ABSTRACT

Proceedings 33rd On-line Symposium
ESVN-ECVN

17th-18th September 2021

Selected research communications of the 33rd On-line Symposium of the ESVN-ECVN
17th to 18th September 2021

TIMETABLE OF THE SYMPOSIUM

FRIDAY 17th SEPTEMBER

08.30-08:45 Opening Ceremony and Welcome: Gualtiero Gandini (Chair)
08.45-09.30 Keynote: Pathophysiology of pain: A short review
   Dr. Federico Corletto
09.30-10.15 Keynote: The “classic” management of chronic pain in veterinary medicine.
   Dr. Louise Clark
10.15-11.00 Coffee Break – Exhibition and Poster Session
11.00-12.15 RESEARCH PRESENTATIONS
   (O1) Increased resting state connectivity in the anterior default mode network of idiopathic epileptic dogs
   000 Katrin M. Beckmann
   (O2) miR-134: A new therapeutic target for drug-resistant idiopathic epilepsy in dogs?
   000 Rodrigo Gutierrez-Quintana
   (O3) Risk factors associated with short-term mortality and recurrence of status epilepticus in dogs
   000 Rory B. Fentem
   (O4) The pharmacokinetics of single oral dose extended-release topiramate and adverse effects after multi-dose
   000 administration in healthy cats
   (O5) Sounds of seizures – Acoustic information enables immediate recognition and detection of generalized tonic-
   000 clonic seizures in dogs
   (O6) Comparison of brain metabolites between idiopathic epileptic dogs and healthy control dogs with single voxel
   000 proton magnetic resonance spectroscopy of the thalamus
   Nico Mauri
   (O7) Surface electroencephalography allows to record event related potentials during quantitative sensory testing in
   000 awake cats
   Aude Castel
12.15-13.00 Keynote: A riddle wrapped in a mystery inside an enigma: Lumbosacral neuropathic and discogenic pain.
   000 Prof. Dr. Frank Steffen
13.00-14.30 Lunch – Exhibition and Poster Session
14:30-15.15 Keynote: Keynote - Pain and Chiari-like malformation: Pathophysiological mechanisms and treatment options
  000 Dr. Clare Rusbridge
14.15-15.15 Flash presentations
  (FP 1) An episodic movement disorder in juvenile Weimaraners
  000 Matthew Green
  (FP 2) Orthostatic tremor in dogs: 60 cases (2003-2020)
  000 Theofanis Liatis
  (FP 3) A case series of three dogs presenting with neurological deficits due to suspected nutritional secondary hyperparathyroidism after being fed an exclusive diet of barf (biologically appropriate raw food) diet
  000 Lina Nowak
  (FP 4) The effects of exercise restriction on dogs and their owners: A pilot study
  000 Gemma Walsmsley
  (FP 5) Vertebral and endplate changes in dogs with suspected fibrocartilagenous embolic myelopathy
  000 Cesar Llanos
  (FP 6) Usefulness of follow up MRI in dogs with discospondylitis: A retrospective evaluation
  000 Maria Inês de Freitas
  (FP 7) A new form of hereditary ataxia in Australian Shepherd. Phenotypic and genetic characterization
  000 Catherine Escrivou
14.35-15.45 Short Break
15:45-16:15 Flash presentations
  (FP 8) Head turn: A study of neurolocalisation
  000 Arangan Nagendran
  (FP 9) Urinary neurotransmitter patterns are altered in canine epilepsy
  000 Teresa Schmidt
  (FP 10) The Reibergram in neurological diseases of dogs
  000 Mirja Püschel
  (FP 11) Evaluation of the effect of phenobarbital administration on biochemistry profile with focus on serum liver concentrations in cats with epilepsy: A multi-center study
  000 Michelle Hermans
  (FP 12) Feline temporal lobe epilepsy: Seven cases of hippocampal and piriform lobe necrosis in England and literature review
  000 Bruno Scalia
  (FP 13) Concentration of C reactive protein in serum and cerebrospinal fluid in dogs with meningoencephalitis of unknown origin or steroid responsive meningitis arteritis
  000 Robin Cavalerie
  (FP 14) Comparison of serum CK and AST levels in canine protozoal meningoencephalitis and non-infectious meningoencephalitis
  000 Bethan S. Jones
  (FP 15) Application of machine learning to guide the clinical reasoning in dogs presenting with seizures and a normal inter-ictal neurological examination
  000 Chloe Smith
16:15-16.45 Coffee Break – Exhibition and Poster Session -
16.45-18.30 Annual General Meeting President ECVN Veronika Stein

Symposium Day 2 - SATURDAY 18th Sept. 2021

08.30-09.10
  (O8) A novel lateral approach to the C7 and C8 spinal nerves and nerve roots for resection of malignant peripheral nerve sheath neoplasia in two dogs
  Oliver Marsh
  (O9) Spinal arachnoid diverticula conformational variations in dogs
  João Miguel Frías
Spinal subarachnoid webs - Are they a variant of subarachnoid dyverticula in dogs?
Erika Bersan

Traumatic and iatrogenic sciatic nerve injury in thirty-nine dogs and ten cats: Clinical and electrodiagnostic findings
Diletta Dell’Apa

09.15-10.00
Keynote: Keynote - Cannabinoids: Just fashion or real opportunity?
Dr. Renato Vellucci

10.00-10.30
COFFEE BREAK – EXHIBITION AND POSTER SESSION

10.30-11.15
Keynote: Future perspectives in the management of chronic pain in human medicine
Dr. Renato Vellucci

11.15-12.10
RESEARCH PRESENTATIONS

Valveless ventriculoperitoneal shunt in dogs and cats – Clinical experience after 20 years
Ragnar Franco Schamall

Comparison of neurotransmitters concentration in canine cerebrospinal fluid, blood, and urine samples measured via high-performance liquid chromatography
Sebastian Meller

Application and accuracy of a magnetic resonance imaging-guided neuronavigation system for brain biopsy in small animals
Chin-Chieh Yang

Optimisation of cerebrospinal fluid metabolomics
Fien Verdoodt

Oligoclonal bands in dogs with meningoencephalitis of unknown origin (MUO)
Julia Katrin Prümmer

12.10-13.10
FLASH PRESENTATIONS

Use of 3D-printing technology to create a simulator for cerebrospinal fluid sampling at the lumbar subarachnoid space
Megan Madden

Utility of a flexed neck sagittal MRI sequence prior to CSF sampling from the cerebellomedullary cistern in dogs
Dafni Sivolapenko

Noninvasive monitoring of intracranial pressure waves using BCMM 2000 Brain4Care monitor in dogs with myelopathies undergoing myelography
Monica Vicky Bahr Arias

Do haste MRI sequence findings correlate with clinical signs in dogs with thoracolumbar disc extrusions?
Sam H. Khan

Long term outcome in dogs with complete sensory and motor loss following thoracolumbar intervertebral disc herniation
Anne Barriere

Safety of early postoperative hydrotherapy in dogs undergoing thoracolumbar hemilaminectomy
Abtin Mojarradi

Long-term follow-up of the spinal segmental stabilisation technique for the surgical treatment of dorsal hemivertebrae associated with kyphosis
Daphne Ellie Mavrides

Evaluation of the effect of extradural administration of morphine for postoperative analgesia following ventral slot surgery in dogs with cervical disk herniation
Federica Tirrito

The nociceptive withdrawal reflex for the evaluation of analgesia in pigs undergoing extracorporeal membrane oxygenation: A pilot study
Maria Petrucci

Tongue atrophy as a neurological sign in hereditary polyneuropathy in Alaskan Malamutes
Josefin Hultman
13.10-14.30 Lunch – Exhibition and Poster Session

14.30-15.15 Keynote: Keynote - Future perspectives in the management of chronic pain in veterinary medicine.
Dr. Louise Clark

15.15-16.00

RESEARCH PRESENTATIONS

(O17) Is cerebrospinal fluid analysis useful in suspected intracranial disease with normal magnetic resonance imaging?
Susana Monforte Monteiro

(O18) Clinical outcome of subclinical bacteriuria in dogs following surgical decompression of Hansen Type I thoracolumbar intervertebral disc herniation
Helena Rylander

(O19) Alteration of Th17 and Treg cells in dogs in the acute phase of painful intervertebral disc herniation
Pinar Can

16.00-16.30 COFFEE BREAK – EXHIBITION AND POSTER SESSION

16.30-17.30

RESEARCH PRESENTATIONS

(O20) Paediatric neurological disorders in dogs and cats: A retrospective multicentric study of 888 cases (2003-2019)
Ana Cloquell

(O21) Diffusion tensor imaging in syringomyelia secondary to Chiari malformation in Cavalier King Charles Spaniel. Preliminary study
Karolina Owsirska-Schmidt

(O22) Foramen magnum decompression and modified cranioplasty using titanium mesh plate in small dogs with caudal occipital malformation syndrome and syringomyelia
Yukiko Nakano

(O23) Evaluating the benefit of contrast Magnetic Resonance (MR) images in detecting spinal cord pathology: A retrospective study
Emmeline Robinson

(O24) Juvenile-onset motor polyneuropathy in 15 cats
Nicolas Van Caenegem

(O25) Mechanical nociceptive thresholds and assessment of descending inhibitory controls in healthy cats and those with diabetes mellitus
Hélène L. M. Ruel

17.30-18.00 Awards & Closing Remarks

Veronika Stein, Gualtiero Gandini, Massimo Baroni, Cristian Falzone
Increased resting state connectivity in the anterior default mode network of idiopathic epileptic dogs

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Epilepsy is increasingly recognized as a network disorder rather than a disorder of isolated epileptic zones. Resting state functional magnetic resonance imaging is a non-invasive method to investigate brain connectivity. In human epilepsy and rodent models, altered functional connectivity in different large-scale brain networks have been identified. Since large-scale brain networks have been consistently identified in anesthetised dogs, application of this technique on canine epilepsy research is promising. The aim of the present study was to investigate differences in resting state networks of epileptic dogs compared to healthy controls. We hypothesize that epileptic dogs show altered large-scale networks compared to healthy control dogs. A group of 17 dogs affected by idiopathic epilepsy, 11 Border Collies and 6 Greater Swiss Mountain Dogs, was compared to 20 healthy beagle dogs under a standardized sevoflurane anesthesia protocol. Group level independent component analysis with dimensionality of 20 components, dual regression analysis and two-sample t-test were performed. Significantly increased connectivity at the anterior default mode network (DMN) of idiopathic epileptic dogs compared to healthy control dogs (p = 0.00060). No significant differences were found at the posterior DMN, primary visual, higher order visual, auditory and somatosensory networks. The DMN is an important higher order brain network and its dysfunction has been found in human epilepsy, but also in epileptic comorbidities such as anxiety and depression. Altered anterior DMN connectivity suggests synaptic reorganization and possibly compensatory mechanisms in canine idiopathic epilepsy and may indicate a target for further advanced computational neuroimaging.

miR-134: A new therapeutic target for drug-resistant idiopathic epilepsy in dogs?

Rodrigo Gutierrez-Quintana¹, Cristina Ruedell Reschke², Aoife Campbell³, Andrea Tipold³, Florian Hansmann³, Holger Volk³, Frances McLauchlan⁵, Roberto José-López¹, Catherine Stalin¹, Adriana Kaczmarska¹, David Henshall²

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Current antiseizure drugs (ASD) provide symptomatic control of seizures in only two-thirds of patients and do not change the underlying pathophysiology. Recently, microRNAs (miR) have emerged as potential novel targets for seizure control and disease-modification in drug-resistant epilepsy. miR-134 is up-regulated in rodents after prolonged or repeated seizures and in brain tissue from humans with drug-resistant temporal lobe epilepsy. MiR-134 can be specifically targeted using antisense oligonucleotides and inhibiting miR-134 has shown potent and long-lasting anticonvulsant and neuroprotective effects in rodent epilepsy models. We aim to assess miR-134 as a circulating biomarker of drug-resistant epilepsy in dogs. Plasma samples from seven healthy dogs and 14 dogs with a tier II confidence level for idiopathic epilepsy (IE) were used. Seven IE dogs were responsive to ASD and seven were drug-resistant (less than 50% reduction of seizures despite at least two ASD). RNA was extracted using the miRCURY RNA isolation kit for biofluids (Exiqon). Levels of miR-134 were assessed by individual Taqman miRNA by RT-qPCR on QuantStudio 12 K Flex PCR system and expressed relative to miR-16. ANOVA with post hoc test was used for groups comparison. Results revealed plasma levels of miR-134 were significantly higher (p = 0.0034) in dogs with drug-resistant epilepsy compared to controls and also considerably higher than in dogs responsive to ASD. This confirms that changes in miR-134 expression are present in canine IE and supports miR-134 as biomarker of drug-resistant epilepsy in dogs and as an interesting therapeutic target for seizure control and disease-modification in drug-resistant cases.

Risk factors associated with short-term mortality and recurrence of status epilepticus in dogs

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Background: Status epilepticus (SE) is a neurological emergency associated with serious consequences for both the patient and owner. Data regarding risk factors for short-term mortality or recurrence in patients with SE is limited. Objective: To identify risk factors associated with short-term mortality (euthanasia or spontaneous death) and with recurrence of SE in dogs. Animals: 130 client-owned dogs presented in status epilepticus. Methods: Retrospective multicentre study using data collected from medical records of dogs presented in SE to the contributing institutions. Multivariable logistic regression analysis was performed using a manual backwards stepwise approach to identify risk factors associated with short-term mortality and with recurrence of SE after discharge. Results: The short-term mortality for patients in this study was 32.3%. Factors significantly associated with short-term mortality included the presence of structural disease, the presence of SE prior to admission at the referral centre and the increasing duration of hospitalisation. SE recurred in 27% of dogs which survived to discharge. Factors significantly associated with recurrence of SE included a prior history of pharmacoresistant epilepsy and the predominance of a focal seizure phenotype. Clinical significance: The results from this study may be used to inform clinicians and dog owners regarding risk factors for both short-term mortality and recurrence in canine patients with SE.

The pharmacokinetics of single oral dose extended release topiramate and adverse effects after multi-dose administration in healthy cats

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Extended-release topiramate is an anticonvulsant approved for use in humans, which is administered once daily and manufactured in capsules that can be opened and sprinkled on food. A prospective study was designed to establish pharmacokinetic parameters and safety after multi-dose administration in eight healthy cats. After ensuring systemic health, baseline plasma samples were obtained followed by administration of 5 mg/kg (n = 4) or 10 mg/kg (n = 4) extended release topiramate sprinkled on food. Plasma sampling occurred up to 84 hours post-administration and concentrations were measured in all samples using liquid chromatography mass spectrometry. Based on these data, steady state predictions were performed to determine the most appropriate dosage and frequency required to achieve a minimum target concentration of 5 ug/mL after multidose administration. After a wash-out period, all cats were then administered 10 mg/kg extended release topiramate sprinkled on food once daily for 30 days. Weekly blood gas, physical examination, and intraocular pressures were obtained. A baseline plasma sample was obtained on day 30 prior to administration of the final dose, followed by 24 hours of plasma sampling. No significant adverse effects were noted during the study and the extended-release topiramate plasma concentration was greater than 5 ug/mL at all sampling time points in all participants after 30 days of administration. In conclusion, once daily administration of 10 mg/kg extended release topiramate is adequate to achieve a plasma concentration of 5 ug/mL without causing significant adverse effects after 30 days of administration.

Sounds of seizures-acoustic information enables immediate recognition and detection of generalized tonic-clonic seizures in dogs

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Epilepsy is the most common chronic neurological disease in humans and dogs. Seizures greatly impact patients’ and caretakers’ quality of life. One of the caretakers’ major concerns is that seizures may remain unnoticed or may be noticed too late. There is need for reliable detection of seizures in order to apply quick emergency treatment for preventing further seizure evolution resulting in cluster seizures or status epilepticus. Artificial intelligence may represent a new tool to overcome this gap. A crucial step in this direction is the creation of quality datasets and computational tools for investigating seizure-related audio, video, and sensor signals. A dataset of 42 audio tracks of videos of dogs with generalized tonic-clonic epileptic seizures was collected and annotated. 138 statistical features were used and 9 classifier types using 4474 sound samples with the duration of 1 second each were investigated. The obtained classifiers were evaluated with k-fold cross-validation and automatic hyperparameter tuning, reaching balanced accuracy of above 70%. Classical machine learning methods show promising results in the detection of epileptic seizure sounds, providing a potential basis for the development of an alert and detection system for domestic and clinical environments. In addition, such systems could significantly improve the detection of seizure frequency and semiology to measure therapeutic effectiveness in more scientific settings. Employing various advanced deep learning techniques and neural networks has even greater potential to increase accuracy; however, larger datasets are needed.
Comparison of brain metabolites between idiopathic epileptic dogs and healthy control dogs with single voxel proton magnetic resonance spectroscopy of the thalamus

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Magnetic resonance spectroscopy (MRS) has been used to characterise ictal and inter-ictal metabolic abnormalities in humans with epilepsy. In veterinary medicine, several advantageous applications of MRS in epileptic and non-epileptic dogs have been presented. However, especially for the investigation of canine epilepsy, MRS published data is limited. The purpose of this case-control study was to assess and compare thalamic MRS-Spectra in dogs with idiopathic epilepsy (IE) and healthy control dogs. We hypothesized that epileptic dogs, show elevated glutamate-glutamine (Glx) and reduced N-acetyl-aspartate (NAA) thalamic concentration compared to controls, similar to humans with idiopathic generalized epilepsy. MRS of the thalamus was performed in 31 IE dogs and 25 healthy control dogs during a retrospective (2015-2019) and a prospective (2019-2021) part of this study. Single voxel proton MRS of the thalamus was performed with a 3-Tesla MRI using an optimized protocol (PRESS-localisation, TE=31 ms, TR=2000 ms, NSA=240). Metabolite concentrations were estimated with an automated data processing spectral fitting algorithm using water signal as reference, and compared between IE dogs and controls using a Wilcoxon unpaired two-sample test. Dogs affected by IE showed statistically significant elevated thalamic Glx concentrations (Cohen’s-d=−0.728). However, no statistically significant difference in NAA between IE dogs and controls was detected. In conclusion, preliminary results of this study show that dogs affected by IE have increased Glx, but no decrease in NAA thalamic concentration compared to healthy controls. These findings support the application of MRS for further investigation of canine epilepsy. Keywords: MRS, [1H] MRS, N-acetyl aspartate, glutamate, glutamine, brain, canine.

Surface electroencephalography allows to record event related potentials during quantitative sensory testing in awake cats

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Quantitative sensory testing (temporal summation number following mechanical stimulation (MS) or application of an acetone drop on a paw), allow to assess rather objectively, mechanical and cold allodynia associated with chronic pain but cannot evaluate the mechanisms associated with pain perception and modulation at the cortical level. We hypothesize that the recording of event related potentials (ERPs) measuring superficial cortical activity in areas involved in pain processing following MS and thermal (TS) stimulations, is feasible in awake cats using surface electroencephalography (sEEG). Eight sEEG electrodes were placed on the skull of six healthy research cats to record sEEG activity before and during either repeated MS or TS (pinprick or an acetone drop on the dorsum of a front paw, respectively). The number of MS tolerated and the latency to observe a behavioral response after TS were recorded. The method of principal component analysis was used to decompose the EEG traces of each trial at each electrode site into basic waveforms (principal components) followed by an analysis of variance to detect if the stimulations generated a specific component. A generalized linear mixed model allowed to detect any electrode site with unique activity generated by the stimulations. The number of tolerated MS was similar to previous reports (mean 26.4 [18-30]). TS did not elicit any significant reaction. Awake sEEG were well tolerated and allowed recording of ERPs in the Cz area following MS and TS. sEEG could allow to evaluate cortical activity associated with allodynia in awake cats with chronic pain.

A novel lateral approach to the C7 and C8 spinal nerves and nerve roots for resection of malignant peripheral nerve sheath neoplasia in two dogs

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Peripheral nerve sheath tumours are malignant mesenchymal tumours that commonly cause neuropathic pain. Surgery with or without adjuvant radiotherapy, or radiotherapy alone, is recommended. Excellent access is required for excision with clear margins, improving prognosis. The surgical approach to the C7 and C8 spinal nerves and nerve roots is complicated by the scapula and possible intra-thoracic tumoral extension. Here, we outline a novel surgical procedure in two dogs to resect brachial plexus masses with rib and intrathoracic involvement that extended into the C6-C7 intervertebral foramen in one case and the C7-T1 intervertebral foramen in the
other. Each patient was placed and secured in lateral recumbency. Fore-quarter limb amputation with first rib removal and distal resection of the affected spinal nerves allowed excision of the intrathoracic and brachial plexus portion of the mass. The table was then tilted 20° towards the vertical plane to improve access to the intervertebral foramina. The C6-T1 vertebrae were approached laterally by dissecting the sternothyroid muscle, distracting the superficial scalenus muscle and removing the deep scalenus muscle from its vertebral attachments. C6-C7 or C7-T1 hemilaminectomies were performed. The C7 or C8 nerve root was resected 1mm distal to its spinal cord origin. Both dogs subsequently received adjuvant radiotherapy. The procedure allowed excellent visualisation and access to intervertebral foramina and nerve roots without complications. At the time of writing, one case was pain-free nine months after surgery and the other remained comfortable for four months before developing a lung mass.

ABSTRACT

Spinal arachnoid diverticula conformational variations in dogs

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The description of spinal arachnoid diverticula (SAD) conformations and their clinical implications are poorly characterized in dogs. This retrospective cross-sectional study was conducted to describe variations of SAD conformations in dogs and to identify if there is an association between SAD conformation and age, time to referral, brachycephalic conformation, body weight, localisation, syringomyelia (SM) presence/localisation in relation to SAD, presence of vertebral malformation/intervertebral disc disease at the site of SAD, treatment, short-term and long-term outcome (4 weeks and more than 6 months from diagnosis, respectively). Sixty-two dogs were included (12 cervical and 50 thoracolumbar SAD). All dogs with a cervical SAD had a cranial tethered conformation and were not included in the statistical analysis. Half of the dogs with a thoracolumbar SAD were cranial tethered and the other half caudal tethered. All dogs with the presence of SM and caudal tethered SAD had a cranial positioned SM (n=22) and all dogs with SM and a cranial tethered SAD (n=19) had a caudal positioned SM. Furthermore, the difference of SM absolute length was statistically significant (P=0.018) between caudal (21.05mm±19.84) and the cranial (13.5mm±11.9) tethered thoracolumbar SAD. The difference of SM length/L2 vertebra ratio was statistically significant (P=0.018) between caudal (1.44±1.45) and cranial (1.1±0.81) tethered thoracolumbar SAD. Only the short-term outcome was statistically significant (P=0.045); the caudal tethered conformation was found to have better outcome regardless of treatment. SAD conformation in dogs can influence SM formation. A possible link between short-term outcome and SAD conformation was found, but further research is warranted.

