ABSTRACT

PROCEEDINGS 32nd Symposium ESVN-ECVN
WROCLAW, POLAND
12th-14th September 2019

Selected research communications of the
32nd Symposium of the ESVN-ECVN
Wroclaw, Poland 12th to 14th September 2019

TIMETABLE OF THE SYMPOSIUM

FRIDAY 13TH SEPTEMBER

07.15-08.15 Registration

08.15-08.30 Opening Ceremony and Welcome: Marcin Wrzosek (Chair)

08.30-09.15 Keynote: 3 Tesla imaging vs. 1.5 - what do we realistically profit from the technology in veterinary neurology?
Dr. Ines Carrera

09.15-10.00 Keynote: Magnetic resonance spectroscopy (1H MRS) - application of the method in clinical neurology.
Dr. Ines Carrera

10.00-10.30 Coffee Break – Exhibition and Poster Session - Exhibition Area

10.30-11.40 ORAL PRESENTATIONS

O1) Tolerability and initial efficacy of convection enhanced delivery of combinatorial II-13ra2 and Epha2 Targeted cytotoxins to dogs with spontaneous intracranial gliomas
John H Rossmeisl

O2) Imaging features of discospondylitis in cats
Sergio Andrade Gomes

O3) A Homozygous 7-Bp Deletion of Gdf7 associated with feline forebrain commissural malformation concurrent with ventriculomegaly and interhemispheric cysts
Yoshihiko Yu

O4) Studying the cognitive and brain phenotype of the delta e50-md canine model of Duchenne Abbe Harper Crawford
O5) Repetitive transcranial magnetic stimulation: a potential novel treatment option for canine drug-resistant epilepsy
   Marios Charalambous

O6) Plasma neurofilament light chain as a biomarker of neuro-aging in dogs
   Wojciech K Panek

O7) Concurrent disc- and osseous-associated cervical spondylomyelopathy: MRI features in 48 dogs
   Ronaldo C. da Costa

11.45-12.30 Keynote: Differentiation of glioblastoma multiforme, metastases and primary central nervous system lymphomas using multiparametric perfusion and diffusion MR imaging of a tumor core and a peritumoral zone-searching for a practical approach.
   Prof. Anna Zimny, M.D. PhD.

12.30-13.30 Lunch – Exhibition and Poster Session Exhibition Area

13.30-14.15 Keynote: A functional magnetic resonance imaging (fMRI) study on the central auditory system
   Dr. hab. Tomasz Wolak, M.D

14.15-15.15 Flash presentations
   FP 1) Surgical treatment of atlanto-axial subluxation using 3D-printed patient-specific drill guides for placement of transpedicular screws in 12 dogs
      Cristina Toni

   FP 2) What do people want to know about canine and feline epilepsy? Looking for answers using google trends
      Marta Płonek

   FP 3) Magnetic Resonance Imaging features of solitary vertebral masses in nineteen dogs and one cat
      Emilie Hanot

   FP 4) Exercise induced metabolic myopathy in German Hunting Terrier dogs: correlation between genotype and phenotype
      Franziska Mühlhauser

   FP 5) Hypersexuality responsive to phenobarbital in a neutered male dsh cat
      Theophanes Liatis

   FP 6) A new frameless optical neuronavigation system for brain biopsies in eight dogs
      Sarah Hanemann

   FP 7) Myelo-CT imaging findings in four dogs with gross surgical confirmed compressive hydrated nucleus pulposus extrusion
      Alba Farré Mariné

   FP 8) Clinical presentation, MRI findings, histopathology and outcome in a cat with masticatory myositis
      Marco Armellini

   FP 9) 3 T MRI characteristics and functional outcome in dogs with severe spinal cord injury following thoracolumbar disc herniation
      Beth Boudreau

   FP 10) Median manubriotomy as a simple method to improve ventral access to c7, t1 and t2 vertebral bodies and corresponding intervertebral disc spaces
      Isidro Mateo

   FP 11) Analysis of treatment and monitoring protocols of cytarabine arabinoside in canine patients
      Devon Wallis Hague

   FP 12) Clinical and MRI findings in two cats with globoid cell leukodystrophy
Alessia Silvia Colverde

FP 13) Evaluation of the involvement of Th17-cells in the pathogenesis of canine spinal cord injury
Annika Kämpe

FP 14) Investigation of a Th17 cell-mediated immune response in dogs with idiopathic epilepsy
Anna Charlotte Maria Knebel

FP 15) Clinical, Magnetic Resonance Imaging and histologic findings of canine thoracolumbar discal cyst
Erica Fiorentino

15.30-16.00 Coffee Break – Exhibition and Poster Session - Exhibition Area

16.00-16.30 ECVN Consensus Statement: International Dyskinesia Taskforce Update.
Sofia Cerda-Gonzalez

16.30-18.00 Annual General Meeting President ECVN Thomas Flegel

GALA DINNER - FRIDAY September 13, 2019 – TOPACZ CASTLE

19.30-1.00 Gala Dinner: Topacz castle

Symposium Day 2 - SATURDAY 14th Sept. 2019

08.30-09.10 ORAL PRESENTATIONS

O8) Static posturography as a novel diagnostic tool in dogs with suspected thoracolumbar spinal cord disease
Devon Wallis Hague

O9) Intraoperative measurement of intraventricular pressure in dogs with communicating internal hydrocephalus
Małgorzata Anna Kolecka

O10) Clinical features and magnetic resonance imaging characteristics of presumptive constrictive myelopathy in 26 pug
Filipa Espadinha Lourinho

O11) Magnetic Resonance Spectroscopy for quantifying the brain regional biochemistry in vivo in murine model of human glioma
Maria Pasierbirska

09.10-09.15 SHORT FLASH BREAK

09.15–10.00 Keynote: How to optimize CT for neurodiagnostics Dr. Tobias Schwarz

10.00–10.30 COFFEE BREAK – EXHIBITION AND POSTER SESSION EXHIBITION AREA

10.30-11.15 Keynote: CT & MRI for neurodiagnostics: Which one, when both, in which order? 
Dr. Tobias Schwarz

11.15-12.05 ORAL PRESENTATIONS

O12) Neurotransmitter concentrations in urine associated with the consumption of a medium-chain triglyceride (MCT) supplement in dogs with idiopathic epilepsy
Benjamin Andreas Berk

O13) Development and characterization of a zebrafish model of hydroxyacyl-coa dehydratase 1-centronuclear myopathy (HACD1-CNM)
Gemma Walmsley

O14) Spontaneous remission in feline acquired myasthenia gravis without associated co-existing disease
Thomas Frederic Nicolas Mignan
Towards a cure for neurological FIP: a pilot trial of GS441524 nucleoside analog in naturally occurring disease

Peter James Dickinson

Whole genome transcriptomics defines an inflammatory environment in CNS histiocytic sarcoma in dogs and potential therapeutic targets

Peter James Dickinson

12.05-12.10 Short Flash Break

12.10-12.40 Flash presentations

FP16) Cerebrospinal fluid velocity in healthy dogs

Daniela Schweizer

FP17) Polyneuritis cranialis - subtype of acute canine polyradiculoneuritis?

Hélène Vandenberghe

FP18) Prognostic value of early computed tomography in dogs after traumatic brain injury

Elsa Beltran

FP19) Magnetic Resonance Spectroscopy findings in a beagle dog with genetically confirmed Lafora Disease

Neringa Alisauskaite

FP20) A patient-specific 3D printed surgical guide to aid localisation of the drilling site during transsphenoidal hypophysectomy in dogs

Leticia Escauriaza

FP21) Novel neuromuscular manifestations of gluten sensitivity in a Border Terrier

Marco Rosati

FP22) Multimodal diagnostic approach for the improvement of diagnostic accuracy of canine neuromuscular Neosporosis

Marco Rosati

FP23) CT and MRI findings of the thoracolumbar vertebral column in an adult dog with presumed congenital hypothyroidism

Ine Comelis

FP24) Prognostic value of GFAP and NSE in dogs with Meningoencephalitis of unknown origin

Ine Comelis

12.40-12.55 Presentation of ESVN-ECVN Annual Meeting 2020, Venice, Italy

Gualtiero Gandini

12.55-14.00 Lunch - Exhibition and Poster Session Exhibition Area

14.00-14.45 Keynote: More than localization: MRI in the paraplegic dog.

Prof. Daniela Schweizer (Gorgas)

14.45-15.30 ORAL PRESENTATIONS

O17) Magnetic Resonance Imaging of hypersynchronized neuronal brain activity in epileptic dogs

Daniela Schweizer

O18) MRI measurements of the normal canine trigeminal nerve

Charlotte Elizabeth Swain
O19) Craniofacial hypoplasia in Cavalier King Charles Spaniels with Chiari-like malformation - a machine learning inspired morphological study

Clare Rusbridge

O20) Susceptibility Weighted Imaging at 1.5 Tesla Magnetic Resonance Imaging: Comparison with T2*-weighted gradient echo sequence and its clinical indications

Philippa Jane Weston

15.30–16.00 COFFEE BREAK - EXHIBITION AND POSTER SESSION EXHIBITION AREA

16.00–16.30 "Eternal struggle: Does a neurologist need radiologist for a neuroradiological diagnosis?"
Fraser McConnell vs. Annette Wessman

16.00-17.00 ORAL PRESENTATIONS

O21) Hereditary sensory and autonomic neuropathy in a family of mixed breed dogs: phenotypic and genetic characterization

Rodrigo Gutierrez Quintana

O22) The prognostic value of modified Glasgow Coma Scale and CT imaging findings of cats after traumatic brain injury

Lydia Poad

O23) Putative resting state networks of the canine brain

Adriano Wang Leandro

O24) Semi-automated image classification for detection of T2 hypointensity on 3 T MRI in dogs with severe spinal cord injury

Beth Boudreau

O25) Canine Wharton's Jelly mesenchymal stem cell therapy in dogs with acute paraplegia and absent pain perception after thoracolumbar disk extrusion

Dominik Faissler

O26) Peri-ictal Magnetic Resonance Imaging changes in dogs with idiopathic epilepsy

Arangan Nagendran

17.00-17.45 Awards & Closing Remarks

Thomas Flegel & Marcin Wrzosek
ABSTRACT

Tolerability and initial efficacy of convection enhanced delivery of combinatorial IL-13RA2 and EphA2 targeted cytotoxins to dogs with spontaneous intracranial gliomas

J. H. Rossmel1,2, D. Herpai1, J. L. Robertson1,2, P. J. Dickinson3, S. B. Tatter2, W. Debinski4
1Department of Neurology and Neurosurgery, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, Blacksburg, VA, USA, 2Brain Tumor Center of Excellence, Wake Forest Baptist Medical Center Comprehensive Cancer Center, Winston-Salem, NC, USA, 3Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, CA, USA

Malignant gliomas are incurable tumors and canine spontaneous gliomas are a faithful model of human disease. In this ethics board approved Phase I trial, we delivered a recombinant bacterial cytotoxic cocktail targeting IL-13RA2 and EphA2 receptors using convection enhanced delivery (CED) to dogs with forebrain gliomas. Nineteen CED infusions were performed in 17 dogs with gliomas that were immunohistochemically positive for IL-13RA2 or EphA2 receptors. Using a 3 + 3 dose-escalation design, cohorts were administered 0.05, 0.1, 0.2, 0.4, 0.8, or 1.6 μg of each cytotoxin/ml of infusate. CED was planned using a shape-fitting algorithm. Cytotoxins were co-administered with gadolinium through reflux preventing catheters to allow intraoperative visualization of infusions using magnetic resonance imaging (MRI). Clinical examinations, adverse events (AE), and volumetric MRI tumor responses were evaluated on days 14, 28, 42, 84, 180, 270, and 365 following treatment. Grades 3, 4, or 5 AE developing within 28 days of infusion were considered dose-limiting toxicities (DLT). The median target volume was 5.47 cm³ (0.69 to 11.4 cm³). The median target coverage was 70% (38-96%). DLT were not observed. Major tumor responses (52-95% volumetric decreases) were documented in 8/16 dogs with available follow-up, with durable (>180 day) responses noted in 6/8 partial responders following a single infusion. Tumor necrosis in infused regions was evident on necropsy in 5 dogs dying of progressive disease. The use of therapeutic planning, intraoperative MRI, and reflux-preventing catheters allowed for safe and effective CED treatment of canine gliomas with IL-13RA2 and EphA2 targeted cytotoxins.

Imaging features of discospondylitis in cats

Sergio A. Gomes1, Sebastien Behr2, Laurent S. Garosi3, Ines Carrera4, Mike Targett2, Mark Lowrie2
1Dovecote Veterinary Hospital, Delven Lane, Castle Donington, Derby DE74 2LJ, UK, 2Neurology/Neurosurgery Service, Willows Veterinary Centre and Referral Centre, Solihull, UK, 3CVS Telemurology, Owen road, Diss, IP22 4ER, UK, 4Diagnostic Imaging, Willows Veterinary Centre and Referral Centre, Solihull, UK, 5School of Veterinary Medicine and Science, University of Nottingham, Sutton Bonington, Leicestershire, LE12 9RD, UK

Discospondylitis is a rare condition in cats. This study describes the imaging features of feline discospondylitis on MRI, comparing them to radiography and CT where available. Medical records of cats diagnosed with discospondylitis presented to three referring institutions, were retrospectively retrieved. Fourteen sites of discospondylitis were identified in thirteen cats, with the L7-S1 intervertebral disc space (IVDS) being affected in 7/14 of cases. Characteristic MRI features included a hyperintense nucleus pulposus signal on T2-weighted (T2W) (10/14) and short tau inversion recovery (STIR) (11/13) with contrast-enhancement in all (11/11), involvement of adjacent vertebral endplates (11/14), hyperintense neighboring soft tissue on T2W (11/14) and STIR (10/13) with contrast-enhancement in all (11/11) and presence of spondylodiscitis deformans (10/14). Other features included narrowed or collapsed IVDS (11/14), contrast-enhancement of vertebral bodies (5/11), epidural space involvement (5/14), compression of the spinal cord or nerve roots (5/14), paraspinal abscessation (3/14), megacolon (5/14) and meningeal signal intensity abnormalities with contrast-enhancement that could indicate secondary focal meningitis (5/6).

A homozygous 7-BP deletion of GDF7 associated with feline forebrain commissural malformation concurrent with ventriculomegaly and interhemispheric cysts

Y. Yu1,2, R. M. Buckley1, E. K. Creighton1, L. A. Lyons1
1Department of Veterinary Medicine and Surgery, College of Veterinary Medicine, University of Missouri, Columbia, United States, 2Laboratory of Veterinary Radiology, Nippon Veterinary and Life Science University, Tokyo, Japan

The purpose of this study was to identify the genetic cause for feline forebrain commissural malformation concurrent with ventriculomegaly and interhemispheric cysts. This syndrome, which was found in the course of the selective breeding for a short ear phenotype, has been characterized clinically and histopathologically, and pedigree analysis indicated autosomal recessive trait. Fifty cats consisted of affected and unaffected cats in the extended pedigree were genotyped using Illumina Infinium Feline 63 K iSelect DNA Array. Genome-wide association study (GWAS), including a subtransmission disequilibrium test and case-control analysis, and homozigosity mapping were performed. Subsequently, whole genome sequencing (WGS) was performed for two affected cats and one obligate carrier cat using illumina HiSeq 2500. WGS data was aligned to the latest feline genome assembly (Felis_catus_9.0) and compared with other 192 domestic cats’ WGS data in the 99 Lives WGS database. Ethical permission was obtained for this study.
GWAS showed an association on chromosome A3. A run of homozygosity was identified on chromosome A3 as well, which was not detected in unaffected cats. WGS revealed a homozygous 7-bp deletion in GDF7 causing the frameshift in affected cats. The obligate carrier was heterozygous. This variant was absent in other 192 domestic cats in the 99 Lives WGS database. This variant was validated using Sanger sequencing. Therefore, this frameshift mutation in GDF7 is considered to be involved in this syndrome. Interestingly, GDF7-null mutant mice have been reported to show severe hydrocephalus with considerable variation. Result highlights the importance of GDF7 in neurodevelopmental course in cats.

[O4]

Studying the cognitive and brain phenotype of the delta E50-MD canine model of Duchenne muscular dystrophy
A. Crawford 1, J. Hildyard 1, A. Lane 1, C. Weaver-Ennis 1, M. Diez-Leon 2, R. Piercy 1
1Department of Clinical Sciences and Services, Royal Veterinary College, London, UK, 2Department of Pathobiology and Population Sciences, Royal Veterinary College, London, UK

Muscular dystrophy, a spontaneous and devastating disease in multiple dog breeds, is caused by an absence or deficiency of dystrophin protein in striated muscles, leading to myofibre fragility and repetitive cycles of degeneration and regeneration, progressive fibrosis and paresis. In addition to muscle, dystrophin is also found in the brain and approximately 50% of human patients with the invariably fatal X-linked Duchenne muscular dystrophy (DMD) consequently show neuropsychiatric disorders, including anxiety, cognitive impairment and autism spectrum disorder, alongside their muscle degeneration. The precise function of dystrophin in the brain remains poorly understood.

The expression pattern and role of dystrophin in canine muscle is relatively well characterized, however, its role in the canine brain has not been investigated, nor have the consequences of dystrophin deficiency on canine cognitive function. Here we hypothesized that deltaE50-Muscular Dystrophy dogs (that carry a splice site mutation that results in deletion of exon 50 in mature dystrophin transcripts) have defective cognitive function.

Using RNAScope and immunostaining techniques we can detect dystrophin in the normal canine brain at cellular and subcellular levels and have verified its expression in the cerebellar cortex, hippocampus and cerebral cortex. Using a battery of tests to assess cognitive function, our current data show that, compared to litter mate controls, deltaE50-MD dogs have reduced attentiveness and motivation, reduced exploration of novel objects and increased anxiety-like behavior.

This study provides novel information on the expression and function of dystrophin in the canine brain, with insight into the link between dystrophin deficiency and cognitive deficits. Ethical approval for this study was obtained from the Institution's Ethics and Welfare Committee.

[O5]

Repetitive transcranial magnetic stimulation: A potential novel treatment option for canine drug resistant epilepsy
M. Charalambous 1, L. Van Ham 2, J. G. Broeckx 2, S. F. M. Bhatti 1
1Small Animal Department, Faculty of Veterinary Medicine, Ghent University, Belgium, 2Department of Nutrition, Genetics and Ethology, Faculty of Veterinary Medicine, Ghent University, Belgium

Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive procedure that modifies neuronal function via a magnetic field generator, which produces small electric currents on the cerebral cortex. A single-blinded randomized placebo-controlled clinical trial was designed and ethically approved to assess the efficacy and safety of rTMS in canine drug-resistant epilepsy.

After random assignment, dogs received either active or sham stimulation. All dogs were sedated during the procedure using the same anesthetic protocol and received repetitive active or sham stimulation of 18 trains (90 low frequency [1 Hz] pulses per train and individually determined coil output) for 90 minutes per day for five consecutive days. The efficacy of the procedure was evaluated by comparing monthly seizure frequency (MSF) and monthly seizure day frequency (MSDF) during a retrospective three-month period with a prospective three-month follow-up period. Three months after sham stimulation, the dogs in the placebo group also received treatment. Adverse effects and complications were reported.

Until this stage, 12 dogs were included, seven in the treatment and five in the placebo group. In the treatment group, both MSF and MSDF decreased (median 36%; mean 37%; range 13%-72%). In the placebo group, the MSF and MSDF did not decrease but after active rTMS was applied, a decrease was detected (median 53%; mean 50%; range, 32-62%). Thorough final statistical analysis will be performed when the study terminates. No adverse effects were reported.

In conclusion, these preliminary results suggest that rTMS might be a safe and effective short-term treatment option for drug-resistant epilepsy.

[O6]

Plasma neurofilament light chain as a biomarker of neuro-aging in dogs
Wojciech K. Panek 1, David M. Murdoch 2, Margaret E. Gruen 2, Robert D. Marek 1, Alexandra F. Stachel 1, Natasha J. Olby 1
1Department of Clinical Sciences, College of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina, USA, 2Department of Medicine, Duke University Medical Center, Durham, North Carolina, USA

Aging of the central nervous system (CNS) is associated with neuroaxonal degeneration and release of cytoskeletal proteins, such as neurofilament light chain (NFL), into the extracellular space and subsequently into the bloodstream. In humans, plasma NFL concentration has been shown to increase with age, with accelerating increases in people with neurodegenerative disease. We hypothesized that plasma NFL could be measured in dogs and would increase with age and neurodegenerative disease.
Study aims were: 1) To measure plasma NfL concentrations in healthy pet dogs at various life stages; 2) To measure plasma NfL concentrations in dogs with Canine Cognitive Dysfunction (CCD) and Degenerative Myelopathy (DM).

