Skeletal Muscle Angiogenic Growth Factors following Exercise Training and Weight Loss in Obese Older Adults

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Adults with impaired glucose tolerance (IGT) have lower skeletal muscle capillarization compared with normal glucose tolerant (NGT) adults; however, aerobic exercise with weight loss (AEX+WL) increases skeletal muscle capillarization and glucose tolerance in people with IGT. Angiogenic growth factors are essential for increases in capillarization, but it is unclear if these growth factors are linked to baseline deficits in capillarization in those with IGT vs. NGT, or to the benefits of AEX+WL in those with IGT. **PURPOSE:** Determine the effects of AEX+WL on skeletal muscle angiogenic factor expression in older adults with IGT or NGT. **METHODS:** Sixteen overweight or obese men 50-75 years of age completed 6 months of thrice-weekly AEX training with dietary counseling to achieve >5% WL. Subjects underwent oral glucose tolerance tests and vastus lateralis muscle biopsies. Vascular endothelial growth factor (VEGF), placental growth factor (PlGF), soluble fms-like tyrosine kinase receptor-1 (sFlt-1) and basic fibroblast growth factor (bFGF) levels were measured by ELISA and expressed relative to total protein. Repeated measures ANOVA was used to evaluate AEX+WL (baseline vs. 6-month) and group (IGT vs. NGT) effects. **RESULTS:** At baseline, all growth factor levels were numerically lower in IGT compared with NGT, but these did not reach statistical significance. Following AEX+WL, body weight and percent body fat were reduced by 10% and 14.5%, respectively, in all subjects ($P < 0.001$ for both), and 120-minute postprandial glucose decreased by 27% in the IGT group ($P < 0.001$). There was a main effect of AEX+WL to increase VEGF (0.095 ± 0.016 vs. 0.114 ± 0.018 ng/µg, $P < 0.05$), PlGF (0.004 ± 0.001 vs. 0.005 ± 0.001 ng/µg, $P < 0.05$), and sFlt-1 (0.216 ± 0.029 vs. 0.264 ± 0.036 ng/µg, $P < 0.01$); however, there were no significant AEX+WL * group interaction effects. **CONCLUSION:** Six-months of AEX+WL increased skeletal muscle angiogenic growth factor levels in older, obese adults with IGT and NGT. These findings coincided with improved glucose tolerance, percent body fat, and aerobic fitness, which extends our previous findings that AEX+WL improves glucose tolerance, in part due to increases in muscle capillarization.