and progenitor cell remodeling. Calcitriol, the active form of vitamin D3, significantly inhibits apoptosis through reduction of oxidative stress and is a potential key stimulator of triglyceride accumulation. This study investigates the novel use of calcitriol for improving adipose tissue survival by reducing inflammation and phagocytic tissue clearance.

METHODS: In vitro, adipose tissue from 3 human donors was cultured for 48 hours in 1% oxygen and 0, 15.6, 62.5, and 250 nM calcitriol. Tissue viability was assessed, and quantitative reverse transcriptase polymerase chain reaction was performed to measure genes related to hypoxia or inflammation. In vivo, an immunocompromised mouse model was used to evaluate the impact of calcitriol on fat graft outcomes. Lipoaspirate tissue (0.3 ml) from 3 human donors was implanted bilaterally on the mouse dorsum and assessed at multiple time points out to 12 weeks. Study groups included lipoaspirate incubated with calcitriol for 60 minutes before injection or thrice weekly intraperitoneal calcitriol injections. Study outcomes included residual graft volume (%) and graft injury as observed through histology.

RESULTS: Under hypoxic culture conditions, calcitriol did not significantly impact adipocyte viability in vitro but did decrease expression of inflammatory cytokines including SOD1, IFNγ, and interleukin-6. In vivo, lipoaspirate submersion before grafting increased graft retention at 1 week ($P = 0.081$, not statistically significant) and 4 weeks ($P < 0.05$), whereas intraperitoneal calcitriol injections significantly increased fat graft volume retention at both 1 and 4 weeks ($P < 0.01$). Results from 12-week data are pending.

CONCLUSION: Calcitriol, an Food and Drug Administration–approved drug with known immunomodulatory properties, seems to be a promising drug for improving long-term fat grafting outcomes. In vitro, calcitriol exhibited anti-inflammatory properties and hypoxic tissue had decreased expression of inflammatory cytokines SOD1, IFNγ, and interleukin-6. In vivo, calcitriol submersion and intraperitoneal injection both significantly increased fat graft volume retention by 4 weeks. Used in tumescent fluid, calcitriol has potential as a simple, economical means of increasing fat graft retention.

Quality- and Quantity-cultured Peripheral Blood Mononuclear Cell Improve the Fat Graft Vascularization and Survival

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INTRODUCTION: Fat grafting is a valuable technique in soft-tissue reconstruction. However, ischemia of the graft tissue with subsequent necrosis and tissue loss impede us from having satisfying long-term results. Recently, the quality and quantity (QQ) culture has been established to increase the vasculogenic potential of endothelial progenitor cells in peripheral blood-derived mononuclear cells (MNCs). Our experiment was designed to test whether QQ-cultured MNC (MNC-QQ) can contribute to vasculogenesis in the human fat graft and decrease the tissue loss.

METHODS: Adipose tissue and peripheral blood were harvested from healthy subjects. Fat grafts were created with peripheral blood-derived MNC (N = 16), MNC-QQ (N = 16), and stromal vascular fraction (N = 16) before grafting in BALB/c nude mice, and compared to nonenriched control fat grafts (N = 16). Grafts were explanted after 1 and 7 weeks and analyzed by weight persistence, immunohistochemistry, and quantitative polymerase chain reaction.

RESULTS: Weight persistence after 7 weeks was significantly higher in the MNC-QQ group (89.8% ± 3.5%) and SVF group (90.1 ± 4.2) compared to control (70.4% ± 6.3%). With 96.6 ± 6.5 vessels/mm², grafts in the MNC-QQ group had the most dense vessel network and scored significantly better than control (70.4 ± 5.6 vessels/mm²). MNC-QQ exerted a direct effect on vasculogenesis by integrating in vessels, and a paracrine VEGF-mediated effect. Tissue consisting of fibrosis and perilipin-positive adipocytes was unchanged among all groups.

CONCLUSIONS: QQ-cultured MNC containing endothelial progenitor cell stimulates the formation of a blood vessel network in the fat graft and enhances the graft survival, indicating its potential for clinical fat grafting.

Nanofiber System for Sustained Release of Insulin-like Growth Factor 1 Nanoparticles to Nerve and Muscle

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