Plasma samples were obtained from healthy dogs and dogs with DM and CCD. Data gathered on the dogs included age, breed, sex, health status. Plasma NfL was quantified using the Single Molecule Array technology (SIMOA, Quanterix).

There were 11 healthy young adult (0.69-3 years, n = 6) and senior dogs (8.1-10.6 years, n = 5) and 18 diagnosed with the neurodegenerative conditions CCD (n = 3, 11.83-15.66 years), and DM (n = 15, 7.5-12.6 years). Protocols were approved by the NCSU Institutional Animal Care and Use Committee.

Mean plasma NfL concentrations were 7.56 ± 7.29 pg/mL in young dogs, 31.96 ± 15.69 pg/mL in senior dogs, 77.49 ± 48.07 pg/mL in dogs with DM and 199.7 ± 111.38 pg/mL in dogs with CCD. Our results suggest that plasma pNfL concentrations increase with age and are markedly elevated in dogs with CCD. Plasma NfL might represent a useful biomarker of neuro-aging in dogs.

Concurrent disc- and osseous-associated cervical spondylomyelopathy: MRI features in 48 dogs
Ronald C. da Costa1, Marília Bonelli1
1Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Veterinary Medical Center, The Ohio State University, Ohio, USA

Cervical spondylomyelopathy (CSM) is typically classified into disc- or osseous-associated forms; however, some dogs have changes associated with both. This subgroup of dogs with CSM has not been thoroughly studied. Our objective was to describe the magnetic resonance imaging (MRI) characteristics of dogs with concurrent DA and OA-CSM. Inclusion criteria was the diagnosis of concurrent DA and OA-CSM caused by a combination of intervertebral disc protrusion and proliferation of articular processes or thickening of the dorsal lamina, with or without concomitant ligamentum flavum hypertrophy using high-field MRI.

A total of forty-eight (48%) dogs out of 205 cases met this criterion: 19 (40%) were giant breeds (13/19 Great Danes - 68%), 27 (56%) were large breeds (14/27 Doberman Pinscher - 52%) and 2 others. Mean and median age was 6.5 and 7 years, respectively (range 0.75-11 years). There were 20 females (42%) and 28 males (58%). Twenty-six (54%) dogs had concurrent osseous and disc-associated spinal cord compression at the same location; 14/26 (54%) caused by concomitant intervertebral disc protrusion and thickening of the dorsal lamina; 7/26 (27%) caused by concomitant articular process proliferation and intervertebral disc protrusion; and 7/26 (27%) classified as circumferential spinal cord compression. Site of main spinal cord compression was C6-7 in 59% and C5-6 in 31% of dogs. Spinal cord hyperintensity on T2-weighed images was observed in 25/48 (52%). Results indicate a substantial percentage of dogs with CSM present with concomitant intervertebral disc protrusion and osseous proliferations, with more than half of cases occurring at the same location.

Static posturography as a novel diagnostic tool in dogs with suspected thoracolumbar spinal cord disease
M. Paustier1, K. D. Foss1, D. W. Hague1, T. A. Harper1, J. Sosnoff2, D. Schaeffer2
1Department of Veterinary Clinical Medicine, University of Illinois at Urbana Champaign, Urbana, Illinois, USA, 2Department of Kinesiology and Community Health, University of Illinois at Urbana Champaign, Urbana, Illinois, USA

Dogs with spinal cord disease (SCD) are evaluated through the application of subjective scoring systems during serial neurologic examinations. Post-treatment outcome is typically measured through the direct observation of an animal’s gait. This form of evaluation is highly subjective and may overestimate or underestimate a patient’s recovery.

Static posturography provides an objective, quantitative alternative to subjective gait analysis through measurement of characteristics of an animal’s balance in quiet stance. The purpose of this study was to evaluate the utility of static posturography as an objective diagnostic adjunct and prognostic indicator in dogs with suspected thoracolumbar SCD. Ethical permission was obtained through IACUC approval and signed consent from individual dog owners.

Control dogs (n = 20) demonstrated a normal neurologic examination and had no known history of neurologic or musculoskeletal disease. Affected dogs (n = 10) presented with clinical signs of thoracolumbar SCD, including pain, weakness and incoordination. All dogs were placed in quiet stance on a commercially available force and pressure measurement system. Measurements related to each dog’s balance were taken during five 10-second trials, including aggregate distance traveled by the dog’s center of force (COF), maximal cranial-caudal and latero-lateral movement of COF, and weight distribution by limb. Repeated measures ANOVA revealed significantly greater distance traveled by the COF in dogs with thoracolumbar SCD relative to control dogs. Other COF-related metrics were not significantly increased in affected dogs. This study has important implications for the development of static posturography as a novel method of evaluating recovery and efficacy of treatment in dogs with SCD.

Intraoperative measurement of intraventricular pressure in dogs with communicating internal hydrocephalus
M. Kolecza1, D. Farke2, A. Olszewska2, K. Failing2, M. Kramer2, M. J. Schmidt2
1Small Animal Clinic Kalbach, Max-Holder Strasse 37, 60 437 Frankfurt, Germany, 2Department of Veterinary Clinical Sciences, Small Animal Clinic, Justus-Liebig-University, Frankfurter Strasse 108, 35 392 Giessen, Germany

Collapse of the lateral cerebral ventricles after ventriculo-peritoneal drainage is a fatal complication in dogs with internal hydrocephalus. It occurs due to excessive outflow of cerebrospinal fluid into the peritoneal cavity (overshunting). In most shunt systems, one-way valves
with different pressure settings regulate flow into the distal catheter to avoid overshunting. The rationale for the choice of an appropriate opening pressure is a setting at the upper limit of normal intracranial pressure in dogs. We hypothesize that intraventricular pressure in hydrocephalic dogs might differ from pressure in normal dogs and we also consider that normotensive hydrocephalus exists in dogs. In order to evaluate intraventricular pressure in hydrocephalic dogs, twenty-three client owned dogs with diagnosed communicating internal hydrocephalus were examined before implantation of a ventriculoperitoneal shunt using a single use piezo-resistive strain-gauge sensor (MicroSensor ICP probe). Total ventricular volume was calculated based on magnetic resonance images before the surgery and expressed in relation to the total volume of the brain (ventricle-brain index, V/B index). The mean CSF pressure in the hydrocephalic dogs was 8.8 mmHg (SD 4.22), ranging from 3-18 mmHg. The covariates “age”, (P = 0.782), “gender” (P = 0.162), “body weight”, (P = 0.065), or “V/B index (P = 0.27)” were not correlated with intraventricular pressure. The duration of clinical signs before surgery, however, was correlated with intraventricular pressure (P < 0.0001). Normotensive communicating hydrocephalus exists in dogs.

Clinical features and magnetic resonance imaging characteristics of presumptive constrictive myelopathy in 26 pugs

F. Lourinho1, A. Holsworth1, F. MacConnell2, R. Trevail1, R. Gonzalves2, R. Gutierrez-Quintana3, C. Morales4, M. Lowrie5, I. Carrera6
1Southern Counties Veterinary Specialists, Ringwood, UK, 2Department of Veterinary Science, Small Animal Teaching Hospital, University of Liverpool, UK, 3School of Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, UK, 4Airs Veterinary Hospital, Barcelona, Spain, 5Dovecote Veterinary Hospital, Derby, UK, 6Willows Referral Centre, Solihull, UK

Constrictive myelopathy has been described in pugs, characterized by fibrous connective and granulation tissue of the dura mater causing spinal cord compression and focal gliosis. Its association with articular facet dysplasia is suspected; however, some studies have reported articular dysplasia as an incidental finding. The imaging appearance of constrictive myelopathy is currently limited to a small number of cases, the majority described by computed tomography myelogram. The aim of this study was to describe in detail the magnetic resonance imaging (MRI) characteristics of presumptive constrictive myelopathy in pugs and its associated clinical signs.

Medical databases of 5 referral veterinary hospitals were reviewed retrospectively to identify pugs with paraparesis and pelvic limb ataxia, with a complete record of signalment, neurological examination and MRI of the thoraco-lumbar region. The exclusion criteria were pugs with other conditions, such as subarachnoid diverticula, hemi-vertebrae causing canal stenosis, intervertebral disc extrusions/protrusions, and multifocal or diffuse intramedullary lesions (such as myelitis or syringomyelia).

From 61 cases, 26 met the inclusion criteria. MRI revealed focal myelopathies in all cases which all show one or more of the following lesions: caudal articular facet dysplasia (24/26), irregular focal subarachnoid space (21/26) with circumferential or dorsal contrast enhancement (9/11), bilateral ventrolateral extradural lesion (22/26). This study describes specific MRI features of pugs with presumptive constrictive myelopathy, which appears to be a consequence of chronic micromotion, and differs from other conditions as subarachnoid diverticula. Our results may help in diagnosing and consequently treating this condition, which may warrant vertebral stabilization.

Magnetic resonance spectroscopy for quantifying the brain regional biochemistry in vivo in murine model of human glioma

M. Pasierbińska1, M. Wieteska2,3, M. Weltniak-Kamirska2, M. Świątkiewicz2, M. Fiedorowicz2
1Nencki Institute of Experimental Biology, Polish Academy of Sciences, Warsaw, Poland, 2Mossakowski Medical Research Centre, Polish Academy of Sciences, Warsaw, Poland, 3Faculty of Electronics and Information Technology, Warsaw University of Technology, Warsaw, Poland

Proton magnetic resonance spectroscopy (1H-MRS) is a well-recognized method used to study metabolic alternation in the brain tissue microenvironment in different diseases. Applied in the brain tumors diagnostic procedure it can provide information about the degree of tumor infiltration into healthy tissue and guidance defining tumor boundaries in treatment planning. Moreover, specific variation in metabolic compounds can advise the differential diagnosis to identify different subtypes of cancer, distinguish neoplastic from inflammatory lesion or evaluate the response to therapy.

Applying 1H-MRS we analyzed the differences in metabolite concentration between healthy and human glioma U87MG bearing hemisphere of the Athymic Nude Mouse, to provide a platform for future investigation of the response to anti-glioma treatment in murine model of human glioma.

Athymic Nude-Foxn1nu 8 weeks old mice (n = 8) were orthotopically xenografted with U87MG glioma cells with stereotactic device with automatic infusion pump. 21 days later the animals underwent 7 T MRI examination: 1H-MRS (PRESS, TE/TR = 20/2000 ms, NA = 1024), was performed for two voxels (2.5x2.5x2.5 mm each). Spectra were analyzed with LCModel.

We found substantial and statistically significant changes in the level of choline, creatinine and N-acetyl aspartate between healthy and tumor bearing hemisphere. Those changes might be related to increased membrane turnover in the tumor core, reduced tissue metabolism and loss, dysfunction or displacement of normal neuronal tissue. Obtained data are notably consistent with findings in patients with glioma and might be used as criteria for evaluation of the response to experimental treatment. Study was approved by the Local Ethics Committee.

Neurotransmitter concentrations in urine associated with the consumption of a medium-chain triglyceride (MCT) supplement in dogs with idiopathic epilepsy

B. A. Berk1,2, T. H. Law1, A. Wessmann3, A. Batthen-Nöthen4, A. Knebel5, A. Tipold5, T. S. Jokinen6, R. M. A. Packer4, H. A. Volk1,5

Applying 1H-MRS we analyzed the differences in metabolite concentration between healthy and human glioma U87MG bearing hemisphere of the Athymic Nude Mouse, to provide a platform for future investigation of the response to anti-glioma treatment in murine model of human glioma.

Athymic Nude-Foxn1nu 8 weeks old mice (n = 8) were orthotopically xenografted with U87MG glioma cells with stereotactic device with automatic infusion pump. 21 days later the animals underwent 7 T MRI examination: 1H-MRS (PRESS, TE/TR = 20/2000 ms, NA = 1024), was performed for two voxels (2.5x2.5x2.5 mm each). Spectra were analyzed with LCModel.

We found substantial and statistically significant changes in the level of choline, creatinine and N-acetyl aspartate between healthy and tumor bearing hemisphere. Those changes might be related to increased membrane turnover in the tumor core, reduced tissue metabolism and loss, dysfunction or displacement of normal neuronal tissue. Obtained data are notably consistent with findings in patients with glioma and might be used as criteria for evaluation of the response to experimental treatment. Study was approved by the Local Ethics Committee.
Medium-chain-triglyceride (MCT) as add-on management of canine epilepsy has been associated with positive effect on seizure control, cognition and behavior in dogs with idiopathic epilepsy (IE). At present, the exact mechanisms leading to the anti-epileptic and/or anti-seizure properties has not yet been fully elucidated. More research is needed to understand the mechanism of action of MCT.

A 6-month multi-centre, prospective, randomized, double-blinded, placebo-controlled cross-over trial was conducted, comparing a 9% MCT-DS with a standardized control-DS in a population of dogs with idiopathic epilepsy, chronically treated with antiepileptic drugs and reaching tier-2 diagnostic level. Concentration and ratios of different neurotransmitters relevant for epilepsy and behavioral comorbidities have been explored in standardized-collected urine samples in fifteen dogs of the 26 dogs completing the trial. The urine concentration of γ-aminobutyric acid (GABA) was increased during MCT supplementation compared to the control oil (15.5 ± 4.0 v. 12.4 ± 7.5 μmol/g, P = 0.044). Additionally, MCT lead to decreased ratio between GABA and glutamate (GLU) (1:2.5 v. 1:5, P = 0.025). MCT-responders showed significant reduction of GLU (−19 ± 11.5 v. 4.1 ± 28.8 μmol/g, P = 0.046), histamine (− 49.9 ± 31.4 v. 46.4 ± 69.6 μg/g) and serotonin (71.3 ± 23.5 v. 120.1 ± 33.4 μg/g). Other neurotransmitters (glycine, phenylethylamine, dopamine, epinephrine, norepinephrine) appeared not significantly different.

In summary, these data show altered levels of neurotransmitter concentrations in urine associated with MCT-DS consumption when compared to control-DS. The initial data is promising and further research is needed to understand the mechanism of action of MCTs as a nutritive, therapeutic option for a subpopulation of IE-affected dogs of the 26 dogs completing the trial. This will be a valuable asset for future research to study the roles of HACD enzymes in muscle development and disease and the pathogenesis of HACD1-associated myopathies.

**Development and characterization of a zebrafish model of hydroxyacyl-CoA dehydrogenase 1-centronuclear myopathy (HACD1-CNMs)**

G. Walmsley1, R. Morgan1, I. McGonnell1, M. Peffers1, R. Barrett-Jolley1, R. J. Piercy1
1Institute of Aging and Chronic Disease, University of Liverpool, UK
2Department of Clinical Science & Services, Royal Veterinary College, London, UK

Mutations in HACD1 cause congenital myopathies in humans, dogs and mice. The autosomal recessive centronuclear myopathy, HACD1-CNMs, has been recognized in Labrador retrievers for over 30 years with 15-20% of the breed carrying the causative mutation. HACD1 is a muscle specific enzyme required for elongating very long chain fatty acids (VLCFA) (>20C); there are four paralogues in mammals with a distinct tissue distribution. The pathogenesis of HACD1-associated myopathies remains poorly understood. Membranous abnormalities, particularly affecting the triad, have been documented in CNM affected dogs and explain the paresis seen clinically.

We aimed to develop a novel CNM model in embryonic zebrafish. Orthologues of mammalian HACD1-4 were identified and their expression evaluated in developing and mature zebrafish muscle using conventional and quantitative RT-PCR and in situ hybridization. We confirmed hacd1 as the major HACD enzyme in zebrafish muscle with expression strongly upregulated during myogenesis as seen in mammals. CRISPR/Cas9 genome editing was used to introduce mutations into hacd1 and a muscle phenotype was observed in F0 embryos including abnormal tail morphology, motor function and disorganized myofibres with abnormal RYR1 immunostaining.

In conclusion, these findings indicate an evolutionarily conserved, but incompletely elucidated, role for HACD1 and VLCFA in muscle. We have generated a relevant model of HACD1-CNMs in zebrafish embryos which recapitulates features of the myopathic phenotype from affected dogs. This will be a valuable asset for future research to study the roles of HACD enzymes in muscle development and disease and the pathogenesis of HACD1-associated myopathies.

**Spontaneous remission in feline acquired myasthenia gravis without associated co-existing disease**

Thomas Mignan1, Laurent S. Garosi2, Mike Targett3, Mark Lownie4
1Dovecote Veterinary Hospital, Delven Lane, Castle Donington, Derby, DE74 2LJ, UK, 2CVS Teleneurology, Owen road, Diss, IP22 4ER, UK, 3School of Veterinary Medicine and Science, University of Nottingham, Sutton Bonington, Leicestershire, LE12 5RD, UK

Acquired myasthenia gravis (AMG) is becoming increasingly recognized in cats, yet information regarding the natural history of disease, treatment, and outcome including occurrence of immune and spontaneous remission remains limited.

The objective of this retrospective study was to determine the outcome of feline AMG in the absence of associated co-existing disease.

Eight cats were included in this study. All cats had an excellent outcome and systematically achieved immune remission within six months of diagnosis, including four cats which did not receive any treatment and whose natural course of disease involved spontaneous remission. Additionally, clinical presentation was heterogenous, comprising cats which were improving or neurologically unremarkable, and neuromuscular weakness and fatigability induced or exacerbated by the wheelbarrow test were the most consistent neurological examination abnormalities associated with AMG in our hands.

Cats diagnosed with AMG in the absence of associated co-existing disease may have a favorable outcome and frequently achieve immune remission. Moreover, the natural history of feline AMG appears to include spontaneous remission when there is no associated co-existing disease. Ruling out the presence of associated co-existing disease may therefore refine prognosis and treatment may not always be necessary in this disease population.
Towards a cure for neurological FIP: A pilot trial of GS-441524 nucleoside analog in naturally occurring disease

P. J. Dickinson1, M. Bannasch2, S. Thomasy1, K. M. Vernau1, E. Montgomery2, K. Knickelbein3, M. Liepins4, B. Murphy5, N. C. Pedersen6

1Department of Surgical and Radiological Sciences, 2Center for Companion Animal Health, 3Veterinary Medical Teaching Hospital, 4Department of Pathology, Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, CA, USA

Feline infectious peritonitis (FIP) is caused by a virulence biotype of the feline coronavirus (FCV) resulting in CNS and/or ocular disease in approximately 60% of cases in non-effusive (dry) disease. Almost all cats will succumb to disease in days to months despite a variety of historical therapies. Recently developed antiviral drugs have shown promise in treatment and potential cures in non-neurological FIP. Data in neurological FIP cases are limited.

A prospective pilot trial was done in 4 cases of naturally occurring FIP with central nervous system involvement. The study was approved by the Institutional Review Board and IACUC. All animals were treated q24h with GS-441524 (5-10 mg/kg) for at least 12 weeks. Cats were serially monitored including physical, neurological and ophthalmological examinations. One index case had serial MRI, CSF analysis (including FCV titers and FCV-PCR) and serial in vivo ocular imaging using optical coherence tomography and confocal microscopy.

All cats had a positive response to therapy. Three cats are alive off treatment (170d, 333d, 345d post treatment initiation) with normal physical and neurological examinations. One cat was euthanized following relapses after primary and secondary treatment. In the index case, resolution of disease was seen based on normalization of MR images, CSF inflammatory response, CSF PCR findings and decreasing CSF FCV antibody titers. Ocular imaging showed resolution of anterior and posterior segment disease.

GS-441524 antiviral therapy shows clinical efficacy and may result in clearance and long term resolution of central nervous system FIP at dosages higher than those required for non-neurological FIP.

Whole genome transcriptomics defines an inflammatory environment in CNS histiocytic sarcoma in dogs and potential therapeutic targets

P. J. Dickinson1, I. Toyoda2, R. B. Rehbn3, J. Rossmeisl3, K. Woolard4, S. Withers3, K. Skorupski1, D. York1

1Department of Surgical and Radiological Sciences, University of California, Davis, CA, USA, 2Veterinary Medical Teaching Hospital, University of California, Davis, CA, USA, 3Department of Small Animal Clinical Sciences, Virginia Tech, Blacksburg, VA, USA, 4Department of Pathology, Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, CA, USA

Canine histiocytic sarcoma (HS) affecting the central nervous system is a devastating tumor with a median survival of less than 2 months following definitive therapies. Analysis of over a hundred cases suggested primary and disseminated CNS HS have distinct breed predispositions and primary tumors are characterized by inflammation within the CSF compartment. Cancer, inflammation and the immune system have a complex relationship with mediators and cellular effectors of inflammation having both anti and pro-tumor effects.