Spinal subarachnoid webs - Are they a variant of subarachnoid dyverticula in dogs?

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Subarachnoid webs (SAW) are described in human medical literature, thought to represent a variant of subarachnoid diverticula (SAD). A definitive diagnosis is often difficult from pre-operative images, needing the aid of intra-operative modalities such as ultrasonography. The ultrasound appearance of SAW is characterised by longitudinal membranes of sub-arachnoid tissue that obstruct the subarachnoid space. The primary objective of this retrospective study was to determine if SAW exist in dogs. We also aimed to evaluate the value of intraoperative ultrasonography during decompressive surgery in cases of SAD/SAW, comparing ultrasound images with pre-operative magnetic resonance imaging data. The study population comprised 12 dogs that underwent MRI and intra-operative ultrasonography. Based on the MRI study, the point of greatest dilation of the subarachnoid space was at T10 vertebral body (5/12), T12 (4/12) and T11 (3/12). All dogs underwent dorsal laminectomy. Durotomy was performed in all cases followed by focal durotomy in 11 cases. Five dogs underwent subsequent spinal stabilisation. Images were independently reviewed by 2 radiologists. A consensus diagnosis of SAW was found in 8 cases, 4 cases were classified as SAD. Surgical planning was modified and extended based on the intra-operative ultrasonography findings resulting in a more extensive approach involving more than 1 vertebral body in 7 cases. In conclusion, dilations of the subarachnoid space showing ultrasound characteristics compatible with the medical descriptions of SAW were found in multiple dogs. In all cases, intraoperative ultrasonography provided essential information to establish a definitive diagnosis, appropriate surgical margins and debondment of adhesions.

Traumatic and iatrogenic sciatic nerve injury in thirty-nine dogs and ten cats: clinical and electrodiagnostic findings

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Aim of the study was to retrospectively evaluate clinical and electrodiagnostic findings of dogs and cats with traumatic and iatrogenic lesions of the sciatic nerve. Patients visited in the period 2006-2020 that underwent neurologic examination and electrodiagnostics were included. A grading scale was applied to results of motor nerve conduction (MNCS) based on amplitudes of CMAPs. These data were compared to clinical findings like absence/presence of nociception in the peroneal and tibial nerves using contingency tables. Thirty-nine dogs and 10 cats (23 males, 26 females) met the inclusion criteria. Injuries were caused by trauma (51%), surgical procedures (44.9%) and injections (4.1%). Electrodiagnostics were suggestive of neuromtosis in 23 nerves (16 peroneal, 7 tibial). Peroneal and tibial nerve were affected in 83% (41/49) and 92% (45/49) of the patients respectively. Of the 39 subjects with both nerves injured, 19 had a prevalent peroneal and 3 a prevalent tibial involvement. Nociception was absent in 5/7 tibial and in 16/16 peroneal nerves that had absent CMAPs (neurotmesis). Nociception was absent also in 5/6 tibial and 8/14 peroneal nerves that had severely reduced amplitudes of CMAPs (<1 mV). A significant association between the grading scale and nociception was found for both the tibial and peroneal nerve (P = 0.006 and P = 0.001 respectively). Different types of trauma and orthopedic procedures can cause injury and dysfunction of the sciatic nerve. Peroneal is often more severely affected than tibial. Electrodiagnostics appear to be superior to neurological evaluation in differentiating neurotmesis from severe axonotmesis, that may carry a better prognosis.

Valveless ventriculoperitoneal shunt in dogs and cats - Clinical experience after 20 years

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¹Clinica Veterinária Petrópolis, Petrópolis - RJ, Brazil

We report our experience in the treatment of hydrocephalus in dogs and cats, using valveless ventriculoperitoneal shunt technique. We believe that, due to the anatomical particularities of these species, the use of a CSF valve as a flow regulator devise is not necessary. Twenty-two dogs and two cats with primary or secondary hydrocephalus (three of them also associated with quadrigeminal cysts) were treated. The surgical procedure was the same as traditional technique, except for the absence of a valve. Complications were: three obstructions in the first month after surgery, two cases of infection and two cases of concentric pachymeningeal fibrosis (obstructing the intraventricular end of the tube). A severe case of subdural haemorrhage was the only intraoperative complication. Twenty animals achieved a normal life and four animals died in the first week after surgery, by causes unrelated to the technique. These results suggests that the valve is unnecessary and, besides adding cost and complexity, reportedly causes unnecessary complications. The complications found in our series was related to the shunt technique and not due the absence of the valve. In no patient was noted, at least clinically, the occurrence of hyperdrainage syndrome. The low morbidity and mortality indicate the safety of this modification of the traditional valvulated technique. We hope these data provides a proof of concept for its clinical utilization.

Application and accuracy of a magnetic resonance imaging-guided neuronavigation system for brain biopsy in small animals
ABSTRACT

The image-guided stereotactic technique can display the location of surgical instrument and biopsy target in real-time, allowing to perform minimal invasive brain biopsy with reduced risks. RETINA® is a frameless stereotactic navigation system, but its application in dogs and cats hasn’t been investigated. Using canine and feline cadavers, a study was conducted to evaluate its accuracy. Phantom lesions were created at various regions and depths in the brain. Eight fiducial markers composed of titanium screws and plastic cylinders filled with diluted gadolinium, were installed at the outer table of frontal sinus and zygomatic arch in each cadaver. T1-weighted turbo field echo three-dimensional MR images in 1-mm thickness were imported into the RETINA®. After placing the reference tracker on the dental bite block, the infrared camera was applied to register the head and the images through detecting the spatial relationship between fiducial markers and reference tracker. The path to the targeted lesion was determined in real-time, and 0.2 μl of diluted gadolinium was injected at each target. Coordinates of navigated target-point and the center of gadolinium deposition were established in repeated MR images. The distance between these coordinates was defined as targeting error. In total, 64 lesions were targeted. The mean targeting error was 2.87 mm ± 0.82 mm. Lesion location, path length, and operator’s experiences did not significantly affect the accuracy. The feasibility and accuracy of this navigation system support its clinical application for brain lesions of diameter > 3.07 mm in dogs and cats.

Optimisation of cerebrospinal fluid metabolomics

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In veterinary medicine there is increasing interest for omics methodologies. Metabolomics is one of the more recent methods where the individual’s biological phenotype is characterised, by integrating host-related and external factors (e.g. diet, microbial community). Fingerprinting of the canine cerebrospinal fluid (CSF) metabolome can lead to new discoveries of clinical biomarkers and may increase knowledge of the pathophysiology of multiple neurological diseases. However, at present there is no optimised and validated extraction protocol for metabolomics in CSF. The objective of this study was to establish a validated protocol for CSF metabolomics. Therefore, CSF samples from healthy Beagles were analysed with ultra-high performance liquid chromatography coupled to high resolution mass spectrometry (UHPLC-HRMS). This platform is considered the gold standard for metabolomics analysis. The extraction was optimised through a design of experiments, using JMP 15 software (SAS, UK). First a 24 factorial design was established with 19 experiments to assess four factors: volume, type of solvent, centrifugation time, usage of a filter. In a second phase, response surface modelling was applied to optimise yield. The extraction of a broad range of polar metabolites, including for example, amino acids, ketones and carbohydrates was envisioned and evaluated. Preliminary data indicate a reliable detection of tryptophan and kynurenine. These metabolites are known to play a role in the microbiota-gut-brain axis (MGBA). In conclusion, this validated protocol is an important step toward standardised metabolomics research in veterinary neurology. It can help unravel the role of MGBA in multiple conditions, such as canine cognitive dysfunction and idiopathic epilepsy

Oligoclonal bands in dogs with meningoencephalitis of unknown origin (MUO)

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Meningoencephalitis of unknown origin (MUO) is an inflammatory disease of the canine central nervous system (CNS) that shares several characteristics with multiple sclerosis (MS), an inflammatory disease of the human CNS. In approximately 95 % of MS patients, ≥ two immunoglobulin G (IgG) oligoclonal bands (OCBs) are detectable exclusively in the cerebrospinal fluid (CSF). The aim of this study was to detect OCBs in CSF and serum in a population of dogs with different diseases (MUO, intervertebral disc disease (IVDD), idiopathic epilepsy (IE), intracranial neoplasia (IN), steroid-responsive meningitis-arteritis (SRMA), and diseases outside the CNS). We hypothesized that, analogous to MS, a high proportion of dogs with a clinical diagnosis of MUO have ≥ two OCBs in the CSF (OCB-positive). 121 paired CSF and serum samples were assessed via isoelectric focusing and immunoblot (MUO n = 28, IVDD n = 23, IE n = 18, IN n = 23, SRMA n = 13, non-CNS n = 96). Presence of an OCB-positive result was significantly higher in dogs with MUO (57 %) compared to all other groups (22 % in IN, 6 % in IE, 15 % in SRMA, 13 % in IVDD, and 0 % in the non-CNS group). Dogs with MUO were 9.9 times more likely to have an OCB-positive CSF result than the group of all other diseases. This result underlines the analogy of MUO in dogs and MS in humans. MUO or one of its subtypes could serve as a translational animal model for MS studies.
Is cerebrospinal fluid analysis useful in suspected intracranial disease with normal magnetic resonance imaging?

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Cerebrospinal fluid (CSF) analysis is a common diagnostic tool used to characterise different neurological disease processes and, when not demonstrating any cytological or biochemical changes, increase the confidence in the diagnosis of idiopathic epilepsy. This retrospective study investigated whether CSF analysis altered the likelihood of diagnosing dogs and cats with intracranial disease in the presence of unremarkable magnetic resonance imaging (MRI). Additionally, the usefulness of CSF analysis with normal and abnormal neurological examination findings was investigated. Clinical, imaging and laboratory records of patients that underwent brain MRI and CSF analysis at two veterinary neurology centres were collected. Five hundred and ninety-six dogs and cats (536 and 60 respectively) with suspected intracranial disease, CSF analysis and an unremarkable MRI, were included. Eighteen animals (0.03%) had abnormal CSF, with 50% presenting pleocytosis (with or without an elevated protein count) and 50% hyperproteinorachia only. Fourteen of these 18 (78%) animals presented with an abnormal neurological examination. In 4 of these, diagnosis and treatment changed based on CSF findings - two dogs were diagnosed with idiopathic cerebellitis, one with meningocencephalitis of unknown origin and one with suspected pachymeningitis. In one case with normal neurological examination and a history of vestibular disease, mildly inflammatory CSF led to short-term treatment with corticosteroids. In this population of patients with normal MRI and neurological examination, it is unlikely that CSF analysis will reveal an undiagnosed intracranial condition. However, CSF evaluation should be considered as a valuable diagnostic tool in animals with an abnormal neurological examination consistent with intracranial disease.

Clinical outcome of subclinical bacteriuria in dogs following surgical decompression of Hansen type I thoracolumbar intervertebral disc herniation

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Thoracolumbar intervertebral disc herniation Hansen type I (IVDH Hansen Type I) is a common cause of acute spinal cord injury in dogs. Surgical decompression is the recommended treatment. Secondary urinary dysfunction and subclinical bacteriuria (SBU) have been documented in veterinary patients; antimicrobial therapy is not the current standard of care in human patients with symptomatic bacteriuria. While studies have looked at the prevalence of SBU in dogs, no studies have followed these patients to see whether they develop clinical signs. The aim of this study was to describe the clinical outcome, in the absence of antimicrobial intervention, of SBU in dogs following surgical decompression of IVDH Hansen type I. Twenty client-owned dogs that underwent surgical decompression for IVDH Hansen type I were included in this prospective study. Urinalysis, urine culture, neurologic status, urination status and blood work were evaluated at presentation, discharge, 2 weeks post-operatively and 4-6 weeks post-operatively. Five dogs had bacteriuria at 4 days (n=1), 2 weeks (4), 4-6 weeks (4), and 9 weeks (1) after surgery. The bacteriuria resolved without any treatment in one dog. Four dogs were treated with antibiotics after persistent bacteriuria at 2 months (1), 4 months (1), and 6 months (2). Incontinence, the only clinical sign in 3 dogs, resolved with treatment. Two dogs did not have clinical signs of bacteriuria. This study suggests that patients who develop bacteriuria post-operatively should be closely monitored and may not require intervention. Signs of clinical bacteriuria may be limited to new onset of incontinence.

Alteration of Th17 and Treg cells in dogs in the acute phase of painful intervertebral disc herniation

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Intervertebral disc herniation (IVDH) can be associated with neuropathic and inflammatory pain. Neuropathic pain has been suggested to be influenced by the proinflammatory immune response and experimentally and in human studies by alteration of Th17 and Treg cells. In the current study, we hypothesized that the Th17/Treg balance may be altered in dogs with painful IVDH when compared with non-painful IVDH. Pain was evaluated subjectively during the neurological examination in 52 dogs. The absolute numbers of Th17 and FOXP3+ Treg cells were quantified using a multicolor flow cytometry in blood samples in the acute phase of the disease before surgical treatment. Th17, Treg cells and Th17/Treg ratio were compared statistically between patients with painful (n=40) and non-painful (n=12) IVDH, and between ambulatory (n=16) and non-ambulatory (n=24) painful IVDH. There was no statistically significant difference between Tcell values of painful and non-painful dogs (p>0.05). Although the mean values of Th17, Treg and
Paediatric neurological disorders in dogs and cats: A retrospective multicentric study of 888 cases (2003-2019)

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Neurological disorders in young animals pose different considerations as to etiology and therapeutic decisions compared with adults. The age of patients can be useful determining the list of differential diagnoses, however, epidemiological studies in young-age dogs and cats with neurological diseases are lacking. Dogs and cats younger than 12 months of age presented to three referral hospitals were included in this retrospective study. Eight hundred and eighty-eight patients met the inclusion criteria. Patients younger than 12 months represented 6.5% of all neurological consultations. Cats were significantly younger than dogs (median of 5.1 months vs. 6.7 months; p<0.001). Forebrain and intracranial diffuse was the most common neuroanatomical localization in both species. Lower motor neuron signs were more common in cats (p<0.001). No diagnosis was achieved in 22% dogs and 27% of cats. Different reasons for the lack of diagnosis were recorded. Among dogs with definitive diagnosis, the most common were congenital anomaly (19%), inflammatory/non-infectious (17%) and trauma (10%). French bulldogs, Chihuahuas, and Pugs were significantly overrepresented for congenital anomalies; Boxers were predisposed to inflammatory/non-infectious diseases, and Yorkshire terriers, crossbreeds and Chihuahuas were predominant in the trauma group. In cats, the most common diagnoses were trauma (26%), inflammatory-infectious (15%) and congenital anomaly (11%). As generally accepted, congenital, inflammatory and traumatic diseases were overrepresented in the juvenile population of both species. Inability to reach a diagnosis was common, and the causes were multifactorial. Epidemiological data presented here assists with determination of the list of differential diagnoses for young dogs and cats with neurologic signs.

Diffusion tensor imaging in syringomyelia secondary to Chiari malformation in Cavalier King Charles Spaniel. Preliminary study

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The aim of this study was to find a correlation between clinical assessment and diffusion tensor imaging (DTI) values in the course of Syringomyelia. Sixteen Cavalier King Charles Spaniel dogs, (eight in the symptomatic and eight in the asymptomatic group), 6-70 months of age (mean 36), 3.5-9.5 kg (mean 7.2), were qualified for the research. All animals underwent the same study protocol that included a clinical and neurological examination followed by MRI examination. DTI was performed with a 1.5 Tesla magnetic resonance scanner (Philips, Ingenia). Two DTI parameters: fractional anisotropy (FA) and apparent diffusion coefficient (ADC) were measured. Measurement of FA and ADC values was made by drawing regions of interest (ROIs) at the level of three intervertebral spaces (C1-C4) in both symptomatic and asymptomatic group. Image post-processing was done using the Fiber Trak package (Philips Ingenia workstation). Statistical analysis showed no significant differences in FA and ADC values between the symptomatic and asymptomatic groups. However, decreased FA values were observed in ROI-2 and ROI-3 in the symptomatic group compared to the asymptomatic group. Compared to the asymptomatic group, in the symptomatic group in ROI-1 the same ADC values were observed, while in ROI-2 and ROI-3 an increase in ADC values was noted. Findings suggest that DTI could be a helpful technique in the study of syringomyelia in Cavalier King Charles Spaniel, in contest of anticipation of eventual development of clinical symptoms in young dogs. DTI values measurements may provide more objective spinal cord microstructure and indirectly also status assessment.

Foramen magnum decompression and modified cranioplasty using titanium mesh plate in small dogs with caudal occipital malformation syndrome and syringomyelia

[O20]

Th17/Treg ratio of the non-ambulatory painful IVDH patients increased compared to ambulatory ones, this increase was found statistically insignificant. Rising Th17 cell numbers were accompanied with increased values of Treg cells. The results of this study show that alteration of T cell subsets might be related with the severity of the inflammation rather than pain in the acute phase of IVDH.

[O21]

Diffusion tensor imaging in syringomyelia secondary to Chiari malformation in Cavalier King Charles Spaniel. Preliminary study

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[O22]

Foramen magnum decompression and modified cranioplasty using titanium mesh plate in small dogs with caudal occipital malformation syndrome and syringomyelia
Evaluating the benefit of contrast magnetic resonance (MR) images in detecting spinal cord pathology: A retrospective study

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Gadolinium based intravenous (IV) contrast medium is commonly used in MRI to better characterize underlying pathology. Although possible to detect a previously unidentified lesion, evidence suggests this is unlikely following brain studies. The objective of this study was to assess whether the administration of contrast media following normal pre-contrast MR sequences is beneficial for detecting a previously unidentified lesion in the vertebral canal. The MRI database (June 2010 - April 2021) of a large referral hospital was searched for patients with spinal cord imaging where post-contrast MR sequences were acquired. Case details including signalment and neurological examination findings were recorded. Each individual imaging report was assessed to determine if a lesion was visible prior to contrast administration, and those cases were excluded. Cases where no lesion was visible on pre-contrast T1 and T2W sagittal and transverse images were then checked for evidence of a lesion visible on post-contrast T1W images. 375 animals were identified, where 354 were reported normal on pre-contrast images, of which 19 were also reported as normal on post-contrast sequences. Mild contrast enhancement was seen in 2 cases: 1 was considered artefactual, and 1 altered interpretation. It appears unlikely that contrast medium will detect a lesion in the vertebral canal when pre-contrast images are normal. However, more cases are required with normal pre-contrast images, and imaging reports may not be reliable as a method of assessing this data.

Juvenile-onset motor polyneuropathy in 15 cats

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Juvenile-onset motor polyneuropathy in cats is infrequently described in the literature and seemed breed-related (Bengal, Siberian, and Snowshoe cats). This retrospective case series included cats presented with (1) age of presentation < 2 years; (2) acute onset of clinical weakness consistent with polyneuropathy; (3) no evident cause such as diabetes mellitus; (4) electrodiagnostic examination consistent with motor polyneuropathy. Medical records, electrodiagnostic findings, muscle and nerve biopsies were reviewed. Owners were contacted by phone at the time of the study. Fifteen cats (5 females and 10 males) were included. Nine cats were purebred (Abyssinian, Bengal, Birman, British Shorthair, Devon Rex, Persian, Ragdoll, Siamese). The median age at the presentation was 7 months old. All cats presented reluctance to jump and to stand, and a plantigrade stance. Electromyography showed spontaneous abnormal activity with positive sharp waves and fibrillation potentials in all cats (100% in pelvic limbs, 93% in thoracic limbs). Nerve conduction study was consistent with generalized motor axonal and demyelinating polyneuropathy. Muscle histology was consistent with denervation in all samples. Common peroneal nerve histology was abnormal in 6/8 cats. The median follow up was 7 months. All cats achieved clinical remission. Five cats received corticosteroids: four after the diagnosis and one due to sluggish recovery. Only one cat relapsed after every corticosteroid’s discontinuation. The median remission latency after electrodiagnostic examination in other cats was 4 weeks. This study described a case series of juvenile-
onset motor polyneuropathy of unknown origin. Our results indicate that young cats of every breed could be affected.

Mechanical nociceptive thresholds and assessment of descending inhibitory controls in healthy cats and those with diabetes mellitus

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This study aimed to evaluate mechanical nociceptive thresholds (MNT) between cats with diabetes mellitus (DMcats) and healthy controls, and to assess the diffuse noxious inhibitory controls (DNIC) of both groups. Eight cats with diabetes mellitus and twelve healthy controls were included in a prospective, randomized, blinded study after owner’s written consent. MNT (N) were measured using a sharp-tipped 4-cm polypropylene probe to apply increasing pressure bilaterally against the metatarsal pad until paw withdrawal, or when a cut-off was reached (10 N) (Bioseb; MNTbio). MNT were also measured through inflation of a modified blood pressure bladder to the cat’s pelvic limb (Topcat Metrology; MNTtop). Stimuli were performed in a randomized order by an observer unaware of the cat’s condition. The DNIC was assessed by comparing MNTtop before and after the application of a conditioning stimulus (inflated blood pressure cuff around the humerus 200 mmHg for 1 minute). A t-test, Spearman’s and Pearson’s tests were used (p < 0.05). MNTbio of controls were significantly lower (2.1 ± 0.7N) than those of DMcats (3.6 ± 1.2N). MNTbio were significantly higher in male (3.3 ± 1.3N) than in female cats (2.1 ± 0.4N). DNIC and MNTtop were not different between groups. There was a positive correlation (rho = 0.52) between body weight and left tarsus MNTbio. These results suggest the presence of hypoalgesia in the lower extremities of DMcats and potential loss of sensory function as demonstrated in humans with pain-related diabetic neuropathy. The methodology could not assess the DNIC in healthy and DMcats.

