Companion Animal Imaging at 3T Revisited

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Purpose: In 2006 alone, an average of $366.00 per household was spent on the care of family pets. Companion animal imaging is a growing part of the diagnostic imaging industry. According to the American Veterinary Medical Association, 49.7% of pet owners consider their pets to be family members.[1] There are many indications for the use of Magnetic Resonance Imaging (MRI) which include pathologies of the brain, head/neck, and spine. In the past, companion animal care options were limited to palliative treatments due to poor imaging. At the Imaging Research Center (IRC), we previously investigated the efficacy of providing this service on an older 3T system designed primarily for human brain imaging. With current state of the art MRI 3T technology we can demonstrate efficacy, best practices for animal imaging, and contribution of MRI for diagnosis and outcome. Imaging at 3T also allows IRC technologists to scan faster with higher resolution which cannot be done with scanners that are older, 1T or less, or radiography.

Method: The Imaging Research Center (IRC) at Cincinnati Children's Hospital Medical Center utilizes a Philips Achieva 3T X-series MRI, SENSE spine coil, and a 32 channel cardiac coil to create diagnostic images that are used for surgical planning. A Mallard Medical ventilator (Figure 1) is used for the care of all companion animals while under sedation. The animal is sedated with isoflurane while the oxygen saturation is measured by a probe that is secured to the companion animal's tongue. Vitals are constantly monitored by a certified Vet Tech provided by the Care Center during imaging. MRI technologists at the IRC strictly adhere to the policies set forth by the facility's infection control department in regard to room cleanliness and coil protection. All of the coils and surfaces that are used for animal scanning are covered in plastic prior to the arrival of the animal subject. Protocols are determined by suspected pathology and are discussed with the Care Center staff prior to the sedation of the animal.

Challenges: Creative coil selection and exact animal positioning is imperative for acquiring high quality diagnostic images. Technologists must assess the size of the animal, positioning of the animal, and the body part being imaged during the coil selection and animal preparation process. For instance, when imaging the cervical spine of a small animal, the best coil choice is a 32 channel cardiac coil with the animal laying supine in a V-wedge. The wedge helps to keep the animal straight and lying in the supine position reduces respiratory motion (Figure 2). The 32 channel cardiac coil will cover from the cerebellum to the thoracic spine. Imaging the spine of a larger animal, such as a Rottweiler, requires the use of a SENSE spine coil and Mobiview with the animal laying supine in a V-wedge. This allows the technologist to obtain maximum coverage and minimal respiratory motion (Figure 3.). To further examine the companion animal spine, the technologist images the disk spaces individually by creating multiple packages, each with three slices (Figure 4). This allows the Care Center to focus on individual disk spaces that may be the cause of pain for the animal. By prudent coil element selection, the 32 channel cardiac and SENSE spine coil are of greatest utility when imaging companion animal spines.

Imaging the companion animal brain requires the technologist to use the 32 channel cardiac coil with the animal lying in the prone position. The IRC performs a 3D T1 with isotropic voxels for reformats (Figures 5 and 6), pre contrast axial T1 and T2 images, susceptibility weighted imaging, and post contrast T1 images in all three planes.

Figure 1. Mallard Medical Ventilator

Figure 2. T2 Sagittal C-spine/Pug

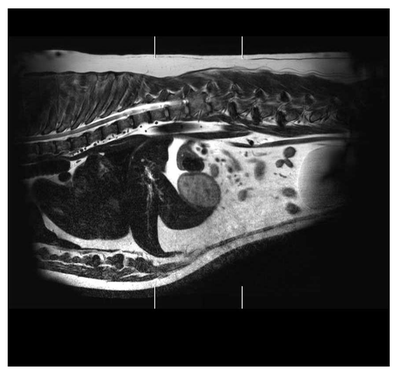

Figure 3. T2 Sagittal Compliation. T-spine/L-spine/Rotweiler

Figure 4. T2 Axial through vertebral disk space.

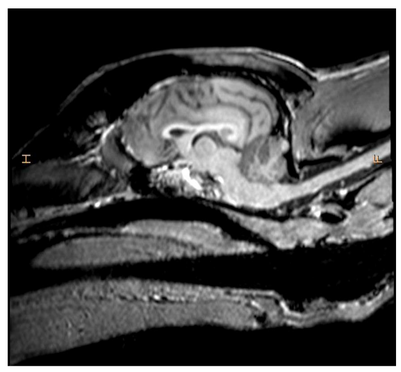

Figure 5. T2 Sagittal Brain

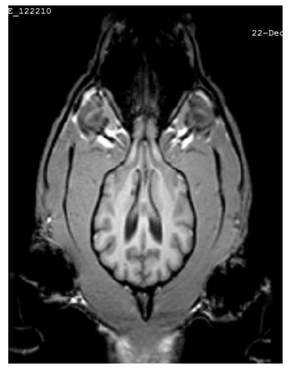

Figure 5. Axial Brain, Pre-Contrast.

Results: The Imaging Research Center has performed MR imaging on nineteen companion animals. Seven of the animals had surgically treatable diseases. Six of these animals were successfully treated with surgery. The animal for whom surgery was not elected has improved with medical management. Twelve of the animals had disease processes requiring medical management and they are all responding well to treatment. The IRC has been able to provide the Care Center with high quality diagnostic images that have been instrumental in surgical planning and good outcomes for the animals. Previously, the use of radiography and older MRI technology primarily allowed pet owners to determine whether the animal was to be *euthanized* or if palliative treatment was an option. The state of the art 3T technology has decreased scan times, increased efficiency, increased resolution therefore diagnosis, and gives pet owners a variety of options for the treatment of their pet.

Conclusions: The utilization of a 3T scanner that is primarily used for human imaging can be effective if proper positioning, knowledge of animal anatomy, and coil selection is employed. There is also the benefit of fast scanning times and high resolution that was not available on older 3T technology, on low frequency systems, or with the use of radiography. The Care Center is now able to provide pet owners with therapeutic solutions and better outcomes. The animal's owner can now decided whether surgery or medical management is an option for treatment. Improved 3T technology, improved animal imaging practices, safe sedation, and monitoring of companion animals are the key areas of practice for the IRC. These best practices are the cornerstone for a successful companion animal imaging program.

Reference: www.avma.org