A retrospective, whole genome transcriptomic analysis of archived, frozen primary CNS HS, disseminated non CNS HS and meningioma (n = 39) was done using RNASeq. Differentially expressed genes, compared to normal cerebral cortex, were defined involving inflammatory and immune modulatory pathways, and potential therapeutic targets. Primary CNS HS was characterized by upregulation of inflammatory pathway genes including targetable pro-tumor, inflammatory markers TNFa, and IL1b (P < 0.001), and potential immunosuppressive markers including TGFb and immune check point proteins including PD1, IDO1, TIGIT and CTLA4 (all P < 0.001). Inflammatory markers were upregulated in meningioma and disseminated HS, however at a significantly lower level than primary CNS HS. Immune checkpoint proteins were not differentially expressed in meningiomas. More than 100 genes were > 60-fold differentially expressed in CNS HS compared to meningioma.

Primary CNS HS is characterized by inflammatory and immune modulatory pathway gene expression consistent with clinico-pathological findings. Data support the investigation of novel therapeutic strategies including checkpoint protein inhibition in this currently untreatable tumor. Differentially expressed genes may provide potential biomarkers for differentiation of primary CNS HS and meningioma.
of seizures. All dogs underwent MRI examination of the brain in a 3 T magnet and a pc-SIRS sequence. The pc-SIRS showed hypersynchronized neuronal brain activity in the interictal period in 11 dogs with IE and one dog without epileptic seizures. The pc-SIRS had a sensitivity of 91.7% and a specificity of 75% to visualize interictal hypersynchronized neuronal brain activity in epileptic dogs. In conclusion, the pc-SIRS technique is the first non-invasive imaging technique visualizing hypersynchronized neuronal brain activity in epileptic dogs. The method has potential to investigate the spatial relationship between the brain areas affected by NCI effects and structural and/or functional connectivity in the brain.

[O18]

MRI measurements of the normal canine trigeminal nerve
C.E. Swain1, G. B. Cherubini2, P. Mantis1
1Dick White Referrals, Six Mile Bottom, Cambridgeshire, UK
2Centre for Vision, Speech and Signal Processing, University of Surrey, Guildford, Surrey, UK

There is no available measuring protocol and reference range for the normal canine trigeminal nerve. This can be problematic in cases of suspected bilateral trigeminal neuropathy since contralateral nerves cannot be a useful reference for comparison. Trigeminal nerves and brain measurements were retrospectively assessed via 3D multiplanar reconstructions (3D-MPRs) of 3DT1 post-contrast MR sequences from 200 dogs with no signs or diagnosis of trigeminal disease. Direct measurements of vertical brain height (BH), trigeminal nerves transverse height (TTH) and trigeminal nerves width in dorsal reconstruction (TDW) were measured immediately caudal to the foramen ovale and used to derive nerve height-to-brain ratio (HBR) and width-to-brain ratio (WBR). Derived HBRs (0.09, IQR = 0.08-0.09) and WBRs (0.1, IQR = 0.09-0.11) maintained similar values across breeds than direct TTHs (3.7, IQR = 3.42-4.00) or TDWs (4.33, IQR = 3.97-4.71). All measurements varied proportionally with bodyweight, including HBR (r = 0.41, P < 0.0001), which could reflect an over-representation of brachycephalic breeds in the <10 kg bodyweight category (P = 0.04) as these animals had significantly smaller HBRs compared to dolichocephalic (P = 0.0258) and mesaticephalic (P = 0.0112) breeds and might be explained by their smaller cranial conformation. Furthermore, there was significantly larger HBRs in senior dogs compared to adult animals (P = 0.0409), which may reflect senile cerebral atrophy. In conclusion, trigeminal nerve-to-brain ratios may allow for more accurate, objective assessment of the canine trigeminal nerves on MRI. Additional studies are required to assess these ratios in known cases of trigeminal neuropathy/neuritis and to further quantify the effects of weight, cephalic index and age on suggested ranges.

[O19]

Craniofacial hypoplasia in cavalier king Charles spaniels with Chiari-like malformation: A machine learning inspired morphological study
S.P. Knowler1, E. Dumas1, M Spiteri2, A. K. McFadyen3, F. Stringer4, K. Wells2, C. Rusbridge1,4
1School of Veterinary Medicine, University of Surrey, Guildford, Surrey, UK
2Centre for Vision, Speech and Signal Processing, University of Surrey, Guildford, Surrey, UK
3akm-stats, Glasgow, Scotland, UK
4Fitzpatrick Referrals, Eashing, Surrey UK

Machine Learning (ML) uses a pipeline of statistical patterns that characterize morphological changes not necessarily apparent to the human observer. This data driven approach can remove bias possible with a hypothesis-driven expert-observer approach. ML was applied to CKCS with Chiari-like malformation (CM) associated pain (CM-P) and syringomyelia (SM) and identified biomarkers in sella turcica/presphenoid and soft palate regions. This inspired further morphological study. Retrospective study of T2W sagittal DICOM anonymized images of 66 client owned cavalier King Charles spaniels (CKCS) separated into 3 phenotypes: i) Control (11 CKCS) without SM or central canal dilatation (CCD). ii) CM-P (15 CKCS) with no SM / CCD <2 mm wide iii) SM-S (40 CKCS) SM ≥2 mm wide. Twenty eight morphometric variables were measured reflecting rostral skull flattening and position of the hard and soft palate relative to the cranial base. Ethical approval NASPA-2018-005. Discriminant Analysis revealed that reduced distance between the rostral cerebrum and frontal bone and the ratio of the cranial height to length best distinguished between the three groups. Reduction in maxillary height was significant for CM-P (P = 0.004). The findings suggest that brachycephaly and reduction in craniofacial tissue are paramount features for symptomatic CM and SM. This ML driven project suggested that CKCS with CM-P and SM-S have craniofacial hypoplasia providing further evidence that CM is a global skull and craniocephalic disorder. The disease may be influenced by human selection for brachycephalic features including a well-defined stop. This has implications for health screening which currently dictates only the caudal skull is imaged.

[O20]

Susceptibility weighted imaging at 1.5 Tesla magnetic resonance imaging: Comparison with T2*-weighted gradient ECHO sequence and its clinical indications
P. Weston1, C. Morales2, A. Parry1, I. Carrera1
1Diagnostic Imaging Department, Willows Veterinary Centre and Referral Service, Solihull, West Midlands, B90 4NH, UK
2Service of Neurology and Neurosurgery, Ars Veterinaria Hospital, Barcelona, Spain

Susceptibility weighted imaging (SWI) is a novel gradient-echo MRI sequence, which is a high resolution, fully velocity-compensated, 3D gradient echo (GRE) technique. It accentuates the magnetic properties of paramagnetic and diamagnetic substances by combining information from magnitude and phase images to emphasize susceptibility contrast. SWI is widely used in human brain MRI protocols. It has been reportedly more sensitive than GRE T2* sequences in the identification of intracranial hemorrhage. SWI allows the visualization of veins due to its sensitivity to deoxyhemoglobin. It is therefore used for the detection of vascular malformations, brain infaracts, traumatic brain injury and neoplasia.
SWI has not been reported in veterinary patients. The aim of this study was to compare SWI and GRE T2* sequences in dogs with intracranial disease. Medical records were retrospectively searched for dogs that underwent a brain MRI examination which included GRE T2* and SWI sequences. Ethical permission was obtained. The relative visibility and appearance of non-vascular and vascular signal voids observed on GRE T2* and SWI was compared.

Thirty-three dogs were included, comprising intracranial neoplasia (26), cardiovascular accidents (4), trauma (2) and empyema (1). Histopathological results were reviewed where available. Hemorrhagic lesions were more conspicuous on SWI than GRE T2* in all cases. Intravascular and extravascular vessels were detected in all cases in SWI versus 7/33 on GRE T2*. This enabled identification of vascular displacement (9), dilation (8), and neovascularisation (23), aiding lesion diagnosis.

Hemorrhagic lesions and vascular structures are more conspicuous on SWI compared to GRE T2* sequences.

Hereditary sensory and autonomic neuropathies (HSAN) are a rare and diverse group of disorders affecting the peripheral nervous system. They are characterized by profound distal sensory loss, acral mutilation and variable autonomic disturbances. Here we describe a family of mixed breed dogs with HSAN caused by a novel variant in FAM134B (RETREG1).

Five 7-month-old mixed breed dogs from 2 related litters were presented for a 2 month history of acral mutilation and progressive pelvic limb gait abnormalities. Neurological examination revealed proprioceptive pelvic limb ataxia with spontaneous knuckling and tarsal hyperextension. Proprioceptive reactions were absent in the pelvic limbs and segmental spinal reflexes were normal. Nociception was absent in thoracic and pelvic limbs, but present in the trunk and tail. Complete blood count, serum biochemistry, urine metabolic screening and CSF analysis were unremarkable. Electromyography and motor nerve conduction were unremarkable, but we were unable to obtain a sensory nerve action potential. Three dogs were euthanized at presentation, one at 2 years of age due to urinary incontinence and one at 5 years of age due to progression of the clinical signs and regurgitation secondary to megaesophagus. Histopathology revealed neuronal necrosis and degeneration in autonomic and dorsal nerve root ganglia with secondary axonal degeneration and loss of myelinated fibers in peripheral and autonomic nerves. Genetic analysis detected a novel pathogenic FAM134B c.656C > T (p.P219L) variant, which is inherited in an autosomal recessive manner. This is the second reported mutation affecting FAM134B causing sensory and autonomic neuropathy in dogs.

The modified Glasgow Coma Scale (MGCS) has been shown to be a useful predictor of short-term prognosis in dogs following traumatic brain injury (TBI). The aim of this retrospective study was to correlate the imaging findings, MGCS and outcome of cats following TBI and to assess any association between MGCS and outcome.

The medical records of cats admitted for head trauma to the Queen Mother Hospital for Animals between 2012 and 2018 were reviewed. Cats were included if they had a record of TBI, recorded MGCS at time of admission or neurological examination sufficient for enabling retrospective interpretation of a MGCS, CT imaging performed and at least 48 hours follow up information. Based on previously described scales, each cat was assigned scores for CT findings and outcome at 48 hours and, when possible, 4 weeks after the TBI occurred. Cats were excluded if they had incomplete data or if death was due to systemic illness or at owner request.

Thirty-eight cats fulfilled the inclusion criteria. The MGCS ranged from 4 to 18 at time of admission. Five cats were euthanized within 48 hours of TBI. A Kruskal-Wallis H test showed that there was a significant correlation between the MGCS score and severity of CT findings (P = 0.019). There was a significant correlation between MGCS score at admission and outcome at 48 hours (P = 0.00).

In conclusion, grading of CT findings, MGCS and outcome of cats following TBI can provide a useful index for prediction of outcome in cats after TBI.

Putative resting state networks of the canine brain

Resting state functional magnetic resonance imaging (rs-fMRI) allows assessment of spontaneous brain activity generated under resting condition. Detected signal is produced by fluctuations in the blood oxygenation level which are coupled to underlying neuronal activity. Using a 3 T MRI scanner, rs-fMRI was performed in 10 healthy beagle dogs under general anesthesia using a standardized protocol.
Pre-processing of the data included automated brain extraction, correction of motion artifacts and filtering of high frequency regions. Additionally, an anatomical T1-weighted brain template of the population was generated and used to register the rs-fMRI images. A group-level independent component analysis (gICA) was performed to identify functionally connected brain networks (20 pre-selected independent components).

The gICA analysis revealed 8 components, which were associated with 7 different putative resting state networks (RSNs): auditory, primary visual, peripheral visual, default mode (rostral and caudal), dorsal attention, the motor/somatosensory and somatosensory.

All reported networks are homologous to mammalian animal models and humans’ RSNs. However, further higher order RSNs commonly reported in humans such as executive control and salience network were not present; suggesting, that whether intact consciousness may be necessary for detection of such networks or absence of these networks in the canine brain.

Characterization of the canine resting state networks opens the possibility to further investigate brain diseases, especially those that lack of obvious morphological alterations.

**[O24]**

**Semi-automated image classification for detection of T2 hypointensity on 3T MRI in dogs with severe spinal cord injury**

B. Boudreau¹, N. Jeffery¹

¹Department of Small Animal Clinical Sciences, Texas A&M University, College Station, Texas, USA

Interobserver reliability limits the application of imaging biomarkers in the study of spinal cord injury. In this study, T2-weighted transverse slices were evaluated from 27 dogs with paraplegia and loss of deep pain perception following acute spinal cord injury.

The region of the spinal cord was hand-segmented from each slice, intensity normalized by z-scoring, and scaled to uniform maximum dimensions. A randomly selected training set of 600 slices was subjected to automatic feature extraction. The resulting features were used to train an image classifier against ground truth established by one blinded neurologist sorting the images into eight visual pattern categories, one of which corresponded to intramedullary hypointensity.

The trained classifier identified intramedullary hypointensity with 87% accuracy on a test set of an additional 600 images, and selected 9/9 individuals with clear intramedullary hypointensity from the complete original dataset. It was then exposed to an additional 800 images from the spinal cords of 18 other dogs. The classifier identified 4/4 individuals with intramedullary hypointensity previously recognized through visual screening by an additional neurologist.

These data demonstrate that a semi-automated process may be applied to identify salient features of spinal cord injury without relying on human judgment. This study represents a preliminary step in development of bias-free application of imaging criteria for spinal cord injury in dogs.

**[O25]**

**Canine Wharton’s jelly mesenchymal stem cell therapy in dogs with acute paraplegia and absent pain perception after thoracolumbar disk extrusion**

D. Faisiér¹, A. M. Hoffman²

¹Cummings School of Veterinary Medicine at Tufts University, Massachusetts, USA, ²University of Pennsylvania School of Veterinary Medicine, Philadelphia, Pennsylvania, USA

Paraplegic dogs with absent pain perception suffering from spinal cord injury after an acute extrusion of nucleus pulposus have a guarded prognosis for return to ambulatory function. Decompressive surgery has a limited impact and medical management of the secondary injury mechanisms has not been successful. Stem cells have become a new treatment option with the expectation to promote anti-inflammatory properties and spinal cord regeneration.

The goal of this blinded prospective study was to compare a sub-arachnoid injection of cryopreserved, thawed 4x10⁷ allogenic Wharton’s Jelly mesenchymal stem cells (WJ-MSC) over the lesion at the time of decompressive surgery. Initial and follow-up examinations were performed at the time of admission, 1,3,7,14,42 and 84 days post-surgery with a focus on ambulation, fecal and urinary continence.

The population included 8 treated and 10 control dogs. Dachshund were the most common breed and Th12-13 was the most frequent compression site in both groups. Ten dogs returned to ambulatory function (55%) with 4/10 suffering from occasional urinary and 3/10 from fecal incontinence. Six dogs did not regain ambulatory function and two were diagnosed with myelomalacia. There was no difference in outcome for treated compared to control dogs. The time from onset to surgery, the number of laminectomy sites and the estimated compression ratio did not influence the outcome.

In conclusion, application of WJ-MSC did not yield significant improvement compared to controls. Future studies should address dosage, cell potency, prior cryopreservation, and site of injection as possible factors contributing to the negative outcome in this trial.

**[O26]**

**Peri-ictal magnetic resonance imaging changes in dogs with idiopathic epilepsy**

A. Nagendran¹, F. McConnell¹, R. José-López², R. Gutierrez-Quintana², L. De Rísio³, D. Sanchez-Masian², R. Gonçalves¹

¹Small Animal Teaching Hospital University of Liverpool, Leahurst, Neston CH64 7TE, UK, ²School of Veterinary Medicine, University of Glasgow, Glasgow, UK, ³Animal Health Trust, Lanwades Park, Kentford, Newmarket CB8 7UU, UK, ⁴Anderson Moores Veterinary Specialists, Winchester, UK

This retrospective multicentre study was designed to review and describe peri-ictal (PI) MRI findings in dogs diagnosed with idiopathic epilepsy (IE); including location, symmetry and, when available, report the findings on repeat MR imaging and diffusion and perfusion weighted imaging. Ancillary data included presence of post-ictal clinical signs, frequency and type of seizures and time to MRI after last
Seventy dogs fulfilled the inclusion criteria. Most common locations included the hippocampi \[n = 24\], piriform lobes \[n = 24\] and the cingulate gyrus \[n = 25\]. Other locations not previously described included caudate nuclei, thalamus and occipital lobes. Diffusion weighted imaging (DWI) was available in 13 dogs and showed predominantly a restrictive pattern in the affected areas. Perfusion weighted imaging (PWI) was available in 7 dogs and showed either hypoperfusion or hyperperfusion of the affected areas. The majority of the study group presented with cluster seizures or status epilepticus within 24 hours of imaging (75%). The majority of dogs in the study group presented with post-ictal clinical signs (75%).

This is the largest study reporting PI changes in dogs with IE and we have identified new neuroanatomical locations affected by these changes. The DWI findings strongly support evidence of seizure-induced cytotoxic edema. The PWI findings could further inform on the reversibility of the changes, thus warranting prospective evaluation.

**POSTER FLASH ABSTRACTS**

**[FP1]**

**Surgical treatment of Atlanto-axial subluxation using 3D-printed patient-specific drill guides for placement of transpedicular screws in 12 dogs**

C. Toni\(^1\), B. Oxley\(^1\), S. Behr\(^1\)

\(^1\)Willows Veterinary Centre and Referral Services, Solihull, UK

The objective of this retrospective case series was to report outcome and complications following ventral atlanto-axial stabilization using 3D-printed patient-specific drill guides for placement of transpedicular screws in dogs with atlanto-axial subluxation. Medical records of dogs treated with this technique between May 2016 and August 2018 were reviewed. Data including pre- and post-operative modified Frankel score, imaging modality performed and complications were collected. Screws placement was graded using a modified Zdichavsky classification based on post-operative computed tomography (CT). Telephone follow up was obtained for each dog.

Twelve consecutive cases were included. Modified Frankel score was 3 in 5/12 (42%) dogs and 4 in 7/12 (58%) on presentation. All dogs underwent pre- and post-operative CT scans. Of 61 bicortical screws placed, 57/61 (93%) were graded 1 and 4/61 (7%) were graded 2a. Post-operative CT revealed good alignment of C1 and C2 in all planes. Reversible perioperative adverse events were described in 5/12 (42%) dogs. Two out of twelve (17%) of dogs were euthanized shortly after discharge for conditions unlikely directly related to the surgical procedure performed. At short-term follow up (18 to 50 days after surgery) 8/10 dogs (80%) had improved neurological status. For the remaining 2/10 (20%) neurological status remained unchanged. All dogs were reported ambulatory and comfortable at telephone follow-up (median 405 days post-surgery, range 180-780 days).

In conclusion this technique is accurate and safe in dogs with atlanto-axial subluxation, with improved neurological status resulting in 10/12 dogs.

**[FP2]**

**What do people want to know about canine and feline epilepsy? Looking for answers using google trends**

M. Plonek\(^1\,2\)

\(^1\)Centre for Experimental Diagnostics and Biomedical Innovations, Wrocław University of Environmental and Life Sciences, Wrocław, Poland, \(^2\)Ranzijn Dierenarts via Flexvet, Veterinary Clinic, Zaandam, The Netherlands

Google is currently the most popular search engine and enables fast and easy access to health-related information. Google Trends is a useful tool that allows the analysis and graphic of Google searches in various countries over time.

The aim of this study was to evaluate and interpret worldwide web search queries related to canine and feline seizures and epilepsy in English-speaking countries over the course of a five-year period and determine related topic searches.

Search terms included “dog seizure,” “dog epilepsy,” “cat seizure” and “cat epilepsy.” The results were retrieved as a number of relative normalized search volume numbers (RNSN) on a 100 point scale.

“Dog epilepsy” was the most searched term. There was an increasing trend of this search over time (2014 mean 42 RNSN vs 2019 mean 72 RNSN). A breakout of related topics (>5000% RNSN) included “cannabidiol drug”, “dog seizure aftermath” and “dog seizure triggers”. In each studied year, the search for this term peaked between the 23rd-31st December (>58 RNSN).

In cats, the term “cat seizure” was less popular and remained at a steady search trend (2014 mean 51 RNSN vs 2019 mean 55 RNSN). Breakout related topics included “euthanasia” and “cat seizure while sleeping”. Peak periods for this search (>69 RNSN) were observed in July, October and December.