An episodic movement disorder in juvenile Weimaraners

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The aim of this retrospective case series was to document an episodic movement disorder in juvenile Weimaraners. Six Weimaraner dogs were presented for episodes of abnormal gait characterised by increased muscle tone, ataxia and hypermetria, leading to occasional collapse. Abnormal movements consisted of high frequency chorea, predominantly affecting the pelvic limbs, almost becoming ballistic at times. Kyphosis and low head carriage were also consistent features. Age of onset was 3 to 7 months. Excitement or exercise were reported to trigger the abnormal episodes, which could occur multiple times daily with a duration of 5 to 15 minutes. Two dogs displayed intermittent anisocoria associated with the episodes. Based on the episode phenomenology, a paroxysmal dyskinesia was considered most likely. Resting neurological examination was unremarkable, although the reported abnormalities were elicited by short periods of exercise or excitement in 3/6 dogs. Results of diagnostics including haematology, biochemistry, magnetic resonance imaging, cerebrospinal fluid analysis and electrophysiology were unremarkable. Organic acid testing in one dog revealed evidence of lower production or decreased metabolism of the neurotransmitters serotonin, norepinephrine, epinephrine and dopamine. Treatment with fluoxetine in 3/6 dogs and acetazolamide in 1/6 dogs resulted in a dramatic reduction in episode frequency in all cases. This episodic movement disorder in Weimaraners appears to share some features of episodic ataxias (EAs) in humans. However, the lack of inter-ictal abnormalities such as myokymia or nystagmus make this less likely. A paroxysmal kinesogenic dyskinesia like that reported in the German shorthaired pointer seems a more appropriate classification.

73 orthostatic tremor in dogs: 60 cases (2003-2020)

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Orthostatic tremor (OT) is a movement disorder characterized by high frequency (13-18 Hz) involuntary, rhythmic, sinusoidal movements affecting predominantly the limbs when standing, which are relieved when sitting, lying or walking. OT can be primary (POT) when a sole sign or OT-Plus when concomitant with another neurological disease. Multicenter retrospective case-series study aiming to expand current knowledge on canine OT. Inclusion criteria was conscious electromyography of a >12 Hz frequency. Fifty-three cases were diagnosed with POT. Giant breeds represented the majority of cases (44/53); the rest were large (8/53) and medium (1/53). Breeds affected were Great Dane (21/53), Newfoundland (9/53), Retriever (7/53); 4 Labrador, 2 Labrador-cross, 1 Golden Retriever), Irish Wolfhound (6/53), Mastiff (6/53) and other (4/53). All dogs were younger than 2-year-old at onset of signs, except for Retrievers. The major presenting complaint was shaky limbs when standing (45/53). Tremor generalisation was noticed in 62.3% of dogs. Tremors usually affected all limbs (75%), while pelvic limb form or head/trunk involvement were less common. Tremors improved, mainly partially, in 84.9% of dogs treated with phenobarbital, primidone, gabapentin, pregabalin or clonazepam. In vascular encephalopathy and subclinical neuropathy cases, OT was considered secondary. POT is a progressive disease of young, purebred, giant/large-breed dogs which responds partially to medications. Retrievers manifest a less-pharmacoresponsive older-dog POT, whilst one manifested OT-Plus associated with subclinical neuropathy.

The effects of exercise restriction on dogs and their owners: A pilot study

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The mental and physical health benefits of regular exercise are well documented for humans and dogs. Lack of exercise is a risk factor for canine obesity, poor physical health and undesirable behaviour. Exercise restriction is often recommended for conservative and post-operative management of orthopaedic and neurological conditions in veterinary patients, yet the impact of exercise restriction on dogs and their owners is poorly documented. Two questionnaire-based studies employing closed and open questions were carried out first targeting clients of the Small Animal Teaching Hospital (SATH) whose pets were required to undergo a period of exercise restriction ≥ 4 weeks and a second surveyed veterinary surgeons in neurology and orthopaedic services. We found that 40% of owners with dogs on restricted exercise found this difficult and a range of effects on the dogs and their
owners were reported. The majority of veterinary surgeons who regularly recommend rest also felt 50-75% of dogs and owners struggle with exercise restriction and it has a large effect on their quality of life. We also carried out a wider internet survey of dog owners and they reported a significant reduction in dog quality of life and effects on mental well-being of both dogs and their owners during exercise restriction. In conclusion, there are mental/behavioural and physical consequences for many dogs and their owners from a period of exercise restriction. Further research will aim to identify which dogs/owners are at risk and how to prevent the negative effects of exercise restriction without affecting recovery.

[FP05]

Vertebral and endplate changes in dogs with suspected fibrocartilagenous embolic myelopathy

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Fibro cartilagenous embolic myelopathy (FCEM) is a frequently diagnosed disease in dogs characterised by ischemic infarction of the spinal cord due to fibrocartilaginous material embolization. Endplate signal intensity changes such as Schmorl’s nodes and vertebral body marrow adjacent to the endplates changes (Modic changes) have been described both in human and dogs. An observational cohort multicentre retrospective study was conducted to describe and characterise vertebral and end plate changes and its prevalence in dogs presented with MRI features of FCEM and compare those changes with a control group of dogs presented with presumptive acute non-compressive nucleus pulposus extrusion (ANNPE). Additionally, vertebral and end plate changes were compared between high field and low field MRI studies. Vertebrae closely related to the spinal cord lesion was analysed using MRI. One vertebra cranial and one caudal to the affected region was also analysed. The disc space closest to the suspected FCEM/ANNPE was recorded, stating if the endplate (cranial or caudal) was normal or abnormal. If abnormal, focal (including Schmorl’s nodes) or diffuse irregularities was recorded. Modic changes if present will be categorized according to described current literature. A total of 77 dogs with suspected FCEM and 46 dogs with suspected ANNPE were reviewed. All dogs from the ANNPE groups failed to show any vertebral or endplate changes. 4/78 dogs showed Modic changes in the FCEM group. In conclusion, the results of this study suggest that dogs with suspected ANNPE do not appear to show vertebral or endplate changes on MRI. Dogs with suspected FCEM rarely show changes on MRI.

[FP06]

Usefulness of follow up MRI in dogs with discospondylitis: A retrospective evaluation

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The usefulness of follow-up Magnetic Resonance Imaging (MRI-2) to assist clinical decision making in dogs treated for discospondylitis is unknown. This cross-sectional retrospective study investigated the features of MRI in dogs treated for discospondylitis, and if MRI-2 can predict the presence or absence of clinical signs. Dogs were included if they met the criteria for diagnosis of discospondylitis and if they underwent MRI-2 a minimum of 28 days following initial MRI (MRI-1). After comparing MRI-1 and MRI-2 images, an observer, blinded to the dog’s clinical signs, subjectively classified the discospondylitis as active or inactive in two separate occasions. A second observer categorized dogs as symptomatic or asymptomatic, based on the presence or absence of clinical signs at the time of MRI-2. Data were analysed using Fisher’s Exact or McNemar tests; logistic regression was performed. A total of 25 dogs were included: 16 dogs were asymptomatic and 9 were symptomatic. Based on MRI-2, 20/25 (80%) and 18/25 (72%) dogs were considered to have active discospondylitis on the first and second assessment, respectively (p = 0.62). No MRI-2 features were predictive of the dogs’ clinical status. The sensitivity and specificity of active and inactive discospondylitis to predict symptomatic or asymptomatic dogs were 40% (21.88 – 61.34) and 80% (37.55 – 98.97), after first assessment, and 38.9% (20.31 – 61.38) and 71.4% (35.89 – 94.92) on second assessment. The clinical status of dogs treated for discospondylitis cannot be predicted by MRI-2, with no evidence to recommend routine use to guide clinical decision making, particularly in asymptomatic patients.

[FP07]

A new form of hereditary ataxia in Australian shepherd. Phenotypic and genetic characterization

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Head turn: a study of neurolocalisation

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Head turn and pleurothotonus have been two interchangeable terms that are frequently used to describe postural abnormalities as part of a neurological examination in veterinary patients. The presence of these abnormal signs has traditionally been attributable to lesions affecting the prosencephalon. The aims of this study were to identify whether lesions in other locations of the central nervous system (CNS) can cause a similar presentation. Dogs were prospectively included if they had photographic or video evidence of head turn. All cases were required to have signalment, neurological examination and advanced imaging. Animals were excluded if the imaging findings represented multifocal pathology. Forty-four dogs met the inclusion criteria. Imaging localisation was made to forebrain [23/44], brainstem [8/44], cerebellum [5/44] and cervical spinal cord (C1-C5) [7/44]. Within the forebrain cases, 10/23 were localised to diencephalon, 8/23 to cerebral cortex and 5/23 a combination of the two areas. Localisation on neurological examination was correct in 21/23 forebrain cases, 6/8 brainstem cases, 6/7 cervical cases and 5/5 cerebellar cases. An ipsiversive head turn was identified in 22/23 forebrain cases, 7/8 of the brainstem cases, 5/5 of cerebellum cases. An averse head turn was identified in 6/7 cervical cases. Concurrent pleurothotonous was identified in 7/7 cervical cases, 4/8 brainstem cases, 10/23 forebrain cases and 0/5 cerebellum cases. In this study, we have identified further anatomical sites that could elicit a head turn. Therefore the presence of a head turn, alongside the rest of the neurological examination, should not preclude other neurolocalisations other than forebrain.

[FP08]
Phenobarbital (PB) is the most common antiseizure drug (ASD) used for the management of feline epilepsy. In dogs, PB is known to cause serum liver enzyme induction and hepatotoxicity especially after long-term administration or high serum PB concentrations. In cats, insufficient evidence is available to draw similar conclusions. The aim of this study was to evaluate the effect of PB administration on the serum biochemistry profile in cats with epilepsy. Medical records of four veterinary center were retrospectively reviewed for cats with epilepsy receiving PB treatment. Serum alkaline phosphatase, alanine transferase (ALT), aspartate transaminase and gammaglutamyl transferase activities and total bilirubin, bile acids, glucose, albumin, total protein, urea and creatinine concentrations before and during PB administration were recorded. Serum PB concentration was also recorded, when available. Thirty-three cats with a median age of 3 years met the inclusion criteria. Idiopathic or structural epilepsy was diagnosed in 25 (76%) and 8 (24%) cats, respectively. The follow-up period ranged from 1 to 62 months. No statistically significant increase in serum liver enzymes and other evaluated biochemistry parameters was found comparing parameters at baseline to parameters during PB treatment. PB administration did only result in serum hepatic enzyme induction in a minority of cats and no increase was found for the other biochemical abnormalities in cats. This strengthens the safety profile of PB as an ASD in cats.

Feline temporal lobe epilepsy: Seven cases of hippocampal and piriform lobe necrosis in England and literature review

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Feline hippocampal and piriform lobe necrosis is an uncommon acute epileptic condition resembling human autoimmune limbic encephalitis and temporal lobe epilepsy. Seizures are typically focal and feature unior bilateral orofacial or head twitching, hypersalivation, lip smacking, mydriasis, vocalisation and motionless staring, with inter-ictal behavioural changes such as unprovoked aggression and rapid running. Emerging evidence supports an autoimmune aetiology, although disruption of hippocampal architecture secondary to brain neoplasia has also been recognised. Most commonly, however, the underlying cause remains unknown. Diagnosis is achieved clinically and with brain MRI; electroencephalography and voltage-gated potassium channel-complex autoantibodies are currently subject of research. Affected cats are frequently refractory to conventional antiepileptic treatment. Seven cases of feline
Concentration of C reactive protein in serum and cerebrospinal fluid in dogs with meningoencephalitis of unknown origin or steroid responsive meningitis arteritis

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Meningoencephalitis of unknown origin (MUO) and steroid responsive meningitis arteritis (SRMA) are the two most frequent noninfectious inflammatory disorders affecting canine central nervous system. C reactive protein (CRP) is frequently measured in dogs’ serum with SRMA to support the diagnosis and monitor the treatment response. To our current knowledge, CRP concentration has never specifically been studied in MUO cases. A prospective observational study, still in progress, is designed to evaluate CRP concentrations in serum and cerebrospinal fluid (CSF) of dogs suspected suffering from MUO (n=18) or SRMA (n=12). The dosages are performed at time of diagnosis and during the follow-up when possible. Preliminary results show normal measurements of CRP in both serum and performed at time of diagnosis and during the follow-up when possible. Fibrillary astrocytoma and lymphoma were diagnosed post mortem in two cats. Considering the existing literature, our cases and the fact that different aetiologies have been associated with similar presentations, the hippocampus and piriform lobe are proposed as neuroanatomical localisation for focal seizures with orofacial involvement in cats, regardless of aetiology. Following review of the literature and comparisons with human medicine, potential complicating factors such as pyrexia and peri-ictal urinary dysfunction are also discussed. This work involved the use of non-experimental animals only and established internationally recognised high standards of individual veterinary clinical patient care were followed, therefore ethical approval was not required.

Application of machine learning to guide the clinical reasoning in dogs presenting with seizures and a normal inter-ictal neurological examination

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Background Brain MRI is currently recommended for inter-ictally normal epileptic dogs if they are less than 6 months or older than 6 years of age. This range is based on small datasets and does not take into account other factors such as breed that may improve its accuracy. Objectives: To assess the ability of machine learning tools (decision trees and random forests) to improve these recommendations. Animals: 326 dogs presenting with generalised seizures and a normal inter-ictal neurological examination. Methods: Retrospective study using machine learning algorithms to formulate a decision tree and random forest for the clinical reasoning of dogs presenting with seizures. Results: Dogs presenting with an age of first seizure of 8 years...
should be considered as the main determinant for performing an MRI scan in dogs presenting for seizures with a normal inter-ictal neurological examination.

[FP16]

Use of 3D-printing technology to create a simulator for cerebrospinal fluid sampling at the lumbar subarachnoid space

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Cerebrospinal fluid (CSF) sampling at the lumbar subarachnoid space (LSS) is technically challenging to learn. Currently, training relies on cadaver availability or performance within a clinical scenario. This study aims to develop an affordable, realistic simulator to train in this technique. Using 3D-printing technology, we produced an anatomically precise model of the lumbosacral vertebral column of a healthy, adult dog. The model was augmented with synthetic materials and a fluidic system to permit successful collection of CSF. The simulator was validated by experts, who rated it highly across multiple criteria. Final year students were recruited to take part in practical sessions using either the simulator (N=16) or a cadaver (N=16). Performance was recorded for each participant and feedback was obtained using an anonymous online survey. Student performance was similar between groups (p=0.39), with 87.5% and 68.75% of students in the simulator and cadaver group, respectively, successfully placing the needle into the LSS. All successful students in the simulator group were able to obtain a CSF sample, compared to none in the cadaver group. No difference in the number of attempts was detected between groups (p=0.7), with the majority of students taking more than 3 attempts. User experience was similar between groups, with 93.8% of students in each group rating the session as a positive learning experience. In summary, we demonstrate the validity of a novel, low-cost and reproducible simulator, which can be used for teaching CSF sampling at the LSS.

[FP17]

Utility of a flexed neck sagittal MRI sequence prior to CSF sampling from the cerebellomedullary cistern in dogs

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Cerebrospinal fluid (CSF) collection from the cerebellomedullary cistern (CM) of dogs with congenital or acquired cerebellar herniation could lead to serious complications. It is anecdotally more challenging in large brachycephalic breeds possibly due to the increased distance between the skin and CM. The first objective of this study was to assess whether flexed-neck sagittal MRI sequences would assist in the decision-making process of collecting CSF from the CM. The second objective was to examine the dimensions of the CM measured in neutral and flexed views, and whether cranial index (CI), skull height and body weight correlated with the distance of the CM from the skin surface. Forty-one dogs of various breeds were included in the study. Mild cerebellar herniation was detected in 23/41 (56%) of the flexed-neck views versus none in the neutral views. The CM area was significantly larger in flexed-neck views than in neutral views (p=0.027), with a strong correlation between the skin and CM. The first objective of this study was to examine the dimensions of the CM measured in neutral and flexed views, and whether cranial index (CI), skull height and body weight correlated with the distance of the CM from the skin surface. Forty-one dogs of various breeds were included in the study. Mild cerebellar herniation was detected in 23/41 (56%) of the flexed-neck views versus none in the neutral views. The CM area was significantly larger in flexed-neck views than in neutral views (p=0.027), with a strong correlation between the skin and CM.

[FP18]

Noninvasive monitoring of intracranial pressure waves using BCMM 2000 Brain4care monitor in dogs with myelopathies undergoing myelography

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Monitoring of intracranial pressure (ICP) is essential in the evaluation and treatment of neurologic diseases; however, this procedure is rarely performed because of the complications and limitations of the available techniques. A noninvasive ICP monitoring device (ICP-Ni) has been used in humans to analyze cerebral complacency, with good results. The device detects cranium deformations via a strain gauge sensor, registering ICP waves. These waves have three peaks and the P2/P1 ratio is related with cerebral complacency. The objective of this study was to determine whether the BCMM-2000 Brain4care monitor detects changes in ICP dynamics caused by contrast injection into the subarachnoid space in dogs undergoing myelography. This study was approved by the Ethics Committee for the Use of Animals (n. 10052.2018.88). The ICP-Ni was monitored in 6 dogs with myelopathies before (M1), during (M2), and after (M3) contrast (iohexol) injection into the subarachnoid space. Cerebrospinal fluid was collected for analysis prior to contrast injection. Subarachnoid pressure (PS) was simultaneously monitored in 3/6 dogs. Correlation between both methods was performed using Pearson’s coefficient. The P2/P1 was greater at M2 for both monitoring methods (p<0.05). At M3, values were similar to M1, due to return of brain complacency. There was a strong correlation (r = 0.73, p = 0.027) between both ICP monitoring methods. Speed of contrast administration, degree of spinal cord compression, and volume of CSF previously collected may affect P2/P1 ratio. The BCMM-2000 Brain4care monitor was effective in detecting changes in ICP dynamics in dogs undergoing myelography.
ABSTRACT

Do HASTE MRI sequence findings correlate with clinical signs in dogs with thoracolumbar disc extrusions?

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Thoracolumbar intervertebral disc extrusions are a common reason for veterinary hospital admission. Whilst multiple factors, including degree and length of compression and rate of onset of clinical signs, have been tested for correlation with clinical severity, no factor has been reliably shown to correlate with severity. Half-Fourier Acquisition Single-Shot Turbo Spin Echo (HASTE) MRI sequences highlight the dorsal and ventral CSF columns and have been used to highlight spinal cord swelling in dogs with thoracolumbar disc extrusions. This swelling has been used as a predictor of progressive ascending-descending myelomalacia but has not been correlated with neurological grade. Dogs less than 15kg who were non-ambulatory due to suspected thoracolumbar intervertebral disc extrusions were prospectively recruited for a study into conservative management. MRI studies were undertaken under sedation including HASTE sequences. The length of CSF disruption was then divided by the length of the L2 vertebra and compared to clinical severity. No statistically significant difference was demonstrated between the mean CSF disruption and neurological grade (p=0.1694) but there was a significant difference in the mean CSF disruption in those who retained deep pain perception and those who did not (p=0.02054). Time to loss of ambulation was also found to not be correlated with CSF disruption (p=0.9519). In conclusion, the length of CSF disruption of HASTE MRI sequences in dogs less than 15kg suffering from intervertebral disc extrusions may be correlated with a loss of deep pain perception.

[FP20]

Long term outcome in dogs with complete sensory and motor loss following thoracolumbar intervertebral disc herniation

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Current veterinary research on spinal cord injury secondary to thoracolumbar intervertebral disc herniation (TL-IVDH) in dogs, mainly focuses on factors influencing functional recovery, but the fate of dogs left with persistent sensory and motor loss remains uncertain and little information exists on the impact of such disability on Owners. Outcome evaluation of a questionnaire-based survey focused on survival of 39 dogs suffering complete sensory and motor loss after TL-IVDH and factors impacting both dogs and Owners’ life is provided. Preliminary results indicate that despite not regaining motor or sensory function, 78% of dogs were still alive one year after discharge. The remaining were euthanized, due to a perceived decreased quality of life (QOL) and not to associated morbidities. Morbidities were mainly related to feet injury, cleanliness (>50%) and urinary tract infections (44.4%). Conversely, bladder management and wheels were well tolerated in most patients. Whilst overall QOL of paralyzed and incontinent pets is perceived as very good, Owner’s QOL is profoundly impacted, due to sacrifice of personal time and house cleanliness. For 44.5% of Owners the worry of their pet suffering remains a stressful factor. 61% of respondents had to adapt their home to pet’s needs. Whilst 88.8% of owners found discharge information very useful, 50% additionally turned to web resources and social media. Although uncommonly, disability remains a reason for euthanasia. Accurate and up to date information on nursing care and logistical aspects should be prioritized at discharge to ensure a more manageable life with a disabled pet.

[FP21]

Safety of early postoperative hydrotherapy in dogs undergoing thoracolumbar hemilaminectomy

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Hydrotherapy is increasingly incorporated in the postoperative care of dogs with thoracolumbar intervertebral disc extrusion (IVDE). Although there are no evidence-based guidelines on when to start hydrotherapy, early initiation could theoretically be associated with an increased risk of postoperative complications. Eighty-three dogs commencing hydrotherapy within five days after surgical treatment for thoracolumbar IVDE were retrospectively included. All postoperative complications were recorded during a follow-up period of minimum 30 days. A complication was deemed major if there was a need for hospitalisation, surgery or if the dog died as a direct consequence of the complication. A complication was deemed minor if outpatient medical treatment was sufficient. No ethical approval was necessary for this study. Hydrotherapy, including swimming and/or underwater treadmill, was started with a mean of 2.7 (1-5) days after surgery. Ten minor and 16 major complications were recorded in 26 dogs. These complications included euthanasia (n=13), due to insufficient neurological improvement (n=8), surgical wound infection (n=5), diarrhea (n=4), surgical site infection (n=1), further extrusion of the originally operated intervertebral disc (n=1), urinary tract infection (n=1) and dermatitis (n=1). Twenty-four of the recorded complications were considered unlikely to be directly caused by the initiation time of hydrotherapy. The remaining two complications, including surgical site infection and further extrusion of calcified nucleus pulposus, may
have been related to early initiation of hydrotherapy. Starting hydrotherapy within five days after thoracolumbar hemilaminectomy may be associated with an increased risk for complications. The safety and benefits of postoperative early hydrotherapy need to be further investigated.

