First Experiences with MAGNETOM Flow.Ace for Veterinary Practice

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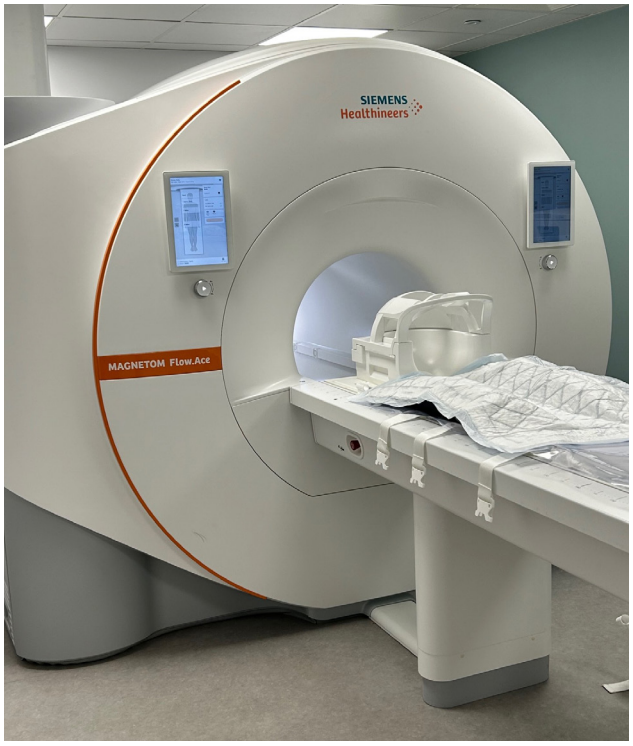
Lumbry Park is a specialist small-animal referral hospital treating cats and dogs. We operate a large facility supported by a team of highly trained clinicians working at the forefront of veterinary medicine. Our MRI system is primarily used for neurological investigations of the brain and spine.

I came to Lumbry Park over five years ago, after working for 15 years as a human radiographer specializing in MRI. My experience spans the NHS, mobile settings, and private sectors, predominantly using MRI systems from Siemens Healthineers. Additionally, I have worked part-time as a lecturer in CT and MRI acquisition.



1 The 1.5T MAGNETOM Flow.Ace at Lumbry Park. Thanks to the DryCool technology, the system has no quench pipe and an ultra-compact footprint of only 24 m².

Previously, Lumbry Park used a 1.5T MAGNETOM ESSENZA MRI system. When this system had to be replaced, the hospital chose the 1.5T MAGNETOM Flow.Ace. This was particularly due to its DryCool technology, which results in the scanner needing just 0.7 liters of liquid helium. The sealed-for-life magnet design also means no helium refills will be needed. Since helium is a finite resource, this makes the system more environmentally sustainable. The integration of AI-assisted imaging with Deep Resolve also significantly improves image quality, especially for smaller patients under 5 kg.

Planning and installation

Planning and installation were straightforward, as the new scanner was placed in the same location as its predecessor. One of the most significant benefits of the MAGNETOM Flow. Platform's DryCool technology is that it eliminates the need for a quench pipe, which removes the risk of helium discharge. During construction, the control area remained operational and clean, and the installation was completed on schedule (Fig. 1).

Clinical adaptation and protocol development

We are the first veterinary site to install a 1.5T MAGNETOM Flow.Ace, and the scanner was delivered with default human imaging protocols. Veterinary imaging differs significantly from human imaging due to smaller patient sizes and unique positioning requirements. As you can imagine, the protocol for imaging a 1 kg kitten varies greatly from what is required for a human patient. To solve these issues, I spent the first week of operation collaborating with an applications specialist who has veterinary experience. I also leveraged my prior experience of setting up two veterinary protocol trees during our interim use of a mobile MRI scanner.

The MAGNETOM Flow.Ace carries the same magnetic projectile risks as any other 1.5T MRI system and these

risks must be managed with strict safety protocols. Since the MAGNETOM Flow.Ace has a smaller footprint than the MAGNETOM ESSENZA, it freed up space in the scanner room, making it easy to transfer patients laterally. The bore size is 60 cm, which accommodates all sizes of cats and dogs. One particularly beneficial feature is the installation of a camera in the room which is positioned strategically to look down the bore. This enables the anesthesia team to closely monitor patients during scans.

In the second week, the applications team handed over scanning operations, while remaining available for future support as we refine our use of the new techniques. Protocol refinement continued with the goal of reducing scan times and enhancing image quality.