Studies assess Google search trends may enhance our understanding of the demand for information concerning specific aspects of animal seizures and epilepsy. The processing of such data may help veterinarians meet these information needs.

**[FP3]**

**Magnetic resonance imaging features of solitary vertebral masses in nineteen dogs and one cat**

E. Hanot\(^1\), A. Caine\(^1\), G. B. Cherubini\(^1\)

\(^1\)Dick White Referrals, London Road, Six Mile Bottom, Cambridgeshire, CB8 0UH UK

The purpose of the study was to describe the magnetic resonance imaging (MRI) features of solitary vertebral masses in dogs and cats, and identify potential MRI features enabling differentiation between malignant and benign lesions.
The study included 19 dogs and 1 cat with a solitary vertebral mass, for which a definitive histopathologic/cytologic diagnosis was available. Medical records and MRI studies were retrospectively reviewed, and animals were divided into malignant and benign groups according to the final diagnosis. Specific imaging features (including intensity on different sequences, region of the vertebra affected by pathology, and presence of cortical destruction, sclerosis or fracture of the affected vertebra) were compared using a Fisher’s exact test. The malignant group comprised fifteen dogs and 1 cat, and 4 dogs were included in the benign group. MRI features of the different histopathologic/cytologic types of masses are described. Involvement of the vertebral body, a hyperintense signal on T2-weighted, STIR and gradient echo sequences and evidence of cortical destruction were significantly associated with malignancy ($P < 0.05$). T2-weighted isointensity, STIR hypointensity and STIR isointensity were significantly associated with benign masses ($P < 0.05$). The presence of bone sclerosis was significantly associated with osteosarcomas as compared to other malignant masses ($P < 0.05$). Fractures (5 cases) were only seen in the group of malignant masses.

This pilot study identifies some MRI features that may help differentiate between malignant and benign solitary vertebral masses. Greater case numbers are needed in future studies.

[FP4]

Exercise induced metabolic myopathy in German hunting terrier dogs: Correlation between genotype and phenotype

F. Mühlhause1,2, A. Tipold1, V. Lepori3, T. Leeb3, K. Matiasek4, A. Sewell5, M. Kornberg2

1Department Small Animal Medicine and Surgery, University of Veterinary Medicine Hannover, Hannover, Germany, 2Anicura Veterinary Clinic for Small Animals Trier, 3Institute of Genetics, Vetsuisse Faculty, University of Bern, Bern, Switzerland, 4Section of Clinical and Comparative Neuropathology, Institute of Veterinary Pathology, Ludwig-Maximilians-University Munich, Munich, Germany, 5Biocontrol, Laboratory for Veterinary Diagnostics Ingelheim, Ingelheim

Fatty acid oxidation is a key process in mitochondrial energy production in eukaryotic organisms. Inherited disorders of involved enzymes, especially of the very long-chain acyl-CoA dehydrogenase (VLCAD), can result in clinically heterogenous signs, which differ in the severity and age of onset in affected human patients. The adult-onset form of a VLCAD-deficiency includes myopathic signs with lipid storage in muscle cells and rhabdomyolysis. We present here 8 German Hunting Terriers with a history of exercise induced weakness, myalgia, brownish pigmenturia and suspected rhabdomyolysis. Physical examinations revealed a stiff tetraparetic gait and diffuse muscle pain. Histopathology of 2 muscle biopsies revealed a necrotizing myopathy with enrichment of interfibrillar lipid droplets and mitochondrial abnormalities. Using whole genome sequence analysis, a nonsense variant ACADVL:c.1728C > A in the gene encoding for VLCAD was detected. Affected dogs, being homozygous for the mutant allele at ACADVL:c.1728C > A with a homozygous genotype for the genetic defect, presented significantly higher concentrations of plasma creatine kinase ($p_{CK} = 0.0007$) and alanine aminotransferase ($p_{ALT} = 0.002$) compared to a control group of 14 German Hunting Terrier dogs with a heterozygous and wildtype genotype. Moreover, acylcarnitine analysis identified an elevated peak of tetaadenoylcarnitine (C14:1) in homozygous mutant dogs ($p_{C14:1} = 0.00004$), analysis in control dogs were unremarkable. Because of classical signs this canine disease caused by a pathogenic ACADVL variant was called exercise induced metabolic myopathy (EIMM). A one year follow-up under symptomatic therapy revealed consistent clinical signs. In conclusion, we discovered a novel hereditary disease and presented a first description of the EIMM phenotype with a clear correlation genotype-phenotype in affected German Hunting Terrier dogs.

[FP5]

Hypersexuality responsive to phenobarbital in a neutered male DSH cat

T. Liatis1, G. B. Cherubini1

1Dick White Referrals, London Road, Six Mile Bottom, Cambridgeshire, CB8 0UH, UK

Hypersexuality manifests as biting, knapping, mounting, pelvic thrusting, penile erection and/or coital intermission. Temporal limbic structures play a significant role in the regulation of sexual arousal independently of testosterone. Moreover, thoracic spinal cord, second sacral, hypogastic and pudendal nerves contribute in erection/ejaculation. Hypersexuality has been reported as a sign of temporal lobe epilepsy (TLE) in humans, and experimentally in cats. A 6-year-old, vaccinated, male neutered DSH cat was presented due to polyphagia and hypersexuality manifested since he was adopted one-year before.

Physical and neurological examination were unremarkable, including absence of scrotal testicles and penile spines, indicative of testosterone absence. Differential diagnoses included TLE, inadequate neutering/cryptorchidism, primary behavioral problem, bladder neoplasia, myelopathy/neuropathy (e.g., FIP), adrenal hyperplasia/neoplasia. Hematology, biochemistry and TT4 were almost unremarkable. Blood serology for FIV, FeLV and FCoV was negative. Serum pre- and post-hCG stimulation testosterone ruled out cryptorchidism (< 0.3 nmol/L). Abdominal ultrasound revealed mildly enlarged colonic lymph-nodes, the cytology of which revealed mild reactive hyperplasia. Urinalysis and culture were positive to Enterococcus spp. MRI of brain and spinal cord, and CSF analysis were unremarkable. CSF PCR for Toxoplasma gondii, FPV, FCoV and Bornavirus was negative. Attempts to treat hypersexuality as a behavioral issue, UTI (co-amoxiclav), pain (meloxicam) and anxiety (diazepam) were unsuccessful. Thus, phenobarbital was prescribed in a low dose (1 mg/kg/PO, q12h) which eliminated the episodes of hypersexuality without sedating. Phenobarbital withdrawal resulted in hypersexuality re-establishment. One year later the cat remained episode-free on phenobarbital. This is the first report to present a presumptive TLE characterized by hypersexuality in a neutered male cat.
A new frameless optical neuronavigation system for brain biopsies in eight dogs

S. Gutmann1, C. Tästensen2, I. Böttcher1, J. Dietzel1, T. Flegel1
1Department of Small Animal Medicine, University of Leipzig, Germany

Optical neuronavigation creates a virtual reality, so the surgeon can see the position of all instruments in relation to the head during the procedure in real-time.

The STORZ biopsy device consists of a computer workstation with special software, infrared camera, patient tracker and reflective instruments. Eight dogs with forebrain lesions diagnosed on MRI were sampled: For biopsy planning a 3D-MRI scan (T1/T2, 1 mm) of the entire patient’s head was performed. Afterwards four pins were placed into the skull at following localizations: both zygomatic arches, paramedian over frontal sinus and occipital protuberance. Then a CT scan of the skull was made. Both data sets were fused automatically. A patient tracker with reflective balls was attached to the skull using three self-tapping screws. The patient was registered by touching the patient tracker as well as the tip of each pin with a reflective instrument. Intracranial lesions were sampled free handed (2-4 samples) through a mini-burr hole of 3 mm diameter using a Sedan side-cutting needle with reflective balls. Diagnostic yield based on specific histopathological diagnosis was 100%. Biopsy samples indicated postictal edema (n = 1), inflammatory (n = 5), necrotizing encephalitis/necrotizing leuencephalitis/ meningoencephalitis unknown origin/distemper virus encephalitis) or neoplastic (n = 2, oligodendroglioma) pathologies. Six dogs showed no neurological deterioration, one dog showed a mild temporary ataxia and one dog died after the biopsy procedure because of progression of a pre-existing foramen magnum herniation.

The frameless optical neuronavigation system by STORZ is a relatively safe and effective tool to gain diagnostic brain biopsy samples in dogs.

MYELO-CT imaging findings in four dogs with gross surgical confirmed compressive hydrated nucleus pulposus extrusion

A. Farré Maríne1, A. Luán Feliu-Pascual1
1Aüna Especialidades Veterinarias, Valencia, Spain

Compressive hydrated nucleus pulposus extrusion (HNPE) represents an atypical variety of disc disease in dogs characterized by sudden extrusion of hydrated, non-degenerated or minimally-degenerated nucleus pulposus material, leading to contusion and varying degrees of spinal cord compression. Magnetic resonance (MR) imaging is considered the diagnostic modality of choice showing extradural, typically “seagull”-shaped, compressive material of hydrated signal intensity (hyperintense in T2-weighted images) immediately dorsal to the affected disc space. The intervertebral disc space is often narrowed, with an ill-defined dorsal annulus and a reduced nucleus pulposus signal. Recently, contrast-enhanced computed tomography (CE-CT) appearance of compressive HNPE has been described as a hypodense extradural compressive lesion with rim enhancement immediately dorsal to the intervertebral disc space, with a sensitivity of 91% and a specificity of 100%.

The aim of this case series collected between 2015 and 2019 is to retrospectively describe the myelo-CT findings in four dogs with gross surgical findings consistent with compressive HNPE (white or transparent water-like or gelatinous material). In all cases, the myelo-CT findings were similar to previously described MR including a focal extradural “seagull”-shaped compressive lesion dorsal to the annulus fibrosus combined with a narrowing of the affected intervertebral disc space. The extruded material tended to be hypodense in soft tissue window, although the presence of subarachnoid contrast might artefactually have contributed to this appearance. These results suggest that myelo-CT could be a useful diagnostic tool for compressive HNPE when MR is not available, although a greater number of cases is required to draw solid conclusions.

Clinical presentation, MRI findings, histopathology and outcome in a cat with masticatory myositis

Marco Armellini1, Lluís Sanchez2, Andrea Lorek1, G. Diane Shelton2, Luisa De Risio2
1Animal Health Trust, Small Animal Clinic, Lanwades Park, Kentford, Suffolk, UK, 2University of California, San Diego, Department of Pathology, Comparative Neuromuscular Laboratory/Biomedical Sciences, California, USA

A four-year-old, spayed female domestic short-haired cat was presented with acute facial swelling and waxing-and-waning bilateral exophthalmos for two weeks while treated with meloxicam and amoxicillin-clavulanic acid. Bilateral asymmetric facial swelling, mild exophthalmos and third eyelid protrusion were detected on clinical examination. Hematology and serum biochemistry revealed eosinophilia and markedly elevated CK activity. MRI of the head revealed diffuse swelling of the temporalis, masseter and medial pterygoid muscles. These muscles were severely and heterogeneously hyperintense on T2-weighted and STIR images, compared to normal skeletal muscle. On post-contrast T1-weighted images they were strongly and heterogeneously enhancing and contained several irregular, non-contrast-enhancing areas. Fine needle cytology of the left temporal muscle revealed eosinophilic and macrophagic inflammation. Bacteriologic and fungal cultures were negative. IgG and IgM for Toxoplasma gondii were compatible with previous exposure. A canine ELISA system against masticatory muscle type 2 M fibers was positive at 1:4000 (reference interval < 1:100). Histopathology of the left temporalis muscle revealed moderately severe multifocal myositis. Based on the diagnostic investigation, a diagnosis of immune-mediated masticatory myositis was made. Treatment with tapering doses of prednisolone resulted in complete resolution of the presenting clinical signs. Five months following diagnosis, while on 0.4 mg/kg/day prednisolone, no relapse has occurred, the cat’s serum 2 M antibody titre is negative and the serum CK activity is within reference range.
To the authors’ knowledge, this is the first case report describing the MRI appearance and successful treatment of masticatory myositis in a cat.

[FP9]

3T MRI characteristics and functional outcome in dogs with severe spinal cord injury following thoracolumbar disc herniation

N. D. Jeffery1, B. Boudreau1

1Department of Small Animal Clinical Sciences, Texas A&M University, College Station, Texas, USA

Dogs that have lost ‘deep pain perception’ following acute thoracolumbar disc herniation have an uncertain prognosis for recovery. In this study we explored the relationship between pre-operative MRI features and recovery of ambulation in such ‘deep pain negative’ dogs following routine decompressive surgery plus extensive (4-vertebral length) durotomy.

Of 13 dogs for which we had the necessary data, 7 recovered to walk again and 6 did not (including one that developed progressive myelomalacia). The median length of the gap in CSF signal on the ‘myelographic’ midsagittal MR image was 4.75 vertebral lengths in dogs that recovered versus 8 in those that did not. The spinal cord of all dogs but one (that recovered) exhibited hypointensity in the gray matter on transverse T2W and STIR images that extended for variable distances. In 4 dogs that did not recover there were also extensive regions of hypointensity in the gray matter and, in some individuals, the central canal, on many transverse T2W images; this pattern was not observed in any of the dogs that recovered to walk again.

MR imaging in this small sample of dogs with severe thoracolumbar spinal cord injury after disc extrusion suggests that regions of T2W hypointensity, suggestive of hemorrhagic necrosis or hematoma, in the gray matter or central canal are associated with a poor prognosis for recovery, even when treated by extensive durotomy. As suggested in previous studies a short gap in CSF columns on myelographic MR images suggests a good prognosis.

[FP10]

Median manubriotomy as a simple method to improve ventral access to C7, T1 and T2 vertebral bodies and corresponding intervertebral disc spaces

I. Mateo1

1Hospital Veterinario Vetsia, Calle Galileo 3, Leganes, Madrid, Spain

The approach to the ventral aspect of caudal cervical and first thoracic vertebrae is hindered by the manubrium and the depth of the access. The aim of the present study is the description of the technique used to improve access to C7, T1 and T2 vertebral bodies and corresponding intervertebral spaces, in 7 patients.

With the animals positioned in dorsal recumbency, a ventral midline incision was made from the mid-cervical area to the second sternebra. The sternocephalicus muscles were divided to the manubrium and the superficial and deep pectoral muscles were disinserted from the manubrium with monopolar electrocautery. Subsequently a median manubriotomy was performed. Small Gelpi retractors were used to keep the manubrium open throughout the procedure, allowing visualization of deeper structures of caudal cervical spinal. Care was taken to avoid penetration to the pleural cavity and to respect the external jugular vein in its union with the brachiocephalic vein. With both sides of the manubrium retracted, an incision between sternohyoideus muscles was made to expose the trachea. Then, the approach to the ventral aspect of the cervical spine was continued in the standard manner. Gelpis Seletz retractors are recommended to retract longus colli muscles.

The procedure improved notably the visualization of the ventral aspect C7, T1 and T2 vertebral bodies, thus allowing a comfortable drilling for ventral slot (5 cases with disc extrusions or protrusions) or implant placement (2 cases). No patient suffered complications during or after the surgical procedure. There was no significant increase in perioperative pain.

[FP11]

Analysis of treatment and monitoring protocols of cytarabine arabinoside in canine patients

M. K. E. Feldner1, K. D. Foss1, D. W. Hague1, D. J. Schaeffer2

1Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, Urbana, Illinois, USA, 2Department of Comparative Biosciences, College of Veterinary Medicine, University of Illinois at Urbana-Champaign, Urbana, Illinois, USA

Cytosine arabinoside (CA) is a chemotherapeutic used as an immunosuppressant or anti-neoplastic agent. It is useful in the treatment of diseases of the central nervous system based on its ability to cross the blood brain barrier. Side effects such as myelosuppression, GI disturbance, and hepatotoxicity have been reported. Therefore, it is critical to monitor patients that receive CA. The purpose of this study is to collect and compare data about CA treatment protocols in veterinary medicine.

Diplomates and candidates of the American College of Veterinary Internal Medicine (ACVIM) neurology, oncology, and small animal medicine listservs were contacted and asked to fill out a 26-question online survey about the administration, monitoring, and side effects in dogs being treated with CA. Survey data was compared to retrospective record data of dogs treated with CA at the study institution. Results from the survey indicate a significant difference in the dose utilized in treatment protocols (P < 0.01). Despite variation in dosage, results show a majority of veterinarians perform similar monitoring procedures prior to the first dose of CA. However, after completing the first dose, monitoring procedures varied significantly (P < 0.01). Analysis of both the retrospective and survey data suggest that intravenous administration is associated with a higher risk for side effect development.

Based on these results, there is variation in CA treatment protocols amongst veterinarians. Additionally, route of administration may affect the side effects that are observed. Additional research is
required to further investigate how route of administration can alter patient outcomes.

**[FP12]**

**Clinical and MRI findings in two cats with globoid cell leukodystrophy**

A. S. Colverde1, C. Falzone2, T. Gagliardo3, G. Gandini4
1Clinica Veterinaria Pedrani, Via Caldierino 13, 36 030 Thiene (VI), Italy, 2Clinica Veterinaria Pedrani, Via Caldierino 13, 36 030 Thiene (VI), Italy, 3Department of Veterinary Medicine, University of Bologna, Via Tolara di Sopra 50, 40 064, Ozzano dell’Emilia (BO), Italy, 4Department of Veterinary Medicine, University of Bologna, Via Tolara di Sopra 50, 40 064, Ozzano dell’Emilia (BO), Italy

The aim of the study was to describe neurological symptoms and MRI findings in two cats with histologically confirmed Globoid Cell Leukodystrophy.

We considered cats with progressive neurological signs and MRI changes due to Globoid cell Leukodystrophy, as per histological confirmation.

Two not related male, 5-month-old cats, were referred for progressive neurological signs reflecting multifocal central nervous system involvement and characterized by intentional head tremor, paralysis with absence of deep pain perception on pelvic limbs and weakness-dysmetria with reduced flexor reflex on forelimbs; menace response was also bilaterally decreased.

MRI scans were performed with a 0.25 T-unit and included FSE T2 and T1 weighted sequences on sagittal and transverse planes; T1WI were repeated after intravenously paramagnetic contrast medium administration (0.1 mmol/kg gadolinium). Diffuse and irregular intramedullary T2-weighted hyperintensities were found on the thoracolumbar area; no obvious morphological and signal changes were detected on pre and post-contrast T1WI. In one patient mild cerebellar volume reduction was found.

CSF examination showed mild pleocytosis (13 cells/ul) and marked protein increase (300 mg/dl) in one patient and mild albuminocytologic dissociation in the second (protein: 62 mg/dl).

Due to the progression of the neurological signs, both patients were euthanized. Histological examination of the brain and spinal cord showed myelin loss and perivascular big macrophages containing PAS positive substance, compatible with Globoid Cells Leukodystrophy.

Globoid Cell Leukodystrophy should be considered as a differential diagnosis in young cats showing progressive multifocal neurological signs with predominant involvement of the spinal cord and irregular-diffuse T2 intramedullary hyperintensities on MRI exam.

**[FP13]**

**Evaluation of the involvement of TH17-cells in the pathogenesis of canine spinal cord injury**

A. Kämpe1, A. Knebel1, R. Carlson1, K. Rohn2, A. Tipold1
1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany, 2Department of Biometry, Epidemiology and Information Processing, University of Veterinary Medicine, Hannover, Germany

Interleukin-17(IL-17) producing helper-T-cells (Th17-cells) play a central role in protection against infections and in autoimmune diseases. However, the involvement of Th17-cells is also discussed in the pathogenesis of pain and in secondary inflammatory reactions.

To investigate a possible role of the adaptive immune system in the pathophysiology of intervertebral disc herniation (IVDH) and spinal cord injury (SCI), we analyzed the influence of Th17-cells in blood and cerebrospinal fluid (CSF) of sixty-two dogs suffering from IVDH and examined, if Th17-cells might have an effect on the course of this disease. Isolated lymphocytes were analyzed after stimulation by using multicolor flow cytometry to measure the amount of Th17-cells. Serum and CSF samples were analyzed by Enzyme-linked immunoabsorbent assays (ELISA) simultaneously. Highly significant differences ($P < 0.0001$) could be determined between three sampling time points: preoperative, postoperative after clinical improvement and after six months and in comparison to the healthy control group (animal experiment number: 33.8-42 502-05-18A290).

Last follow-up examinations of Th17-cells were comparable to the control group, preoperative Th17-cell-levels were decreased. Compared to healthy controls IL-17 measured in serum was significantly higher ($P < 0.0001$) in dogs with IVDH. However, there was no considerable difference between IL-17 levels in CSF amongst all groups ($r_{SP} = 0.0482$).