[FP23]

Long-term follow-up of the spinal segmental stabilisation technique for the surgical treatment of dorsal hemivertebrae associated with kyphosis

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Optimal treatment for myelopathy associated with thoracic congenital vertebral malformation (CVM) in brachycephalic breeds has not yet been established. Published surgical techniques include spinal segmental stabilisation (SSS) surgery. The aim of this study was to report chronic complications (>2 months post-operatively) following SSS in a group of dogs. Follow-up medical records (2006-2020) of 12 cases that underwent SSS at three university hospitals were retrieved and analysed with a minimum follow-up period of 1 year. The data collected included signalment, duration of clinical signs and neurological examination pre-operatively, imaging results, neurological status immediately post-operatively and at follow-up periods of >12 months including complications. All dogs showed initial neurological improvement which was sustained in most cases and 7 of these showed chronic complications. Four out of these seven were managed without further surgical intervention although two of these dogs were severely impaired. Most chronic complications were similar in nature with overlapping features, and they were all associated with implants. This case series demonstrated that the rate of chronic complications associated with SSS was high (58%) but the majority of these did not require revision surgery. Those requiring revision surgery did not deteriorate postoperatively suggesting that long-term improvement does not require the permanent presence of implants. The findings of this study support the continued use of SSS in selected cases of CVM where neurological deficits are relatively mild and there is owner awareness of potential chronic complications.

[FP23]

Evaluation of the effect of extradural administration of morphine for postoperative analgesia following ventral slot surgery in dogs with cervical disk herniation

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Intervertebral disk herniation (IVDH) is a common neurological disorder in dogs. Intraoperative extradural morphine administration reduces postoperative analgesic requirement in dogs following surgery for thoracolumbar IVDH. The aim of this study was to investigate if intraoperative extradural morphine administration could reduce postoperative analgesic requirement (rescue analgesia) in dogs with surgically treated cervical IVDH. Thirty dogs with cervical IVDH were prospectively enrolled. Dogs were randomly selected to receive either intraoperative extradural morphine administration (14 dogs treated with 0.03 mg/kg instilled in an absorbable gelatin sponge placed on the surgical site) or no treatment (16 dogs received saline). Clinical, neurologic, pre- and postoperative magnetic resonance imaging findings, intraoperative variables were collected. An observer, blinded to the intraoperative treatment, evaluated pain, before and within 24 hours after surgery using the Glasgow composite pain scale-short form (CMPS-SF). Rescue analgesia was administered if postoperative CMPS-SF score was >4. Demographic data were similar between groups. No significant association was identified between intraoperative morphine administration and the need for rescue analgesia (p > 0.05). No adverse effects were recorded. Preoperative glucocorticoid administration (p < 0.001) and preoperative high CMPS-SF scores (p = 0.04) were associated with increased chance of requiring rescue analgesia. Preoperative CMPS-SF score >5 could potentially be used as indicator of greater degree of pain in the postoperative period, with acceptable accuracy (72%), sensitivity 84% and specificity 64%. In conclusion, cervical, extradural 0.03 mg/kg morphine administration is a safe treatment although it does not reduce postoperative pain in dogs with cervical IVDH.

[FP25]

The nociceptive withdrawal reflex for the evaluation of analgesia in pigs undergoing extracorporeal membrane oxygenation: A pilot study

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Tongue atrophy as a neurological sign in hereditary polyneuropathy in Alaskan malamutes

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Alaskan malamute polyneuropathy (AMP) is an inherited degenerative neuropathy caused by a mutation in the N-myc downstream-regulated gene 1 (NDRG1). A human polyneuropathy caused by mutations in the same gene is classified as Charcot-Marie-Tooth type 4D (CMT4D). In a subset of CMT4D-affected humans, macroscopic tongue atrophy was briefly reported besides more classical signs of polyneuropathy. Clinical signs in affected dogs are characterized by exercise intolerance, inspiratory stridor, paresis, ataxia and muscle atrophy. Data on tongue appearance, electromyography (EMG) and histopathology of the tongue and hypoglossal muscles and nerves, including thinly myelinated nerve fibres, small onion bulbs, myelin folds and angular atrophic myofibres. NDRG1-associated polyneuropathy may involve degeneration of the hypoglossal nerves with secondary neurogenic tongue atrophy. To date, there are no reports in dogs with inherited peripheral polyneuropathies describing similar macroscopic and histopathologic changes in the tongue. Tongue atrophy should be considered as a potential additional clinical sign in dogs with peripheral polyneuropathies.

Cystic structures adjacent to lateral ventricles are abundantly reported in human medicine, especially in fetuses and neonates. Several entities are described with partly overlapping terminology such as connatal cysts, coarctation of lateral ventricles, periventricular (pseudo)cysts and subependymal pseudocysts (SPCs). A 10-months-old male Pomeranian was presented with cervical hyperesthesia and tetraparesis after a trauma. MRI and CT studies revealed atlantoaxial instability, atlanto-occipital overlapping, supraoccipital bone dysplasia and ventriculomegaly. Additionally, two paraventricular cyst-like structures were observed in the rostral area of the lateral ventricles, without visible connection to the ventricular lumen. Signal characteristics were identical to CSF. In literature, differential etiological diagnoses for intracranial cystic lesions are described: normal variants, developmental cystic lesions, cysts due to perinatal injury, vascular cyst-like structures, hemorrhagic cysts and infectious cysts. The localization of bilaterally symmetrical cyst-like structures ventrolateral to the rostral aspect of the lateral ventricles in this case best fit the description of SPCs in humans. In humans, two types of SPCs are recognized: acquired (post-hemorrhagic) and congenital (germinolytic). Congenital SPCs may have a vascular, infectious, genetic, metabolic or toxic background. They may be an isolated finding in normal...
neonates, but have also been linked to other neuropathology. The authors only found mention of SPCs in veterinary literature in an article about bovine viral diarrhea virus infected calves. In this case, congenital SPCs were tentatively diagnosed based on MRI findings and not deemed clinically significant. Histopathological confirmation of the existence of this entity in dogs remains to be documented, as well as its possible relevance.

**[P02]**

**Suspected trochlear nerve neoplasia in a dog**

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Neoplasia of the trochlear nerve (TNN) is reported infrequently in human medicine. The diagnosis is based on neuroimaging and clinical signs, predominantly diplopia. We report a case of suspected TNN in a dog. A 13-year-old male Kooikerhondje was presented with acute vestibular signs including a left-sided head tilt, horizontal nystagmus and vestibular ataxia. Hematological and biochemical tests were unremarkable. MRI revealed a T2 hyper-/isointense and contrast-enhancing mass lesion coursing rostrally on the right side from dorsal to the trigeminal nerve roots near the caudal colliculus, adjacent to the mesencephalon, to the cavernous sinus corresponding to the path of the TN. CSF analysis revealed a protein concentration of 31 mg/dL. Outward rotation of the eyeball was inferred based on the fundoscopy finding of lateral deviation of the superior retinal vein. The dog was presumptively diagnosed with idiopathic vestibular disease (left) and a right-sided TNN. Follow-up revealed expected amelioration of vestibular signs. Upon further questioning during the next 6 months of followup, the owners reported that the dog does not catch a thrown kibble as he used to (possible sign of diplopia). TNN (schwannoma) is considered very rare in humans, with less than 40 reported cases since 1976. They are most frequently localized in the ambient cistern (adjacent to the mesencephalon). Human patients with an isolated trochlear nerve mass and deficit have a good prognosis. Serial MRI scans are recommended without specific antitumoral therapy unless they develop signs of brain stem compression. There are no reports of confirmed TNN in dogs.

**[P03]**

Long-term follow-up of a spinal nephroblastoma in a dog treated with surgical removal and adjunctive radiation therapy

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Spinal cord nephroblastoma is a neoplasia in dogs, occurring usually between the 10th thoracic and 3rd lumbar spinal cord segments, presenting as an intradural-extramedullary solitary mass. The mass is believed to originate from ectopic metanephric blastemal remnants, trapped between the dura mater and the spinal cord during embryogenesis, which undergo neoplastic transformation. This neoplasm usually affects dogs between 5 months and 4 years of age. The purpose of the present report is to describe successful long-term treatment with surgery and radiation therapy of a spinal nephroblastoma in a 10-month-old American Staffordshire Terrier. The dog was presented with a progressive, non-painful, thoracolumbar (T3-L3) myelopathy. CT showed an intradural-extramedullary, hyperattenuating mass lesion at the level of T12 with associated compression of the spinal cord. On MRI the mass was iso- to hyperintense on T1- and T2-weighted images and was hyperintense on STIR images. The mass had moderate contrast enhancement. Based on clinical and medical imaging findings a nephroblastoma was suspected. Marginal surgical removal of the mass was performed and after histopathological confirmation of the diagnosis, (external beam) radiation therapy was started. The patient received a total of 5000cGy over 20 fractions of 250cGy each. Thirty-two months post-therapy the neurological examination of the dog is still unremarkable. In most documented cases conservative or surgical management are given, however, prognosis is poor. To our knowledge only one case has been reported of a dog receiving surgical and radiation therapy without clinical evidence of tumour recurrence for >2.5 years after treatment (Brewer et al., 2011).

**[P04]**

Head-shaking nystagmus in two dogs

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Head-shaking nystagmus (HSN) is reported in human scientific literature as a sign of vestibular dysfunction of variable etiology. HSN is a nystagmus induced by oscillation of the head at high frequency in the horizontal plane and is employed as a clinical test by neurootologists. We report the clinical signs and diagnostic findings of two dogs with head-shaking nystagmus, previously unreported in veterinary
neurology. A 4-year-old male neutered miniature Poodle was presented with conjugate horizontal nystagmus to the left occurring 10-20 seconds after vigorous head-shaking. A short head nystagmus was also seen. It reportedly started 4 weeks after enucleation of the left eye. The clinical examination, MRI and CSF analysis were normal. Corticosteroids and broad-spectrum antibiotics were prescribed by the referring veterinarian. Markedly decreased episode frequency was reported thereafter. A 2-year-old female neutered Shetland Sheepdog was presented with a chronic head tilt and conjugate upbeat vertical nystagmus after head-shaking. The clinical examination, MRI, CSF analysis, BAER test, ERG and caloric tests were normal. The dog was treated with pyridoxine hydrochloride, benfotiamin and cyanocobalamin combination, propentofylline and physiotherapy. During follow-up over a period of 10 months, there was no progression or regression of signs. The cause of the HSN in these two canine cases remains unknown. A human study reports HSN to occur in 100% of vestibular neuritis cases, 69% of Ménière's disease cases and 22% of benign paroxysmal positional vertigo cases. Links to ocular disorders have been reported. It remains speculative if treatment with corticosteroids would be indicated in these cases.

Inflammatory disease affecting the central nervous system in dogs: A retrospective study in England (2010-2019)

Rita Gonçalves, Steven De Decker, Gemma Walmsley, Sarah Butterfield, Thomas W. Maddox

Inflammatory diseases affecting the central nervous system (CNS) are common, life-threatening conditions in dogs that may be associated with immune-mediated or infectious causes. The relative prevalence of different aetiologies causing CNS inflammatory disease is unknown so our aim was to determine this and identify predictors for infectious versus immune-mediated causes. A retrospective cohort study was carried out over a 10-year period in 2 referral institutions using multivariable and multinominal logistic regression for risk factor identification. 1205 dogs were included. A total of 17 different diagnoses were identified, with immune-mediated disease (82.2%) considerably more common than infectious conditions (17.8%). The most common immune-mediated conditions were MUO (47.6%) and SRMA (29.3%) and the most common infectious conditions were discospondylitis (6.5%) and tetanus (4.6%). Younger age (p<0.001, OR=1.017, CI 1.013-1.022) and shorter duration of the clinical signs before presentation (p<0.001, OR=1.009, CI 1.004-1.014) were associated with immune-mediated disease whereas being male (p=0.001, OR=1.839, CI 1.296-2.609), progressive clinical signs (p<0.001, OR=2.967, CI 1.915-4.597) and identification of a possible trigger (p<0.001, OR=4.281, CI 2.84-6.453) were associated with infectious causes. 89.5% of all dogs survived to discharge with no significant difference in short or long-term survival between immune-mediated and infectious conditions. Our data confirms that immune-mediated disease is more common than infectious conditions as a cause for inflammatory CNS disease in dogs in England, as previously suspected. Risk factors for the most common diagnoses were identified from signalment, history and examination findings to give valuable information that can guide clinicians with their investigations.

Correlation between magnetic resonance imaging and histological lesions in a case of Meningoencephalitismyelitis secondary to Neospora caninum infection in a greyhound

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Neospora caninum is a protozoal agent known to occasionally cause meningoencephalitis and/or myelitis in dogs. MRI and histological features of Neospora caninum myelitis have been described separately. However, to the authors' knowledge, there is currently no description of correlated MRI and histopathological findings of meningoencephalomyelitis secondary to Neospora caninum in dogs. An 11-year-old male neutered raw fed greyhound was presented for a two-week history of progressive nonlateralised, non-painful ambulatory paraparesis deteriorating acutely to non-ambulatory tetraparesis. The neurological examination was consistent with a multifocal CNS disease. MRI revealed multifocal, diffusely, bilateral asymmetrical, intra-axial lesions affecting mainly the cortical grey matter than white matter and hippocampus; focal, bilateral, asymmetrical, ill-defined lesions affecting the caudate nucleus, thalamus, cerebellar nodulus, midbrain and cervical spinal cord. Compared to grey matter/spinal cord parenchyma, the lesions were hyperintense in T2w and T2w FLAIR images, iso to hypointense in T1w images and were mildly to markedly diffusely contrast enhancing. CSF analysis revealed a predominantly eosinophilic pleocytosis. Serology and CSF polymerase chain reaction were positive for Neospora caninum. Despite medical treatment, the patient deteriorated and was euthanised. Post-mortem examination revealed no macroscopic changes. Microscopic examination of the brain and spinal cord revealed multifocal, marked, necrotizing, lymphoplasmacytic and histiocytic, meningoencephalitis and myelitis with intra-axial round protozoal cysts containing myriad tightly packed 2-3 μm basophilic zoites. In conclusion, Neospora caninum should be considered a differential diagnosis in multifocal CNS disease in elderly patients. Moreover, MR imaging should assess the entire central nervous system to assess accurate extension of the lesions.
Owners’ perception of seizure sensor devices in veterinary medicine

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Accurate knowledge of seizure frequency is key to optimising treatment. New methods for detecting seizures are currently investigated in humans, which rely on changes in biomarkers, also called ‘seizure sensors devices’. A critical step in development, is understanding user needs and requirements. No information has been published regarding this subject in veterinary medicine. An online survey was created and consisted of 27 open, closed, and scaled questions divided over two parts: part one focussed on general questions related to signalment and seizure semiology, the second part focussed specifically on the use of seizure sensor devices. Two hundred and thirty-one participants caring for a dog with idiopathic epilepsy, were included in the study. Open questions were coded using descriptive coding by two of the authors independently. Data was analysed using descriptive statistics and binary logistic regression. Our results showed that nearly all dog owners made changes in their daily life which mainly focussed on intensifying supervision. Most owners felt more confident leaving the house if their dog's seizures could be predicted or monitored in some way. Results of part 2 of the study demonstrated that seizure sensor devices would improve owners' confidence in managing epilepsy. Owners that were already keeping track of their dog's seizures were more likely (4.2 times) to show confidence in seizure sensors devices, highlighting the need for better monitoring systems. Our results indicate there is a market for sensor devices in veterinary medicine and provides suggestions which should be taken into consideration when developing such a device.

Imaging diagnosis, surgical resection and histopathological findings of a canine esthesioneuroblastoma

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Idiopathic generalised tremor syndrome in dogs

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Idiopathic generalised tremor syndrome (IGTS) causes tremor, and often vestibulocerebellar signs. The condition is poorly understood but believed to have an immune-mediated aetiology. Previous publications are restricted to case reports or lack exclusion of structural causes. Medical records of 76 dogs diagnosed with IGTS that had undergone magnetic resonance imaging (MRI) of the brain and had metabolic and toxic causes excluded were collected retrospectively. Their clinical signs, diagnostic investigation findings, treatment and outcome are described. Crossbreeds were affected most commonly (42.1%), followed by West Highland white terriers (14.5%) and cocker spaniels (10.5%). There was a higher proportion of affected females (68.4%) than males. The median age of affected dogs was 17 months, median bodyweight was 9.15kg. All dogs presented with tremors and most experienced concomitant neurological signs. Eighteen were pyrexic and 32 had reported gastrointestinal signs. MRI of the brain was normal in most cases whilst cerebrospinal fluid analysis frequently revealed a mild, commonly mononuclear pleocytosis, and elevated total protein concentration. All animals were treated with prednisolone and 39 also received diazepam. Median follow-up time was 17 months during which time 16 patients experienced relapsing clinical signs. Overall outcome was good, although 10 patients experienced persistent mild clinical signs. IGTS should be suspected in any dog with a generalised tremor and concurrent neurological signs. Further studies into the aetiology of this condition are recommended, an immune mediated pathology in the spectrum of CNS diseases is expected.

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Diffuse lumbar hyperostosis secondary to atypical T-cell multicentric lymphoma: Case report

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A 4-year-old female spayed Bullmastiff-cross presented with a history of progressive paraparesis, as well as weight loss and polyuria-polydipsia. Neurological examination was consistent with L4-S3 myelopathy. On magnetic resonance imaging (MRI), all vertebrae showed homogenously increased short tau inversion recovery (STIR) signal with strong contrast enhancement. The signal intensity changes were associated with circumferential concentric thickening of the vertebral pedicles, dorsal lamina and vertebral body, leading to marked circumferential narrowing of the vertebral canal along the length of L5 with secondary spinal cord compression. Lateral radiographs of the vertebral column from T6 to Cd2 showed normal to decreased bone radiopacity of the lumbar vertebrae, and loss of visualisation of the dorsal cortex of the vertebral body from L1 to L6. Moderate new bone formation around the spinous processes of T11 and T12, and the articular facets at the level of T11-12 and T12-13 was noted. Bone biopsy of the new bone around the T12-13 articular facet consisted of mature cartilage and bone, which was disorganised and forming thick trabeculae. Fine needle aspiration of the popliteal lymph nodes showed significant expansion in the proportion of intermediate-sized lymphoid cells, suggestive of a lymphoma. Flow cytometry confirmed a T-cell lymphoma. The dog was euthanised. Necropsy confirmed the presence of stage V multicentric T-cell lymphoma, as well as diffuse hyperostosis of the vertebral bodies. To our knowledge, this is the first report of presumed paraneoplastic lumbar skeletal hyperostosis.

Short term outcomes of surgically treated, paraplegic, nociceptive negative French bulldogs diagnosed with intervertebral disc extrusion

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Intervertebral disc extrusions (IVDE) are a common spinal disorder in dogs, especially within chondrodystrophic breeds. Loss of deep nociception is a well-documented negative prognostic indicator in dogs with IVDE, with approximately only 50% of dogs recovering neurological function after surgery. The objective of this study was to assess the rate of recovery in surgically treated, paraplegic, nociceptive negative French Bulldogs. A retrospective cohort study was performed on French Bulldogs who presented to two referral hospitals between 2015-2020. Their medical and MRI records were reviewed, with analysis of signalment, clinical examination, location of lesion, complications, short term outcome and quantitative MRI changes including lesion length, extent of spinal cord swelling and severity of spinal cord compression. Forty-nine French Bulldogs met the inclusion criteria, with 14 (28.6%) showing neurological improvement at the time of discharge. Dogs with L4-S3 lesions had a significantly worse outcome (p = .025) with 3/24 (12.5%) dogs showing neurological improvement, compared to 11/25 (44.0%) of dogs with T3-L3 lesions. Dogs which had the larger cord compression (as measured by having a smaller spinal cord height at the site of maximal compression (p = .001), and a greater severity of this compression compared to the height of the normal spinal cord (p = .022)) had a better clinical outcome. This study suggests that French Bulldogs with IVDE and absent nociception have a worse short term outcome following surgery compared to previous studies. Based on these findings, further investigations into why French Bulldogs show less neurological improvement compared to other chondrodystrophic dogs are warranted.
In dachshunds the number of calcified intervertebral discs seen on radiography at a young age is associated with risk of developing disc herniation in later life, and this has been shown to be heritable. Radiographic screening programs have been implemented in several countries to quantify the number of calcified discs and provide breeding recommendations. The aim of this retrospective study was to estimate agreement between computed tomography (CT) and radiography in detecting calcified discs in a population of healthy British dachshunds. 13 healthy dogs aged between 2-4 years were included in the study. CT and radiographs of the whole spine were available for each. The spinal radiographs had been previously scored by an independent assessor as part of a screening program. Three different observers with different levels of experience assessed the CT images and reported the number of calcified discs identified for each dog. There was an almost perfect agreement among the three observers identifying calcified discs on CT images. CT was shown to be 5.9 times more sensitive at identifying disc calcifications than radiography, with the highest difference being in the thoracic and the closest agreement in the cervical region. Overall, 145 calcified discs were identified by CT as opposed to 42 by radiography. This study demonstrates a significant difference in the ability to identify calcified intervertebral discs in a small population of healthy dachshunds between CT and radiography and suggests CT may be a more appropriate method for assessing disc calcification for potential future breeding schemes.

Generalized stiff, rigid gait in a dog affected by hypothyroidism

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Hypothyroidism is among the most frequent endocrinopathies in dogs and neuromuscular signs have been reported in affected cases; the most common neurological signs include cranial neuropathies, laryngeal paralysis and generalized neuromuscular weakness. Skeletal muscles involvement is generally subclinical or associated with signs of polyneuropathy. We describe the clinical, laboratory and electromyographic findings of myotonic-like myopathy in a dog with hypothyroidism. A 9 years-old male, Maltese dog was referred for a 2-months subacute and progressive history of abnormal gait characterized by hind limbs ataxia and mild paraparesis that progressively worsened in generalized stiffness, rigidity, short-strided gait of the front limbs and exercise intolerance. Cranial nerves evaluation, postural reactions and spinal reflexes were normal. Hematologic analyses, total T4 measurement and TSH stimulation test confirmed a diagnosis of hypothyroidism; the ACTH-stimulation test resulted negative for hyperadrenocorticism. Computer tomography and magnetic resonance imaging excluded spinal cord involvement. The electromyography (EMG), performed with the dog unsedated, revealed complex repetitive discharges associated with fibrillation potentials and positive sharp waves. EMG abnormalities were mainly detected in proximal appendicular muscles of the front limbs and in cervical epaxial muscles. A myotonic-like myopathy secondary to hypothyroidism was suspected and supplementation with Levothyroxine (22 μg/kg/die) was started. Four weeks later, the dog showed significant improvement of clinical signs; only mild rigidity persisted. The retest of total T4 revealed the hypothyroidism to be not adequately controlled; Levothyroxine dose was increased and clinical signs almost completely solved. Hypothyroidism should be included as differential diagnosis in dogs with myotonic-like myopathy.

