

Grading Lipoaspirate: Is There an Optimal Density for Fat Grafting?

**Allen, Robert J. Jr. M.D.; Canizares, Orlando Jr. M.D.; Scharf, Carrie M.D.;
Nguyen, Phuong D. M.D.; Thanik, Vishal M.D.; Saadeh, Pierre B. M.D.;
Coleman, Sydney R. M.D.; Hazen, Alexes M.D.**



Abstract

Background: Clinical results of fat grafting have been unpredictable. In this article, the authors hypothesize that centrifugation creates “graded densities” of fat with varying characteristics that influence lipoaspirate persistence and quality.

Methods: Aliquots of human female lipoaspirate (10 cc) were centrifuged for 3 minutes at 1200 g. The bloody and oil fractions were discarded. Subsequently, 1.0 cc of the highest density and lowest density fat was separated for lipoinfiltration or analysis. Highest density or lowest density fat grafted into adult FVB mice was harvested at 2 and 10 weeks to quantify short- and long-term persistence, respectively. Progenitor cell number and expression of vascular endothelial growth factor, stromal cell–derived factor-1 α , platelet-derived growth factor, and adiponectin were analyzed by flow cytometry and enzyme-linked immunosorbent assay, respectively.

Results: Greater percentages of highest density fat grafts remain at 2 and 10 weeks after injection compared with lowest density fat grafts (85.4 ± 1.9 percent versus 62.3 ± 0.1 percent, $p = 0.05$; and 60.8 ± 4.9 versus 42.2 ± 3.9 , $p < 0.05$, respectively). Highest density fractions contain more progenitor cells per gram than lowest density fractions (2.0 ± 0.2 -fold increase, $p < 0.01$). Furthermore, concentrations of vascular endothelial growth factor, stromal vascular fraction, platelet-derived growth factor, and adiponectin are all elevated in highest density compared with lowest density fractions (34.4 percent, $p < 0.01$; 34.6 percent, $p < 0.05$; 52.2 percent, $p < 0.01$; and 45.7 percent, $p < 0.05$, respectively).

Conclusions: Greater percentages of highest density fractions of lipoaspirate persist over time compared with lowest density fractions. A vasculogenic mechanism appears to contribute significantly, as highest density fractions contain more progenitor cells and increased concentrations of several vasculogenic mediators than lowest density fractions.