In conclusion, a high activity/usage or consumption of IL-17-producing-cells is suspected in acute IVDH. The decreased amount of Th17-cells recovers postoperatively. These findings may indicate an involvement of Th17-cells in the pathogenesis of IVDH and emphasize the importance of these cells in the interaction of pain and an immune reaction.

**[FP14]**

**Investigation of a TH17 cell-mediated immune response in dogs with idiopathic epilepsy**

A. Knebel1, A. Kämpe1, R. Carlson1, K. Rohn2, A. Tipold1
1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany, 2Institute for Biometry, Epidemiology and Information Processing (IBEI), Hannover, Germany

Th17 cells and their proinflammatory cytokine interleukin-17 (IL-17) seem to be associated with the development of chronic inflammatory and autoimmune diseases. We investigated whether a Th17-cell mediated influence can be identified in some dogs with idiopathic epilepsy (IE).

Th17 cells were identified and quantified by flow cytometry in blood of dogs with IE ($n = 57$) and IL-17 was measured in CSF ($n = 35$) and serum samples ($n = 33$) using an ELISA. Ten healthy beagles formed the control group. Results were correlated with clinical parameters e.g. seizure frequency, seizure severity or response to treatment. Th17 cells were also randomly controlled in dogs with IE in a follow up study. The study was conducted in accordance with the ethical
Elevated levels of stimulated Th17 cells/μL were observed in ten dogs with IE (17.54%). There was a positive correlation between stimulated Th17 cells of dogs with IE and seizure severity (P = 0.0460). IL-17 levels in CSF and serum samples of dogs with IE were significantly increased compared to the control group. However only one correlation with clinical data or sampling time points could be observed: a negative correlation between IL-17 values in CSF samples and the amount of AEDs given to treat dogs with IE.

In conclusion, in single dogs with IE and severe seizures increased Th17 cell numbers were detected in blood. In these individual cases an autoimmune reaction against brain structures could be a potential cause for seizures and anti-inflammatory treatment could be indicated.

Clinical, magnetic resonance imaging and histologic findings of canine thoracolumbar discal cyst

E. Fiorentino1, N. Gasparinetti1, C. Falzone1
1Diagnostica Piccoli Animali srl, Zugliano (VI), Italy

Several types of extramedullary cysts have been reported in dogs; discal cysts remained poorly described and not fully proven in veterinary medicine. The purpose of this prospective study was to report clinical, magnetic resonance imaging (MRI) features and histologic findings of thoracolumbar discal cysts in dogs.

Medical records and MRI of dogs presented from 2014 and 2019 with compressive myelopathy due to thoracolumbar cystic lesions communicating with the intervertebral disc were reviewed. All dogs should have had a neurologic examination, an MRI exam suggestive of discal cyst, surgical removal and histological confirmation of the cyst.

Eight dogs were included with 2 mixed large size breed dogs, 2 German Shepherds, 1 Labrador, 1 Pitt Bull, 1 Czechoslovakian Wolf dog, 1 Siberian Husky. The mean age at time of presentation was 8.5 years; 7 patients were male and one female. The neurological signs more often were severe and started acutely (<48 hours) in all but two dogs, that had a more subacute onset (3 to 7 days). MRI showed compressive thoracolumbar myelopathy due to a round to oval shaped epidural space-occupying lesion communicating with the intervertebral disc, iso/hypointense on T1WI and mostly hyperintense on T2WI, with a variable contrast-enhancing wall, highly suggestive of a cystic structure. Histology confirmed the cyst, showing a wall made of dense fibrous connective tissue and mainly chondroid cells. All dogs dramatically improved after surgery.

Despite rare, discal cysts should be considered amongst the differential diagnosis in dogs with acute thoracolumbar myelopathy and can be successfully surgically treated.

Cerebrospinal fluid velocity in healthy dogs

M. A. Christen1, D. Schweizer1, H. Richter2, M. Dennler2

Cerebrospinal fluid (CSF) circulates from intracranial to spinal CSF spaces driven by the expansion of intracranial vessels. Alteration of CSF flow velocity can be seen in a variety of diseases, including obstructing of CSF spaces. This may result in secondary disorders such as hydrocephalus or cystic lesions within the forebrain or spinal cord. Phase-contrast magnetic resonance imaging (PC-MRI) is a non-invasive method to measure CSF flow velocity and to detect abnormalities in flow pattern. There is a lack of data on CSF flow velocity and pattern in dogs. Aim of this study is to measure CSF flow in a group of healthy dogs to evaluate the normal CSF flow. In this prospective study six adult healthy Beagle dogs were examined in a 3 Tesla magnetic resonance imaging system. CSF flow velocity was measured perpendicular to the flow at the level of the mesencephalic aqueduct, foramen magnum and at level of C1-C2 in transverse orientation. Ethical approval for the study was obtained.

CSF flow was detected bidirectional in all three locations and displayed as biphasic waveforms. Mean peak flow velocity in cm/s at the mesencephalic aqueduct was 0.92 (range 0.51-2.01), at the foramen magnum 1.84 (range 0.89-2.73) (ventral subarachnoid space) and 1.17 (dorsal subarachnoid space; range 0.75-1.8). At the cervical spine, the mean velocity measured ventral to the spinal cord was 2.03 (range 1.1-3.0) and dorsal to the spinal cord 1.27 (range 0.96-1.82). In conclusion, 2D phase contrast magnetic resonance imaging is a feasible technique to measure CSF flow velocity in dogs. We acquired data in healthy dogs to compare them to patients with intracranial and spinal pathologies.

Polynéuritis cranialis: Subtype of acute canine polyradiculoneuritis?

H. Vandenberge1, L. Escauriaza1, V. Mortera2, E. Laws2, F. X. Liebel3, T. Harcourt-Brown3, N. Granger4
1Bristol Veterinary Specialists at Highcroft, CVS Referrals, UK, 2North Downs Specialist Referrals, Bletchingley RH1 4QP, UK, 3Small Animal Referral Hospital, Langford Vets, University of Bristol, BS40 5DU, Bristol, UK

Polynéuritis cranialis attributed to Guillain-Barré (GBS) syndrome is a rare condition described in human patients, displaying a combination of ocular signs, bulbar signs and often facial weakness with ancillary test results consistent with GBS.

We have retrospectively identified dogs with: (1) deficits involving more than 2 cranial nerves (CN) either motor, sensory or autonomic, based on clinical examination and EMG when available; (2) a monophasic disease course pattern of acute / sub-acute onset; and (3) exclusion of diseases affecting the brain parenchyma on advanced imaging. Seven dogs (6 females, 1 male, aged 2-10 years old) were identified with 5-30 days histories of multiple cranial nerves deficits. Median number of CN involved was 4 (range 3-7). Five dogs were presented with dropped jaw, 5 dogs with facial weakness, 5 with peripheral vestibular signs and 3 dogs with bulbar signs. Deficits were asymmetric in
5 dogs. Brain imaging was normal in 4 dogs and contrast enhancement of one or more CN was seen in 3 dogs. Albuminocytological dissociation was noted on CSF analysis in 3 dogs and mononuclear pleocytosis in 1 dog. The outcome was fair to good in dogs without bulbar signs and more guarded in dogs with bulbar signs. Polyneuritis cranialis had thus far only been described once in a dog and an immune-mediated disease was suspected. It might represent a subtype of acute canine polyradiculoneuritis. We would like to recruit further cases prospectively to look more closely at presence of anti-glycolipid antibodies, response to intravenous immunoglobulins and outcome.

**[FP18]**

Prognostic value of early computed tomography in dogs after traumatic brain injury

S. Wyatt\(^1\), C.Y. Lee\(^2\), M. Pivetta\(^1\), E. Beltran\(^1\)

\(^1\)Royal Veterinary College, Hatfield, UK

Traumatic brain injury (TBI) is associated with significant mortality and valid prognostic indicators for survival are limited in veterinary medicine. The study objective was to determine whether early CT findings are associated with short-term prognosis after TBI in dogs.

An electronic database was retrospectively searched for dogs with TBI which underwent CT imaging within 72 hours of injury; 49 dogs with TBI met the inclusion criteria for this study which was granted ethical permission by the study institution. CT findings were evaluated by three reviewers blinded to clinical presentation and were classified based on a modified advanced imaging system (MAIS) from grade I-VI. Other imaging characteristics recorded included presence of midline shift, percentage parenchyma involved, and presence of skull fractures. Outcome measures included survival to discharge and occurrence of post-traumatic seizures (PTS).

Seventeen dogs (34.7%) had abnormal brain parenchyma on CT. Midline shift was present in eight dogs (16.3%). There was a significantly worse prognosis associated with more extensive intraparenchymal injuries, midline shift, and brainstem lesions. There was also a significant association with MAIS grade and short-term prognosis. Eight dogs (16.3%) experienced PTS; dogs with higher MAIS were significantly more likely to suffer PTS.

CT is a valuable tool in predicting short-term prognosis following TBI in dogs and the MAIS may be useful for predicting survival to discharge and occurrence of PTS.

**[FP19]**

Magnetic resonance spectroscopy findings in a beagle dog with genetically confirmed Lafora disease

N. Alisauskaite\(^1\), M. Dennler\(^2\), K. Beckmann\(^3\), N. Zölch\(^3\)

\(^1\)Neurology Service, Department of Small Animal Surgery, Vetsuisse-Faculty Zurich, Zurich, Switzerland; \(^2\)Clinic for Diagnostic Imaging, Department of Diagnostics and Clinical Services, Vetsuisse-Faculty Zurich, Zurich, Switzerland; \(^3\)Forensic Medicine and Imaging, Institute of Forensic Medicine, University of Zurich, Zurich, Switzerland

Lafora disease (LD) is an autosomal recessive degenerative disease primarily affecting the central nervous system in various species, including people and specific dog breeds, such as beagles. In beagles it is caused by mutation in NHLRC1 gene, leading to intracellular accumulation of polyglucosan bodies (Lafora bodies) primarily in the somatodendritic compartment. Cortical atrophy was demonstrated in humans and dogs in MR imaging. In humans, magnetic resonance spectroscopy (MRS) of the brain reveals reduced N-acetyl-aspartate (NAA) relative to brain metabolites - creatine (Cre), choline (Cho) and myo-Inositol (mI), in patients suffering from LD compared to controls. MRS findings in dogs suffering from LD are lacking.

A 6-year-old female beagle was presented with history of a single generalized tonic-clonic seizure and multiple episodes of reflex myoclonus. Neurological examination was unremarkable. 3-Tesla MRI and MRS with voxel positioning in the thalamus were performed and compared to 12 healthy beagles’ results. Signal-to-noise ratio and full width at half maximum were comparable between investigated dog and controls.

MRI examination of the head and CSF analysis were unremarkable. MRS revealed decreased levels of glutamate-glutamine complex (Glx), NAA and increased phosphoethanolamine (PE) relative to water and Cre compared to the value range in controls. Additionally, NAA/Cho ratio demonstrated the most pronounced difference compared to healthy beagles. Genetic test confirmed LD.

In this case MRS showed abnormalities with absent changes in conventional MRI. Reduced NAA reflects neuronal loss and is comparable to MRS findings in humans suffering from LD. Reduced Glx levels might be associated with antiepileptic drug administration.

**[FP20]**

A patient-specific 3D printed surgical guide to aid localization of the drilling site during transsphenoidal hypophysectomy in dogs

L. Escarriaga\(^1\), J. Fenn\(^2\), D. Roper\(^3\), H. Vandenbergh\(^1\), B. Oxley\(^2\), N. Granger\(^2\)

\(^1\)Bristol Veterinary Specialists at Highcroft, CVS Referrals, UK; \(^2\)The Royal Veterinary College, University of London, Hawkshead Lane, Hatfield, Hertfordshire, UK; \(^3\)Willows Veterinary Referrals, United Kingdom & Vet3D, Coventry, UK

Trans-sphenoidal hypophysectomy in dogs is increasingly recognized as a viable surgical treatment for Cushing’s disease. However, it comes with technical challenges due to the anatomy of the bone and presence of important blood vessels around the pituitary. The surgeon’s landmarks to locate the sella turcica are the pterygoid hamular processes and shape of the sphenoid bone, but these remain imperfect. We thought of designing a patient-specific mold which would delineate the exact burring site into the sphenoid bone for correct and safe entry into the sella turcica.

To achieve this, we have dissected and obtained CT images of the head of two cadavers, designed guides for each anatomical specimen, 3D printed the skulls and fitted the guides, drilled the sphenoid bone, then finally checked with CT accuracy of our approach. The guide locks on the upper arcade molars. It extends caudally to meet the
sphenoid bone where it takes the shape of a rectangular frame. The size and location of the drilling site, in the middle of the frame, is defined from reconstructed sagittal CT images where the sphenoid outer and inner cortices are visualized. For both anatomical specimens, entry into the sella turcica was possible. We provide here proof-of-concept that a low profile 3D printed patient-specific guide can help successful entry into the sella turcica. We believe that this guide could increase safety of hypophysectomy and reduce surgical time and surgeon’s apprehension to damage important anatomical structures around the pituitary fossa. The technique could be extrapolated to cats with little difficulties.

**[FP21]**

**Novel neuromuscular manifestations of gluten sensitivity in a border terrier**

M. Rosati1, R. Cappello2, N. Kolb1, V. Alf1, K. Matiasek1

1Section of Clinical and Comparative Neuropathology, Ludwig-Maximilians-University, Munich, Germany, 2North Downs Specialist Referrals, Bletchingley, UK

Gluten related disorders (GRDs) are a spectrum of clinically diverse entities with ingestion of gluten as common trigger. Serological tests used to confirm GRDs rely on detection of anti-gliadin antibodies (AGA) and transferrinase-2 antibodies (TG2). Border terriers with paroxysmal gluten-sensitive dyskinesia (PGSD) and non-coeliac gluten sensitivity (NCGS) have been recently described but GRDs with neuromuscular manifestations in the breed has not been reported so far. An 11 years old, male Border Terrier was referred because of paraparesis with insidious onset and progressive course. On neurologic examination the patient showed paraparesis and reduced spinal reflexes. Clinicalopathologic investigation was unremarkable. Electrodiagnostic tests detected normal electrical activity of the muscles while nerve conduction studies displayed reduced amplitude and decreased motor nerve conduction velocity. Muscle and nerve biopsies displayed very mild, oligofocal, lymphohistiocytic myositis and moderate diffuse non-infiltrative large fiber nodo-paranodopathy. Evaluation of AGA and TG2 from serum revealed 0.31 of AGA IgG (normal <0.12) and 1.23 of TG2 IgA (normal <0.41). A diagnosis of GRDs with neuromuscular manifestations was made and a gluten free diet was started. Clinical signs resolved within 7 days from beginning of the diet. GRDs in dogs can manifest in a variety of ways and recognition of suggestive clinical signs and histologic patterns should advise the clinician to perform gluten serological testing for confirmation. Gluten-free diet is the treatment of choice and results in complete remission of all associated clinical manifestations.

**[FP22]**

**Multimodal diagnostic approach for the improvement of diagnostic accuracy of canine neuromuscular neosporosis**

V. Alf1, F. Tirrito2, F. Giebels3, J. Tabanez4, E. Mercuriali5, C. Falzone6, P. Zagarella7, A. Fischer8, T. Steinberg9, A. Kiviranta10, R. Cappello11, K. Matiasek1, M. Rosati1

1Section of Clinical and Comparative Neuropathology, Ludwig-Maximilians-University, Munich, Germany, 2Neurologi Veterinarii Associate, Milan, Italy, 3Division of Clinical Neurology, Vetsuisse Faculty, University of Bern, Switzerland, 4Fitzpatrick Referrals, Godalming, Surrey, UK, 5Istituto Veterinario di Novara, Novara, Italy, 6Clinica Veterinaria Pedrani Diagnostica Piccoli Animali, Zugliano, Italy, 7Centro Traumatologico Ortopedico Veterinario, Arenzano, Italy, 8Section of Neurology, Centre for Clinical Veterinary Medicine, Ludwig-Maximilians University, Munich, Germany, 9Neurology Referral Service, Tierklinik Haar, Haar, Germany, 10Department of Clinical Veterinary Sciences, University of Helsinki, Helsinki, Finland, 11North Downs Specialist Referrals, Bletchingley, UK

Neospora caninum can cause multisystemic infections in dogs that serve as intermediate and/or definitive host in the cycle of the parasite. Infestation taking place in the nervous system can involve brain, spinal cord, nerve roots, peripheral nerves and muscles. Antemortem diagnosis can be difficult and delay negatively reflects on the final outcome. Here we retrospectively compare the diagnostic utility of different tests in dogs with clinical signs of neuromuscular neosporosis.

11 cases of confirmed N. caninum infection were reviewed. Diagnostic modalities comprising serology, PCR and histopathology of muscle and nerve biopsies were compared. Age of onset was between 2 months and 9 years (mean 22.5 months). 8/11 patients showed neuromuscular signs only while 3/11 showed also CNS involvement. Serology was performed in 9/11 with 6/9 showing titers >1:160. PCR on muscle samples detected N. caninum DNA in 8/11. Histopathology revealed inflammatory myopathy in 9/11, necrotizing myopathy in 2/11 and tachyzoites in 8/11. Nerve biopsies showed signs of neuropathy in 5/7. All three tests were performed in 9/11 with confirmation in 3/9 from all tests, 4/9 from two tests and 2/9 from one test. Diagnosis of N. caninum infection should rely on a multimodal diagnostic approach and negativity of one single test should not allow for exclusion. In this case series, muscle and nerve biopsies combined with PCR from muscles increased the chances of parasite identification. Serology alone appears less reliable especially if performed at a single time point. Poor outcome was associated with delayed diagnosis.

**[FP23]**

**CT and MRI findings of the thoracolumbar vertebral column in an adult dog with presumed congenital hypothyroidism**

M. Hermans1, I. Cornelis1, S. F. M. Bhatti1, L. Van Ham1, K. Kromhout2

1Small Animal Department, 2Department of Veterinary Medical Imaging and Small Animal Orthopedics, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

Congenital hypothyroidism (CH) is a rare congenital endocrine disorder in dogs and cats. Hallmark clinical signs of congenital hypothyroidism are mental impairment and skeletal developmental abnormalities including delayed maturation and epiphyseal dysgenesis, resulting in disproportionate dwarfism. A 7-year-old male entire miniature Schnauzer presented with progressive paraparesis and ataxia since 1 month. The dog was diagnosed with hypothyroidism at the age of one year, with initiation of L-thyroxine treatment. General physical examination showed a
disproportionate body shape. Neurological examination revealed non-ambulatory paraparesis with absent proprioception, delayed withdrawal and absent patellar reflexes in both pelvic limbs. A CT scan of the thoracolumbar vertebral column revealed shortening of the vertebral bodies of all the included vertebrae with flattening of the cranial and caudal epiphysis resulting in cube shaped vertebrae. Multiple mild to more severe extradural spinal cord compressions at the level of the IVD spaces, likely compatible with protrusions, were noted. Subsequent MRI examination revealed no additional abnormalities.

To the best of our knowledge, this is the first case report describing the CT and MRI characteristics of the thoracolumbar vertebral column in an adult dog with presumed CH. Closure of the growth plates was noted on the images most likely as a consequence of the age of the dog and medical treatment. Multiple disc protrusions in juvenile-onset CH have been described previously in a mixed-breed dog and were considered to be due to the skeletal developmental abnormalities resulting in joint laxity and consequent vertebral instability.

[FP24]

Prognostic value of GFAP and NSE in dogs with meningoencephalitis of unknown origin
B. C. Elias1, L.A. Gomes1, S. F. M. Bhatti2, L. Van Ham2, E. Cox3, I. Cornelis2
1Department of Small Animal Internal Medicine, Department of Veterinary Clinics, Universidade Estadual de Londrina, Londrina, Paraná, Brazil, 2Small Animal Department, 3Department of Parasitology, Virology and Immunology, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

To date, little is known about prognostic factors for dogs diagnosed with meningoencephalitis of unknown origin (MUO). The aim of this study was to evaluate the short-term prognostic value of two biomarkers, Glial Fibrillary Acidic Protein (GFAP) and Neuron-Specific Enolase (NSE), in CSF and serum in dogs diagnosed with MUO. Twenty-seven dogs were retrospectively included in this study, 5 dogs in the control group (CG) and 22 dogs in the MUO group (MG). The dogs in the CG were all adult, healthy research Beagles. The diagnosis of MUO was made based on neurological examination findings, brain MRI, CSF analysis, and exclusion of infectious diseases. GFAP and NSE were measured by ELISA in CSF and serum at time of MUO diagnosis.