Correlation of narrowed intervertebral disc space on survey radiographs with diagnosis of intervertebral disc herniations

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Whilst multiplanar imaging has allowed for greater accuracy in the diagnosis of intervertebral disc disease it is not always accessible due to financial, geographic or global pandemic constraints. Such circumstances lead to a reliance of more readily available imaging modalities. Data were collected from a single hospital’s records of dogs who had undergone both survey radiography and magnetic resonance imaging of the same region of the vertebral column. Radiographs were blinded and reviewed by two authors for the presence of a narrowed intervertebral disc space. A diagnosis of intervertebral disc herniation (IVDH) and the presence of a narrowed intervertebral disc space were compared. A significant correlation between a narrowed intervertebral disc space and a diagnosis of intervertebral disc herniation and also intervertebral disc extrusion (IVDE) was found (p<0.001). Odds ratios and percent relative risk calculated for the likelihood of having a diagnosis of IVDH and IVDE when a narrowed disc space is identified were 7.52 and 119.8%, and 8.7 and 314.3% respectively. A narrowed intervertebral disc space seen on survey radiography increases the likelihood of IVDH in dogs whose neurological dysfunction localises to the spinal cord and is a useful tool for first opinion practitioners and their clients for whom multiplanar imaging is not a viable option.
Brain biopsy of intracranial lesions require high accuracy during needle placement. In a previous study, a median target point deviation of 0.83 mm for brain biopsy needle placement using the MRI-based patient-individual stereotactic brain biopsy device was determined. The case report describes the clinical use of this MRI-based 3D-printed brain biopsy frame for sampling forebrain lesions in two dogs. Both dogs displayed generalized tonic-clonic epileptic seizures due to forebrain lesions. For planning of brain biopsies, dogs were prepared as follows: 1. Placement of three bone anchors with markers at the skull, 2. T2W 1mm MRI scan of the brain, 3. Definition of biopsy trajectories in the MRI datasets. The 3D frame consisting of three legs and a biopsy port was designed and printed by an engineer. Five days later the brain biopsy in general anesthesia was performed. The legs of the frame were fixed to the bone anchors with specific screws. A minimal-invasive access to the brain was created and the brain biopsy needle was placed along the pre-planned trajectory into the intracranial lesion. Brain biopsy samples (2-3) were taken. The dogs received a control MRI and were under observation until discharging of hospital. Histopathological examination of brain biopsy samples revealed a gliomatosis cerebri in dog 1 and an oligodendroglioma WHO grade III in dog 2. All brain biopsy samples were diagnostic. No complications during or after brain biopsy were noticed. The dogs were discharged 48 hours after biopsy procedure without deterioration of neurological status.

**[P16]**

### Technical accuracy of the registration process with a frameless optical neuronavigation system

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For neurosurgical interventions, such as brain biopsies or removal of brain tumors, advanced neuronavigation systems are becoming increasingly important in small animal medicine. Modern neuronavigation systems create a virtual reality image of the brain allowing the surgeon to track instruments in real time. Optical neuronavigation systems consist of a dual camera system emitting infrared light and reflective markers (spheres) identifying the patient as well as the instruments being used. The matching of the surgical situs into the virtual coordinate system of the preoperatively acquired imaging data sets of the patient is performed via an image-to-patient registration process, which includes a so-called registration error. The aim of the study was to determine the technical accuracy of the registration process of STORZ frameless optical neuronavigation system by using different marker points (pins or anatomical landmarks) for registration process and to compare the registration error between two observers. For each run of each observer the registration error, the maximum registration error and, weather the run was suitable for operation mode (required preset maximum error of 0.5 mm) were recorded. This study shows that by using pins a very small registration error can be achieved (median of 0.15 mm in both observers). The anatomical landmarks are considerably more imprecise (median up to 0.72 mm), and most runs were unusable for the operation mode. The differences in the registration accuracy among the examiners are in submillimeter range and therefore not clinically relevant. Further, user experience in handling the device has no influence on registration error.

**[P17]**

### Supratentorial subdural fluid accumulation secondary to sterile effusive meningitis: Case report

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An 8-year-old female spayed Lurcher-cross presented with a five-day history of lethargy, inappetence, pain of unknown origin and vacant staring. The day prior to presentation, the dog had also suffered a transient episode of collapse with opisthotonos. Pre-referral haematology, biochemistry, urinalysis and abdominal ultrasound and radiography were all unremarkable. Spinal magnetic resonance imaging (MRI) from C1 to C3 had also been performed and showed mild syringomyelia from mid-C2 to caudal-C4. Neurological examination on presentation revealed an obtunded mental status and discomfort on cervical ventroflexion but was otherwise unremarkable. MRI of the brain revealed moderate-to-severe subdural fluid accumulation around the entire left cerebral hemisphere containing a T2W hyperintense, T1W hypointense, incompletely FLAIR-suppressing and non-enhancing material. There was severe meningeal thickening and enhancement surrounding this fluid accumulation. There was moderate midline shift to the right, moderate caudal transtentorial, herniation and cerebellar impaction into the foramen magnum. There were also faint areas of poorly-defined T2W hyperintensity in the white
matter tracts of the left cerebral hemisphere. A left rostroventral cranietomy and durectomy was performed. A moderate amount of clear fluid was drained from the left subdural space. Surgical blood contamination precluded cytological interpretation. Fluid and meningeal tissue culture was negative, including extended and enrichment culture. Histopathology of the excised dura was consistent with moderate chronic neutrophilic and macrophagic meningitis with no infectious agents identified. This is a report of supratentorial subdural fluid accumulation causing increased intracranial pressure secondary to sterile effusive meningitis.

Mycobacterial epidural pyogranulomatous steatitis in a cat

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A two-year-old male neutered domestic shorthaired cat presented with recent spinal hyperaesthesia followed by a 24-hour progressive non-ambulatory non-painful tetraparesis localising to C1-T2 myelopathy. Physical examination, biochemistry, haematology, thoracic and abdominal imaging were unremarkable. MRI showed a well-defined, crescent-shaped, extra-dural, compressive, T2WI/T1WI/STIR hyperintense contrast-enhancing mass lesion within the dorsal and right lateral vertebral canal from C2 to C3-C4. CSF analysis revealed a mild mononuclear pleocytosis and increased protein concentration. Serology for Feline Corona Virus (FeCoV), Toxoplasma gondii, Cryptococcus antigen, FIV/FeLV and CSF PCR for Toxoplasma gondii and FeCoV were negative. A C2-C3 hemilaminectomy was performed and the mass was resected. Histopathology showed a marked pyogranulomatous cellulitis with multifocal lymphohollicular hyperplasia. PAS and Ziehl-Neelsen staining were unremarkable. Immunohistochemistry for FeCoV was negative. Mycobacterium spp. PCR from the resected tissue showed positive amplicons and the DNA sequence was most closely related to the genus Mycobacterium. Treatment included a one-week course of anti-inflammatory doses of prednisolone and a 6-month antibiotic therapy consisting of Clarithromycin, pradofloxacin and rifampicin. A rapid and complete recovery was confirmed by re-examination after 2 weeks and no recurrence was reported by the time of writing 31 months later. This is the first report of mycobacterial epidural steatitis in a cat. It emphasises the relevance of mycobacterium infection as a differential diagnosis in patients diagnosed with a pyogranulomatous epidural steatitis, as well as the importance of PCR analysis and sequencing for the detection of mycobacterial organisms in the affected tissues. A good long-term outcome can be achieved with appropriate therapy.

Global brain ischaemia as a cause of late onset seizures in a domestic shorthaired cat

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Cerebrovascular accidents (CVA) cause sudden onset of seizures in cats and dogs. Global brain ischaemia (GBI) in veterinary species is an uncommon manifestation of CVA and has been associated with cardiovascular dysfunction secondary to anaesthesia. Late-onset seizures after GBI has not been reported in veterinary species before, but both early and late onset seizures secondary to ischaemia are well recognised in human medicine. A two-year old female neutered domestic shorthaired cat with a history of blindness since ovariohysterectomy ten months previously was presented for investigation of suspected seizure activity over a three-month duration. Neurological examination confirmed central blindness, a quiet and slightly disorientated mentation, absent bilateral nasal mucosal sensation, wide excursions of the head in either direction and reduced postural reactions in all limbs. Routine haematology and biochemical profiles, thiamine and cobalamin levels were unremarkable. Magnetic resonance imaging (MRI) revealed global brain ischaemia and cortical atrophy. The clinical history and imaging findings were consistent with hypoxia and/or hypoperfusion during the previous anaesthesia. Treatment with phenobarbitone resulted in excellent control of seizures with no further events in a five-month follow-up period and though blind, the cat’s owners report a good quality of life. Anaesthesia accidents can occur during short, ‘routine’ procedures in apparently clinically healthy animals and may have severe long-term effects for patients. This case suggests that late-onset seizures can occur following ischaemic injury. Phenobarbitone effectively managed seizures in this case.

Recovery after inadvertent intramedullary microchip implantation at C1-C2 in a kitten - A case report

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Penetrating spinal cord injuries (PSCI) in humans are associated with severe myelopathies and often have a poor prognosis. The decision between medical and surgical treatment is still discussed controversially, as the outcomes are not significantly different. In veterinary
movement, only a small number of surgically treated PSCI cases in companion animals have been published. Information on medical management however is lacking. Here, we report a case of a peracute paralysis in a 15-week-old male British Shorthair cat following inadvertent microchip implantation into the spinal cord. Neurological examination revealed a non-ambulatory tetraparesis and left front limb plegia localised to C1-C5 spinal cord segments instantly after microchip placement. Computer tomography (CT) was performed showing a microchip that was diagonally placed within the vertebral canal and spinal cord at the level of C1-C2 vertebrae. Based on the microchip-location and the concern of further iatrogenic spinal cord injury through surgery, medical management was chosen. Despite the impressive extent of the injury and the clinical symptomatology, the patient showed continuous neurological improvement and was ambulatory six days later with controlled urination and defecation. After recovery, six weeks later, a permanent mild-moderate tetraparesis with ataxia remained with a good quality of life. At the age of 13 months, a follow-up CT was performed which showed a relative cranial displacement of the microchip reaching into the foramen magnum. In conclusion, conservative treatment of PSCI in young cats might be an option for patients where severe surgery related complications are suspected or owners reject surgery.

Movement analysis by a dog with lower back pain, treated with orthomanual veterinary medicine and measured with the pressure plate

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Charly, a 2.5 year old crossbreed dog was referred to the clinic with unwillingness to jump into the car. A CT scan of the lower back was included showing lumbosacral instability. Physical, neurological and orthopaedic examinations showed pain during palpation of the lumbosacral region and lumbosacral instability. Concurrent orthopaedic, neurological or systemic disorders were excluded. Based on the clinical signs, findings during examination and the CT-scan lower back instability was diagnosed. Lower back pain is a frequently observed problem which occurs mostly in older dogs of large to giant breeds. Initial signs are unwillingness to jump and expressions of pain in the lumbosacral spine region. Numerous diseases can cause lower back pain. Degenerative lumbosacral stenosis (DLSS) is frequently diagnosed. With radiography and/or MRI/CT the cause of lower back pain can be confirmed. Currently several therapy strategies are developed for DLSS with various results. Therapy can consist of cage rest, medication and surgery or a combination of these therapies. Charly was treated orthomanually with manipulation of the lower back. Her gait was measured objectively with a pressure plate before and immediately after treatment, two weeks after treatment and three months after treatment. Control CT-scan of the lower back was conducted after two months. Within two weeks after treatment she showed a complete clinical recovery and obvious improvement was measured with the pressure plate. Three months after treatment she had improved even more. Orthomanual veterinary medicine may be considered an adjunct modality for the conservative treatment of lower back instability in dogs.

CT findings, surgical resection and histopathology, of an intracranial primitive neuroectodermal tumour in a dog

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Primitive neuroectodermal tumours are embryonal neoplasias derived from neuroepithelial cells capable of differentiating into neuronal, ependymal, and glial cells. These are rare and malignant representing less than 3% of reported primary intracranial neoplasms. A 12-year-old male neutered mixed-breed dog was referred for excision of an extra-axial mass located in the right frontal lobe detected one week earlier with CT. The dog suffered generalised seizures, and neurological localization was consistent with a right telencephalic lesion. The mass was macroscopically excised using a right trans-frontal approach. Immediate post-surgical CT showed no tumour left. Histological analysis revealed a papillar meningioma (WHO grade III). The dog recovered uneventfully from the surgery but two months later, suffered seizures and neurological deterioration. Followup CT revealed an extra-axial hypointenning mass with mild and homogeneous contrast uptake in the right olfactory lobe but extending into the left side. A second surgery was carried out and the lesion was excised on both sides. Post-surgical CT confirmed complete gross excision. The histological analysis revealed a neoplastic cell population of large and polygonal cells compressing and infiltrating the nervous tissue. A solid growth pattern was predominant but rosettes and pseudorosettes were seen. Histopathology and immunohistochemistry were indicative of a primitive neuroectodermal tumour. Toceranib and Lomustine were initiated. The dog recovered from the second surgery, but a week after the reintervention deteriorated neurologically and was euthanized one month later. Post-mor tem examination was not granted. In conclusion, this case reports the importance of considering neuroectodermal tumours as a possible differential diagnosis of intracranial neoplasia.
Unilateral blindness associated with steroid-responsive meningitis arteritis in a nine-month-old beagle

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A 9-month-old male entire Beagle presented with acute lethargy, pyrexia (39.9°C) and marked cervical and thoracolumbar pain. Cranial nerve examination revealed abnormalities of the left eye characterised by an absent menace response, absent dazzle reflex, absent direct and consensual pupillary light reflexes (PLRs) with re-dilation on a swinging flashlight test indicating a non-visual left eye. Funduscopic examination and electroretinography were unremarkable bilaterally. The findings were consistent with a left retrobulbar optic nerve lesion as part of the multifocal CNS localisation. Complete blood profile showed moderate neutrophilia, monocytosis and markedly elevated C-reactive protein. CSF analysis showed neutrophilic pleocytosis (97% neutrophils, 52 total nucleated cell count/ul). MRI of the brain and optic nerves, thoracic and abdominal imaging, urinalysis including cul-}

Spinal arachnoid diverticulum and syringomyelia in a cat with chronic lumbar vertebral fracture

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A 3-year-old female domestic shorthair cat was presented with a 6-week history of progressive, painful, symmetrical, pelvic limb ataxia and ambulatory paraparesis localising to T3-L3 myelopathy, following a road traffic accident. Referred thoracic radiographs showed an oblique fracture line and new bone formation representing early healing around the caudal endplate of L3, collapsed L3-L4 intervertebral disc space, malalignment of the vertebral canal at L3-L4, and a sacrococcygeal fracture that was managed with tail amputation by the referring veterinarian surgeon. CT was performed at 6 weeks post-trauma and demonstrated fusion of the dorso-lateral aspects of the vertebral arch, articular facets, and ventral intervertebral disc space at L3-L4. MRI revealed a very large, severely compressive, dorsal, drop-shaped, T2W/STIR hyperintense, T1W hypointense, FLAIR suppressing, non-contrast-enhancing, intradural-
extramedullary lesion at L4, compatible with a spinal arachnoid diverticulum (SAD). From L4 to L6, there was a large, well-demarcated, wedge-shaped, dorsal and ventral, T2W hyperintense, FLAIR incompletely and heterogeneously suppressing, T1W hypointense, non-contrast-enhancing, intramedullary lesion compatible with syringomyelia and spinal cord interstitial oedema. A Funkquist-B dorsal laminectomy with durotomy and resection of the SAD was performed at L3-L4. One month post-operatively, there was marked improvement of the gait with mild persisting ataxia and no detectable spinal pain. The findings of a SAD immediately caudal to the vertebral fracture is suggestive of a post-traumatic aetiology. To the authors’ knowledge, this is the first report of post-traumatic SAD and syringomyelia in a cat.

**[P26]**

**Key feature-cases as virtual patients in veterinary neurological education**

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Virtual patients (VP) are a common eLearning feature in veterinary medicine. Mostly long cases (LC) including explanations and expert opinions are used. Key Feature-Cases (KF) are short cases, focusing a few critical decision points that are essential for clinical reasoning (CR) to solve a case. Usability, learning success and acceptance were determined and compared between the VP-Formats. Two elective courses were offered to undergraduate veterinary students, presenting 38 VPs in CASUS⁹. In eight cases, students were able to create illness scripts and finally compare it with the expert response using the CR-Tool as new feature. These cases were compared to eight other cases with similar clinical findings without the CR-Tool. Besides the evaluation of learning analytics (time, success, case scores) an evaluation was performed via LimeSurvey⁹. A total of 229 students participated, 199 completed the survey. The average processing time of LCs was 53 min, that of KF-Cases 17 min. 78% of LCs were successfully completed, 73% of the KF-Cases. The average processing time of cases with CR-Tool was 19 min. The success rate was 58.3% vs. 60.3% for cases without CR-Tool. 134 respondents agreed that the casework made them feel better prepared to secure a diagnosis in real patients. Flexibility in learning (n=93) and practical relevance (n=65) were the most frequently listed positive remarks. KF-Cases are suitable for the majority of students and significantly contribute to strengthen clinical decision-making skills in veterinary neurology. The CR-Tool is useful but requires further adaptation in structure and terminology.

**[P27]**

**Suspected intermediate syndrome and intussusception following Propoxur toxicity in a dog**

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Carbamates are a class of insecticides that act binding to acetylcholinesterase reversibly. Propoxur is a common carbamate used as insecticide/molluscicide. Clinical signs of carbamates toxicosis are a consequence of overstimulated nicotinic and muscarinic receptors. Rare complications, as a delayed neurological syndrome called Intermediate Syndrome (IS) and intussusception have been described, although they have never been observed in the same dog. An 8-month-old mixed breed dog was referred because of vomiting, generalized muscle tremors and miosis. Five hours before the presentation, the owners saw the dog eating something during the daily walk. The dog was initially treated with fluids, atropine and midazolam. Complete blood exams showed a marked reduction of cholinesterase activity. Blood toxicology tests, performed using liquid chromatography tandem mass spectrometry, revealed the presence of Propoxur. Around 24h after the presentation, the dog developed a small intestinal intussusception, which was treated with an enterectomy and an end-to-end anastomosis. 36h after the surgical procedure, after an initial improvement, the dog developed weakness and respiratory difficulties. The neurologic exam showed mental obtundation, severe generalized muscle weakness of neck and limbs with major involvement of the thoracic limbs, reduced flexor reflexes in the four limbs and a short and shallow respiratory pattern, pointing out a suspected IS. The dog’s neurologic conditions progressively improved and he was discharged at day 5 from the presentation with only mild impairment of the neck strength. Despite the IS and intussusception are rarely described in carbamates intoxication, the clinician should be aware of their possible and simultaneous occurrence.

**[P28]**

**Paroxysmal dyskinesia in two pomeranian dogs**

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Canine paroxysmal dyskinesia (cPxD) is a subtype of movement disorder. Diagnosis of cPxD is limited to observation of an episode that characterised by sudden, unexpected, repeated, and formulaic movements of non-pain-related causes, and occur in the absence of evidence of associated pain. Treatment options are limited and include anticholinergics, benzodiazepines, and neuroleptics. In this report, we describe two cases of cPxD in pomeranian dogs, which were treated with and without propoxyphene. Both dogs showed a marked improvement in clinical signs after treatment. The authors suggest that further studies are needed to better understand the pathogenesis of cPxD and develop effective treatment options.
Phenotypic characterization of paroxysmal dyskinesia in toy poodle dogs

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Canine paroxysmal dyskinesia (cPxD) is a movement disorder in which there are recurrent episodes of abnormal, involuntary movements without changes in consciousness. It has been proposed that cPxDs have been misdiagnosed as focal seizures. The increased popularity of smartphones and the possibility to observe these episodes from owners’ videos has allowed a greater recognition of cPxD. A multicentre retrospective study was conducted, with the aim to describe in detail the clinical presentation of cPxD in toy Poodle dogs. Dogs were included if presented for episodes of involuntary movements without loss of consciousness and if video footage and detailed description of the episodes were available. Supporting information was added prospectively by using a questionnaire directed to the owners. Eight dogs were included. The mean age of onset was 3.4 years. The episodes were mainly characterized by sudden onset of dystonic movements of >1 limbs, difficulties in walking, kyphosis and head/body tremors/oscillations. All dogs appeared frightened during the episodes. The episodes lasted from 2 to >30 minutes. 5/8 dogs suffered from gastrointestinal symptoms. All dogs but one were tested for anti-gliadin and anti-transglutaminase-2 antibodies, which resulted negative in 4/7. 6/8 dogs received exclusively a gluten-free diet with a clinical resolution or marked reduction of the episodes. The phenotypic characteristics of the episodes and the response to the diet should help the clinician to differentiate the cPxD from focal seizures in Pomeranians from focal seizures.

