MATERIALS AND METHODS: Adults undergoing liposuction on bilateral body areas were included (n=12). Under sedation, liposuction on one side was conducted with standard tumescent (1L of LR with 30ml of 1% lidocaine and 1 mcg/ml epinephrine). Tumescent without lidocaine was infiltrated on the contralateral side. Five milliliter lipoaspirate samples were processed for isolation of the stromal vascular fraction (SVF). Apoptosis and necrosis of SVF were examined by Annexin V–FITC/PI staining and analyzed by flow cytometry. ASC’s were also cultured and, after 24h, adherent, viable ASC’s were counted. The effect of ropivacaine on ASC survival was compared to PBS control and lidocaine in a cell culture, dose-response model.

RESULTS: From Annexin V–FITC/PI flow cytometry, the lidocaine group showed an average percentage of live ASC’s of 68.0±4.0% (28.5±3.8% of apoptosis and 3.4±1.0% of necrosis) as compared to 86.7±3.7% (11.5±3.1% of apoptosis and 1.8±0.7% of necrosis) in the no-lidocaine group (p = 0.002). In cell culture, the average number of viable ASC’s was also lower in the lidocaine group (367,000±107) as compared to the no-lidocaine group (500,000±152), a 26.6% decrease (p = 0.04).

In our dose-response study, ASC survival was significantly lower (p<0.01), in a dose-dependent manner, when treated by lidocaine and ropivacaine as compared to the correspondent PBS control. No significant difference was found between lidocaine and ropivacaine.

Conclusions: Excluding lidocaine from tumescent solution significantly improves ASC survival and decreases the apoptotic response. This increased survival may affect fat graft take by increasing angiogensis and enhancing the healing cytokine milieu, and it will affect expansion and differentiation of cells for use in research or regenerative medicine by optimizing stem cell harvest.

Ropivacaine, despite having a decreased side effect profile, does not represent an alternative to lidocaine in terms of ASC survival.

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Mechanical Isolation of Adipose-Derived Stromal Vascular Fraction: Is It Becoming a Growing Trend?

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BACKGROUND: Adipose stromal vascular fraction has demonstrated utility in fat grafting and regenerative medicine. Standard stromal vascular fraction isolation is an expensive and lengthy process relying on the use of bacterial collagenase. The type and concentration of collagenase is not standardized, and adipose tissue exposed to the enzyme has been considered more than “minimally manipulated” by American regulations. Recent efforts to find alternative methods have resulted in the use of non-enzymatic isolation methods. The purpose of this study was to explore the published literature reporting the use of non-enzymatic isolation methods. The purpose of this study was to explore the published literature reporting the use of non-enzymatic isolation of adipose stromal vascular fraction to improve the understanding of the current methods and potentially make their use more approachable.

METHODS: A systematic review of the literature was performed with a search of six terms on the PubMed and Medline databases. One thousand sixty-six articles were subject to evaluation by predetermined inclusion and exclusion criteria.

RESULTS: Two level II evidence articles and 7 level IV evidence articles were selected. Stromal vascular fraction was isolated by subjecting human lipoaspirate to centrifugation, shaking/vortexing, or filtration. Six articles reported performing isolation in a laboratory setting and three in...
the operating room. Non-enzymatically isolated stromal vascular fraction contained cells expressing CD44, CD73, CD90 and CD105 that when expanded in culture differentiated along adipogenic and osteogenic lineages. When compared to enzymatic isolation, mechanical isolation methods required less time but produced lower cell yields. Two articles reported improved volume retention in fat grafts supplemented with mechanically isolated stromal vascular cells.

CONCLUSIONS: Stromal vascular fraction isolated by non-enzymatic methods contain regenerative cells that may be analyzed in vitro or applied in vivo. Because lower cell yields are observed, they may be suitable and expedient for cases in which there is an abundance of adipose tissue that may be directed towards stromal vascular fraction isolation. Additionally, further randomized case-control studies to compare and improve these techniques are needed to optimize the number and quality of isolated cells and to identify the ideal clinical applications for these cells.

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Stromal Vascular Fraction Enhanced Adipose Transplantation in Hair Loss: Early Experience & Active Phase II FDA Investigation

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INTRODUCTION: Evidence demonstrates the role of adipose tissue in support of the stem cell niche and driver of the complex hair growth cycle. Additional evidence supports that the growth factors from adipose-derived stem cells can promote hair growth. Furthermore, a number of investigators reported an increase in hair growth after subcutaneous fat grafting.

This paper reports on a prospective, single blinded clinical trial of the effect of autologous and SVF enhanced fat grafting on hair growth for androgenetic alopecia.

MATERIAL AND METHODS: Nine healthy patients (eight men and one woman) with pattern hair loss were treated by autologous fat transplantation enriched with stromal vascular fraction (SVF) to the scalp. Harvested lipoaspirate was separated into two aliquots. One aliquot was purified using the Puregraft system (Puregraft®, Puregraft LLC). The remaining tissue was digested to obtain concentrated stromal vascular fraction cells (SVF, Kerastem Technologies, LLC). The SVF was mixed with the purified fat tissue and injected into the affected areas of the scalp.

Patients were followed for safety, tolerability and differences in hair growth. We employed global photography and macrophotography with trichoscan analysis, to quantitatively track hair count, hair density, anagen/telogen rates (48 hours later), and cumulative hair thickness. Follow-up was at 6 weeks, 12 weeks, and 24 weeks.

RESULTS: 6 patients were analyzed at 6-month, 3 patients were lost to follow-up. 6-month trichoscan analysis revealed an average of 14% increase in hair count compared to baseline (p=0.01) (mean difference of 28 hairs) along with a 34% average increase in the anagen percentage (p=0.09). An analysis of hair growth limited to individuals with Grade I-IV hair loss (n=5) showed an average of 17% (p=0.02) in hair count (mean difference of 30 hairs) at 6-months.

CONCLUSION: Initial data demonstrates that cell-enriched fat grafting to the scalp may represent a promising alternative to treating baldness in men and women. STYLE is an actively enrolling phase II study in the United States further investigating this promising therapeutic approach.