The NSE and GFAP concentrations in CSF and serum in the MG were significantly higher compared to the CG (P = 0.008 and P = 0.013, respectively). When a cut-off value of 250 ng/mL of GFAP in the CSF and 150 ng/mL in the serum was used, a sensitivity of 75% and specificity of 100% for mortality at 3 months was observed in both tests. When a cut-off value of 3.5 ng/mL of GFAP in CSF was stipulated for mortality at 3 months, 69% sensitivity and 100% specificity was observed.

In conclusion, NSE and GFAP are expressed in CSF and serum of healthy dogs and dogs with MUO, with a significant difference between both groups. Although results appear promising, large scale studies are necessary to confirm the presented findings.

Poster Abstracts

[PF1]

Spontaneous hemispheric collapse and subarachnoid hemorrhages in a dog with congenital hydrocephalus internus
A. Olszewska1, D. Farke1, K. von Pückler von Schwichow2, M. J. Schmidt4
1Department of Veterinary Clinical Sciences, Small Animal Clinic, Justus-Liebig-University, Frankfurter Strasse 108, 35 392 Giessen, Germany

Overdrainage and collapse of the hemispheres is a potential severe complication after surgical treatment of internal hydrocephalus using ventriculo-peritoneal shunts. Here we describe a case of a spontaneous hemispheric collapse in an untreated dog with congenital hydrocephalus internus.

A twelve-week-old, male Golden Retriever was presented with a history of obtundation, impaired vision, and progressive gait abnormalities of all limbs for three days. Neurological examination revealed a dome shaped skull, a broad-based stance and a moderate cerebellar ataxia. The postural responses were markedly delayed in all limbs. Moderate ventro-lateral strabismus, vertical nystagmus and absent menace response were observed bilaterally. Clinical signs indicated multifocal localisation (forebrain, cerebellum). MRI showed dilation of all cerebral ventricles, irregular thinning of the periventricular white and gray matter, showing consistency with internal hydrocephalus. In addition, the hemispheres were collapsed at the right temporal and left frontal lobe with hemorrhage filling the adjacent subarachnoid space. The dog underwent left frontal and right temporal craniotomy for removal of the hemorrhage. The dog improved on all neurological signs and was discharged after seven days. Repeated MRI after three months showed re-expansion of the cerebral hemispheres. Subarachnoid hemorrhages were markedly reduced. Collapse of the hemispheres can occur spontaneously in dogs with hydrocephalus internus. Removal of the hemorrhage can improve clinical signs.

[P2]

Congenital sensorineural deafness in English setters in the UK: Prevalence and association with phenotype and sex
Oliver Marsh1, Julia Freeman1, Jan Van Dijk2, Luísa De Risio1
1Animal Health Trust, Lanwades Park, Kentford, Newmarket CB8 7UU, UK, 2Zoetis, Chester, UK

The purpose of this study was to estimate the prevalence of congenital sensorineural deafness (CSD) in the English Setter (ES) in the United Kingdom, and to determine whether any association between phenotype and CSD exists in this breed.

The study was approved by the institution’s clinical research ethics committee. The hearing clinic database was searched for ES puppies aged 5-10 weeks presented as full litters undergoing brainstem auditory evoked response (BAER) testing for the purpose of CSD screening between 2000 and 2018. The age, sex, presence of patches at birth, coat color, iris color, hearing status and parental hearing status
(based on BAER) of each puppy was recorded. Multivariate binary logistic regression was performed to determine the significance of these variables as predictors for the likelihood of puppies being unilaterally or bilaterally deaf.

Inclusion criteria were met for 447 ES puppies. The hearing status was bilaterally normal in 427 (95.5%) of puppies. The prevalence of unilateral and bilateral CSD was 3.6% and 0.9%, respectively. Female puppies were 3.3 times more likely to be deaf than males, and puppies with both parents of unknown hearing status were 4.6 times more likely to be deaf than puppies with at least one parent of known normal hearing status. None of the other variables investigated were found to be significantly associated with CSD.

The overall prevalence of CSD in this study population was 4.5%, with female puppies and those with two parents of unknown hearing status being at greatest risk.

**[P3]**

**Partial lateral corpectomy in a cat with a T9-T10 Intervertebral disc protrusion**

K. Santifort1, F. Viehoff1, I. Schaafsma1
1VetReferral Practice ‘t de Pietersberg'; Pietersbergseweg 14, Oosterbeek 6862 BV, The Netherlands

Clinically relevant intervertebral disc disease (IVDD) is less commonly reported in cats than in dogs. However, as diagnostic imaging and surgical techniques are implemented more commonly in felines, there is an increasing body of evidence and experience to support choices in the treatment of feline IVDD cases.

A 12-year-old female neutered domestic shorthair cat was presented with chronic progressive ambulatory but severe paraparesis, ataxia and fecal/urinary incontinence. Neurological examination findings were consistent with a painful T3-L3 myelopathy. Radiographs and MRI revealed intervertebral disc protrusion (IVDP) at T9-T10 with overlying spinal cord T2-hyperintensity. Conservative management for 4 weeks did not result in improvement. A right partial lateral corpectomy at T9-T10 was performed through a lateral thoracotomy approach according to the description provided by Böttcher et al. 2008. Post-operative care consisted of analgesia, physiotherapy and bladder management. Despite post-operative worsening of clinical signs, gradual recovery over the next 6 weeks resulted in an overall satisfactory outcome with residual mild ataxia and spastic monoparesis (right hind) and no urinary incontinence. Fecal incontinence remained, however, which is troublesome for the owners.

Clinically relevant IVDD at T2-T10 is uncommon. Feline T9-T10 IVDD has only been reported twice before. One case (IVDP) was managed surgically (laminctomy and fenestration - unsuccessful outcome) and one (suspected acute non-compressive nucleus pulposus extrusion) was managed conservatively (good outcome). This case report underlines the importance of consideration of decompressive surgery for feline cases of clinically relevant IVDD, in particular lateral corpectomy at sites were other techniques may not provide adequate surgical access.

**[P4]**

**The use of C-reactive protein in canine discospondylitis**

G. J. Nye1, F.X. Liebel1, T.R. Harcourt-Brown1
2Small Animal Referral Hospital, Langford Vets, University of Bristol, Langford House, Langford BS40 5DU, Bristol, UK

Serum C-reactive protein (CRP) is an acute phase protein (APP) used as an ancillary test in multiple canine inflammatory conditions, for example steroid-responsive menigitis-arteritis (SRMA) and may be more sensitive than hematomal analysis at identifying inflammatory diseases. A retrospective analysis of dogs with discospondylitis was performed to identify cases where CRP was tested and where performed, a follow-up CRP following antibiotic treatment.

Fourteen dogs were identified with discospondylitis, confirmed on magnetic resonance imaging (MRI) or computed tomography (CT); and a positive urine, blood or disc aspirate culture with a pre-treatment CRP. 12/14 dogs had an elevated CRP. 7/12 dogs with elevated CRP had a post-treatment CRP at 4-6 weeks and in all cases the CRP was normal. 1/7 dogs had a relapse of clinical signs despite this normal CRP. Of the 12 cases with elevated CRP, 6/12 had white blood cell changes. 10/14 dogs had pyrexia as a clinical sign; the two dogs with a normal CRP were also normothermic.

This study demonstrates that CRP can be normal in cases of canine discospondylitis, and that a future prospective study would be beneficial to assess CRP as a monitoring tool for response to treatment and aid with decision making with regards to cessation of antibiotic therapy. The one case of relapse suggests this might not be a reliable guide.

**[P5]**

**Masticatory muscle myositis in dogs: MRI findings and treatment with dexamethasone**

M. Foreman2, G.B. Cherubini3
2Dick White Referrals, Station Farm, London Road. Six Mile Bottom, Cambridgeshire, CB8 0UH
3Small Animal Referral Hospital, Langford Vets, University of Bristol, Langford House, Langford BS40 5DU, Bristol, UK

Masticatory muscle myositis (MMM) is an immune-mediated inflammatory condition of the muscles of mastication. Two presentations exist - an acute form with signs of trismus, pain and muscle swelling, and a chronic form characterized by muscle wastage and limited range of jaw motion. Diagnosis can be via serology, muscle biopsy or imaging. Prednisolone is the current treatment of choice, with additional immunosuppressive agents as required. In human subacute myositis, dexamethasone has been shown to be more effective and have fewer side effects than prednisolone. The aim of this study was to assess the use of dexamethasone in the treatment of MMM in dogs.

Ethical approval was obtained for a retrospective case series of dogs diagnosed with MMM at our centre between 2011-2018. Case records, imaging and laboratory results of 17 dogs were reviewed. Follow up examinations were performed at 2 and 10 weeks. 15 of 17 dogs underwent MRI as part of their diagnostic workup. All dogs showed contrast enhancement, and 3 dogs showed STIR...
Epilepsy surgery: Cortical resection and hippocampectomy—in a cat with drug-resistant structural epilepsy

D. Hasegawa1, R. Asada1, Y. Yu1, Y. Hamamoto1, S. Mizoguchi1, T. Kuwabara1  
1Nippon Veterinary and Life Science University, Clinical Veterinary Medicine, Tokyo, Japan

Epilepsy surgery, namely unilateral cortical resection and hippocampectomy, was performed in a 12-year-old domestic shorthair cat with drug-resistant epilepsy. The cat had been showing the right atrophic temporoparietal cortex and hippocampus, that might be caused by perinatal vascular accident, the right forebrain signs and recurrent focal epileptic seizures with or without evolving into generalized seizures that often clustered since 3-month-old. Seizures were comparatively controlled (about 1-2 seizures/3 months) by phenobarbital, zonisamide, diazepam, and gabapentin until 10-year-old, but were gradually being uncontrolled (2-3 seizures/month). To identify the epileptogenic zone, an epidural grid-electrode was placed on the right temporoparietal cortex chronically and electrocorticography (ECoG) was monitored for 18 days. As ECoG revealed that some spontaneous seizures onset from a certain area, cortical resection of that area was performed. After the operation, seizures were not observed for two months, but then seizures recurred. Therefore, the second operation was performed to remove the right additional cortical and atrophic right hippocampus, that might be related to brain development, whereas the limited presence of AQP-4 in the senior group could be associated to a reduced compliance of water regulation, yet further studies are required.

Ethical permission was obtained for the study.

Expression of aquaporin 4 in normal canine brains

P. Álvarez1, E. Blasco2, M. Pumarola2, A. Wessmann1

1Pride Veterinary Centre, Riverside Road, Derby, DE24 8HX, United Kingdom, 2Departament de Medicina i Cirurgia Animals, UAB, Bellaterra, 08193 Barcelona, Spain

Aquaporin 4 (AQP-4) is growing in recognition as a potential marker for cancer progression, differentiation and therapeutic intervention. Limited information is available about AQP-4 expression in the canine brain, thus, investigations are necessary to establish a basis for future studies.

We analyzed immunohistochemical expression of AQP-4 in a retrospective series of 9 non-pathological canine brains classified in three groups: young, adult and senior. Formalin-fixed paraffin-embedded brain tissue sections were immunostained for AQP-4 as well as Glial fibrillary acidic protein (GFAP) to additionally confirm the correlation between AQP-4-expressing cells and astrocytes. All groups contained AQP-4-expressing cells with the strongest reaction on the subpial, perivascular and periventricular surfaces. No AQP-4 expressing cells were present in the choroid plexus. Semiquantitative comparison between groups highlighted that AQP-4 is predominantly distributed in the subcortical white matter in the senior group, while the young group showed an increased diffuse labelling involving different neuroanatomic structures of gray and white matter. There was a redistribution tendency of AQP-4 to the white matter tracts in the adult group.

This is the first study to immunohistochemically describe AQP-4 distribution in normal canine brains of different age groups. The results showed that AQP-4 expression is highly conserved between species. A particular pattern was appreciated during the aging process. We hypothesize that the marked elevation of AQP-4 in the young group might be related to brain development, whereas the limited presence of AQP-4 in the senior group could be associated to a reduced compliance of water regulation, yet further studies are required.

Ethical permission was obtained for the study.

Clinical, diagnostic imaging, surgical findings and long-term outcome in a cavalier king Charles spaniel with thoracolumbar caudal vertebral articular process hyperplasia

F. Stabile1, L. De Risio2

1Animal Health Trust, Lanwades Park, Kentford, Newmarket CB8 7UU, UK

A two-year-old female spayed Cavalier King Charles Spaniel presented with 10-day history of progressive painful T3-L3 myelopathy. Magnetic resonance imaging (MRI) of the spine revealed an extradural dorsal spinal cord compression at the level of T12-T13 vertebrae caused by hyperplasia of the caudal vertebral articular process (VAP) of T12. Similar changes were noticed at the level of the T13-L1 vertebral, not causing spinal cord compression. In order to plan surgical decompression computed tomography (CT) of the spine was performed. This revealed thickened T12 dorsal lamina, hyperplastic T12 caudal VAP and hyperplastic T13 cranial and caudal VAP. The patient underwent T12-T13 dorsal laminectomy and spinal cord decompression by removal of the hyperplastic caudal VAP of T12.
Post-operative 6-year follow-up revealed a normal neurological examination. A combination of MRI and CT allowed optimal treatment selection and surgical planning for VAP hyperplasia. Surgical treatment by dorsal laminectomy provided successful long-term outcome. A previous case series on dysplastic caudal VAP included a 10 month old CKCS with signs of T3-L3 focal myelopathy. In that case MRI of the spine revealed an hourglass cranial bone compression at the level of T12-T13 caused by bulging of the dorsal annulus fibrosus and ligamentum flavum hypertrophy with or without VAP-new bone formation, suggesting that this spinal abnormality was secondary to chronic micro-instability. In our case, the spinal cord compression was solely osseous in origin and no ligamentous hypertrophy or DJD was associated to the caudal VAP hypertrophy, supporting the hypothesis that VAP hyperplasia was likely due developmental anomaly.

[Sagittal craniosynostosis as underlying cause for unusual brain and skull morphology in boxers]

D. Farke1, B. Guillier1, A. Olszewski1, M. J. Schmidt1
1Department of Veterinary Clinical Sciences, Small Animal Clinic, Justus-Liebig-University, Frankfurter Strasse 108, 35 392 Giessen, Germany

A high incidence of closed sutures and synchondrosis was documented in brachycephalic dogs, which potentially has a substantial influence for the development of their brachycephalic head morphology. The question arises whether these variations are part of a physiologic spectrum or represent a pathological condition (ie, craniosynostosis). Boxer dogs can have unusually deformed brains and a high, and narrow cranial vault. We retrospectively examined MRI scans of 46 boxers and 100 mesocephalic dogs of different age for the open or closed status of their cranial sutures. An open suture was defined as a hypointense signal interruption of the hyperintense calvarial bone marrow signal in T2-weighted images. A closed suture was defined as a hypointense signal interruption of the hyperintense calvarial bone marrow signal in T2-weighted images. Multiple logistic regression was performed to test the effect of age on closure of the sutures between each group. The probability of finding a closed sagittal suture was at all times higher in boxers compared to mesaticephalic dogs (P < 0.0001). The sagittal suture remained unfused in mesocephalic dogs up to 10 years of age, whereas sagittal sutures were already fused in 3 months boxers.

There was no difference for the other examined cranial sutures. This non-syndromic sagittal craniosynostosis might be a dog model for human scaphocephaly ("Kahnschädel"-Syndrome).

[Canine spinal neoplasia: Epidemiologic and clinical features in 112 dogs]

R. García1, S. Añor2, S. Ortiz1, C. De la Fuente1, E. Blasco2, M. Pumarola2
1Departament de Medicina i Cirurgia Animals, UAB, Bellaterra, 08193 Barcelona Spain

The purpose of the study was to characterize canine tumors within or surrounding the spinal cord associated with neurological signs diagnosed from 2011 to 2018. The database of the veterinary histopathology service of a Spanish university was reviewed to identify dogs diagnosed with spinal neoplasia through necropsy or biopsy. Owner permission was obtained in all cases. 112 dogs were included in the study. Dogs had a mean age of 8.19 years at initial presentation. No sex predisposition was observed. Overrepresented breeds included cross breed [19.6% (22/112)], French Bulldog [8.9% (10/112)], Boxer [7.1% (8/112)] and Labrador Retriever [7.1% (8/112)]. Intramedullary neoplasia was less frequently present [3.57% (4/112)] than extradural [39.28% (44/112)] or intradural-extradu- medullary [57.14% (63/112)]. Primary neoplasia was found in 93.75% (105/112) of patients. Secondary neoplasia was only seen in 6.25% (7/112) of cases. Peripheral nerve sheath tumors and meningiomas were the most common primary neoplasms [31.25% (35/112) and 23.21% (26/112)], respectively followed by poorly differentiated mesenchymal neoplasia [11.6% (13/112)]. All intramedullary tumors in the studied population were gliomas, and oligodendrogliomas were the most common [2.67% (3/112)].

Our study suggests that primary spinal neoplasia is more common than secondary spinal neoplasia. French Bulldogs and Boxers are overrepresented breeds. Although large cohort studies about spinal neoplasms are lacking, our results differ significantly with those previously reported in dogs from the United States, in which intradural-extradu medullary tumors was the most common location and intramedullary tumors were much less frequent than in our population.

[Focal myokymia/neuromyotonic in a dog with unilateral facial and vestibular neuropathy testing positive for canine minute virus]

V. Indzhova1, J. Brocal1, L. Mazi1
1Department of Neurology and Neurosurgery, Wear Referrals Veterinary Hospital, Durham, UK

Myokymia is defined as a continuous muscle fiber activity manifesting as a vermicular undulation of the skin overlying the affected muscle. Focal myokymia is a rare clinical sign previously reported in only four dogs suggesting hyperexcitability of the associated nerve. A one-year-old, female spayed, crossbreed dog presented with a four-week history of right head tilt and persistent progressive vermicular muscle contractions affecting the right eyelid, right upper lip and right ear. No signs of facial paresis were detected. The remainder of general and neurological examination was unremarkable. Hematology and serum biochemistry including total T4 were normal. Toxoplasma gondii and Neospora caninum serology titers were negative. Conscious electromyography of the levator nasolabialis and orbicularis oris muscles revealed spontaneous muscle activity in forms of multiplets with an intraburst frequency of 250 Hz, compatible with neuromyotonic discharges. The clinical signs ceased under general anesthesia. Nerve conduction study of the right facial nerve revealed lower amplitude, temporal dispersion and polyphasis compared to the
contralateral. MRI of the head showed an enlarged contrast enhancing intratemporal portion of the right facial nerve. CSF cell count, cytology and protein were normal. PCR for infectious diseases on CSF was positive for Canine minute virus (Carnivore bocaparvovirus-1). Treatment with prednisolone at 0.5 mg/kg BID in the first four weeks led to a marked improvement of the clinical signs, without complete resolution. The follow-up is currently ongoing.

Focal myokimia can be the only presenting sign of facial neuropathy. The role of Canine minute virus in neurological diseases deserves further investigations.

Behavioral changes under levetiracetam treatment in dogs
J. R. Erath1, J. Nessler2, F. Riese1, E. Hänefauth1, K. Rohn2, A. Tipold1
1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany, 2Institute for Biometry, Epidemiology and Information Processing, Hannover, Germany

In veterinary medicine Levetiracetam is a well-tolerated antiepileptic drug (AED) with only mild to moderate side effects. Behavioral changes are rare in animals. In contrast, in human medicine the impact of Levetiracetam on behavior was frequently described. Since in our clinic single canine patients with behavioral abnormalities after Levetiracetam application were observed, the current study should elucidate the occurrence of behavioral changes after administration of this AED in dogs.

Eighty-four client-owned dogs with recurrent seizures receiving Levetiracetam as monotherapy, add on treatment or pulse therapy were evaluated. The behavior of the dogs before and after Levetiracetam treatment was ascertained using validated questionnaires. Forty-four dogs already developed changes in their behavior during the disease without Levetiracetam application. After Levetiracetam administration, these behavioral changes were intensified in 14/44 dogs and 4/44 dogs developed at least one additional behavioral abnormality in comparison to their behavioral state before treatment. In 10/40 dogs without preexisting behavioral abnormalities, newly observed behavioral traits were noticed (eg, anxiety, aggression). The changes already occurred after the first application in 5 of these 10 dogs. Levetiracetam was administered as pulse (7/10) or long-term therapy (3/10). Behavioral changes were reversible in 5/10 dogs. 15 of all examined dogs developed positive behavioral changes under treatment (eg, increased energy).

