Introduction: Cutaneous scleroderma is a progressive disorder with considerable morbidity. To date, no cure exists for scleroderma, with 55% survival at 10 years for the diffuse cutaneous form. Recent studies have shown that injected adipose tissue have both a volumetric and regenerative effect on dystrophic skin. This study evaluates the effectiveness of fat injection for the treatment of scleroderma in a murine model.

Methods: 45 female C3H mice underwent daily injection with 0.05mg of subcutaneous bleomycin for 4 weeks in order to create a murine scleroderma analogue. Twenty five control mice were injected daily with sterile saline. At the completion of the injections all mice underwent biopsy of the affected area for PCR and histological analysis. Experimental animals underwent fat injection from inguinal fat pads of donor mice subcutaneously to the affected area at this time. Half of the control and experimental mice were sacrificed 4 weeks after biopsy and fat injection. The dorsal skin of the animals was harvested and submitted for PCR and histological examination. The remainder of the animals were sacrificed 8-weeks post-surgery. Standardized photomicrography was used to obtain images of H&E and trichrome slides, which were analyzed using ImageJ software (Rasband, N.I.H). Dermal thickness and subcutaneous fat thickness were measured at five randomly selected sites within a sample, which were then averaged. On trichrome slides, five 100 x 100 pixel random dermal squares were analyzed for blue spectrum to estimate collagen content. Student's paired t-test was used to compare experimental vs. control groups for histological examination. Quantitative PCR was also used to evaluate levels of TGF-B, Col1A1, CTGF, and Hsp47 in biopsy specimens from half of the animals from each group. PCR results were analyze using unpaired t-test. P-value <0.05 was considered to be significant for all tests.

Results: Gross analysis of experimental animals showed improvement of cutaneous scleroderma after fat injection. H&E and trichrome stains revealed changes consistent with scleroderma after injections with statistically significant improvement in subcutaneous fat thickness, dermal thickness, and collagen deposition after fat grafting. PCR analysis demonstrated significant improvement in levels of Col1A1 and CTGF at 4-weeks after fat injection and improvement at 8-weeks in Col1A1, TGF-B, and CTGF.

Conclusions: Fat grafting is effectively reverses cutaneous scleroderma in a murine model. Further studies must be conducted to ensure safety and effectiveness in human patients.