

DOI 10.2478/v10181-011-0072-1

Short communication

A comparison of magnetic resonance imaging sequences in evaluating pathological changes in the canine spinal cord

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Abstract

This paper discusses 28 canine patients subjected to low-field magnetic resonance imaging (MRI) of the spinal cord for neurological indications. The authors describe and compare the used MRI sequences with an indication of the most effective sequences in MRI examinations that require short scanning time. The most effective sequences supporting a quick diagnosis of spinal diseases in dogs were SE (spin echo), FSE (fast spin echo) and 3D HYCE (hybrid contrast enhancement).

Key words: magnetic resonance imaging, spinal cord, dog

Introduction

Pathological changes of the spinal cord are a common neurological problem in dogs. Magnetic resonance imaging (MRI) is the standard technique for diagnosing recurrent spinal cord hernia, degenerative changes of the spinal cord, Wobbler syndrome, spinal cord malignancies, arachnoid cysts, cauda equina syndrome, discospondylitis, atlantoaxial instability, meningeal calcification, spondylosis, hydromyelia, syringomyelia, neurosurgical evaluations in the spinal cord area, assessment of post-operative complications (fibrosis, residual disc fragments), fibrocartilaginous embolism, mechanical damage of the spinal cord and spinal cord hemorrhage (Gonzalo-Orden et al. 2000, Besalti et al. 2006, Okada et al. 2006). This study compares some magnetic resonance sequences in diag-

nosing selected pathological changes in the canine spinal cord with the inclusion of own experimental material.

Materials and Methods

Dogs of various breeds were subjected to magnetic resonance imaging tests between May 2010 and February 2011. The indications for MRI were neurological disorders of various intensity. The duration of neurological signs ranged from 2 to 60 days. The dogs were examined using a low-field MRI scanner with magnetic field intensity of 0.25 Tesla (Vet Grande, Esaote, I) under general anesthesia. Images of the spine were produced in the sagittal, transverse and dorsal plane using T1-weighted and T2-weighted images. The slice thickness was 3-4 mm for sagittal

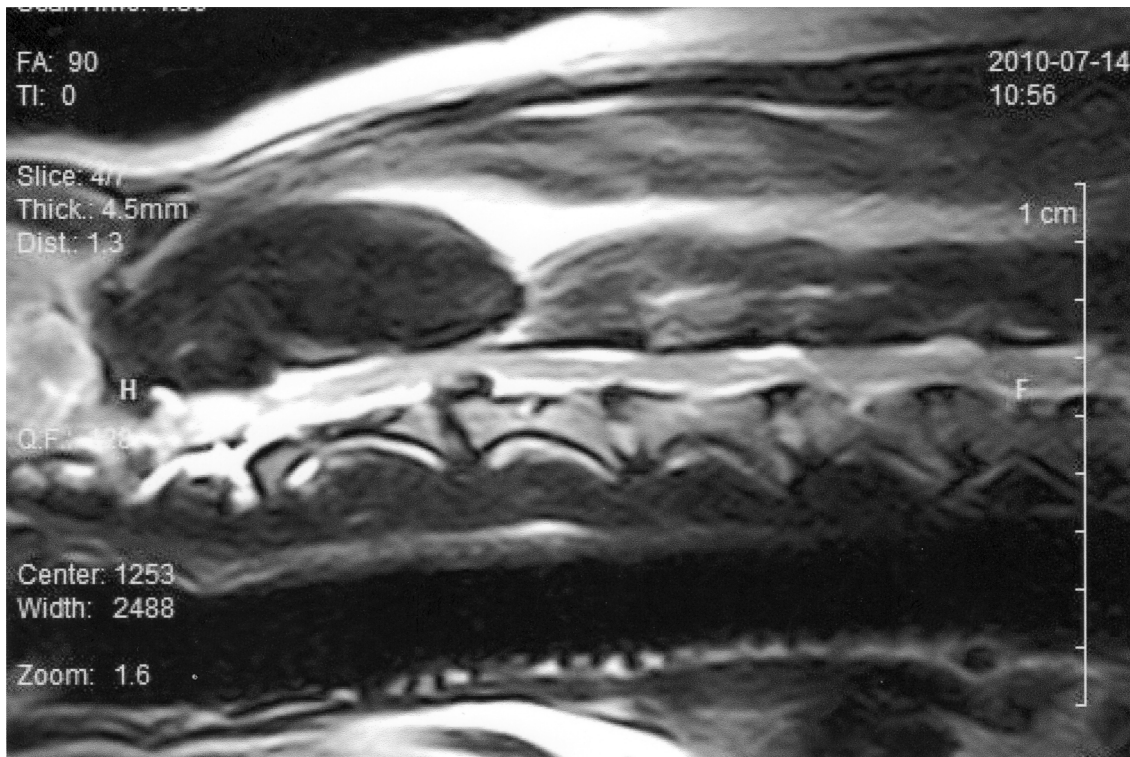


Fig. 1. T2-weighted image in sagittal plane with FES REL sequence showing disc extrusion.

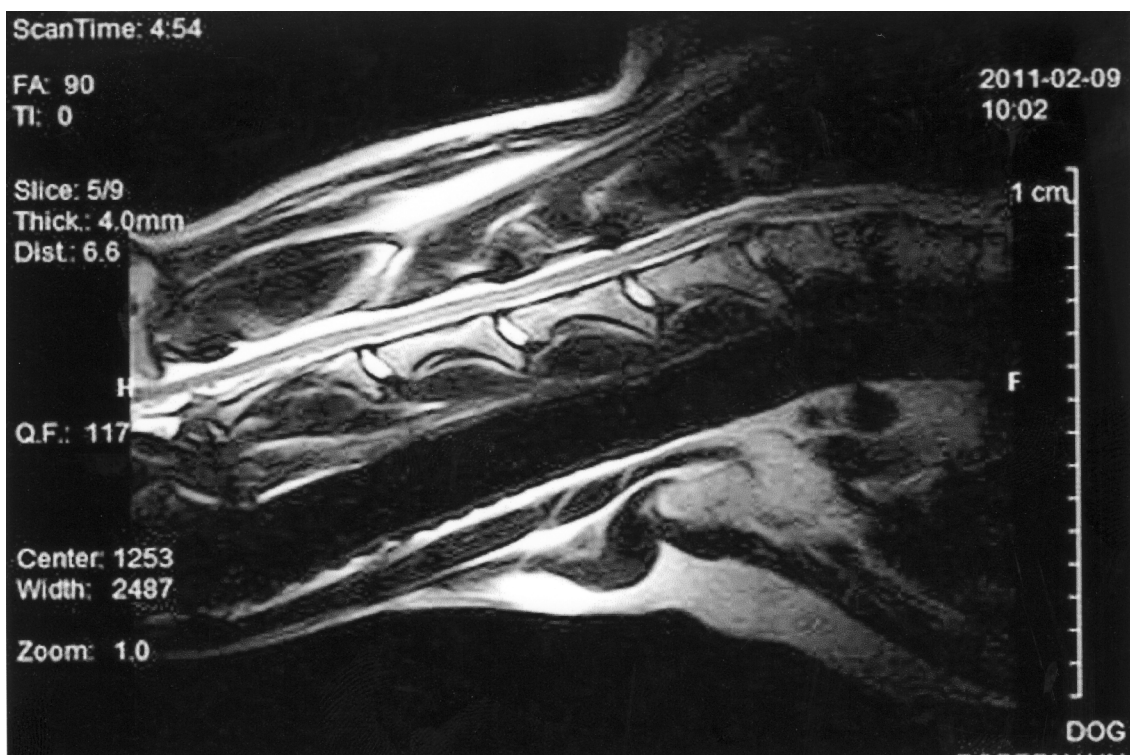


Fig. 2. MRI image of the dog neck with Wobbler syndrome.