In conclusion, positive and negative behavioral changes under Levetiracetam treatment occur in dogs. Pre-existing behavioral problems should be taken into account, when deciding for Levetiracetam treatment and potential intensifying or change in the dogs’ behavior should be discussed with the owners.

MyeloCT findings in five dogs and one cat with presumptive syringohydromyelia
M. P. Sorolla-Casanova1, A. Farré Mariné3, A. Luján Feliu-Pascual1
1AÚNA Especialidades Veterinarias, 46 980 Paterna Valencia Spain, 3Departament de Medicina i Cirurgia Animals, UAB, Bellaterra, 08193 Barcelona, Spain

Gliomas are infiltrative nervous system tumors that often migrate along white matter tracts beyond the initial location, making complete surgical excision difficult, and decreasing life expectancy in affected patients.

A 13-year-old neutered female mongrel weighing 27 kg was presented with a chronic history of incoordination and generalized tonic-clonic seizures for two months. A brain computed tomography (CT) scan showed an isosattenuating intra-axial lesion with homogeneous contrast enhancement in the left cerebellar hemisphere consistent with neoplasia, and secondary hypertensive hydrocephalus.

A left occipitotemporal craniectomy was performed and all macroscopic tumor tissue was removed with histopathological diagnosis, showed a dense population of small and medium cells with round to oval nuclei and loose chromatin, with infiltrative growth pattern, increased vascularization and 90% of cells with diffuse immunopositivity against Olig-2 but absent to GFAP. On the basis of these findings, the tumor was classified as a poorly differentiated glial neoplasia. A CT scan 13 months later failed to reveal tumor regrowth; however, a pituitary mass was detected. Eighteen months after surgery the patient remained seizure-free on antiepileptic treatment with a complete resolution of the initial neurological signs but showed left pelvic limb lameness due to cranial cruciate ligament rupture and postural reaction deficits and lumbar discomfort due to a suspected degenerative lumbosacral stenosis. The dog died 18 months after surgery of pericardial effusion due to a cardiac mass. Post-mortem examination was not granted.

The described case report represents an atypical case of a caudal fossa glioma excision with an exceptionally long survival time.
Clinical and magnetic resonance imaging features of a hydrated nucleus pulposus extrusion (HNPE) at the level of T3-T4 in a dog

M. Olender1, L. Blond1, S. Piazza1
1Centre Hospitalier Vétérinaire Languedocia, 395 rue Maurice BéjartParc 2000, 34 080 Montpellier, France

A four-year-old German shepherd male was presented for an acute onset of non-ambulatory paraparesis without any signs of pain. Neurologic examination showed normal thoracic limbs and cranial nerves, no voluntary motor function on the pelvic limbs, with normal spinal reflexes. A T3-L3 spinal cord lesion was suspected. A CT-scan of the vertebral column showed no abnormalities. The MRI showed a medullar compression by an extradural material, isointense on T2w to the hydrated nucleus pulposus, with a seagull shape, at the level of T3-T4. This image was consistent with a HNPE. A progressive improvement of the neurological examination was noticed with physiotherapy only.

The extrusion of hydrated nucleus pulposus is a compressive myelopathy caused by herniation of a non- or slightly -degenerated nucleus pulposus, occurring both in chondrodystrophic and non-chondrodystrophic breeds. The neurological signs are often severe with common respiratory distress on cervical lesion. The MRI findings are characterized by an extradural compressive material isointense to hydrated nucleus pulposus, directly above an intervertebral disc space, ill-defined dorsal annulus, reduction of the nuclear volume and narrowing of the affected intervertebral space. The extruded material lies symmetrically on the midline, ventral to the spinal cord and takes a characteristic seagull shape. So far, the HNPE was found mostly within the cervical spinal cord. Two studies describe a thoracolumbar (T13-L1) localization. To the author’s knowledge, this describes the first case of a HNPE in the high thoracic region, usually preserved of disc extrusion by the intercapital ligament.

Accuracy of low-field MRI and CT in the detection of lesions in patients with pupillary abnormalities
A. Martinez1, I. Mateo2
1Hospital Veterinario Vetsia, Calle Galileo 3, Leganes, Madrid, Spain

Pupillary abnormalities are frequent in patients with neurologic diseases. However, their prevalence and the utility of MRI and CT to detect these lesions remain unknown. The purpose of this study is to establish the prevalence of pupillary abnormalities (miosis, midriasis or anisocoria) in patients with neurologic diseases and to describe their neurroradiological findings in low-field MRI and CT, and the accuracy of these techniques in detecting lesions suspected on the basis of neurological examination.

Medical records of dogs and cats referred for neurological investigation were retrospectively reviewed. Inclusion criteria included: the presence of pupillary abnormalities not attributable to ophthalmologic lesion and low-field MRI or CT available for evaluation. A total of 4331 patients were reviewed (224 with pupillary abnormalities), of which 123 fulfilled inclusion criteria. Eighty-six patients have uni (42) or bilateral (42) mydriasis, 37 had miosis and 2 patients had both. One hundred cases were evaluated with MRI, 20 with CT and 3 with both techniques.
Neurological examination suggested a focal lesion (61/123 of cases), mainly affecting cranial nerves (36/61). This lesion localization could be demonstrated by means of MRI or CT in 16/36 of cases. Three cases had the lesion in other locations than expected and in 17/36 of cases a lesion could not be demonstrated.

In cases with multifocal disease (62/123), MRI or CT was able to detect one lesion in 22/62 of cases. In 5/62 cases a lesion could not be observed with imaging techniques.

**[P18]**

**Assessment of the cutaneous trunci muscle reflex in neurologically abnormal cats**

A. M. Paushter1, D. W. Hague1, K. D. Foss1, W. E. Sander1

1Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, Urbana, Illinois, USA

Evaluation of the cutaneous trunci reflex (CTR) is a standard component of the veterinary neurologic examination in both dogs and cats. In the dog, this reflexes has been determined to be present in nearly all patients, the border has been mapped, and it has established diagnostic and prognostic value. While the neurophysiology of the CTR has been described in the cat, no study has evaluated the reflex clinically.

The purpose of this study was to evaluate the presence of the CTR in a population of neurologically abnormal cats in regard to age, sex, breed, body condition score (BCS), neurolocalization, and mentation. A retrospective medical record review was performed to identify cats with a history of neurologic disease undergoing a complete neurologic assessment between 9/24/2012 and 3/20/2019. Ethical permission was not required for this retrospective study, as the animals involved were cases presenting to the veterinary teaching hospital.

A total of 182 cats were identified. CTR outcome (present, absent), signalment, neurolocalization, mentation, and diagnosis were recorded. The CTR was present in 118 cats (64.8%) and absent in 64 cats (35.2%). Statistical analysis revealed no association between CTR outcome and age, sex, breed, BCS, neurolocalization, or mentation. These findings call into question whether the CTR can be consistently and reliably elicited in the cat and, ultimately, whether continued inclusion of the CTR in the cat neurologic examination provides a benefit over the potential for patient stress and irritation.

**[P19]**

**Stability of canine and feline cerebrospinal fluid samples regarding total cell count and cell populations stored in “TRANSFIX/EDTA CSF Sample Storage Tubes”**

L. Meier1, R. Carlson1, J. Nessler1, A. Tipold1

1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hanover, Germany

Because of fast leucocyte degeneration in cerebrospinal fluid (CSF) laboratory examinations of CSF-samples should be performed approximately within 30 minutes after withdrawal. The storage of CSF-samples in "TRANSFIX/EDTA CSF Sample Storage Tubes" (Cytomark, Buckingham, UK) (TransFix-tubes) should prevent leucocyte degeneration for 72 hours.

Fresh CSF-samples (n = 43) were divided in two aliquots (native; stored in TransFix-tubes) and examined within 30 minutes, on day 1 and 3 after withdrawal using microscopic leucocyte-count and morphologic cell-assessment. Furthermore, leucocyte-spiked CSF-samples (n = 20; native/stored in TransFix-tubes) were analyzed using flow cytometry on four consecutive days. Antibodies against CD3, CD4 and CD21 (lymphocyte-marker), CD11b (granulocyte-marker), CD14 (monocyte-marker) and CD45 (panleukocyte-marker) were used to differentiate the cell populations.

After storage in TransFix-tubes, the leukocytes could not be adequately stained with Türk’s solution and differentiating erythrocytes and leukocytes in the cytometer was difficult. In addition, the cell morphology could not be sufficiently assessed because of shrunken leukocytes and indistinct cell nuclei. However, using flow cytometry, a higher cell count was measured in samples stored in TransFix-tubes compared to native samples. The antibodies against CD3, CD4, CD21, CD11b and CD45 showed a good binding capacity and thus enabled differentiation of cell populations. Nevertheless, after storage in TransFix-tubes, monocytes were no longer detectable using an antibody against CD14.

In conclusion, TransFix-tubes can be used for extended storage prior to flow cytometric analysis of CSF-samples for the differentiation of lymphocyte and granulocyte populations, but not of monocytes. Microscopic leucocyte-count and morphological cell assessment cannot be performed in the described stored samples.

**[P20]**

**Pituitary apoplexy due to pituitary adenoma infarction in a dog: Clinical and 3 T MRI features**

G. Galli1, C. Briola2, G. Bertolini2, M. Caldin3, M. Menchetti1

1San Marco Veterinary Clinic, Neurology and Neurosurgery Division, Veggiano (PD), Italy, 2San Marco Veterinary Clinic, Interventional Radiology Division, Veggiano (PD), Italy, 3San Marco Veterinary Laboratory, Veggiano (PD), Italy

Pituitary apoplexy (PA) is a neurological syndrome that results from sudden infarction/hemorrhage within a normal or tumoral pituitary gland. A prompt imaging is essential to correlate hemorrhagic/ischemic changes with clinical signs. Our purpose is to describe clinical and 3 T-MRI findings of PA in a dog.

A 13-year-old Springer Spaniel was referred for a sudden onset of compulsive behavior. The dog was previously diagnosed with pituitary-dependent hyperadrenocorticism and a pituitary adenoma was detected by CT. The neurological examination revealed an anxious and compulsive behavior, internal ophthalmoplegia and bilaterally reduced menace response, suggesting a rostral and middle cranial fossa neurolocalization. The brain MRI showed a rounded well-defined pituitary mass, T2w, FLAIR and GE-T2* heterogeneously hyperintense, T1w iso/hypointense and moderately contrast enhancing. Within the mass parenchyma, two focal well-defined areas were...
detectable, one was T2w and T1w hyperintense, FLAIR isointense, mildly contrast enhancing and showed a signal void artifact in the GE-T2* sequence, compatible with late subacute hemorrhage; the second was T2w hypointense, T1w, FLAIR and GE-T2* iso/hypointense and moderately enhancing compatible with acute hemorrhage. In the ADC map, generated from DWI sequence, the second lesion corresponded to a region of restricted water diffusion. After 24-hours the dog recovered, but mild internal ophthalmoplegia was still present.

To our knowledge, this is the first report describing MRI findings in a dog with PA. Neurologic signs in dogs with PA can be temporary and may improve. In cases of suspected PA, MRI is particularly useful for early detection of acute pituitary infarction and/or hemorrhage.

**[P21]**

3 T magnetic resonance imaging of protothecosis encephalic lesions in a Scottish shepherd dog

A. Cocchette1, C. Briola2, A. Cirila2, T. Furlanello4, P. Danesi5, M. Menchetti1

1San Marco Veterinary Clinic, Neurology and Neurosurgery Division, Veggiano (PD), Italy, 2San Marco Veterinary Clinic, Interventional Radiology Division, Veggiano (PD), Italy, 3San Marco Veterinary Clinic, Ophthalmology Division, Veggiano (PD), Italy, 4San Marco Veterinary Laboratory, Veggiano (PD), Italy

Protothecosis is a disease caused by saprophyte aerobic unicellular algae. In dogs it is an uncommon infection that mainly occurs as a disseminated form, involving mostly the gastrointestinal tract, eyes and central nervous system (CNS). Despite its worldwide presence, MRI findings in dogs are rarely described. Our purpose is to describe the clinical signs and 3 T MRI findings in a dog with CNS protothecosis infection.

A 4-year-old Scottish Shepherd dog was referred because of 3 weeks history of blindness and chronic diarrhea. The neurologic examination revealed obtundation, vestibular ataxia, right head-tilt, horizontal left nystagmus, dilated pupils with bilaterally absent direct and consensual PLR and bilaterally absent menace response. The ophthalmologic exam showed bilateral exudative chorioretinitis with white plaque-like lesions. These findings were consistent with a multifocal neuro-localization. The brain MRI showed multifocal, periventricular moderate-defined T2W and FLAIR hyperintense, T1W iso/hypointense, mildly enhancing periventricular lesions, increased thickness of the trunk formed by III, IV, VI and ophthalmic branch of V cranial nerves at the level of the left orbital fissure and bilateral multifocal ill-defined T2W and FLAIR hyperintense, iso/hypointense T1W and mildly contrast enhancing lesions in the temporal muscle. CSF examination showed a neutrophilic and monocytoid pleocytosis. Fecal and urine cultures resulted positive for *Prototheca zopfii* genotype 2. Itraconazole therapy was started, but the dog worsened and the owner elected euthanasia. Necropsy confirmed invasion of perivertebral soft-tissues by myelomatous masses extending from the adjacent vertebral BM.

Multiple myeloma (MM) is a multicentric malignancy characterized by monoclonal plasma cells expansion, usually being secretory or, rarely, non-secretory, and primarily arising from bone marrow (BM) resident plasma cells. In veterinary literature, the majority of lesions are of osteolytic nature and multiple spinal cord compressions by myelomatous masses are rarely described.

A 13-year-old Labrador dog was referred because of 2-week-history of paraparesis. The neurologic exam showed severe paraparesis, proprioceptive ataxia, proprioceptive deficits on pelvic limbs and severe thoraco-lumbar hyperalgesia. These findings were consistent with a thoraco-lumbar myelopathy. Laboratory tests, including serum micro-capillary electrophoresis, were unremarkables, except for mild increase of whole blood ionized calcium. Computed Tomography (CT) showed various degrees of osteolysis of scapulae, ribs, sternum, pelvis, vertebral arches and spinous processes of L1, L3, L4, L6 and L7, with soft-tissue masses arising from the vertebral body expanding into the vertebral canal, causing extradural spinal cord compression. CT-guided cytology was consistent with MM. Due to the severe clinical presentation, the owner elected euthanasia. Necropsy confirmed invasion of peri-vertebral soft-tissues by myelomatous masses extending from the adjacent vertebral BM.

Non-secretory MM is extremely rare in canine medicine and the presence of signs of thoraco-lumbar myelopathy multiple spinal cord compression due to myelomatous masses are unusual as well. In similar cases, CT gives the advantages to produce a full-body scanning with optimal visualization of bone lysis and spinal cord compressions.

**[P23]**

Acquired myasthenia gravis and myocarditis secondary to a thymoma in a dog

R. Perillo1, F. Giannuzzi2, A. Marchioni2, S. Gasparini1, M. Rondena2, M. Menchetti1

1San Marco Veterinary Clinic and Laboratory, Neurology Division, Veggiano (PD), Italy, 2San Marco Veterinary Clinic and Laboratory, Oncology Division, Veggiano (PD), Italy, 3San Marco Veterinary Clinic and Laboratory, Pathology Division Veggiano (PD), Italy

Canine thymomas are associated with multiple paraneoplastic syndromes, amongst which myasthenia gravis is the most common. Acquired myasthenia Gravis (MG) is an autoimmune disease characterized by the presence of antibodies against acetylcholine receptors (AChRs). AChRs antibodies are the most commonly formed, but the
production of antistriational antibodies, binding to skeletal and cardiac muscle proteins has also been recorded both in humans and dogs. An association between the occurrence of antistriational antibodies and giant cell myocarditis (GCM) has been described in humans, where GCM concurrent to thymoma-associated MG is a well-recognized syndrome. Our purpose is to describe a case of a dog with thymoma-associated MG and myocarditis.

A 4-year-old mixed-breed dog was referred because of one-month history of exercise-induced weakness, hypersalivation and regurgitation. The neurologic examination was indicative of a neuromuscular junction disease and MG was suspected. A CT-scan examination showed the presence of megaesophagus and a thymic mass. Serum antibodies against AChRs confirmed the diagnosis of MG. Treatment with piridostigmine was started and the thymic mass was surgically excised. Histologically the mass was consistent with type A thymoma. 24-hours after surgery the dog developed a third-degree atrioventricular block. Severe arrhythmia and increased troponin serum levels suggested myocarditis which rapidly lead to cardiopulmonary arrest. Histopathologic examination of the heart revealed a lymphocytic and macrophagic myocarditis with multifocal cardiomyocyte necrosis and rare giant cells. This histopathological picture could represent a GCM variant in dogs. To our knowledge this is the first report of thymoma-associated MG with concurrent myocarditis in a dog.

**[P24]**

**Transient relapsing neuromyopathy during potassium bromide therapy in a dog**

R. Perillo¹, M. Frizzi², P. Giannuzzi², M. Rosati³, K. Matiasek³, E. Bianchi⁴, M. Menchetti⁵

¹San Marco Veterinary Clinic and Laboratory, Neurology Division, Veggiano (PD), Italy, ²San Marco Veterinary Clinic and Laboratory, Surgery Division, Veggiano (PD), Italy, ³Section of Clinical & Comparative Neuropathology, Ludwig-Maximilian University, Munich, Germany, ⁴Department of Veterinary Science, University of Parma, Italy

Potassium bromide (KBr) intoxication can be caused by either toxic concentrations or susceptibility of the patient to therapeutic dosage. In rare cases, KBr intoxication can cause generic involvement of the peripheral nervous system. Our purpose is to describe the clinical, electrodiagnostic and histopathologic findings of a transient-relapsing neuromyopathy in a dog under KBr therapy.

A 2-year-old Australian Shepherd dog, treated with phenobarbital and KBr for idiopathic epilepsy, was referred because of 6-month history of subacute onset and chronic progressive exercise intolerance and gait abnormalities. The neurological examination showed generalized lower motor neuron disease. Thyroid function tests were normal and serum KBr levels were in the therapeutic range. Electrodiagnostic investigation revealed mild pathological spontaneous muscle activity. Muscle and nerve biopsies showed diffuse, mild to moderate muscle atrophy and slight crenations of myelin sheaths. These findings were indicative of mild and unspecific neuromyopathy. The KBr was suspended, with progressive and complete resolution of neuromuscular signs within one month. Few months after stopping the KBr, the dog developed numerous epileptic seizures, which were refractory to other treatments. KBr was then reintroduced, with the improvement of the epileptic seizures accompanied by rapid onset of neuromuscular signs. This relapse confirmed our suspicion of neuromyopathy related to KBr.

Bromide intoxication should be suspected in cases of generalized neuromuscular signs also in dogs with normal serum values. An early identification of the cause and suspension of KBr lead to a complete resolution of the symptoms.

**[P25]**

**Clinical presentation, histological and imaging features of a primary poorly differentiated extradural hemangiosarcoma with pulmonary metastasis in a dog**

K. O’Byrne¹, A. Taur²

¹School of Veterinary Medicine, Melbourne University, Australia, ²Chestergates Veterinary Specialist, Chester, Cheshire CH1 6LT

Extradural neoplasms are the most prevalent type of spinal neoplasia in dogs; however, hemangiosarcoma has been infrequently reported. This study describes clinical, imaging and histopathologic features of a primary lumbosacral extradural hemangiosarcoma.

An 8-year-old Staffordshire Bull Terrier presented for progressive left-sided pelvic limb and tail paresis with fecal incontinence. Neurological examination revealed left pelvic limb postural reaction deficits, perineal hypeaesthesia, anal sphincter hypotonia and lumbo-sacral pain. Prior to referral, myelography supported a non-compressive myelopathy and an epidural methylprednisolone acetate (Depo-Medrol) injection was administered with no improvement.

Magnetic resonance revealed a circumferential T2W and STIR hyperintense extradural mass, extending from L5-Cd1 with strong contrast enhancement. These resulted in moderate-to-severe spinal cord and cauda equina compression. Multiple contrast-enhancing lytic lesions involved the dorsal aspect of L6 and L7 vertebral bodies with extension to neural arch. Enlargement of the L5-S1 nerve roots was observed with moderate contrast enhancement extending to the paravertebral muscles. Thoracic and abdominal computed tomography revealed multiple soft tissue nodules throughout the pulmonary parenchyma.

