Insulin-like Growth Factor I In Skeletal Muscle After Weight-lifting Exercise In Frail Elders

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BACKGROUND:
Age related sarcopenia (loss of muscle) has been linked to many diverse processes affecting the quality of life of the elderly. The mechanisms underlying this syndrome and its potential reversibility have been only partially defined. The purpose of these analyses was to determine the level of muscular adaptation (at the cellular level) in response to both high intensity resistive exercise and nutritional supplementation.

OBJECTIVE:
To assess muscle remodeling and functional adaptation to exercise and diet interventions, 26 men and women (aged 72-98) underwent a quadriceps (vastus lateralis) biopsy before and after a 10-week study. These subjects were part of a study of 100 men and women (age 72-98) who participated in one of four treatment groups including; a placebo control condition, progressive resistance training, multi-nutrient supplementation, or both resistance training and supplementation.

RESULTS:
Analysis of biopsies showed Type II atrophy, Z band, and myofibril damage were present at baseline. Combined resistance training and nutritional supplementation increased strength by 257$\pm$ 62% ($P = 0.0001$) and type II fiber area by 10.1$\pm$ 9.0% ($P = 0.033$), with a similar trend for type I fiber area (+12.8 $\pm$ 22.2%). Resistance training alone was associated with a 2.5-fold increase in neonatal myosin staining ($P = 0.0009$) and an increase of 491 $\pm$ 137% ($P<0.0001$) in IGF-I staining. Ultrastructural damage (a step in the remodeling process) increased by 141 $\pm$ 59% after exercise training ($P = 0.034$). Strength increases were largest in those with the greatest increases in myosin, IGF-I, ultrastructural damage, and caloric intake during the trial.

SUMMARY:
This study provides the first evidence of skeletal muscle remodeling in response to resistance training in frail individuals of extreme old age. Age-related sarcopenia appears largely confined to type II muscle fibers suggesting that interventions aimed specifically at stimulating type II fibers (e.g., contractions demanding high force output, i.e. power) may be most effective in the prevention and treatment of sarcopenia. Muscle hypertrophy was linked to higher caloric intake suggesting that adequate energy balance is a critical component of treating sarcopenia with exercise in frail elders.

CONCLUSION:
Frail elders respond robustly to resistance training with musculoskeletal remodeling, and significant increases in muscle area (hypertrophy) are possible with resistance training in combination with adequate energy intakes.

KEISER PIECES USED:
Leg press and leg extension

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