

New methods enable the early detection of Achilles tendon damage

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Two biochemical methods, developed at the Centre of Excellence for High Field Magnetic Resonance at the MedUni Vienna by Vladimir Juras from the University Department of Radiodiagnostics, are enabling Achilles tendon damage to be visualised at an early stage. The processes used are sodium imaging and T2 mapping.

Both methods are providing the first ever glimpse inside the biochemical structure of the Achilles tendon, which cannot be examined using conventional MR scans. Previous biochemical analyses have shown that Achilles tendonitis - injury to the tendon at [cellular level](#) - is associated with changes in the biochemical composition and in particular with a rise in the proteoglycan content.

High sodium content points to damage

The process of sodium imaging, which is possible on the 7 Tesla ultra-high-field magnetic resonance (MR) scanner at the MedUni Vienna, allows the sodium concentration in the tendon to be quantified, since it has a direct relationship to the proteoglycan content. Proteoglycans are [molecules](#) with a special ability to collect and hold water and form an important part of [connective tissue](#).

“A high sodium concentration indicates later damage. The tendon is in trouble,” says Juras, who is part of the group of researchers led by Siegfried Trattnig at the MR Centre of Excellence at the MedUni Vienna, which is the world leader in the development and clinical application of biochemical magnetic resonance techniques in the musculoskeletal system.

Making structural changes to collagen fibres visible

The second method developed at the MedUni Vienna is known as T2 mapping of the Achilles tendon. Says Juras: “T2 is an MR parameter that reflects the behaviour of water molecules in certain environments. T2 is a hundred times shorter in tendons, for example, than in cartilage, which is why a special sequencing technique is needed. If the structure or volume of the [collagen](#) fibres changes, T2 is sensitive to these changes.” Collagen fibres are responsible for tendons' tensile strength. The Achilles tendon comprises numerous bundles of tendons, and these bundles are made up of collagen fibres. Damage to these collagen fibres can cause tearing of the Achilles tendon. T2 mapping allows changes to these fibres to be detected early on. Studies on both methods have now been published in the specialist journals *Radiology* and [Magnetic Resonance in Medicine](#).

Both methods are used at the MedUni Vienna at the Vienna General Hospital, particularly in the rehabilitation of patients who have suffered an Achilles tendon rupture and surgery, to rule out consequential damage. They can also be used, however, for preventative purposes. Says Juras: "It would be great, for example, for a football team to see whether players are at risk of suffering an [Achilles tendon](#) rupture."

More information: Service: Radiology und Magnetic Resonance in Medicine, "[Sodium MR Imaging of Achilles Tendinopathy at 7 T: Preliminary Results.](#)" V. Juras, et al. *Radiology*, 2012 Jan;262(1):199-205.

[Regional Variations of T2 in Healthy and Pathologic Achilles Tendon In Vivo at 7 Tesla: Preliminary Results.](#)" V. Juras; et al. *Magnetic Resonance in Medicine*, In Press.

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