COMPUTER ENHANCED MRI: TENDON VASCULARITY/TENDINITIS

M. Eileen Bashara, DPM

High resolution magnetic resonance imaging offers a dramatic advantage in imaging of soft tissue and evaluation of bone marrow. It offers superior detail with which to view tendon, ligament, cartilage and nerve. Gadolinium, an intravenous contrast agent can further improve our diagnostic capability in evaluating the vascularity of tendons, specifically the posterior tibialis tendon and the Achilles tendon. With computer enhanced subtraction images and standard MR images, the vascularity of the tendons can be evaluated. Furthermore, with reference to previously published reports on the vascularity of the Achilles and other tendons, the enhancement pattern demonstrated on MR with the computer enhanced subtraction techniques was quite similar to the vascularity pattern demonstrated on animal and cadaver studies. A review of the literature has shown that there has yet been no effective in vivo method to determine tendon vascularity, because of the minimal blood flow to tendons.

Gadolinium - DTPA, has been used in diagnostic evaluation of intramedullary disease of the spine. While the T1 and T2 weighted lesions usually localize the abnormality, Gadolinium enhancement is helpful to distinguish the tumor nidus from the surrounding edema or adjacent syrinx. It can also provide some indication of tumor vascularity. Enhancement can also help to distinguish neoplastic process from inflammation, particularly if there is a decline in the degree of enhancement and edema on follow up studies.

Gadolinium has also been used successfully in distinguishing enhanced postoperative scar tissue from non-enhancing disk protrusion in the spine.

BLOOD SUPPLY

The blood supply of the tendo Achilles is tenuous. The main supply occurs in the middle third of the tendon and originates from a branch of the tibialis posterior artery. This branch runs over the retro Achilles fat pad into the peritenon posteriorly and disperses over the tendon proximally and distally. Small branches from the calcaneus supply the Achilles distally. Occasionally, the peroneal artery dominates the supply of blood to the Achilles. It has been shown angiographically that the portion of the tendon that lies 2 to 6 cm proximal to the attachment in the calcaneus has the lowest blood supply.

TENDINITIS

Tendinitis can be caused by a partial rupture, tumor within the tendon, or ossification within the tendon. Tendinitis can also be caused by a chronic tenosynovitis from overuse injuries seen in athletes, and in systemic diseases such as rheumatoid arthritis, gout, and other seronegative disorders. It has been suggested that degenerative changes within the tendon which are secondary to these disorders can lead to partial tears or complete ruptures.

Inflammation of the peritenon can occur in younger individuals with no related systemic disorder. It usually occurs in the pseudosheath of the tendo Achilles where there is a firm attachment of the sheath to the underlying tendon. A painful thickening of the heel cord, usually in its distal 5-6 cm. is present. The heel cord is nodular, very firm, fibrotic, and tender. There is also

considerable thickening of the peritenon. Magnetic resonance imaging reveals the thickened tendon as well as the thickened sheath. Rupture of the tendon is a frequent end stage.

Current research on the tibialis posterior and Achilles indicate that their blood supply is sparse. Harris was the first to suggest that the posterior tibial tendon may be vulnerable to injury due to a low degree of vascularity. Relatively avascular areas in a tendon can result in focal death of cells, resultant degenerative changes and rupture. Macnab et al. demonstrated with injection techniques in the supraspinatus tendon, the degenerative changes that commonly occur in a critical zone of a vascularity.

PROCEDURE

An ankle MR study is performed with Gadolinium. Multiple sagittal and axial T1 and T2 weighted images are obtained pre contrast Gadolinium. This is then followed by post axial T1 weight images. The study is then transferred to a computer system for processing and a color subtraction technique.

SUMMARY

Giant strides in MR imaging technology and its application in the foot and ankle are taking place. MR angiography, MR kinematics of the ankle for evaluation of ankle instability, and surface rendering, along with improvements in high resolution imaging are ongoing and exciting. In the meantime, MR has revolutionized foot and ankle imaging.

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