Comparison of high-field and low-field magnetic resonance imaging of stifle joint disorders in dogs

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Abstract

The most common cause of hindlimb lameness in dogs is cranial cruciate ligament rupture. In 48-77.3% of the population this trauma leads to secondary damage of the meniscus. Depending on the magnetic strength of the used device, different diagnostic accuracy can be achieved. The examination sensitivity of magnetic resonance imaging is affected by many factors which are independent of diagnostic strength, such as correct positioning of the patient, size of the stifle joint examined, or selection of the right protocol of sequences. Sensitivity of meniscus damage detection was 100% and 90%, respectively, in high- and low-field magnetic resonance. The best results were reported during examination of the stifle in dogs above 10 kg b.w. at a flexion angle of 145°, and in sagittal and dorsal planes. Regardless of the magnetic strength applied, imaging of the whole cranial cruciate ligament is difficult. Moreover, MRI allows the detection of the first signs of osteoarthritis, which were observed 4 and 6 weeks after rupture of the cranial cruciate ligament using high and low-field MRI. This also applies to lesions in the subchondral bone or a bone marrow which occurred in association with insufficiency of the stifle joint, and were mainly localized in the epiphysis of the femur and tibia. The present article provides a comparison of different examination protocols and images of damaged stifle structures, such as menisci, ligaments and bones of the stifle joint visualized with low-field and high-field magnetic resonance. Magnetic resonance arthrography is also discussed.

Key words: magnetic resonance imaging, canine, stifle joint, cranial cruciate ligament, meniscus, arthrography, tears

Introduction

Historically, the magnetic field gradient was used in the 1970s to perform the diagnostic imaging (Maccia et al. 2007). It was a new way of imaging characterized by better contrast resolution of a soft tissue in comparison with traditional radiography (Baird et al. 1998a). Since that time, there have been more devices with higher magnetic fields, starting from low-field, through midfield, to high-filed. The increased quality of the images obtained using low-field devices and the cost of receiving them achieved in the mid-to-late 1990s renewed interest in low magnetic fields (Rutt and Lee 1996, Gavin 2011).