MRI-induced retrocalcaneal bursitis

Abstract This case report describes a patient with acute retrocalcaneal bursitis, which developed after MRI examination of the ankle. The sagittal T2*-weighted gradient echo sequence revealed an extensive susceptibility artifact in the area surrounding the Achilles tendon near its insertion at the os calcis. This artifact was caused by postsurgical metallic particles. We postulate that these particles were mechanically stimulated by the magnetic field and induced the inflammatory response.

Key words MRI · Artifacts · Ferromagnetic particles · Ankle · Bursitis

Introduction

Magnetic resonance imaging (MRI) is a useful tool for diagnosing acute and chronic injuries of the foot and the ankle [1]. This imaging technique is based on the behaviour of protons in a magnetic field, which makes it possible to distinguish between ligaments, fat, tendons, bone and fluid [1]. MRI is contra-indicated in patients with ferromagnetic devices or implants [2]. MRI induces in iron, nickel and cobalt a second magnetic field, which carries the risk of dislodgement, vibration and local heat [2, 3]. Implanted ferromagnetic material induces typical susceptibility artifacts that hinder normal anatomy assessment [4]. These artifacts are also reported after usage of ferromagnetic surgical tools (Fig. 1) [2, 5–10]. The small particles are usually not detected by X-ray or computer tomography (CT) [10]. In this report we describe an inflamed retrocalcaneal bursa (retrocalcaneal bursitis), which we postulate was induced by MRI examination.

Case report

A 38-year-old Caucasian woman was referred for endoscopic treatment of her right-sided retrocalcaneal bursitis in 1998. In 1982 a rightsided calcaneal Haglund exostosis had been removed. After a pain-free interval of 7 years, she started to complain of local pain and tenderness located 5–8 cm above the insertion of the right Achilles tendon, which was aggravated by sporting activities (jogging or distance running). Activity reduction, heel lifts, physical therapy and steroid infiltration into the peritendineum did not relieve the symptoms. In the diagnostic work-up an MR examination was performed. Within a few hours after MRI, pain and swelling developed at the Achilles tendon insertion. Conservative treatment with rest, ice application and anti-inflammatory drugs were of no benefit.

Six weeks after the MRI examination she presented at our clinic with pain and a low exercise tolerance, which limited her physical activities. On examination there was pronounced swelling and pain at the site of the retrocalcaneal bursa. Some 7 cm above its insertion there was slight tenderness over the Achilles...
tendon. The range of ankle motion was unrestricted. Apart from slight deformation of the calcaneus due to prior removal of the Haglund exostosis, the radiograph of the foot showed no abnormalities (Fig. 2). A three-phase bone scan revealed slight increased uptake at the tuberosity of the os calcis. A diagnosis of acute retrocalcaneal bursitis was made and surgical intervention was planned. The prior MR examination was re-examined (Siemens Magnetom). On the sagittal T2*-weighted gradient echo sequence there was an extensive susceptibility artifact near the insertion of the Achilles tendon (Fig. 3). This artifact hampered further interpretation of this area. On the sagittal spin echo T1-weighted series (TR 600.0 ms, TE 30.0 ms) and sagittal STIR series (TR 2700.0 ms, TE 48.0 ms) the area of susceptibility was less than on the T2*-weighted sequence. There was an area of hyperintensity on STIR images about 5 cm cranial to the calcaneal bone (images not available).

Calcaneoplasty was performed by means of a tendoscopic approach [11]. The retrocalcaneal bursa, which extended 2.5 cm cranial to the superior calcaneal rim and over the full width of the os calcis, and the superior calcaneal rim were removed by a 4-mm shaver. Near the Achilles tendon insertion small iron fragments were identified endoscopically and subsequently removed. On pathologic examination of the resected tissue from a similar procedure the size of the iron fragments varied from 0.2 to 2.0 mm. Postoperative treatment consisted of partial weightbearing for a few days. The patient had an uneventful recovery. Apart from slight tenderness over the Achilles tendon some 7 cm above the insertion, she remained symptom free at 1-year follow-up.

**Discussion**

Susceptibility artifacts are relatively frequently encountered with MRI [3, 7, 9, 10]. They are the result of magnetisation of ferromagnetic materials. In orthopaedic surgery, drilling, shaving and chiselling of bony structures are frequently performed procedures. Metallic particles from the surgical tools accumulate in the surrounding soft tissue and cause artifacts on MR imaging. Non-ferromagnetic materials like titanium are nowadays widely used and are not associated with MR artifacts. The focal loss of signal at the site of the metal is due to lack of protons [10]. The loss of signal surrounding the metal-tissue interface is caused by the inability of protons to precess [10]. Gradient echo technique is especially sensitive to susceptibility artifacts. Spin echo sequences are recommended in these patients [14]. In daily practice, prior to undergoing MRI patients are screened for the presence of implants and devices. Dislodgement or movement of cardiovascular, intra-ocular or intracranial implants and devices might have grave consequences [2, 4]. In most instances the patient is aware of the presence of these objects. However, patients may be unaware of the presence of small metallic particles.

In our patient the clinical signs of acute retrocalcaneal bursitis developed after MRI examination of the ankle. We postulate that it was caused by postsurgical metallic particles, which vibrated and were locally heated by the magnetic field. These two mechanical stimuli induced an inflammatory response of the surrounding soft tissue. The small ferro-