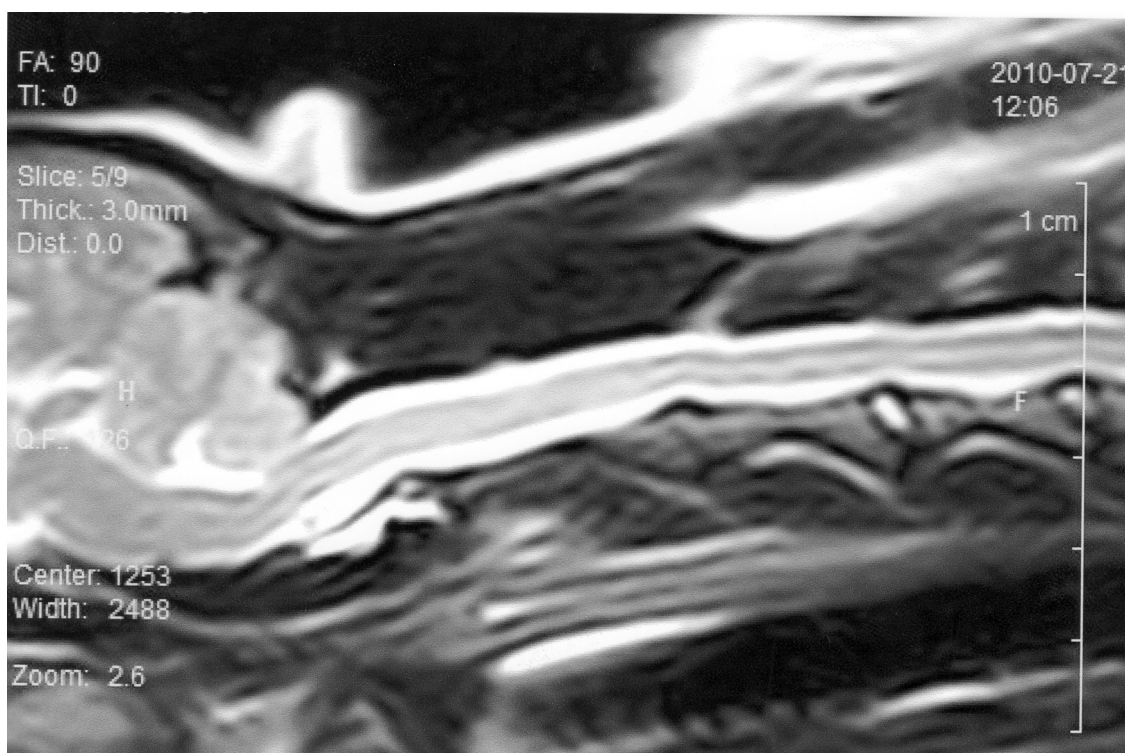


Fig. 3. MRI of Cavalier king charles spaniel with Chiari malformations and first stage of syringomyelia.

images with a 0.3-0.4 gap. The transverse slice thickness varied from 3 to 5 mm with a 0.2 – 0.5 gap, depending on the size of the examined dog. The signal intensity of pathological changes was graded as hyperintense, isointense or hypointense. The applied contrast agent was gadolinium in the amount of 0.15 mmol/kg i.v. (Omniscan).

Results and Discussion

Intervertebral disc disease was the most frequently observed spinal disorder in the examined dogs that accounted for 64% of pathological changes in the group of 28 patients. The group of animals diagnosed with intervertebral disc disease comprised 55% dogs with disc protrusions and 45% dogs with disc extrusions (Fig. 1). The highest incidence of intervertebral disc disease was observed in dachshunds, and these findings are consistent with literature data (Besalti et al. 2006, Mateo et al. 2011, Suran et al. 2011). The second most predominant spinal disorder was the Wobbler syndrome (Fig. 2) which was reported in two dobermans and one Rhodesian ridgeback. There were individual cases of discospondylitis, spinal cord hemorrhage, fibrocartilaginous embolism, cauda equina syndrome, neoplasms and Chiari malformation (Fig. 3).

The most frequently used sequences were SE, FSE REL, X BONE and 3D HYCE prior to contrast

administration, and SE and 3D HYCE after contrast administration.

In the described experiment, MRI sequences were selected in view of the authors' prior findings as well as published data (Penderis and Dennis 2004). 3D HYCE sequence was found to deliver optimal results in the transverse plane and it produced clear and legible images. The sequences that produced a correct diagnosis with a relatively short scanning time in the sagittal plane were SE and FSE REL. The results yielded by both sequences were compared and deemed as satisfactory. Every doubtful case was additionally examined with the use of the T1 SE sequence with contrast, and it was compared with the images obtained before contrast administration.

The results of our study demonstrate that SE, FSE REL and 3D HYCE are highly effective sequences in diagnosing spinal cord diseases in dogs.

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