Both computed tomography (CT) and magnetic resonance imaging (MRI) offer significant advantages over survey radiographs and myelography. The overall diagnostic sensitivity of MRI is superior to CT for both brain and spinal cord disorders, and as such MRI can be used to image the vast majority of neurologic disorders with few exceptions (e.g. spinal trauma caused by gun shot).

Computed tomography is a very fast technique that in some cases can be used under sedation (e.g. cases of spinal trauma). With newer CT scans the image quality is consistently very good. Image quality on MRI can vary significantly depending on the equipment used. Higher field MRIs (1.5 or 3.0 T), generally offer much better tissue resolution than lower fields (0.27 T) MRI scans. As MRI is the modality of choice for essentially all brain diseases, the discussion below will outline some of the indications for CT and MRI comparing both modalities primarily for spinal diseases.

**Spinal Neoplasia**

Both CT and MRI are sensitive techniques for the diagnosis of spinal tumors. Due to the superior soft-tissue resolution, MRI is usually the preferred imaging method; however, CT is excellent for visualization of osseous lesions, which are commonly observed in spinal tumors.

A study comparing myelography and CT concluded that the lytic/proliferative osseous lesions were depicted more clearly on CT than on radiographs. In one study, myelography was more useful in differentiating between intradural-extramedullary and intramedullary tumors than CT. This same observation was made when comparing myelography and MRI in another study. Careful evaluation of the images in all 3 planes (transverse, sagittal and dorsal) may assist in defining the location of the tumor. Dorsal images are particularly useful. The MRI findings of spinal meningiomas, the most common intradural tumor, have been well described. Most meningiomas are iso- to hyperintense on T1-weighted images and hyperintense on T2-weighted images. Homogeneous, strong contrast enhancement and presence of dural tail are also consistently observed.

**Intervertebral disc disease**

Recent studies have compared myelography and CT in the diagnosis of IVDD in dogs. In one study with 182 dogs, noncontrast CT had a sensitivity of 81.8%, while myelography had a sensitivity of 83.6%. Another study found a sensitivity of 90% for CT, and 88% for myelography. MRI allows clear visualization of intervertebral disc disease. Sagittal and transverse images should be used concurrently to assess the severity and lateralization of spinal cord compression. MRI also allows assessment of the spinal cord parenchyma and detection of spinal cord signal changes. In cases with multiple sites of spinal cord compression, identification of hyperintensity on T2-weighted images indicates the site with the worst compression. The spinal cord hyperintensity seen on T2-weighted images correlate with the severity of clinical
signs. Three studies in dogs have indicated that the presence and extension of spinal cord signal changes have prognostic implications. A study suggested that areas of hyperintensity longer than 3 times the body of L2 were associated with poor prognosis with only 20% of dogs with this signal change regaining ambulatory status. The presence of hyperintensity was a more reliable prognostic indicator than absence of deep pain perception (nociception).

Cervical Spondylomyelopathy

Cervical spondylomyelopathy (CSM) is characterized by static and dynamic spinal cord compressions. Both MRI and CT have been used in the diagnosis of CSM in dog. Non-contrast CT findings in dogs with CSM reveals the shape of the cervical vertebral canal, osteoarthritic changes in the articular processes, and mineralized disc herniation within the vertebral canal. CT-myelography allows cross-sectional images of the spinal cord area and provides superior visualization of areas of spinal cord compression compared to myelography. MRI has been considered the best imaging technique for humans with cervical spondylotic myelopathy for more than 25 years. The main advantage of MRI over CT-myelography is the ability to directly visualize the spinal cord. This allows detection of spinal cord signal changes that are helpful to determine the primary spinal cord lesion in cases with multiple compressions. Spinal cord signal changes are seen in approximately 50% of dogs with CSM.

Lumbosacral disease

The CT findings in dogs with LS disease have been extensively studied. CT abnormalities observed are loss of epidural fat, increased soft tissue opacity within the intervertebral foramen, bulging of the intervertebral disc, vertebral canal stenosis and thickened articular processes. In non-contrast CT, the epidural fat surrounds the nerve roots and dural sac, however, with stenosis and compression, the epidural fat is lost and the compressive soft tissue becomes indistinguishable from adjacent nerves. The degree of lumbosacral compression detected using MRI has no correlation with the severity of clinical signs. Transverse images allow assessment of the dorso-ventral diameter of the foramina, while the parasagittal images allow evaluation of the cranio-caudal diameter of the foramina. CT and MRI findings for LS disease showed a high agreement between both modalities, however, the correlation between CT or MRI findings with surgical findings is low. MRI and CT findings also had no correlation with outcome. It is also important to remember that clinically normal dogs can have imaging characteristics of LS diseases without clinical signs. This is in fact quite normal, so one must be very careful to attribute lumbosacral compression as the sole cause of neurological signs in dogs.

References:


