Vet Res Commun (2008) 32 (Suppl 1):S279–S281
DOI 10.1007/s11259-008-9128-9

ABSTRACT

CT assessment in canine meningoencephalomyelitis

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Published online: 7 August 2008

Keywords Cerebral spinal fluid · CT · Dog · Meningoencephalomyelitis

Abbreviations

CNS	central nervous system
CSF	cerebral spinal fluid
CT	computerized tomography
MEM	meningoencephalomyelitis
MRI	magnetic resonance imaging

Introduction

Meningoencephalomyelitis (MEM) is an inflammatory process of the CNS that may have viral, bacterial, rickettsial, fungal or parasitic causes. When no pathogen is identified these are defined as non infectious MEMs (Bagley 2000; Cauzinille 1999; Suzuki et al. 2003). The diagnosis of MEM is based on clinical examination, blood tests and on the Cerebral Spinal Fluid (CSF) test (Fisher 2002). In fact CSF modifications can often be observed during inflammatory,

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infectious, neoplastic and traumatic diseases as well as in some degenerative diseases of the brain and the spinal marrow (Munana 1996; O'Neill 2005). The assessment of antibody titers, in the CSF and serum, allows us to diagnose etiologically suspect cases. For some MEM forms, it is necessary to make a biopsy of the CNS to make an *intra-vitam* diagnosis (Platt 2004). Amongst all the imaging techniques, Magnetic Resonance (MRI) has proven to be the most effective in defining the CNS morpho-structural lesions due to MEMs (Lamb et al. 2005). On MRI lesions appear as hyper-intense areas in T2-weighted sequences or FLAIR or hypo-intense in T1-weighted images (Lamb et al. 2005). In 1992 Plummer and collaborators used Computerised Tomography (CT) in MEM cases and observed post-contrast impregnation areas, frequent lesions of the encephalic lacunary system and mass effect lesions. Nevertheless, based on the results obtained, the authors of this study concluded that CT was not sufficiently specific and not very sensitive in MEM diagnosis (Plummer et al. 1992). Still, nowadays, MRI veterinary services are not so widespread, particularly in Italy, while CT equipped centres are becoming more and more numerous. Therefore, the goal of our research work was that of offering a contribution to assess the sensitivity and specificity of the CT scan in MEM diagnosis.

Materials and methods

From June 2006 to February 2007 13 dogs with CNS pathologies were referred to the clinic of the Veterinary Surgery Division and, then, to the Radiology Centre of the School of Veterinary Medicine of Naples. Upon clinical observation the dogs symptoms were compatible with cervical or brainstem, vestibular, forebrain syndrome. CFR samples were taken from the cisterna magna in all the subjects. Colour assessment and cytological tests were perfermed in all the samples. In particular, cytology were pefomed by preparing a plate with cells sedimented in a test-tube after low rpm centrifugation (1500 revolutions/min for 10 minutes). A CT scan of the encephalus and/or the spinal marrow of the cervical tract was perfomed on all the subjects. The CT scan was made with a third generation scanner (GE Mod. PACE PLUS), On subjetcs under narcosis (diazepam 0.2 mg/kg i.v., thiopental 7–10 mg/kg i.v., isofluorane+O_2). The dogs were in sternal-abdominal recumbency for examination of the encephalus or in dorsal recumbency for examination of the cervical rachis. The encephalus was studied by 3 mm contiguous scans perpendicular to the palatine bone. The cervical rachis was studied first by single narrow scans through the inter-somatic spaces and then by 3 mm contiguous slices starting from C1-C2 to T2-T3 in the case of an absence of lesions possibly due to disc hernias or ligament hypertrophy or to vertebral morpho-structural alterations. In all the studies a second series of post-contrast scans was made after iopamidol administration (370 mg/kg - Iopamiro 370). CT scans were examined on a workstation (Apple PowerBook G4) equipped with a dedicated software (OSIRIX©) using the nervous tissue window settings (WW 100; WL 50). During the CT scan assessment, in order to exclude any alteration due to artefacts, only lesions repeating in at least two adjacent slices were taken into consideration. The assessment of the sensitivity, specificity and accuracy of CT was made considering CSF test results as a "gold standard".