Ventriculomegaly in Cavalier King Charles Spaniels with Chiari-like malformation: Relationship with clinical signs and imaging findings

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Ventriculomegaly, secondary to disturbance of cerebrospinal fluid flow at the craniocervical junction, has been reported in CKCS with CM. However, its clinical relevance is unclear. The aim of the study was to calculate lateral ventricles dimension in CKCS with CM and to investigate the association between ventriculomegaly and signalment, clinical signs, ventricular asymmetry, CM and syringomyelia (SM) grade, medullary kinking index, follow-up, and epileptic seizures. A retrospective study was performed enrolling forty-three client-owned CKCS with magnetic resonance imaging diagnosis of CM. Initial and follow-up (up to 36 months) clinical status was graded. Images were reviewed to quantify dimension of lateral ventricles, to evaluate ventricular symmetry, CM and SM grade, and medullary kinking index. Cases presenting epileptic seizures were also recorded. The most common initial clinical signs were scratching and neck pain. Ventriculomegaly was identified in 70% of dogs, CM grade 2 was observed in 77% of cases, ventricular asymmetry and syringomyelia were identified in 54% and 80% of dogs, respectively; median medullary kinking index was 37.77%. Moreover, 28% of dogs presented epileptic seizures. No significant association was identified between dimension of lateral ventricles and signalment, clinical signs, and imaging findings; no significant association was identified between ventriculomegaly and epilepsy (p ≥ 0.05). In conclusion, the prevalence of ventriculomegaly in CKCS with CM is high but this finding does not seem related to the severity of clinical signs, to CM/SM, to medullary kinking index, and to epileptic seizures.
Pharmacokinetic profile of 3 different administration routes of cannabidiol in healthy dogs

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The study protocol was approved by the Ethical Committee of the Faculty of Veterinary Medicine, Ghent University (EC 2018-42). In veterinary neurology there is a growing interest in cannabidiol (CBD), although there has been much speculation about its therapeutic value in numerous disorders (e.g., epilepsy, pain relief). The oral bioavailability of CBD is low in humans and dogs and continues to be a main issue in clinical trials. This limitation indicates the necessity to explore alternative delivery routes of CBD. The aim of this study was to determine the pharmacokinetic plasma profile of CBD after a single dose via intranasal (IN) and intrarectal (IR) administration in healthy dogs and compare this to the oral administration route (PO). Six healthy Beagle dogs were randomly allocated to a 3-way crossover study. Following a two-week wash-out period, each dog underwent the same protocol but receiving CBD through a different administration (IN, IR, PO) route. Blood samples were collected before CBD administration and at fixed timepoints until 60 hours after administration. The mean AUC(0-inf)/dose after 20mg IN and 100mg PO CBD administration was 3 and 13.7 ng/mL·h, respectively (p = 0.09). The maximal plasma CBD concentration after 20 mg IN and 100 mg PO CBD administration was 1.4 and 2.2 ng/mL, reached at 0.5 and 3.5 h (Tmax), respectively (p = 0.43). The plasma CBD concentrations after 100mg IR CBD administration were below the limit of quantification and therefore not pharmacokinetically analyzed. In conclusion, IN or IR administration of CBD did not increase its bioavailability compared to PO administration.

What do we know about diagnosis and treatment of idiopathic vestibular syndrome in dogs and cats – Do we really know what we are doing?

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Idiopathic vestibular syndrome (IVS) is a diagnosis of exclusion, with unclear aetiology, diagnosis and therapy. The aim of the current study was to better characterize and define IVS, its diagnosis and treatment. One-hundred-thirteen boarded neurology specialist participated in an online survey. IVS definition differed, but IVS was generally defined (n=103) as an acute to peracute onset ‘peripheral’ vestibular syndrome. As gold standard for diagnosis of IVS neurological exam (NE), MRI, serum biochemistry (SB), complete blood count (CBC), otoscopy, blood pressure (BP), CSF, T4/TSH were chosen. There were discrepancies choosing the five most important diagnostics: North-America, dogs: NE, MRI, SB, CSF, CBC /cats: NE, SB, MRI, otoscopy, BP; EU, dogs: NE, otoscopy, SB, T4/TSH, MRI, CBC /cats: NE, otoscopy, SB, MRI, BP. UK, dogs: NE, MRI, T4/TSH, SB, otoscopy / cats: NE, MRI, SB, BP, otoscopy, SB and CSF. Interestingly, there was a relative consensus for treatment: IV fluids and antiemetics. Additional mentioned drugs varied: propentofylline (only mentioned in the EU) and betahistine, (mentioned in all regions by single individuals). Despite IVS being a common presentation in practice, opinions about its definition, diagnosis and treatment differ. To the authors knowledge there has been no controlled study into IVS treatment, only into diagnosis. The current study summarises expert opinion and can provide a basis for future studies into diagnosis and treatment.

Atypical presentation of multiple cystic lesions in a brain tumour in a dog

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Choroid plexus papilloma is a primary intracranial tumour usually characterized as a well-defined mass with marked, uniform contrast enhancement on MRI. This report describes an atypical presentation of choroid plexus papilloma. A 7-year-old male Cocker Spaniel presented with a 1-month history of vestibular ataxia and seizures, showing vestibular ataxia, circling to the left, delayed proprioception and absent menace response on the left and rotary nystagmus. A multifocal localisation was suspected. MRI revealed multiple well-defined cystic-like lesions at the level of the optic chiasm, left cerebellar hemisphere, left caudal midbrain and within the right caudal cranial fossa associated with the subarachnoid space. These lesions were markedly hyperintense on T2W and hypointense on T1W. At the level of the caudal cerebellar peduncle, there was a solid rounded contrast enhancing mass and isointense on T2W, being continuous with the choroid plexus of the fourth ventricle.
suggesting a choroid plexus tumour with ‘drop metastases’. Histopathology revealed cuboidal cell proliferation arranged in numerous papillae lined by one layer of cuboidal cells giving rise to rosettes and pseudorosettes embedded in fibrovascular stroma. Proliferating cells displayed very mild anisocytosis and anisokaryosis with less than one mitosis per 10hpf, confirming a choroid plexus papilloma WHO grade I at the level of the cerebellar flocculus with metastases in the ventral subarachnoid space, third and lateral ventricles. Atypical, multiple cystic lesions associated with choroid plexus papilloma metastases has rarely been discussed. This report highlights the importance of this major differential in the presence of this unusual and striking MRI finding.

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**Is acute polyradiculoneuritis painful in dogs?**

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In humans, Guillain-Barré syndrome is the most frequent acute idiopathic polyneuropathy (AIP). It is characterized by progressive weakness, starting in the legs and ascending to the arms and cranial muscles. Pain is a frequent symptom, manifesting in 72% of the cases, the intensity varying from mild to severe. The highest pain levels occur in the first 2 weeks, or the peak, near the end of the disease. Acute polyradiculoneuritis (APRN) is considered to be the canine analog of Guillain-Barré syndrome and the most frequent AIP in dogs. The ventral motor nerve roots in particular are affected. It is characterized by acute paraparesis, rapidly progressing to generalized lower motor neuron tetraparesis/tetraplegia. The dorsal sensory nerve roots are variably affected. Pain is rarely reported and generally accepted to be less pronounced and less frequent than in humans. Three dogs (2 Maltese and 1 Jack Russell terrier) with clinical, electrodiagnostic and histopathological evidence of APRN, almost continuously flexed/extended one or, more frequently, both hindlimbs, producing a dancing movement. In dog 1, these movements started shortly before typical clinical signs of APRN and continued shortly after these signs recovered. Treatment of dogs 1 and 3 with gabapentin for presumed neuropathic pain resulted in disappearance of these hindlimb movements after a few days of treatment only (dog 2 was not treated). Further research is necessary to know the prevalence and different kinds and mechanisms of pain in dogs with APRN in order to improve therapies for reduction of pain in both dogs and humans.

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**The influence of ketamine on thalamic metabolite concentration in idiopathic epileptic dogs and their healthy siblings**

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Administration of ketamine in idiopathic epilepsy (IE) is controversial as pre-existing neurotransmitter imbalance in IE dogs are suspected and possible convulsive effects of ketamine are reported. However, it is largely unknown to what extent this pre-existing imbalance affects the dog’s response to ketamine. Proton magnetic resonance spectroscopy (MRS) allows non-invasive in vivo measurements of brain metabolites including glutamate/glutamine (GLX) and GABA. The aim of this study was to investigate the effect of low dose ketamine on brain metabolites by MRS in IE dogs compared to healthy control dogs. We hypothesize that ketamine will increase brain GLX concentration in IE and healthy control dogs. 21 IE and 12 unaffected control dogs were prospectively enrolled. A standardized anaesthetic protocol was used. 3 Tesla MRS was performed in the thalamus before and 2 minutes after 1 mg kg^-1 intravenous ketamine administration. MRS data were analysed using LCModel software. Paired two-samples Wilcoxon test was used to assess changes induced by ketamine and differences between epileptic and non-epileptic dogs after normality testing. A p < 0.05 was considered statistically significant. The changes induced by ketamine were not significantly different GLX, but for the estimates of GABA to water ratio in IE (0.16 (-0.97 - 1.06) (median (range))) compared to healthy controls dogs (-0.20 (-0.95 - 0.68)). Measuring GABA concentrations using MRS is challenging and results should be interpreted with caution. Administration of low dose ketamine may result in changes in GABA, but not in GLX concentration in IE dogs compared to healthy control dogs.

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**Post-hemilaminectomy analgesia with intramuscular methadone or transdermal fentanyl in dogs**

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In spinal decompressive surgeries such as hemilaminectomy, the postoperative pain degree is considered intense, and there is growing interest in establishing adequate standards for analgesia in this period in dogs. This study aimed to evaluate analgesia using two μ receptor agonist opioids by two different routes of administration, transdermal for fentanyl (FT) and intramuscular for methadone (MI). Eight dogs from the hospital routine underwent thoracolumbar hemilaminectomy and intervertebral disc fenestration surgery to treat intervertebral disc extrusion. They were randomly assigned to two groups of equal number, transdermal fentanyl group (FT) and methadone group (MI). At the end of surgery, a fentanyl patch was applied to the animals in the FT group, remaining there for 72 hours. In the MI group, post-surgical analgesia was performed with intramuscular applications of methadone at intervals of six hours until 72 hours postoperatively. The animals were evaluated by the simplified form of the Glasgow Composite Pain Scale (SF-GCPS) every 2 hours in the first 24 hours, every 4 hours until completing 48 hours, and then a last evaluation at 72 hours postoperatively. The intra-class correlation coefficient among observers for the SF-GCPS was near-perfect (0.85). In the MI group there was need for three analgesic rescues, while in the FT group there was no rescue. In conclusion, both fentanyl and methadone provided satisfactory analgesia in the first three postoperative days in dogs undergoing thoracolumbar hemilaminectomy. Better stability in pain scores in the postoperative period was observed for animals treated with FT, as well as less occurrence of side effects in this group.

Focal spinal hyperesthesia as a prognostic factor in paraplegic dogs without deep pain perception

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Intervertebral disc extrusion (IVDE) is the most common cause of compressive injuries in spinal cord of dogs, whose prognosis is variable and depends on several factors, being the deep pain perception (DPP) considered the main parameter. Studies on new prognostic factors are assessed in order to provide more accurate estimates of functional recovery. Therefore, this study aimed to evaluate whether spinal hyperesthesia (SH) at the site of compression can be used as a prognostic factor for functional recovery of dogs with IVDE without DPP undergoing thoracolumbar hemilaminectomy. Among the 68 dogs included in this retrospective study, 73.5% (50/68) presented SH, and in 26.5% (18/68), pain was not identified. Recovery was satisfactory in 60% (30/50) of dogs with SH, and only in 27.7% (5/18) of dogs without SH, indicating that paraplegic dogs without DPP, but with presence of SH, have 2.2x more chances of recovering when compared to dogs without SH. The presence of SH in dogs without DPP may suggest the existence of sensory tracts, as well as preserved motor tracts at the injury site, which increase the chances of functional recovery. No studies were found that evaluated the SH measuring palpation of the spine as a prognostic factor, which reinforces the relevance of this study. In conclusion, spinal hyperesthesia at the site of compression in paraplegic dogs with thoracolumbar IVDE, without DPP, can be used as a possible prognostic indicator of functional recovery.

Suspected familial pituitary neoplasia in two dogs

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Pituitary tumours represent a high percentage of intracranial neoplasia in dogs and humans. In people, most occur sporadically, but inherited genetic predisposing factors are increasingly recognized. To our knowledge, familial pituitary neoplasia has not been reported in veterinary medicine. We herein report a family of French Bulldogs where two members developed a pituitary neoplasia. The first dog (mother), a 8-year-old, female neutered French Bulldog was presented to our hospital with complaints of worsening abnormal mentation and behaviour during the last two months. Abnormalities detected on neurological examination were indicative of a forebrain lesion. MRI revealed a large (21x23x26 mm) spheroidal mass in the sellar/parasellar region. A non-functional pituitary macroadenoma was suspected based on MRI characteristics and endocrine functional tests results. Supportive treatment and radiotherapy were established but the dog died during treatment. The owner declined autopsy. Three years later, the second dog (son), a 7-year-old, male non neutered French Bulldog was evaluated with similar clinical signs. A pituitary mass with the same characteristics as described for the first dog was observed on MRI although with a small size (16x16x18 mm). Supportive treatment and radiotherapy were established, and the dog is still alive. Familial isolated pituitary tumours in humans are a well-known clinical entity and account for 2-3% of pituitary neoplasia. Our report highlights the need for genetic studies to confirm the presence of this hereditary tumour in dogs because, in people, this neoplasia tends to affect young patients, to present as macroadenomas and often is relatively difficult to control.
A case of globoid cell leukodystrophy firstly identified in Russia in a 3-month-old West Highland white terrier (WHWT) puppy confirmed by MRI, histopathology, and a genetic test

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Globoid cell leukodystrophy (Krabbe disease) is a genetic disorder, caused by mutation in a gene encoding galactosylceramidase resulting in the accumulation of galactosylsphingosine (psychosine) which consequently leads to the loss of myelin, reactive astrocitosis, and formation of globoid cells. A 3-month-old WHWT male puppy with a 21-day progressive paraparesis of the pelvic limbs and urinary incontinence was presented to the clinic. The neurological examination showed ambulatory paraparesis of the pelvic limbs, reduced patellar reflex, disorientation, aggressive behavior, positional bilateral vertical nystagmus, and signs of headache. Complete blood count and biochemistry, radiography and MRI of the thoracolumbar region were all within normal limits. MRI of the brain showed a bilateral symmetrical hypertensive lesion on T2 weighted images (WI) of the white matter at the level of rhinencephalon, corona radiata, occipital lobes, cerebellum hemisphere, and medulla, as well as decreased signal intensity on T2WI of the thalamus, caudate nucleus, midbrain and pons. The absence of corpus colosseum, reduced cerebellum size was also identified. Due to the overall negative prognosis, the animal was euthanized. Results of sequencing showed point substitution 473A>C within both alleles of GALC gene. The autopsy showed inclusion of globoid cells and macrophage infiltration of the white matter. To our knowledge, this is the first described globoid cell leukodystrophy case in Russia, confirmed by a pathomorphological evolution and DNA analysis. It means that 473A>C mutation can lead to Krabbe disease independently of geographical origin of an animal. Moreover, some of the mentioned MRI changes have never been described before.

Disseminated Mycobacterium tuberculosis infection presented initially as myelitis in a dog

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A 1-year old male neutered mixed-breed dog presented with 2-month progressive pelvic-limb ataxia, diffuse spinal pain, joint swelling and intermittent fever. MRI of the spine was not performed due to financial issue. CSF analysis revealed mild mononuclear pleocytosis, while synovial fluid analysis revealed neutrophilic pleocytosis. ANA titer was >320. Pathogen screening tests, including CSF and synovial fluid bacterial culture, Cryptococcus antigen test, PCR of canine distemper virus, Babesia, Ehrlichia and Toxoplasma in blood and CSF, were all negative, except positive serum Ehrlichia antibody. Initially, the patient was treated with doxycycline for suspected ehrlichial meningomyelitis and arthritis, but with minimal improvement. Treatment was then switched to immunosuppressive dosage of prednisolone, targeting systemic lupus erythematosus or steroid responsive meningitis-arteritis. Clinical signs improved in the first 2 weeks, remained static for 5 weeks, but later deteriorated into tetraparesis, obtundation, hematuria, and sepsis at 12th week following treatment. The patient was euthanized. Post-mortem examination revealed multifocal granulomatous lymphoplasmacytic meningoencephalomyelitis and disseminated pyogranulomatous inflammation in multiple organs, including kidneys and lungs. Intralysosomal fast positive rods were detected and Mycobacterium tuberculosis was confirmed by PCR. This case report demonstrated that neurological symptoms, especially signs suggestive of myelitis, can be the initial presentation for M. tuberculosis infection in dogs. In countries with low incidence rates in human, M. tuberculosis infection in companion animals is considered rare. Due to the non-specific clinical presentation and the difficulties of cultivating M. tuberculosis, achieving the ante-mortem diagnosis would be challenging unless clinicians were aware of this differential diagnosis.

Uncommon manifestation of a canine pheochromocytoma. A case report

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A 9-year-old male neutered Golden Retriever was presented with a history of acute onset deteriorating cervical pain. The dog was normal on general physical and neurological examination. Magnetic Resonance Imaging of the cervical spine revealed a focal, extramedullary, infiltrative, poorly demarcated, heterogeneous mass with moderate contrast enhancement at the level of the left cranial articular process of the axis (C2), leading to an osteolysis and pathological fracture of C2 as well as marked soft tissue trauma. Due to severe
findings and the grave prognosis, the dog was euthanized. At post-mortem examination, the right adrenal gland was severely enlarged as a result of a neoplasm arising from the adrenal medulla. C2 was lytic with surrounding musculature displaying a white, well-demarcated, tough mass lesion. In addition, there were neoplastic growths in and adjacent to the prostate and pulmonary lymph nodes. Based on gross, histologic and immunohistochemical findings, a pheochromocytoma (PCC) originating from the right adrenal gland was diagnosed which metastasized into the cervical vertebral column, prostate and pulmonary lymph nodes. PCCs are endocrine tumors derived from chromaffin cells, that can metastasize and invasively infiltrate into the caudal vena cava. Depending on their potential to produce catecholamines, they can also lead to cardiovascular, respiratory and/or gastrointestinal clinical signs. In conclusion, this case report highlights the variable manifestation of PCC regarding clinical signs and distribution of metastases. PCC should be considered as a differential diagnosis for cervical pain in elderly patients without other clinical signs for PCC.

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Unspecific clinical signs as polydipsia, polyuria, ataxia and behavioral changes are known side effects of antiseizure drugs (ASD) in dogs and reduce quality of life (QoL) of dogs and their owners. Concurrent diseases like lower urinary tract infections (lowUTI) might be mis-interpreted as side effects in dogs receiving ASD therapy. Five dogs were identified during recruitment for an idiopathic epilepsy (IE) treatment trial with ethical permission. Of these animals (n = 38; female n = 17, male n = 21); five (13.16%) dogs were diagnosed with lowUTI caused by E. coli. Affected dogs were female (intact n = 3; neutered n = 2), weighting over 20 kg. Therapy was phenobarbitone (PhB; n = 5, >3 months), potassium bromide add-on therapy (n = 2). Reported chronic side effects were: mild ataxia, polyuria/polydipsia, behavioral changes, polyphagia and recent deterioration consisting of restlessness (n = 5), apathy (n = 4), overgrooming anogenital region (n = 2), marked ataxia (n = 2), incontinence (n = 2), exercise intolerance (n = 1) and malodor (n = 1). Pyuria, hematuria and bacteriuria were detected in affected dogs. Urine analysis revealed positive nitrite (n = 2), proteinuria (n = 2) and specific gravity (mean: 1015.6, range: 1002-1022) before antibiotic treatment. E. coli (>10⁶ CFU/ml) was isolated from cystocentesis samples in all dogs. Amoxicillin-clavulanic acid (13.15 mg/kg BID, n = 34) therapy improved the condition of all dogs within 24-48 hours. Samples of urine were unremarkable at follow-up. Clinical signs were misinterpreted for weeks in each dog, reducing QoL, potentially aggravating epilepsy. Further studies are needed if polydipsia and diluted urine in dogs treated with ASDs can increase risk for lowUTI in addition to potential immunosuppressive effect of PhB.

Should we treat canine drug-resistant idiopathic epilepsy with antibiotics?

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Despite the administration of anti-seizure drugs (ASDs), 30% of dogs with idiopathic epilepsy (IE) are drug-resistant. Therefore, the search for non-drug treatment alternatives is important. We evaluated the effect of amoxicillin-clavulanic acid on the epileptic seizure frequency and cluster seizures canal drug-resistant IE. A dog with drug-resistant IE of 7.5 months duration became seizure free during an amoxicillin-clavulanic acid treatment of 4 weeks duration for an infectious mono-arthritis. Based on that observation, 4 other dogs with drug-resistant IE were given amoxicillin-clavulanic acid in order to improve their epileptic seizure control. The mean epileptic seizure frequency of these 5 dogs was 3 seizures/week (range 2-7) with a mean cluster seizure frequency of 1 cluster/week (range 0-2) during 2 months prior to antibiotic administration. The mean duration of antibiotic administration was 32 days (range 21-64 days). During amoxicillin-clavulanic acid administration, 3 dogs showed seizure freedom. 1 dog showed an 80% decrease of both epileptic seizure and epileptic cluster frequency, and 1 dog showed an increase in epileptic seizure and epileptic cluster frequency of 54% and 38%, respectively. In the 2-month follow-up period after cessation of antibiotic administration, the mean epileptic seizure and mean cluster frequency increased again to 1.5 seizures/week (range 1-3) and 0.4 clusters/week (range 0-1), respectively. In these dogs, it was suggested that antibiotic administration generated an altered gut microbiome. This report suggests the presence of a canine gut-brain axis and manipulation of this axis may offer beneficial effects in the epileptic seizure control of dogs with drug-resistant IE.

Use of leflunomide as a part of combined treatment and as monotherapy in comparison with the standard treatment protocols in animals with meningoencephalitis of unknown origin (MUO)

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MUE is an immune-mediated disease of the central nervous system (CNS) in dogs. The usage of immunosuppressive drugs can improve clinical signs and delay the progression of the disease. Several drugs such as glucocorticosteroids, cytarabine, cyclosporine, and azathioprine are generally used to treat MUO and considered as standard treatment in combination or alone. However, due to the COVID-19 pandemic, the availability of some of these drugs remains limited, suggesting the need for evaluation of alternative medications for treatment MUO, such as leflunomide. 16 dogs with MUO receiving leflunomide with additional immunosuppressive agents have been retrospectively compared with a group of 51 dogs receiving standard treatment. Clinical picture and MRI results consistent with MUO were the inclusion criteria as well as the presence of inflammatory cerebrospinal fluid in some animals. In the leflunomide group treatment started with standard therapy combined with leflunomide in dose 1.1-6.6 mg/kg (mean 3.0 mg/kg). The statistical analysis was performed using the Kaplan-Meier method, log-rank test, and Pearson’s chi-square test. The results didn’t show any statistically significant differences in survival, however the mean survival time in the leflunomide group was 693 days in comparison with 809 days in the
Successful use of intravenous human immunoglobulin for treatment of suspected acute polyradiculoneuropathy in a cat

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Successful use of intravenous human immunoglobulin for the treatment of suspected acute polyradiculoneuropathy in a cat. This is the first case reporting the safe and successful use of IVIg for the treatment of acute polyradiculoneuropathy in a dog.