2 A lightweight and flexible BioMatrix Contour Coil.

Hardware and imaging enhancements

The new BioMatrix Contour Coils provided with the scanner are particularly well-suited to veterinary applications. They are flexible and soft, enabling close contact with the animal, which enhances signal quality (Fig. 2). We have three sizes, which we use for different applications. The smallest size is perfect for brain imaging in animals weighing as little as 1kg. The medium size is excellent for anterior signals in larger animals and for multiarea scanning. We find this particularly useful for hip-to-knee imaging. The scanner does not use localization lights. Instead, you set a localizer center point that corresponds with markings on the table. It's very simple to use and removes the hazards that come with laser lights.

Precise patient positioning is still essential in small-animal imaging. Proper alignment reduces the need for additional transverse imaging and improves diagnostic clarity. We use long sandbags and secure straps on the table to help maintain the ideal positioning. We use ropes to extend the forelimbs, which allows access to IV positions and enables even spinal positioning. For brain imaging in animals weighing less than 10 kg, we fully wrap the head in the BioMatrix Contour Coil. This minimizes the anatomy-to-coil distance and therefore provides a good signal.
For brain imaging in larger animals, we place the head in the posterior head coil and use the Contour Coil for anterior signal to limit the area of interest to the coil (Fig. 3).

3 A general anesthesia (GA) setup with a 22 kg dog for brain/cervical spine imaging using the posterior head coil and anterior BioMatrix Contour Coil.

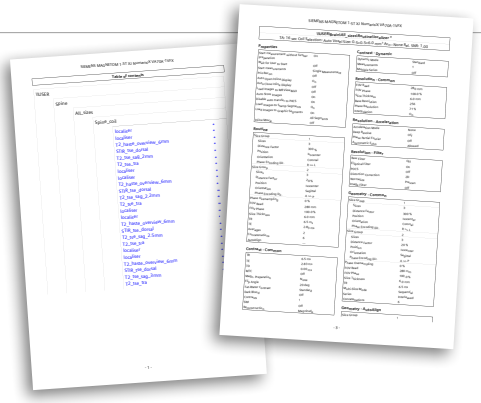
Protocol optimization and training

By the third month of operation, over 100 patients had been scanned. Our MAGNETOM Flow.Ace has exceeded expectations, providing high-quality images with reduced scan times. Initial protocol development posed a challenge due to the absence of veterinary presets, but the protocols we developed are now available on the MAGNETOM World site to benefit other veterinary practices.

Two sample protocols are provided below: Table 1 shows the protocol for spine imaging in a medium canine patient (9–20 kg), while Table 2 has the details for the brain in a very small patient (1–4 kg). Multiple averaging is still needed in our small patients to help reduce noise in conjunction with Deep Resolve (Table 2).

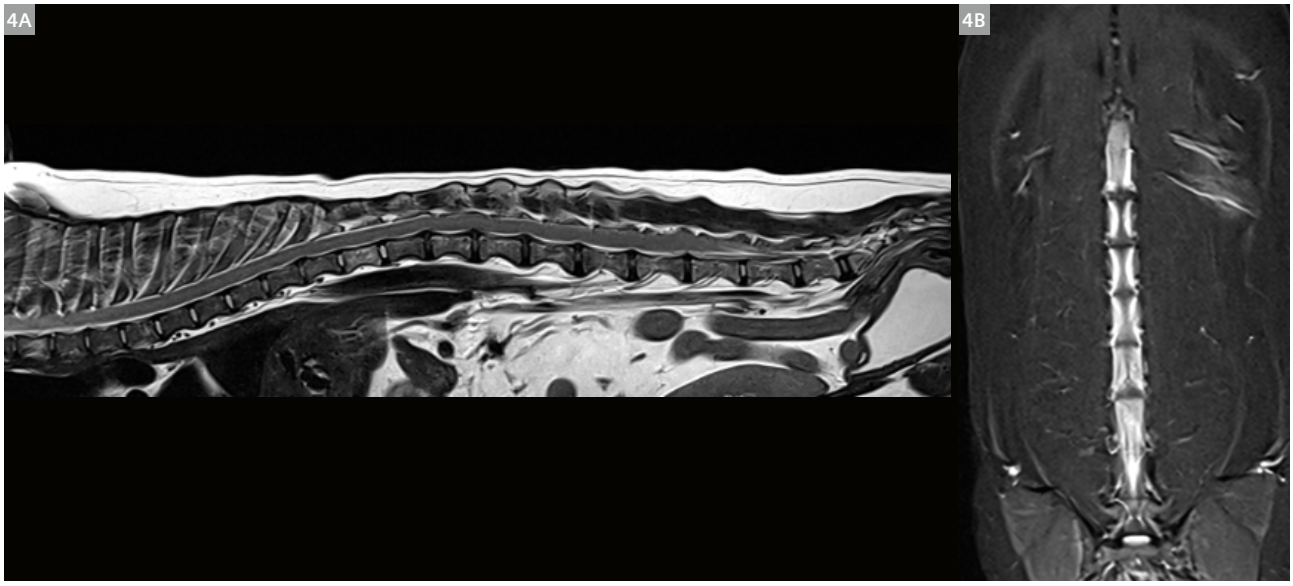
To download the **exar.1 file and the PDF**, please visit us at

