrigel, low-dose (10^4) hADSCs in Matrigel, Matrigel only, or not injected (n=10 per group). At 10 weeks, animals were sacrificed and scar tissue was harvested for histological and molecular analysis.

Results: HSI oxygenated hemoglobin values in lipoaspirate treated scars increased significantly more compared to 6-week pre-treatment baseline than all other groups ($p < 0.05$). Planimetry analysis showed reduction in wound area in lipoaspirate treated mice compared to control groups ($p < 0.01$). Blood vessel density quantification on Masson's trichrome stains suggests increased density in lipoaspirate treated scars versus controls ($p < 0.01$).

Conclusion: HSI, blood vessel density, and scar analysis suggest improvement in lipoaspirate treated scars compared to controls. Preliminary molecular data offers some insight to this trend. No effect was seen with ADSCs at either concentration at the analyzed timepoints. Molecular analyses are ongoing to investigate cellular mechanisms in regulating scar remodeling.

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