Clinical use of toceranib in the treatment of glioma in a dog

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Gliomas are common CNS tumors affecting dogs, generally presenting a rapid, fatal outcome. Clinical signs are amplified by associated vascular events. Clinical and surgical treatments fail to improve survival. Radiotherapy presents better results, although with high financial costs. Gliomas are fast-growing tumors and, therefore, must induce extensive vascular network, generally by expressing cytokines that promotes extensive neovascularization. Anti-angiogenic drug therapy has been shown to be an interesting alternative in the management of different tumor types, although with variable results. Tyrosine kinase receptors are involved in several important metabolic steps to regulate cell growth and differentiation, and their dysfunctions have already been shown to be an important cause of neoplasia. We evaluated toceranib (Palladia, Zoetis) as the only treatment for a 13-year-old female Shih-Tzu dog, presenting focal epileptic seizures and subacute onset of behavioral changes. Magnetic resonance imaging (MRI) showed an intra-axial lesion in the right frontoparietal lobe, with moderate perilesional vasogenic edema. Biopsy of the lesion showed results compatible with high-grade astrocytoma. Prednisone and phenobarbital were associated. After 6 months, a follow up MRI showed total regression of the tumoral mass, and normalization of the brain parenchyma, with only one small non-contrast enhanced hyposignal area in T1 remaining in the center of the previous lesion. No adverse clinical and laboratory signs were noted on the dog until the follow-up was lost after one year. We believe this finding indicates a need for a larger scale study, to better understand the effects of toceranib in the treatment of gliomas in dogs.

Research on the use of IVIg for the treatment of acute polyradiculoneuropathy in a cat.

A 1-year-old male neutered Savannah cat presented for rapidly progressive non-ambulatory tetraparesis. The onset of neurological abnormalities was first noted 24 hours after a vaccine booster, and consisted of cerebellar signs, that lasted 48 hours and spontaneously resolved. Paraparesis was then noted after a week, which progressed, and two days later the cat re-presented and had non-ambulatory tetraparesis with minimal voluntary motor function in all limbs and tail, absent spinal and palpebral reflexes, and difficulty vocalising. An acute polyradiculoneuropathy was suspected. Supportive care and one dose of dexamethasone (0.3 mg/kg IV) were administered, but within 12 hours the clinical signs progressed to tetraplegia and severe hyperventilation with lack of chest excursions. The cat was anaesthetised for mechanical ventilation. After 12 hours, treatment with intravenous human immunoglobulin (IVIg) was attempted via infusion over 6 hours. No adverse reactions were noted. The patient developed aspiration pneumonia later that day and antibiotic treatment was started. Approximately 36 hours since the start of mechanical ventilation, gradual weaning off the ventilator was successfully achieved. Afterwards, the patient demonstrated improved voluntary motor function compared to admission. The following morning, the cat was ambulatory with mild tetraparesis, and able to vocalise normally. At the rec-heck, 2 weeks later, the physical and neurological examination were normal. The use of IVIg for treatment of Guillain-Barré syndrome in humans and Acute Idiopathic Polyradiculoneuritis in dogs has been described, this is the first case reporting the safe and successful use of IVIg for the treatment of acute polyradiculoneuropathy in a cat.

Peracute and severe neck pain associated with thickening of the dorsal atlanto-axial ligament on CT in three dogs

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Traumatic and congenital lesions of the atlanto-axial joint are generally known and thoroughly discussed in veterinary literature. We would like to present three dogs with possibly trauma-induced severe neck pain associated with an abnormal dorsal atlanto-axial ligament (DAL) on CT imaging. A 3-year-old Border Collie, a 1-year-old Barbet and a 9-month-old Boxer presented with acute and severe neck pain. Acute onset during frisbee playing (Border Collie) and after rolling over (Boxer) were witnessed. Treatment with NSAIDs caused only
slight temporary improvement. Severe neck pain was the only abnormality on neurological examination. Complete blood count and serum biochemistry profile were within normal limits in all dogs, except for a moderately increased CRP (30.2, 40.7 and 60.6 mg/l; RI <10 mg/l). A CT scan of the cervical vertebral column revealed irregular thickening of the DAL in all three dogs and presence of heterogenous contrast enhancement. No spinal cord compression or osseus abnormalities were seen. In all dogs, placement of an external splint caused immediate relief of clinical signs. Complete resolution of clinical signs was obtained after 1-5 months in all dogs. Follow-up CT was performed in one dog (Boxer) after 4 weeks, revealing normalisation of the DAL. Thickening and possible secondary inflammation of the DAL can be found on CT examination in dogs with peracute and severe neck pain and might be related to hyperflexion/extension of the atlanto-axial joint as is seen in whiplash in people. The condition carries an excellent prognosis after external splinting which can be removed after normalisation of CRP values and eventually CT findings.

[50]

Calvarial idiopathic hyperostosis syndrome producing skull pain in a young pit bull terrier

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Calvarial Idiopathic Hyperostosis Syndrome (CHS) is a self-limiting benign disease of skull not very reported in veterinary medicine characterized by a proliferative osseous lesion of the skull. In this case we describe a CHS in a young male Pit Bull Terrier producing severe skull pain. A 6-month-old intact male of Pit Bull Terrier presented to the University of Murcia Teaching Hospital for evaluation of a severe swelling of the right side of the head of two weeks of progression. The dog was lethargic and physical examination showed pyrexia, a moderate oculus sinister exophthalmos and lateral globe deviation with severe inflammation and pain of the frontal and occipital bones area. A complete hematology and biochemistry did not show relevant abnormalities. Computed Tomography (CT) revealed thickening and increased attenuation of the right frontal, parietal and occipital bones. An expansive lesion with heterogeneous attenuation was observed affecting the frontal bones. This lesion presented irregular but well-defined borders that obliterated part of the right frontal sinus, causing slight lateral displacement of the ipsilateral eyeball. A CHS was diagnosed and meloxicam and omperazol was the treatment selected. The clinical signs improved, although suffered a new relapse two weeks later. As CHS has been purported to be associated with bacterial osteomyelitis, a treatment with metronidazole and enrofloxacin was added. The dog improved, although symptoms persisted until the animal was 1 year-old. In summary, the CHS is a shelf-limiting process that it should be treated with non-steroids anti-inflammatory agents and antibiotics until the animals reach skeletal maturity.

[51]

Normal hypocretin-1 levels in a dog with suspected acquired narcolepsy-cataplexy

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Narcolepsy is an infrequent disorder characterized by abnormalities of the sleep-wake cycle and cataplexy, produced by alterations in hypocretin and its receptors. Familial narcolepsy in dogs is caused by mutations in the hypocretin receptor-2 gene, and early onset of signs is observed. Acquired narcolepsy has been associated to loss of hypocretin producing neurons in the hypothalamus, which causes markedly decreased hypocretin-1 levels in CSF. A 6-year-old male Fox Terrier was referred for an acute onset of collapsing episodes triggered by food or excitement. Episodes consisted of sudden skeletal muscle atonia followed or not by REM sleep, consistent with narcolepsy-cataplexy. Approximately 20-30 daily episodes were reported. Neurological examination was normal except for obtundation, and collapsing episodes occurred every few minutes on consultation. Arterial blood pressure, complete blood analysis, cortisol levels, serum ELISA assay for *Leishmania infantum* and *Ehrlichia ewingii*, echocardiography, electrocardiography during the collapsing episodes, abdominal ultrasound, thoracic radiographs, MRI scan of the head and cerebrospinal fluid (CSF) analysis were unremarkable. CSF hypocretin-1 levels were within normal limits (229.78 pg/mL; ref > 110 pg/mL). A presumptive diagnosis of acquired narcolepsy was established due to the pathognomonat cataplexy episodes. Treatment with prednisolone (4 mg/kg followed by tapering dose) and clomipramine resulted in partial response. Clomipramine was substituted for venlafaxine, and marked improvement was achieved. Acquired adult-onset narcolepsy with normal CSF hypocretin-1 levels has only been reported in one dog with a pituitary macrotumour. The case reported here supports the existence of different pathophysiologic mechanisms, probably targeting different brain localizations, implicated in acquired narcolepsy in dogs.

[52]

Prevalence of neurological disorders in pug dogs in the United Kingdom: A single centre retrospective study - Preliminary analysis
Polyglucosan body neuropathy meets inflammatory demyelination – A rare adult overlap syndrome in a neuromuscular cat

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Immune-mediated polyneuropathy (IMPN) accounts for about 65% of PNS diseases in cats. Most IMPNs present with sudden onset early in life but they may occur throughout lifetime with variable courses and neuromuscular signs. Herein, we describe a case, in which neuromuscular dysfunction was due to IMPN on top of another lateonset neuropathy in a cat. A 12-year old, male-neutered Domestic Shorthair cat was admitted due to progressive gait abnormalities for 1 year. Neurological examination revealed head tremor, paraparesis and tetraataxia, accentuated in hindlimbs. On electromyography, spontaneous activity was recorded from multiple front and hindlimb muscles. Decreased motor nerve conduction velocity was seen in tibial and peroneal nerves, and muscle action potential was reduced in ulnar nerve upon proximal stimulation. Nerve and muscle biopsies revealed extensive intraaxonal polyglucosan bodies next to chronic-active inflammatory demyelination of large myelinated fibres. Polyglucosan bodies are a common incidental finding in CNS of geriatric people, dogs and cats. Their occurrence in peripheral axons even at high age is rare and restricted to individual fibres. Widespread abundance and association to progressive neurological dysfunction is a feature of adult-onset polyglucosan body disease (APBD) in people, a rare variant of genetic glycogen storage disorders. Search of the neuromuscular archive led to one single other case of polyglucosan body neuropathy overlapping with chronic inflammatory demyelinating polyneuropathy (CIDP)-type of IMPN in a 13-year old cat. The metabolic cause of APBD in cats and whether pure occurrence without inflammation would have manifested clinically is yet unclear as is the efficacy of immunotherapy.
Comparative study into intervertebral disc disease in English Cocker Spaniels, French bulldogs and dachshunds

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This study aims to describe the anatomical distribution and clinical features of intervertebral disc extrusions (IVDE) in English Cocker Spaniels (ECS), Dachshunds and French Bulldogs (FBD) and compare the relative risk for them to experience cervical extrusions. A retrospective, multicentre study was designed and a total of 951 dogs were included: 474 dachshunds, 332 FBS and 145 ECS with IVDEs. The imaging data bases at two referral hospitals were searched for dogs of the desired breeds which experienced IVDE between January 2015 to December 2020. IVDE location, signalment, clinical signs and neurological examination findings were recorded. IVDE locations were classified as cervical (C1/2-C5/6), cervicothoracic (C6/7-T2/3), thoracolumbar (T9/10-L3/4) or lumbosacral (L4/5-L7/S1). The results showed ECS distribution for cervical, cervicothoracic, thoracolumbar and lumbosacral were 24%, 3%, 52% and 21% respectively. Dachshunds showed a distribution of 3%, 1%, 92% and 3%. FBD showed a distribution of 33%, 0%, 54% and 12%. The median age of extrusion presentation was higher in the ECS (8 years) vs Dachshunds and FBD (5 years and 3 years old respectively). ECS were more likely to experience IVDEs between C1-T2 than Dachshunds (OR 9.90; 95% CI 5.39-18.16) but less likely than FBDs (OR 0.73; 95% CI 0.48-1.13). Chi squared showed a significant difference when comparing ECS to Dachshunds (P < 0.001) but not when comparing ECS and FBDs (P = 0.158). In conclusion, cervical extrusions are more common in the FBDs compared to the ECS and Dachshund. ECS are more likely to experience IVDEs at an older median age than FBS and Dachshunds.

Old dog-new tricks - Suspected MUO in two Australian shepherd dogs: A case series

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Meningoencephalitis of unknown origin (MUO) is mostly considered a disease of small and terrier breeds aged between approximately three and seven years, with a recent study stating that 25% of MUO cases affect large breeds, with no Australian Shepherds listed until now. In this case study, 2 Australian Shepherds, 10 and 11 years old, were presented with progressive clinical signs of multifocal encephalopathy. Magnetic resonance imaging (MRI) revealed multifocal, intraaxial lesions of the cerebral cortic grey matter in one dog and cerebellar and thalamic grey matter in the other dog respectively. Lesions were hyperintense in T2W and fluid-attenuated inversion recovery sequence with no to mild inhomogeneous contrast enhancement. A diagnosis of MUO was based on diagnostic imaging, cerebrospinal fluid findings, negative regional infectious titres and good response to immunomodulatory therapy. Both dogs had serial MRIs. Follow-up MRI examination after 3 months showed complete resolution of MRI abnormalities in one dog treated with cytarabine and prednisolone. The other dog showed recurrence of clinical signs 23 months after diagnosis and tapering of prednisolone. Re-MRI showed multifocal de novo lesions. After start of cytarabine and prednisolone treatment, clinical signs improved again. The dog is still alive at the time of writing, the other was lost to follow up 5 months after the diagnosis. In conclusion, MUO should be on the differential list also in elderly patients, which can have good outcomes with immunomodulatory therapy. Further studies are needed to explore if Australian Shepherds are at an increased risk of MUOs at senior age.

Epidural and synovial lipomatosis in a 3-year old Eurasian dog receiving sustained steroid therapy

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A 3-year-old male neutered Eurasian dog was presented for evaluation of a several week history of hindlimb paresis, urinary incontinence and loss of appetite. He was treated with immunosuppressive dosages of prednisolone for 2 years for chronic inflammatory enteropathy, and with cyclosporine and leflunomide for 3 months for a suspicion of primary immune-mediated polyarthritis. However, impaired locomotion persisted. Upon presentation, a mild paraparesis was noted. Diffuse pain upon thoraco-lumbar palpation was elicited. CT myelography and MRI revealed an extradural mass extending from T8 to L3 causing dorsal compression and ventral displacement of the spinal cord. Tomographic and MRI findings were consistent with fat. Because of the lack of improvement, the dog was euthanized. Histopathological examination showed tightly packed together mature adipocytes in the ependymal mass and in the tarsal synovial membrane.
compatible with lipomatosis. Lipomatous tissue is defined as an overgrowth of non-encapsulated adipose tissue. Some predisposing factors described in humans are reported in this case: long-term steroid treatment, which is the main factor associated with spinal epidural lipomatosis in humans, and possible aberrant handling of fat substrates related to enteritis.

**[P58]**

Ventriculoperitoneal shunting and radiation therapy treatment in a cat with a suspected choroid plexus tumour and hypertensive hydrocephalus

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Radiation therapy (RT) is an established treatment choice for inoperable intracranial tumours in cats. Ventriculoperitoneal shunts (VPS) placement has been described for the treatment of hydrocephalus secondary to intraventricular tumours in dogs. To the best of the authors knowledge, this is the first report of successful VPS placement and subsequent RT treatment in a cat with a suspected choroid plexus tumour causing hypertensive obstructive hydrocephalus. A 14-year-old male DSH was presented for a history of behavioural changes and urinary incontinence. The neurological examination was consistent with a right forebrain lesion and suspected raised intracranial pressure (ICP). Brain MRI revealed an intraventricular multilobulated well-defined T2W-hyperintense and T1W-hypointense, markedly contrast enhancing mass lesion within the dorsal aspect of the third ventricle, causing hypertensive obstructive hydrocephalus. A VPS was placed within the left lateral ventricle, followed by a RT course of 45-Gray total dose in 18 daily fractions. At the time of writing, 6-months post-RT and 4-months after cessation of prednisolone treatment, the patient remained neurologically normal. 6-months post-RT follow-up CT revealed mild reduction in the mass size and resolution of the hydrocephalus. Raised ICP causes severe clinical signs, can lead to brain ischaemia and herniation and significantly increases anaesthetic risk during RT treatment. VPS placement in cats with hypertensive obstructive hydrocephalus may allow immediate resolution of neurological signs due to raised ICP, and therefore a safer RT treatment.

**[P59]**

Multiple ischemic lacunar infarct in three Eurasier with suspected primary hyperlipidaemia

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Primary hyperlipidaemia (PH) is rare in dogs, a genetic disorder has been suspected in Miniature Schnauzer; PH has never been reported in Eurasier. Three Eurasier (2 siblings), median age 19 months (range: 15-22 months), were evaluated for vestibular and forebrain signs. The neurolocalisation was at the central vestibular system (2/3) and forebrain (1/3). MRI found multiple ischemic lacunar infarcts mostly involving thalamus, midbrain and the forebrain (territory of the caudal perforating artery and caudal and medial cerebral arteries). Biochemistry profile revealed severe hypercholesterolaemia (median 926, 6 mg/dl; Ri: 156-369 mg/dl) and mild hypertriglyceridemia (median 188.33 mg/dl; Ri 30-112 mg/dl); the rest of the blood work-up including screening for endocrine disease, urine analysis and CSF was unremarkable. Two dogs were treated with low-fat diet, omega-3 supplementations and either bezafibrate or artovastatin with a reduction of cholesterol and triglycerides levels and good long-term control of clinical signs. One dog rapidly deteriorated and died. Post-mortem examination and MRI were performed. Histopathology revealed diffuse atherosclerosis of the cerebral arteries, circle of Willis and basilar artery with thickening of the intima and media caused by deposition of cholesterol-like clefts associated to areas of ischemic necrosis, reflecting the MRI changes. The increased risks for atherosclerosis and subsequently cerebrovascular accidents in patients affected by severe hypercholesterolaemia is well documented in human medical literature and less common in animals. In these cases, no predisposing diseases were found and therefore hyperlipidaemia was thought to be primary. In light of the close genetic background of these dogs, a hereditary disorder was postulated but further research is required.

**[P60]**

Generalized idiopathic polymyositis mimicking masticatory muscle myositis in a dog

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Masticatory muscle myositis and generalized idiopathic polymyositis are the most common immune-mediated inflammatory myopathies in dogs. Unlike human medicine, where the diagnosis and classification of inflammatory myopathies have continuously evolved over the last decades with the combination of histopathological and immunohistochemical evaluation and identification of myositis-specific
autoantibodies, in dogs, the latter has only been described in masticatory muscle myositis. We report a dog that presented with subacute spontaneous pain when chewing or eating and exophthalmos, followed by chronic progressive masticatory muscle atrophy and enophthalmos. Creatine kinase activity was drastically increased (8,180 UI/L). Electromyography showed abnormal spontaneous activity in masseter and temporalis muscles only. These findings were tentatively consistent with masticatory muscle myositis. Serological autoantibodies against type 2M myofibers were negative. Histological and immunohistochemical examinations of the temporal muscle showed marked diffuse endomysial mononuclear cellular infiltration, mainly composed by CD8+ cells, with non-necrotic myofiber invasion, signs of regeneration and marked interstitial fibrosis. Strikingly, similar but milder changes were observed in triceps brachii muscle. Serological and/or PCR testing for neosporosis, toxoplasmosis, leishmaniosis and tick-borne diseases were negative. Taking together, these findings led to the diagnosis of generalized idiopathic polymyositis. Immunosuppressive treatment with prednisolone allowed clinical and biochemical remission. Eight weeks after, relapse was diagnosed based on increased creatine kinase activity elevation (1,679 UI/L). Prednisolone treatment was started over with azathioprine as add-on therapy. Both treatments were progressively and alternatively tapered with satisfactory outcomes. This case highlights the requirement for multiple muscle biopsies and appeals for extended immunohistochemical studies in canine inflammatory myopathies.

Canine protothecosis causing severe ventriculitis in a dog

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Canine Protothecosis (CP) is an uncommon infectious disease, being Prototheca zopfii the most common identified species in dogs. Magnetic resonance imaging (MRI) description of central Nervous System lesions produced by CP in small animals is limited to four case reports and mainly consists of intraparenchymal lesions frequently surrounding the lateral ventricles. Suspected mild ependymitis was observed in one case. The aim of this case report is to describe new MRI features in a dog with histopathological confirmed CP. A 5-year-old male crossbreed dog was referred due to a 2-months history of lethargy, hyporexia, diarrhea, weight and vision loss, and lumbar pain. Physical examination was unremarkable. Neurological examination was consistent with multifocal neurolocalization involving forebrain and spinal cord. Complete bloodwork, thoracic radiographs and abdominal ultrasound did not reveal abnormalities. MRI of the head showed severe thickening and enhancement of choroid plexuses, meningeal and ependymal contrast enhancement, multifocal intraparenchymal lesions involving caudate nuclei, hippocampus, thalamus, piriform lobes and corpus callosum, consistent with multifocal inflammatory-infectious disease. Cerebrospinal fluid showed marked mixed pleocytosis. PCR for standard infectious agents were negative. Protothecosis was diagnosed by rectal scrapes and subretinal fluid citology. Despite treatment with itraconazole, prednisolone, and metronidazole, neurological signs progressed and the dog was euthanized two weeks later. Histopathology showed severe pyogranulomatous choroid-ventricle meningoencephalitis secondary to protothecosis. To our knowledge, this is the first description of severe ventriculitis associated to protothecosis in a dog. CP should be included in the differential diagnosis of ventriculitis visualized on MRI in dogs.