www.magnetomworld.siemens-healthineers.com/hot-topics/canine-and-feline-mri



Sequence	Slice thickness mm	Slice gap mm	TR ms	TE ms	Resolution	Time min:s	Averages	Phase oversampling	Deep Resolve
MYELO	10	NA	8000	765	410 × 400 I	0:48	6	100	✓
STIR dor	2.5	0.3	7440	44	245 × 272 I	3:34	1	150	✓
T2 sag	2.5	0.3	3000	85	448 × 400 I	4:59	4	150	✓
T2 tra	3	0.3	5640	91	218 × 256 I	4:30	3	200	✓

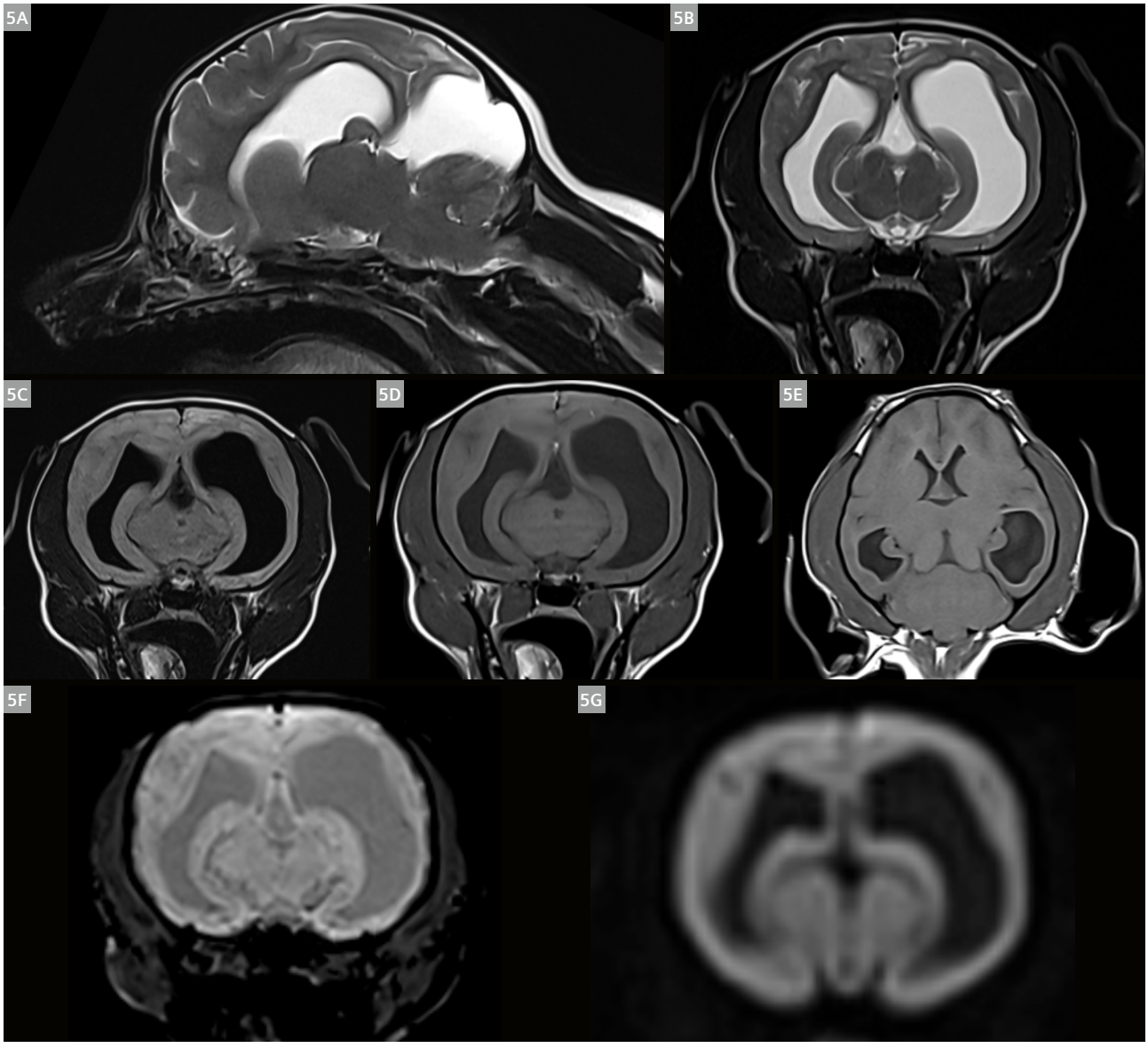
Table 1: MRI protocol for spine imaging in a 9–20 kg patient using the Spine Array Coil.