Results

In 5 subjects (5/13) the cytological examination showed a mild, moderate or severe pleiocytosis which was then differentiated into neutrophilic, mononuclear and mixed pleiocytosis and was therefore considered as positive to MEM. In the other 8 subjects, the

CSF test was negative. With the CT scan a MEM diagnosis was made in 7 subjects (5 true positive and 2 false positive cases) All the subjects considered as CT-positive presented relatively hyperdense single or multiple focal lesions before contrast and impregnating single or multiple focal lesions after contrast. Encephalic lesions were mainly located in the posteroventral districts whereas spinal cord lesions had a variable location. In none of the CT-positive subjects did these lesions show a mass effect and only one subject showed a moderate hydrocephalus. In the remaining 6 CT-negative dogs, two did not show any alteration, 1 showed a small defect of the left temporal cortical region, compatible with the outcome of an ischemic lesion, 1 showed a small non-impregnating mass on the foramen magnum floor, 1 showed a spondylitis at T2 and, finally, 1 showed a disc hernia between T2 and T3. The CT scan showed 100% sensitivity, 71% specificity and 83% accuracy.

Discussion

Unlike the evidence reported by Plummer et al., our sample did not show any lesions with mass effect and/or alterations caused by oedema, whereas one single subject proved to be hydrocephalus. Nevertheless, this subject showed a moderate hypertrophy of the epistropheus tooth and the encephalic lesion was located in the brainstem, dorso-cranially to the hypertrophic tooth. Another interesting result from our study is represented by the prevalence of the kind of lesion reported and, that is, the presence of relatively hyper-dense small areas during pre-contrast scans which became impregnated post-contrast. The CT scan showed a high sensitivity: none of the CSF-positive subjects were CT-negative. The specificity and accuracy were good, although the presence of two false-positive subjects shows that CT can lead to diagnostic mistakes by excess. On the other hand, the absence of false-negative subjects may be considered as evidence for the reliability of CT in MEM diagnosis.

Our results, despite the small number of cases and the fact that the CSF test is not conclusive as to whether the inflammation is of a primary origin, lead us to conclude that the CT scan can be considered a valid diagnostic aid in dogs' MEM, when it is impossible to access MRI.

References

Bagley R.S., 2000. Malattia neurologica multifocale. In *Trattato di Clinica medica veterinaria,* 2nd edition. S. J Ettinger and E.C. Feldman (Eds.), Antonio Delfino editore: Milano, 603–606.

Cauzinille L., 1999. Sindrome meningo-encefalo-mielitica non infettiva, *Summa*, **7**, 9–14.

Fisher M., 2002. Disseminated granulomatous meningoencephalomyelitis in a dog. *Canadian Veterinary Journal*, **43**, 49–51.

Lamb C., Croson P.S., Cappello R., Cherubini G.B. 2005. Magnetic Resonance findings in 25 dogs with inflammatory cerebrospinal fluid. *Veterinary Radiology Ultrasound*, **46**(1), 17–22.

Munana K.R., 1996. Encephalitis and meningitis. *Veterinary Clinic of North America: Small Animal Practice*, **26**(4), 857–871.

O'Neill E.J., Merrett D., Jones B. 2005. Granulomatosus meningo encephalomyelitis in dog: a review. *Irish Veterinary Journal*, **58**(2), 86–92.

Platt S.R., 2004. *Neck and back pain.* In *BSAVA Canine and Feline Neurology*, 3rd edition. S.R. Platt and N.J. Olby (Eds.), BSAVA: Gloucester, 202–213.

Plummer S.B., Wheeler S.J, Thrall D.E., Kornegay J.N., 1992. Computed tomography of primary inflammatory brain disorders in dogs and cats. *Veterinary Radiology Ultrasound*, **33**(5), 307–312.

Suzuki M., Uchida K., Morozumi M., Yanai T., Nakayama H., Yamaguchi R.S., 2003. A comparative pathological study on Granulomatous Meningoencephalomyelitis and central Malignant Histocytosis in dogs. *Journal Veterinary Medicine Science*, **65**(12), 1319–1324.