Diagnosis and treatment of a type IV dermoid sinus in a Cavalier King Charles Spaniel in the frontal region

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Congenital neural tube development defects, such as a dermoid sinus/cyst, have been identified in Rhodesian Ridgeback dogs and in several other breeds, mostly located along the dorsal spine but rarely in the cervical and head region. A 6 years old, male neutered Cavalier King Charles Spaniel was presented with a four years history of an intermittently draining orifice on the midline of the frontal bone of the skull. Neurological examination was normal. Magnetic resonance imaging and a computed tomography scan of the head revealed an extra-axial mass in the midline between the frontal lobes, contacting the meninges and extending rostrally through a defect in the frontal bone. A cerebrospinal fluid analysis showed a mild mononuclear pleocytosis and negative bacterial culture, consistent with a non-infectious inflammatory response. Surgery was performed and the mass was removed via a frontal craniotomy. Histopathology of the mass found stratified squamous and keratinising epithelium with adnexal structures, which was consistent with a diagnosis of a dermoid sinus. Five months after the surgical treatment a self-limiting discharge was observed at the level of the scar. However, repeat magnetic resonance imaging failed to identify the underlying reason. This is the first report of a type IV dermoid sinus in the frontal region including advanced imaging illustration of the disease.
**ABSTRACT**

88-month-old meerkat (Suricata suricatta) is referred to the neurology service of the hospital for tonic-clonic epileptiform seizures for two weeks. The physical examination and neurological was normal. Bloodtest, x-rays and ultrasound did not reveal abnormalities that justified the patient’s symptoms. The neurological location was in the thalamus-cortex. The most likely differential diagnosis was epilepsy of unknown origin or structural epilepsy, with meningoencephalitis of infectious origin being the most likely diagnosis. Magnetic resonance imaging (MRI) revealed hyperintensity in T2W and FLAIR in both piriform lobes, which could be due to a postictal finding. The rest of the brain, brainstem, and brainstem structures were normal. Cerebrospinal Fluid analysis (CSF) don’t revealed pleocytosis and protein level was normal (23 mg/dl). Laboratory results are PCR negative for distemper, toxoplasma, and neospora. Anticonvulsant treatment with levetiracetam was used at dose 10 mg/kg each 8 hour. After treatment, the patient improves clinically and presents a reduction in seizure frequency. At the time of writing this clinical case, the animal is still alive and stable. To the author’s knowledge this is the first report of epilepsy of unknown origin in a meerkat. Given the limited bibliography of this type of pathologies in this species, we have no precedents of cases. Periodic controls will be carried out, assessing the improvement or not of the patient and they will be described.

**Cervical pain secondary to cervical vertebral venous thrombosis presumed to be associated with iatrogenic hyperadrenocorticism**

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A 3.5-year-old neutered mixed-breed dog was presented for an acute-onset of cervical hyperesthesia and reluctance to move for 24 hours. He's been treated for one month with corticosteroid (prednisolone 0.4 mg/kg, q12h, PO) for an immune-mediated polyarthritis presumed type I. Only strong cervical hyperesthesia was present. A complete blood count detected a stress leukogram pattern. C-reactive protein dosage was within reference interval. A computed tomography scanner of the cervical region highlighted a medullary compressive internal vertebral venous plexus (IVVP) and vertebral veins (VV) distention. It extended from vertebrae C1 to C6 with a filling defect of their lumen, evocative of thrombosis. Causes of a hypercoagulable state were investigated. Coagulation assessment revealed a severe reduction of antithrombin activity with no underlying cause of loss or production defect. An excessive consumption was suspected. By exclusion, hypercoagulable state was suspected to be secondary to iatrogenic hyperadrenocorticism caused by the corticosteroid treatment. Corticosteroid dose was rapidly decreased at that time then tapered off over 1.5 months. An anticoagulant therapy (clopidogrel 1.0 mg/KG, q24h, PO and rivaroxaban, 0.82/kg, q24h, PO) was immediately initiated. Hemostasis profile, including antithrombin activity, was within reference value after one month. A follow-up computed tomography scan performed at 3 months,
showed normal cervical spine with resolution of vessels’ abnormalities. Anticoagulant therapy was stopped. The dog is still alive and free of clinical signs at time of writing. This is the first case report of cervical IVVP and VV thrombosis in a dog suspected to be due to iatrogenic hyperadrenocorticism with a complete resolution of lesions after tapering off corticosteroid treatment.

Clinical presentation, diagnostic findings and outcome of presumed idiopathic hypoglossal mononeuropathy in a cat

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Hypoglossal Nerve (HN) dysfunction may cause atrophy, asymmetry, or deviation of the tongue. This dysfunction could be related with caudal medulla lesions, or with neuropathy of the HN. Unilateral hypoglossal mononeuropathy are widely described in human medicine. The purpose of this case report is to describe clinical presentation, diagnostic findings and outcome of a hypoglossal mononeuropathy in a cat. A four-year-old neutered male Norwegian forest cat presented with a one-week history of abnormal movement of the tongue and difficulty in grooming behaviour. Neurological examination revealed deviation of the tongue toward the right side, asymmetry due to atrophy of the left side and ipsilateral muscle fasciculations. Also, ptyalism was detected on the left side. Complete bloodwork including serum total T4, magnetic resonance imaging of the head and cerebrospinal fluid analysis were unremarkable. Electromyography of the tongue showed spontaneous fibrillation potentials and positive sharp waves on the left side of the tongue. The cat was discharged without treatment. On consultation follow-up three weeks later, the cat showed an improvement of the clinical signs with a complete recovery two months after the diagnosis. Due to the lack of abnormal findings and spontaneous resolution, a diagnosis of presumed idiopathic left hypoglossal neuropathy was established. No relapses have been reported after 36 months. The main differential diagnosis of unilateral tongue atrophy in veterinary medicine includes neoplasias (meningioma, peripheral nerve sheath tumour) and atlanto-occipital luxation. In the author’s knowledge, this is the first report describing a suspected idiopathic hypoglossal dysfunction in a cat.

Ultrasound-guided erector spinae interfascial plane block for spinal surgery in three cats

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The Erector spinae plane (ESP) block consists of an interfascial injection of local anaesthetic between the erector spinae muscle group and the transverse processes of the thoracic vertebrae. This block targets the dorsal rami of the thoracic spinal nerves to desensitise the cutaneous area near the dorsal midline, the paraspinal muscles, the dorsal vertebral laminae and the facet joints. The purpose of this case series is to describe the perioperative analgesic effect and complications of ultrasound guided ESP block with bupivacaine in three cats undergoing spinal surgery. The surgical procedures performed were hemilaminectomy along with durectomy and excision of the mass in cat 1, hemilaminectomy in cat 2 and minihemilaminectomy in cat 3. The bupivacaine dose used was 1.8-2.5 mg/kg. Eight cardiovascular responses were recorded in this case series, but only one was clearly associated with nociception. Just one cat received intraoperative rescue analgesia. Cat 1 and 2 recorded just one high pain score in the first 24 h postsurgery, and cat 3 recorded three high pain scores. The total amount of methadone given in the 24 h post-surgery was 0.6 mg/kg in cat 1, 0.9 mg/kg in cat 2 and 0.8 mg/kg in cat 3. All three cats suffered mild and transient intraoperative complications (bradycardia, hypotension and apnoea episode of <5 min), which were easily addressed. There were no postoperative complications. To the authors’ knowledge, this is the first time that ESP block is reported in cats in the literature. This novel locoregional anaesthesia technique is part of a multimodal analgesia approach for spinal surgery in cats as an alternative to traditional systemic analgesia.

Atypical magnetic resonance imaging features of fibrinoid leukodystrophy (Alexander disease) in a Beagle

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A 3-month-old female entire Beagle presented with a history of progressive ataxia. Neurological examination was consistent with a caudotentorial encephalopathy. The dog presented a wide-base stance, bilateral excursions of the head, four limbs ataxia and hypermetria, abnormal hopping responses on all limbs, absent menace response on both eyes but normal vision and decreased oculocephalic reflexes. Several vestibular episodes with opisthotonus and vertical nystagmus were noted. Reactive encephalopathies were ruled out. Magnetic resonance imaging (MRI) of the brain showed a markedly abnormal cerebellum with symmetrical hyperintensity on T2W and FLAIR sequences and hypointensity of the cerebellar white matter
and loss of definition and swelling of the folia on T1W images. These abnormalities extended to the white matter tracts of the caudal aspect of the brainstem and cervical spinal cord. Periventricular and periaqueductal hyperintensities were noted on T2W and FLAIR sequences. This suggested a multifocal, mostly caudotentorial leukoencephalopathy. Cisternal cerebrospinal fluid analysis was unremarkable. Serology for Neosporosis was negative. The dog deteriorated and was euthanized two months after initial presentation. Histopathological analysis of the brain showed accumulation of Rosenthal fibers in the astrocytes consistent with a diagnosis of fibrinoid leukodystrophy. We would like to flag the MRI features close to type I Alexander disease in people. Caudotentorial fibrinoid leukodystrophy as a possible cause of caudotentorial encephalopathy in puppies. This disease has been reported in dogs with typical MRI features close to type I Alexander disease in people. Caudotentorial neurological deficits combined to predominant caudotentorial distribution of the MRI abnormalities in this case are consistent with the less common type II Alexander disease.

Investigating the effect of medium-chain triglycerides on Th17 and regulatory T cells in 7 healthy beagles

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Medium-chain triglycerides (MCT) enriched diets are used to treat epilepsy and cognitive dysfunction in dogs and humans, however, the exact therapeutic mechanism remains largely unclear. Increased levels of Th17 and a Th17/Treg cell imbalance have been suggested to influence seizure severity, behavioural comorbidities and response to treatment in a subset of patients with epilepsy. In children with intractable epilepsy, a ketogenic diet has been shown to correct a Th17/Treg cell imbalance. To investigate whether oral supplementation of MCT has an effect on Th17 and Treg cells in clinically healthy dogs, we measured absolute numbers of Th17 and Treg cells in peripheral blood of 7 healthy beagles using multicolor flow cytometry. Blood samples were collected at three different time points: while feeding a commercial hypoallergenic diet, 2 hours after one dose of MCT and after 2 weeks of feeding a diet enriched with MCT (9% of caloric intake). The study was conducted in accordance with the local animal welfare and ethical procedures (Approval number: 33.12-42502-04-20/3352). Two hours after a single MCT feed, levels of stimulated Th17 cells were elevated, while the absolute number of regulatory T cells decreased. There were no significant changes in the absolute number of Th17 and Treg cells after two weeks of feeding a diet enriched with MCT compared to the measurement before feeding MCT. In conclusion, where a one-off MCT administration did influence Th17 and Treg cells levels in peripheral blood in healthy dogs, a two week MCT administration had no influence.

Greater Swiss mountain dogs with idiopathic epilepsy in Germany—An investigation of the phenotype

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Genetic predisposition of idiopathic epilepsy (IE) has been demonstrated in individual breeds. According to the responsible breeding association in Germany, the number of Greater Swiss Mountain Dogs (GS) with seizures is increasing and nearly 3% of registered dogs suffer from seizures. In order to describe seizure phenotype and to examine seizure causes, a questionnaire-based study was performed. In cooperation with the Swiss Mountain Dog Association of Germany e.V. (SSV e.V) we evaluated 112 questionnaires filled in by owners of GS showing seizures and by their veterinarians between the years 2005 to 2021. Seizure characteristics, clinical and further examinations, treatment, treatment response and pedigree information were collected. IE was classified according to the International Veterinary Epilepsy Task Force consensus proposal. 93 (83.06%) dogs had IE (suspected genetic epilepsy) with confidence level I, II or III, the others had structural epilepsy, reactive seizures or epilepsy of unknown cause. The median age at seizure onset was 29.7 months. The most frequent seizure type were focal seizures evolving into generalized ones (62.37%), often starting with vomiting (n=38), retching (n=19) or salivation (n=19). Furthermore, cluster seizures (CS) (49.46%) and status epilepticus (SE) (38.71%) were observed in a substantial part of the cases. Forty (43.01%) dogs died during the observation period, 34 (36.56%) were euthanized (n=19) or died spontaneously (n=15) during CS or SE. In GS idiopathic epilepsy presents with a severe phenotype with frequently occurring CS and SE. This study could serve as basis for further genetic evaluations.

Spike-and-wave complexes as a feature of Juvenile myoclonic epilepsy in a miniature poodle

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Epilepsy is one of the most common neurological disorders in dogs in which epileptic activity can be focal or generalized. Focal epileptic
episodes can be mistaken with non-epileptic paroxysmal movement disorders. Differentiation between both disorders can be challenging. Confirmation of the epileptic nature of those events can be only obtained by observing characteristic changes in electroencephalography. The aim of this study was to present the neurological and electroencephalographic diagnostic work-up of unusual myoclonic episodes in a dog. A 9-month-old female Miniature poodle was presented with a history of progressive recurrent episodes of impaired balance, twitches of the body and head movements with wobbling backwards. The consciousness was difficult to assess but was suspected as impaired. Each episodes lasted few seconds, initially once/twice per week and finally progressed within few weeks to multiple times per day. The was no other clinical signs before and after the episodes. Clinical and neurological examination was normal. EEG using Nikhon Khoden and magnetic resonance imaging of the brain using Siemens 3Tesla device were performed. Four-hour EEG with video monitoring showed frequent, bilaterally synchronous, generalized 4-5 Hz spike and waves complexes during the awake state. The dog was treated with levetiracetam, and showed 90% decrease in frequency of the episodes in the follow-up after 8 weeks. The current case report describes the occurrence of juvenile myoclonic epilepsy diagnosed by electroencephalography which is method of choice for the differentiation of epileptic seizures and movement disorders. Spike-and-wave complexes are typical for this epileptic disorder.

**ABSTRACT**

Occipito-atlanto-axial stabilization in a young French bulldog using 3D printed patient-specific drill guides and implants

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Occipito-atlanto-axial (OAA) malformations in dogs cause both contusive and compressive injuries that lead to varying degrees of cervical spinal cord and brainstem disease. An 8-month-old male entire French bulldog presented with a progressive history of abnormal posture, with the head held in an extended position, and ataxia of all four limbs with a floating forelimb gait. Neurological examination suggested a painful and C1-C5 myelopathy. MRI and CT revealed an abnormal keyhole-shaped and narrowed foramen magnum, hypoplastic occipital condyles and a malformed atlas. There was compression of the cord from the transverse ligament. A dorsal surgical approach was chosen to replicate the posterior occipito-cervical fixation system used for humans- which usually relies on a pedicle screw and rod system. A human based system could not be used given the size of the animal. Therefore, bespoke 3D printed contoured titanium rods were made. Screw positions in the occiput, C1 and C2 were planned with a computer-assisted-design software and drilling guides made to allow their insertion. The objective of the design was to lay and rest the metal rods on screws and secure these together with polymethylmethacrylate cement for stabilisation. To promote fusion of the OAA region, bone graft and demineralised bone matrix were combined above the occiput and C1, of which the outer cortex was eroded with a burr. Gradual improvement was observed over the following 4 weeks, with mild residual ataxia and normal head/neck carriage at 6 months follow-up. This case reports an innovative technique using 3D-printed metallic implants and drilling guides to bridge the OAA region.

**Otitis media/interna with or without polyp in cats: Does meningeal enhancement on postcontrast MRI and/or inflammatory CSF change our perspectives?**

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Otitis media/interna (OMI) is a frequent aetiology in cats with peripheral vestibular syndrome (PVS) with or without a polyp. Magnetic resonance imaging (MRI) in combination with cerebrospinal fluid (CSF) examination is perceived as the gold standard diagnostic approach. They provide information about meningeal enhancement (MgE) and CSF abnormalities, which suggest concurrent meningitis. However, the relationship between MgE and abnormal CSF in cats with OMI has not yet been investigated. Study’s objectives were to establish the association between MgE and CSF findings, their individual correlation with bacteriology results from affected ear samples, and with clinicians’ therapeutic choice in cats with OMI. MRI and CSF analyses of 58 cats with PVS diagnosed with OMI were retrospectively evaluated. MgE was reported in 26/58 cases of which 7 had an increased total
It has been widely reported that the spinal cord to vertebral canal area ratio in the thoracolumbar spine is greater than that in the cervical spine i.e. there is more epidural ‘space’ in the cervical region than the thoracolumbar. This is frequently reported to be the cause of the often more severe neurological deficits observed in dogs with thoracolumbar disc herniations when compared to cervical. To the authors’ knowledge, no studies have previously assessed this theory within the same dog. Computed tomography images of 37 French bulldogs presenting to the Queen’s Veterinary School Hospital between 2016 and 2019 were retrospectively reviewed. Exclusion criteria were evidence of vertebral malformations or spinal cord compression at the sites where measurements were obtained, presence of cervico-thoracic or thoracolumbar transitional vertebrae, or of neurological deficits. Images were independently reviewed by two assessors using Horos® DICOM viewer. Area measurements of the spinal cord and vertebral canal were made at the level of the midbodies of C5 and L1. Results demonstrated a statistically significant difference between the area ratio in the cervical and the thoracolumbar spine. The area ratio was lower in the thoracolumbar spine when assessed by both observers individually, suggesting the vertebral canal was relatively larger in this region. Although inter-observer agreement was generally poor, intraobserver agreement was good. In conclusion, this study demonstrated that, contrary to previous reports, the epidural space does not appear larger in the cervical region than the thoracolumbar at least in this population of French bulldogs.

Eustachian tube formation and angulation in dogs affected by primary secretory otitis media

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Primary secretory otitis media (PSOM) is common especially in brachycephalic dogs. Various aetiologies have been discussed, including infectious, inflammatory and morphological causes. However, there remains a lack of data supporting any of the current hypothesis. The aim of the current study was to elucidate the role of the Eustachian tube in PSOM. Computer tomography images of 72 dogs with or without PSOM were evaluated in the study. Morphological measurements (Eustachian tube length and width) and angulation of the Eustachian tube of 97 control ears were compared to 47 PSOM affected ears. Data are reported as Median with 25-75 percentiles. Groups were compared with a Mann Whitney U-test and a P-value of less than 0.05 was deemed significant. Eustachian width was significantly smaller in width in affected cases (1.02 (0.86-1.46)) compared to controls (1.29 (0.71-1.52)), as was angulation wider in affected (42.22 (33.91-44.43)) versus non-affected (35.64 (31.91-40.12)) respectively. This study demonstrates that Eustachian tube width and angulation might contribute to development of PSOM, which is similar to what has been shown in children. Future studies are needed to explore if the morphological changes have functional consequences and therefore lead to PSOM.

Prevalence of discospondylitis and association with vertebral body malformations in screw-tailed brachycephalic dogs

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Discospondylitis is characterised by infection, most commonly bacterial, of the intervertebral disc and vertebral body endplates. This retrospective study aimed to report the prevalence of discospondylitis in screw-tailed brachycephalic dogs and to investigate the association of discospondylitis with congenital vertebral body malformations. The electronic medical database was searched for screw-tailed brachycephalic dogs diagnosed with discospondylitis between June 2010 and 2020. Cases with a confirmed diagnosis on CT or MRI and complete medical records were included. Discospondylitis location, presence of congenital vertebral body
Tethered cord syndrome resulting in perineal pain in a mixed breed dog: Diagnosis, surgical treatment and postoperative outcome

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Tethered cord syndrome (TCS) is a diverse clinical entity characterized by clinical signs caused by excessive tension on the spinal cord. This tension can result from a caudodorsally displaced, thickened or inelastic filum terminale. It can occur in conjunction with other spinal malformations or as a sole malformation. The reported cases in veterinary medicine highlight clinical signs of lower motor neuron signs in the pelvic limbs and urinary incontinence. In humans with TCS, pain is a primary symptom, typically localized to the lower back, perineum and lower extremities suspected secondary to muscle spasms, which have not been described in veterinary species. A 1.5 yo female spayed mix breed dog presented with a several month history of suspected back pain, characterized by random yelping. A source of pain could not be identified on examination. An MRI was performed, which identified a caudodorsally displaced filum terminale and reduced dynamic movement of the conus medullary consistent with TCS. A L6-7 dorsal laminectomy and intradural filum release was performed. Intraoperatively, severe muscle tremors were seen during paraspinal muscle dissection, which resolved with diazepam. Postoperatively, the patient’s pain worsened despite standard pain management, with pain localized to the perineum. Diazepam was restarted to treat suspected perineal muscle spasms, resulting in marked improvement in the clinical signs of pain. Six months postoperatively, diazepam was fully tapered and the patient has remained clinically normal with no recurrence of clinical signs. This case highlights the possibility of perineal pain secondary to muscle spasms in dogs with TCS.

Cervical disc disease in whippets: Results of an online survey involving Italian owners and breeders

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Whippet dog is not usually included among the breeds commonly affected by myelopathies associated with degenerative disc disease. Despite this, the experience of some neurologists is that the occurrence of these conditions, especially cervical disc disease (CDD) often associated with severe neurological deficits, is frequent in this breed. The aim of the study was to get information about the occurrence of CDD in Whippets and the perception of the problem by owners and breeders. In collaboration with the Italian “Club del Levriero”, a questionnaire was sent to Italian owners and breeders of Whippets. The answers were processed using spreadsheets and organized in graphs. The answers about 278 Whippets were recorded. The occurrence of CDD was 7.9% for all dogs, 13% for dogs between 5-10 years old. Diagnosis was based on physical and neurological examinations associated with imaging techniques: Computed tomography (CT) 40%, Magnetic resonance imaging (MRI) 25%, myelography 35%. Stress on the back, continuously flexed and extended during the rotary gallop, to store energy and develop a high-velocity gait, may be a possible cause of spine diseases. Limits of the study were the not-specialized public that questioned owners, but the owners who experienced the problem were probably prompter to respond. The occurrence of CDD in the Whippet appeared relatively high if compared with other disorders for which specific screenings are recommended by many international breed clubs. These results should prompt veterinary neurologists to further studies on the diagnostic, therapeutic, and prognostic aspects of CDD in Whippets.

Successful pain management after filum terminale internum detethering in 2 CKCS with Chiari-like malformation

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Cavalier King Charles Spaniels (CKCS) are affected by Chiari-like malformation (CM) and syringomyelia (SM) causing neuropathic chronic pain. Severely affected cases fail to respond to medical management and occipital cranioplasty is often recommended. Clinical relapse of neuropathic pain is recorded in a high number of cases treated with this surgical approach. An association between Chiari I malformation (CM1) and tethered cord syndrome in human patients presenting post failed CM1 surgery is recognised (Milhorat et al., 2009). For these patients, de-tethering of the filum terminale internum may be effective in relieving symptomatology, restoring normal brain stem length, normalizing the position of the cerebellar tonsils, and in some cases, avoiding the need for posterior fossa surgery (Milhorat et al., 2009). CKCS have a caudally displaced spinal cord and dural sac when compared with a range of weightmatched breeds (Sparks at al., 2019). Additionally, painful CKCS without SM have been found to have a shorter filum terminale internum (Sparks at al., 2020) Two CKCS affected with CM had a successful resolution of pain following de-tethering surgery, including a 7-year-old who relapsed after occipital cranioplasty and a 1-year-old with no previous surgery. The filum terminale internum was sectioned via a dorsal laminectomy without complications and both animals were free of pain, without medication, for 20 and 7 months respectively at the time of writing. Follow up MRI was performed on one dog. De-tethering of the filum terminale internum will remain controversial until definitive treatment guidelines are established in human and veterinary medicine.