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The influence of loading magnitude and loading rate on collagen fibre damage
L. Henao Murillo, K. Ito and C.C. van Donkelaar

Methods
72 cartilage plugs were harvested from 1 year old cows. The plugs were mechanically loaded at various magnitudes: 15 (n=18), 25 (n=18), 35 (n=18) and 45 N (n=18); and loading rates: 5, 60 and 120 mm/min. Immediately after loading, cartilage was processed and stained with col2-3/4m antibody for collagen damage. This damage was graded by four observers, and the inter- and intra-observer reliability was evaluated (κ=0.69 and κ=0.9, respectively).

Results
Collagen and structural damage was found in most of the samples, and increased with increasing loading magnitude and loading rate.

Background
Articular cartilage is a thin, smooth and bright layer that covers and protects joints. Cartilage allows joints to withstand several times the corporal weight. When cartilage degeneration starts it normally progresses into osteoarthritis (OA). The detection of the very first moment at which cartilage degeneration is starting could be very useful for physicians to apply early treatments, allowing cartilage to regenerate by itself. However, predicting whether damage would progress into OA, requires the understanding of the mechanical and biological mechanisms by which cartilage is getting damaged. The aim of this study was to assess how loading magnitude and/or loading rate are related to the amount of damage in collagen type II fibres.

Conclusion
Both loading magnitude and loading rate play an important role in the production of cartilage damage. Interestingly, the development of fissures and clefts depends more on loading magnitude, while collagen damage depends more on loading rate.