

Aging Of Skeletal Muscle: A 12-Yr Longitudinal Study

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OBJECTIVE:

This study examines age-related changes in skeletal muscle size and function after 12 years. Twelve healthy sedentary older men (age 65.4 +/- 4.2 yrs) were studied in 1985-86 (T1) and nine were reevaluated in 1997-98 (T2).

RESULTS:

Isokinetic muscle strength of the knee and elbow extensors and flexors showed losses ($P < 0.05$) ranging from 20 to 30% at slow and fast angular velocities. Computerized tomography showed reductions ($P < 0.05$) in the cross-sectional area (CSA) of the thigh (12.5%), all thigh muscles (14.7%), quadriceps femoris muscle (16.1%), and flexor muscles (14.9%). Analysis of covariance showed that strength at T1 and changes in CSA were independent predictors of strength at T2. Muscle biopsies taken from vastus lateralis muscles showed a reduction in percentage of type I fibers (T1 = 60% vs. T2 = 42%) with no change in mean area in either fiber type. The capillary-to-fiber ratio was significantly lower at T2 (1.39 vs. 1.08; $P = 0.043$). Overall, losses in lower body strength were greater (2.0-2.5%/year for extensors and flexors, respectively) than losses in upper body strength (1.4-2.2%/year for extensors and flexors, respectively). This longitudinal study suggests that a quantitative loss in muscle CSA is a major contributor to the decrease in muscle strength seen with advancing age and, together with muscle strength at T1, accounts for 90% of the variability in strength at T2.

SUMMARY:

These results underscore the contribution of a quantitative loss in muscle CSA (size of muscle, numbers of fiber types, etc.) to muscle weakness in the elderly. An important element of these results is that baseline (beginning) strength was also a significant contributor to the loss of strength with aging. The magnitude of the changes in this group of healthy men with few medical problems suggest stronger exercise recommendations are needed to prevent sarcopenia and the early onset of disability. In addition, the larger reductions in strength observed in muscles of the lower body compared to the upper body, highlight the need for practitioners to emphasize lower body strength in exercise for older adults.

EQUIPMENT USED:

An isokinetic dynamometer, CT scan and biopsy were used to measure the changes in muscle size and function.

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