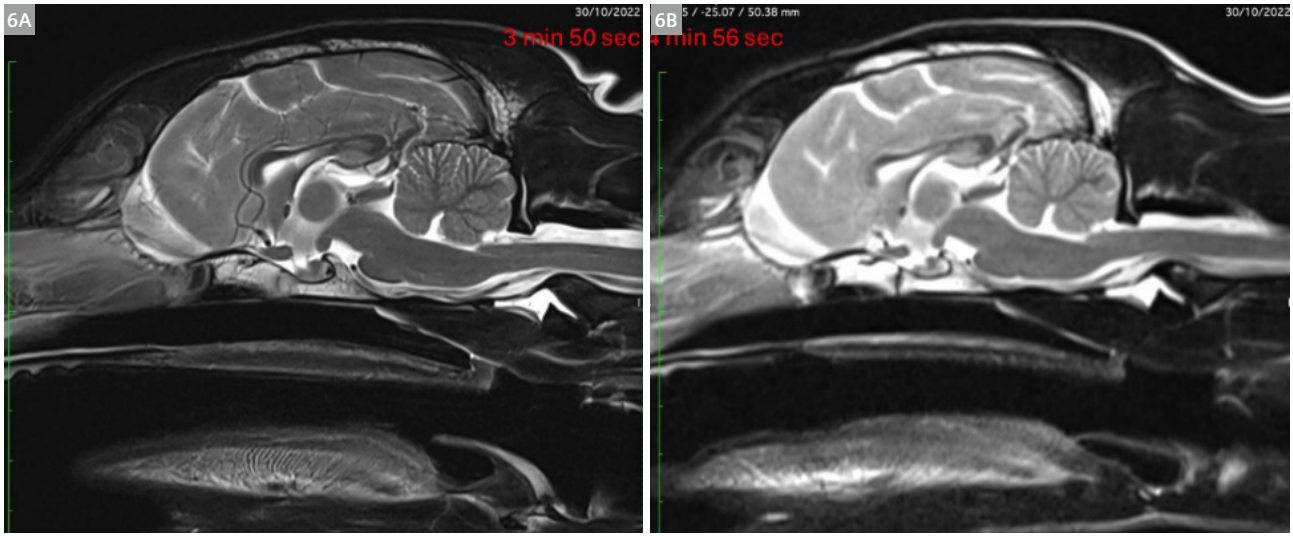
4 **(4A)** T2-weighted sagittal, **(4B)** T2 STIR dorsal.

Sequence	Slice thickness mm	Slice gap mm	TR ms	TE ms	Resolution	Time min:s	Averages	Phase oversampling	Deep Resolve
T2 sag	2.5	0.1	5350	96	230 × 288 I	5:12	4	200	✓
T2 tra	2.5	0.1	5980	74	180 × 240 I	5:02	3	200	✓
FLAIR tra	2.5	0.1	8000	87	180 × 240 I	5:13	3	100	✓
T1 tra	2.5	0.1	526	17	156 × 208 I	4:17	3	200	✓
T1 dor	2.5	0.1	645	13	190 × 244 I	4:22	2	200	✓
SWI tra	1.5	0.3	50	40	160 × 160 I	5:06	1	5	×
DWI tra	3	0.3	4640	78	104 × 104 I	4:26	1	0	×

Table 2: MRI protocol for brain imaging in a 1–4 kg patient using the small BioMatrix Contour Coil.



5 **(5A)** T2w sag, **(5B)** T2w tra, **(5C)** FLAIR tra, **(5D)** T1w tra, **(5E)** T1w dor, **(5F)** SWI tra, **(5G)** DWI tra.



6 **(6A)** 1.5T MAGNETOM Flow.Ace versus **(6B)** 1.5T MAGNETOM ESSENZA. Sagittal T2-weighted imaging of the brain with an acquisition time of 3:50 min vs. 4:56 min, respectively.

Training the team on the new interface progressed rapidly, with radiographers and imaging technicians adapting their skills from the MAGNETOM ESSENZA. The user-friendly interface enabled quick proficiency across the team. The guided workflows from myExam Assist allow us load the correct sequences directly, streamlining our processes. Deep Resolve Boost does require more phase oversampling than the MAGNETOM ESSENZA to mitigate aliasing effects, but this also improves the signal-to-noise ratio, and the overall scan acquisition time is still faster. Deep Resolve also reduces image noise, allowing for fewer averages compared to the older technology.

We had the opportunity to re-scan a previous patient using the MAGNETOM Flow.Ace, which allowed us to directly compare the image quality. Although the scan was conducted just three weeks into protocol development, improvements were already evident (Fig. 6).

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