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Can the Healthy Tendon be Ruptured?

The significance of mechanical and physiological factors for experimental rupture of the Achilles tendon in rats is being studied.

A survey of the anatomy, physiology and mechanics of the bone/tendon/muscle-group in general shows that the tendon is at its most vulnerable

- 1) when tension is applied on it obliquely
- 2) when tension is applied on it quickly
- 3) when it is tense before the trauma
- 4) when the attached muscle is maximally innervated
- 5) when the tendon/muscle-group is stretched by exterior stimuli (e.g. gravity or the muscular strength of the thigh)
- 6) when it is weak in comparison with the muscle (this is most likely to occur in cases where the muscular strength is kept up through exercise at the age (appr. 25 to 30 years in humans), when physiological degeneration of the connective tissue sets in.

With these factors in mind we began a series of experiments on rats. In the experiments performed so far on white rats (unfit laboratory rats) and brown rats (fit wild rats) it has been possible to cause rupture of the Achilles tendon in all the biggest (oldest) wild rats, and only in these. Signs of degeneration in any of the tendons concerned has not been found through histological examinations performed immediately after the ruptures.

The investigation has thus shown, that contrary to earlier theories, rupture can be caused in undamaged tendons in experiments with animals.

The relative importance of the factors listed in (1 to 6) above cannot be determined until the whole series of experiments has been finished and consequently the results of these cannot yet be related to rupture of the Achilles tendon in humans.