

SHORT- AND LONG-TERM EFFECT OF EXERCISE ON HUMAN CARTILAGE

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KEY WORDS: cartilage, deformation, exercise, adaptation

OUTLINE: The effects of exercise on hyaline articular cartilage have traditionally been examined in animal models, but due to a lack of accurate, non-invasive technology, little information has been available on human cartilage until recently. Magnetic resonance imaging now permits to analyze cartilage morphology and its composition quantitatively in vivo.

This presentation will briefly report the methodological background of quantitative cartilage imaging and will summarize work on short term (deformational behaviour) and long term effects (functional adaptation) of exercise on human articular cartilage. Current findings suggest that human cartilage deforms very little in vivo during physiological activities and recovers from deformation within 90 min after loading. Whereas cartilage deformation appears to become less with increasing age, sex and physical training status do not appear to affect in vivo deformational behaviour. There is now good evidence that cartilage undergoes some type of atrophy (thinning) under reduced loading conditions, such as postoperative immobilization and paraplegia. However, increased loading (as encountered by top athletes) does not appear to be associated with systematically increased average cartilage thickness. Findings in twins suggest a strong genetic contribution to cartilage morphology, and phylogenetic comparisons between animals suggest that the size of the joint area, but not the cartilage thickness, is highly adapted to body weight and loading. Potential reasons for the inability of cartilage thickness to adapt to mechanical stimuli include a lack of evolutionary pressure and a decoupling of mechanical competence and tissue mass.

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