A L5-L6 dorsal laminectomy was performed and the friable and grayish epidural soft tissue mass was sampled. Hematoxylin and eosin stained tissue sections revealed a non-encapsulated, highly cellular mass whose spindle-shaped cells had indistinct borders with moderate anisokaryosis and anisocytosis. Neoplastic cells demonstrated positive immunostaining for vimentin and von Willebrand factor, whilst Sox10 and S100 were negative, favoring a diagnosis of poorly differentiated hemangiosarcoma.

In conclusion, primary epidural hemangiosarcoma with polyostotic vertebral extension and pulmonary metastatic disease should be considered as a differential for extradural neoplasia.
Diagnostic utility of cerebrospinal fluid analysis in dogs with suspected idiopathic epilepsy

S. E. Gilbert1, T. J. Cardy1, F. E. Taylor-Brown1
1Cave Veterinary Specialists Limited, George’s Farm, West Buckland, Somerset, TA21 9LE, UK

Idiopathic epilepsy (IE) is the most common cause of repeated seizures in dogs. International Veterinary Epilepsy Task Force (IVETF) consensus reports recommend performing MRI of the brain and cerebrospinal fluid (CSF) analysis to reach a Tier II diagnosis of IE. CSF sampling has documented risks including infection, bleeding and iatrogenic trauma. The aim of this retrospective study was to identify how often dogs with suspected IE have abnormalities on CSF.

Dogs aged 6 months and 6 years presenting with a history of >2 seizures with at least 24 hours between seizure episodes, a normal neurologic examination, no evidence of toxic or metabolic causes, a normal MRI scan (including contrast administration) and cerebromedullary CSF analysis, were included. Dogs with CSF red blood cells (RBC) >500/ul were excluded. Normal CSF was defined as total protein (TP) <30 mg/dL and total nucleated cell count (TNCC) <5/ul.

Seventy-one dogs were included. Of these 8/71 dogs (11.3%) had abnormalities on CSF analysis: 5/8 dogs (62.5%) had albuminocytologic dissociation (range 32-58 mg/dL), 3/8 dogs (37.5%) had mild increases in TNCC (6-10/ul) and 1/8 dogs (12.5%) had mild increase in both TP and TNCC (36 mg/dL and 7/ul). Cytology in dogs with elevated TNCC revealed a mononuclear pleocytosis. Only 1/8 dogs with abnormal CSF had a seizure within 24 h of investigations and 5/8 dogs had a seizure within one month of investigation. CSF analysis is an important part of the diagnostic investigation for suspected IE but rarely reveals significant abnormalities in dogs with normal neurological examination findings and normal MRI.

Epidural hematoma associated with round cell neoplasia in the lumbar spine of a dog

R. Fentem1, V. Mortera1, C. Lamb1
1North Downs Specialist Referrals, Brewer Street, Bletchingley RH1 4QP, UK

A 9-year-old female neutered Labrador retriever presented with a 12-day history of progressive paraparesis and submandibular lymphadenomegaly. Magnetic resonance imaging showed a well-defined, bilateral lenticular-shaped mass in the epidural space at L4-L5 compressing the spinal cord. The mass was isointense in T1W images, hyperintense in T2W images, showed foci of susceptibility in gradient echo images and did not enhance after gadolinium administration. These features were interpreted as probable epidural hematoma. Investigations into coagulopathy were negative. The mass was removed surgically. Histopathology was consistent with a round cell neoplasm and associated hemorrhage. Cytology of lymph node aspirates was consistent with lymphoma. Chemotherapy was initiated; however, the dog did not respond to treatment and was euthanized 4 days later. This case report highlights the potential for neoplasia to be a cause of epidural hemorrhage in animals without coagulopathy.

Feline meningoencephalomyelitis of unknown origin: Clinical and pathological findings, case series

J. Nessler1, P. Wohlsein2, J. Erath1, A. Tipold1
1Department of Small Animal Medicine and Surgery, 2Department of Pathology, University of Veterinary Medicine, Hannover

Meningoencephalitis of unknown origin (MUO) contains a broad spectrum of inflammatory diseases of the central nervous system in which no infectious agent can be detected. In cats, little is known about MUO.

This retrospective monocentric case series (2012-2019) aims to contribute a description of clinical and pathological features of suspected MUO in four cats. For all examinations, informed written owner’s consent was obtained according to university’s guidelines.

The cats (3 domestic shorthair cats, 1 Burmese; 22-215 months of age) were presented with a variety of clinical signs: one cat developed paraceutic onset of seizures and coma, two cats were presented because of chronic progressive diffuse forebrain signs, one of them with paroxysmal episodes of circling, ataxia and reduced consciousness. The forth cat showed chronic progressive L4-S1 paresis. None of the cats had signs of pain. Only one cat presented with signs of systemic illness (hyperthermia). In magnetic resonance imaging, focal or multifocal intraaxial lesions with moderate to marked patchy contrast enhancement and only mild mass effect in the forebrain or thoracolumbar spine were detected. One cat had additional signs of brainstem hemorrhage. Albuminocytologic dissociation occurred in all examined cerebrospinal fluid samples. Histopathologically lymphohistiocytic or lympho-plasma-histiocytic perivascular accentuated meningoencephalitis or -myelitis and in two cases, additionally necrotizing vasculitis and multifocal hemorrhage were present. Infectious agents such as FIV, FeLV, Borna virus, Rabies virus, Morbilli virus, tick-borne encephalitis virus, feline and porcine herpes virus, Corona virus, Toxoplasma, or Mycoplasma spp. were not detected in any case via serology, PCR or immunohistochemistry.

Clinical reasoning in feline vestibular disease: Which presenting factors are important?

N. J. Grapes1, F. E. Taylor-Brown2, S. De Decker1
1Clinical Science and Services, Royal Veterinary College, University of London, Hatfield, UK, 2Cave Veterinary Specialists, George’s Farm, Wellington, Somerset, UK

Disorders affecting the vestibular system can result in a number of commonly recognized clinical signs, however these are not specific to the underlying diagnosis. This retrospective study evaluated whether
Cardiac troponin I levels in dogs with idiopathic epilepsy and status epilepticus

M. Kwiatkowska1, A. Tipold2, E. Huenerfauth2, A. Pomianowski2
1Internal Medicine Department, Veterinary Medicine Faculty of Warmia and Mazury University, Olsztyn, Poland. 2Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany

Dogs suffering from idiopathic epilepsy experience recurrent tonic-clonic seizures, some of them have status epilepticus (SE). The aim of this prospective clinical study was to prove the hypothesis that cluster status epilepticus may lead immediately after the event to an elevation of cardiac Troponin I (cTNI) levels when compared to levels obtained from dogs suffering from recurrent single tonic-clonic seizures. cTNI is a well-known marker for myocardial damage. Fourteen dogs with idiopathic epilepsy (tier II confidence level) were prospectively recruited for the study. Based on the severity of seizures, patients were divided into two groups and cTNI levels compared between them. Group 1 consisted of dogs presented with cluster seizures or status epilepticus. In group II dogs with recurrent single tonic-clonic seizures for a minimal period of 2 years and with a minimal frequency of 2 seizures per year were included. Dogs with chronic heart and kidney diseases were excluded. cTNI levels were elevated in dogs with SE with a mean value of 0.56 ng/mL (0.09-3.28); ref. value <0.06 ng/mL. Blood sampling was performed 10-240 minutes after cessation of SE (mean value 90 minutes). In the control group cTNI levels were within the reference range with a mean value of 0.021 ng/mL (0.01-0.04 ng/mL).

In conclusion, status epilepticus may lead to increased cTNI levels and myocardial injury in contrast to recurrent tonic-clonic seizures. Further investigations are necessary to determine whether the injury is transient or permanent and whether administering treatment to patients with evidence of myocardial injury is beneficial.

Mid-cervical block and hemivertebrae in two French bulldogs: CT and MRI findings and a 3D printed model

S. Bertram1, S. Gillespie1, H. Dirrig1, M. Pivot1, P. Mahoney1, A. de Stefani1
1Royal Veterinary College, University of London, Hatfield, UK

Congenital vertebral malformations (CVM) like block vertebrae, hemivertebrae, transitional vertebrae and neural tube defects are common and well-recognized findings on diagnostic imaging of the vertebral column in 'screw-tailed' brachycephalic dogs. Except for transitional vertebrae in Pugs, the thoracic and lumbosacral vertebral column are most commonly affected. Cervical CVMs are rarely reported in dogs and there is only one radiographic report of cervical hemivertebrae in a 4-month-old Doberman Pinscher.

Two female neutered French Bulldogs were presented due to a chronic history of intermittent cervical hyperesthesia and muscle spasms. In both patients, MRI and CT imaging showed C3 and C4 blocked vertebrae and C4 ventrolateral vertebral body aplasia. One of the dogs additionally had C3 and C5 ventrolateral vertebral body hypoplasia. Both dogs showed mild to moderately compressive intervertebral disc protrusions at C2/3 and or C4/5. Spina bifida was present at C2 and or T1. Furthermore, there was generalized thoracic caudal articular process hypoplasia and aplasia and varying types of thoracic and sacral hemivertebrae.

To the best of our knowledge this is the first record of multiple cervical hemivertebrae in dogs. The clinical relevance of these imaging findings remains uncertain. It can be hypothesized that changes in cervical biomechanics led to the described adjacent chronic intervertebral disc degeneration, protrusion and spinal cord compression.

Probable sudden unexpected death in dogs with epilepsy

E. Huenerfauth1, J. R. Erath1, S. Hoppe1, J. Nessler1, A. Tipold1
1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany.

Sudden unexpected death in epileptic patients (SUDEP) is defined as death related to recurrent unprovoked seizures, death is unexpected/sudden in a patient with reasonable state of health, without an obvious medical cause of death, no trauma, asphyxia or intractable status epilepticus, in post mortem examination no obvious reason for death
Successful management of chloralose-intoxication in three cats causing status epilepticus and myoclonus

N. Meyerhoff1, F.J. Söbbeler1, A. Maslanka1, A. Tipold1

1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine Hannover, Hannover, Germany

Chloralose is a rodenticide potentially accessible to outdoor cats. Clinical data on intoxication with this substance is needed for improvement of treatment and prognosis.

Cat one (DSH, 3 years, fn) showed peracute orofacial seizures with secondary generalization and status epilepticus (SE) managed with midazolam and levetiracetam IV. Laboratory changes were mild hyperammonia and hyperglycemia. Radiographs revealed radiopaque material in the stomach. Via endoscopy and gastric lavage wrapping of alpha-chloralose mouse bait was salvaged. Subsequent symptomatic treatment resulted in complete remission and discharge after two days.

Cat two (DSH, 8 years, mn) and three (BSH, 6 years, fn) belonging to the same household were presented in SE with 8 hours interval. The cats showed mild hypothermia, bradycardia (124/min; 118/min) and hypersalivation. Laboratory changes included moderate electrolyte imbalances, hyperglycemia and ALT elevation in cat two and moderate hyperglycemia and liver enzyme elevation and hyperbilirubinemia in cat three. Both cats received oxygen, crystalloid fluids, lipid infusion bolus, anticonvulsants (intravenous diazepam, midazolam, phenobarbital, followed by oral levetiracetam for one week), glycopyrrolate IM, N-acetylcystein IV, omeprazole IV/PO and lactulose PO. After generalized seizures in cat two stopped, myoclonus was seen for 36 hours as well as ataxia until 96 hours later. Cat three developed recurring myoclonus for 30 hours. Both cats were discharged without pathological findings and five-month follow-up was unremarkable. Urine of cat two analyzed via gas chromatography demonstrated absorption of chloralose.

Intoxication with chloralose causing SE has a good outcome if managed rapidly.

[P34]

Congenital meningocele with associated tension pneumocephalus in a 5 year-old greyhound

A. García-Fernández1, M. Pérez2, S. Monteagudo3, M. Beasley4, A. Shores4

1Department of Veterinary Medical Imaging and Small Animal Orthopedics, Ghent University, Belgium, 2Small Animal Department Faculty of Veterinary Medicine, Ghent University, Belgium

A meningocele is a congenital fluid filled herniation of the meninges through a cranial bone defect. Development of the central nervous system is a highly regulated process. An abnormal closure of the rostral neuropore of the neural tube during the embryogenesis could lead with congenital malformations affecting the brain and skull.

A five year old female spayed Greyhound was presented with a history of 3 seizures one month ago. Mild pain on cervical manipulation was the only abnormal finding on physical and neurological exams. Magnetic resonance imaging (MRI) of the brain and computed tomography (CT) of the head were performed, revealing changes consistent with a congenital meningocele or meningoencephalocele and associated meningoitis caused by a bilateral congenital defect of the frontal sinuses. Associated tension pneumocephalus was causing severe compression of the cerebral cortex and cerebellum.

A modified transfrontal craniotomy and durotomy were performed and the bilateral meningocele was confirmed. The cavity was drained and sealed with a gelatinous, absorbable sponge and bone wax. The meninges were closed with simple-interrupted, absorbable monofilament sutures. The frontal bone was replaced and secured with 0-nylon sutures. The patient was discharged 2 days after surgery on cefalexine (22 mg/kg, p.o., q8h for 1 month), trimetoprim-sulfametoxazole (25 mg/kg, p.o., q12h for 1 month), firocoxib (5 mg/kg, p.o., q24h for 12 days) and omeprazole (1 mg/kg, p.o., q24h for 1 month).

Post-op complications were not identified and at the time of writing, owner reports that the patient has backed to normal and no seizures episodes have occurred.

[P35]

Abnormal epaxial and hypaxial muscle development due to a presumed segmental spinal hypoplasia at the level of T12 and T13 in a French bulldog

K. Kromhout1, K. De Roover2, S. F. M. Bhatti2, L. Van Ham2, I. Cornelis3

1Department of Veterinary Medical Imaging and Small Animal Orthopedics, Ghent University, Belgium, 2Small Animal Department Faculty of Veterinary Medicine, Ghent University, Belgium

Abnormal epaxial and hypaxial muscle development due to a presumed segmental spinal hypoplasia at the level of T12 and T13 in a French bulldog.

K. Kromhout1, K. De Roover2, S. F. M. Bhatti2, L. Van Ham2, I. Cornelis3

1Department of Veterinary Medical Imaging and Small Animal Orthopedics, Ghent University, Belgium, 2Small Animal Department Faculty of Veterinary Medicine, Ghent University, Belgium
Segmental spinal hypoplasia (SSH) is a rare congenital abnormality in humans, in which a segment of the spine or spinal cord fails to develop properly. SSH with concurrent hydromyelia is currently only described in calves that mainly present unable to stand since birth. When able to stand, they show a typical bunny-hopping gait with both pelvic limbs. An 11-month-old female entire French Bulldog presented with urinary and fecal incontinence since the age of 7 weeks. General physical examination, complete neurological examination and abdominal ultrasound revealed no abnormalities. A CT scan of the thoracolumbar and lumbosacral vertebral column revealed presence of congenital vertebral malformations from T5-T9. The spinal cord diameter was decreased by 35% from T12 to L2 compared to the rest of the spinal cord. At the level of T12 and T13, both epaxial and hypaxial muscles were replaced with fat (hypodense aspect). Additional MRI examination revealed comparable findings of fatty replacement of the muscles, this being hyperintense on T2W- and hypointense on T1W- images compared to the normal muscles, with suppression on STIR. The decrease in spinal cord diameter was also visible revealing an additional pronounced hydromyelia from T12 to L1.

To the best of our knowledge, this is the first case report describing the presence of abnormal muscle development due to a presumptive SSH of the thoracolumbar spinal cord in a dog. Although imaging findings are supportive of this congenital disorder, histopathology is currently lacking as the dog has a good quality of life according to the owner.

Severe neck pain caused by an occipital condyle fracture in a dog
K. Kromhout1, K. Chiers2, E. Van der Vekens1, S. F. M. Bhatti3, L. Van Ham4, I. Cornelis3
1Department of Veterinary Medical Imaging and Small Animal Orthopedics, 2Department of Pathology, Bacteriology and Poultry disease, 3Small Animal Department, Faculty of Veterinary Medicine, Ghent University, Belgium

Occipital condyle fractures (OCF) are described in human medicine and mostly result from blunt trauma with significant craniocervical torque or axial loading to the cervical spine. A 9-month-old male entire Dobermann Pinscher (32.5 kg) presented with a 1-week history of acute onset severe cervical hyperesthesia after a fall on a frozen path. General physical examination revealed no abnormalities. Neurological examination revealed a normal gait with a low head carriage and severe hyperesthesia both on palpation and manipulation of the neck. A CT scan of the cervical vertebral column revealed the presence of a comminuted fracture at the dorsomedial aspect of the right occipital condyle and sclerosis of the underlying bone. As no spinal cord compression was present, medical management was initiated consisting of an external splint, strict rest and pain medication. Due to the lack of clinical improvement, the dog was humanely euthanized 1 month after diagnosis and a complete necropsy was performed. On gross pathology, the dorsomedial part of the right occipital condyle showed a sharply demarcated blue discoloration. Histopathology was compatible with healing of a traumatic fracture.

To the best of our knowledge, this is the first case report of a traumatic OCF in a dog. The dog only presented with severe neck pain, as is described in human literature, however neurological deficits can be present in up to 20% of humans with OCF. Medical management can result in good outcomes in human patients, but a long period of strict rest and immobilization should be provided.

Magnetic Resonance Imaging (MRI) changes with cocaine toxicity in two dogs
E. Gilbert1, C. Rotter1, R. Fernandes1, C. Rusbridge2
1Fitzpatrick Referrals Neurology and Orthopedics, Godalming, England, 2University of Surrey, Guildford, England

Our objective is to describe Magnetic Resonance Imaging (MRI) changes in two dogs with cocaine toxicity. A 4 month old, male entire French bulldog presented with a 24-hour history of acute onset ataxia and generalized tremors. A 6-month-old, female entire Pomeranian presented with a 9-hour history of acute onset ataxia, abnormal mentation, a positional, slow rotary nystagmus with mydriatic pupils, vomiting, generalized tonic-clonic and focal seizures. Brain MRI in both cases revealed subtle bilateral symmetrical hyperintense lesions of the internal capsule in T2-weighted (T2W) and Fluid-Attenuated Inversion-Recovery (FLAIR) sequences. The lesions were isointense in T1-weighted imaging and did not enhance following paramagnetic contrast.

Urine samples were assayed for common toxins by Gas Chromatography-Mass Spectrometry (GC-MS) analysis and both dogs were positive for cocaine. Cerebrospinal fluid analysis, dynamic bile acids, routine biochemistry and hematology in both dogs was unremarkable. Clinical signs resolved within 72 hours in both cases with symptomatic treatment consisting of: fluid therapy and methocarbamol in the French bulldog with tremors and phenobarbital and intralipid in the Pomeranian with seizures. MRI was not repeated as both remained neurologically normal at follow up.

Bilateral hyperintense lesions on T2W and FLAIR images within the white matter are reported in humans with cocaine exposure and are postulated to be associated with mitochondrial dysfunction and/or related to reduced cerebral perfusion.

Cocaine intoxication should be considered in cases with acute neurological signs including tremor and seizures with white matter hyperintensity on T2W and FLAIR MRI.
Cryptococcosis is an opportunistic systemic mycotic disease of animals and people, that affects mainly immunocompromised patients. Caused by encapsulated yeast species of the genus Cryptococcus; the two main pathogenic species are “C. neoformans” and “C. gattii”. Six year old, male German Shepherd that lives on urban coast region of the south of Spain, was presented for deterioration of a peripheral vestibular syndrome diagnosed previously in another centre. In the past, the dog had had multiple external otitis and upper respiratory tract signs. On physical examination the dog had sinusonal lesions, regional lymphadenopathy and chorioretinitis. The neurological examination revealed altered mentation, right vestibular dysfunction with right pleurostotonos, absent bilateral menace response, non-ambulatory tetraparesis, proprioceptive deficits on all limbs and cervical hyperesthesia. Neurolocation of multifocal meningoencephalomyelitis was established. Computer tomography showed bilateral rhinitis without cribiform plate destruction. Direct identification of fungal organisms on CSF, in addition to culture and PCR from nasal discharge; confirmed C. neoformans var grubii as causal agent. Treatment with fluconazole, short-term corticosteroids, clindamycin and trimethoprim-sulfamethoxazole was stabilized. Due to progressive neurological deterioration the dog was euthanized on the fifth day of therapy.

In the knowledge of the authors, it is the first case in Spain of meningoencephalomyelitis was established. Computer tomography showed bilateral rhinitis without cribiform plate destruction. Direct identification of fungal organisms on CSF, in addition to culture and PCR from nasal discharge; confirmed C. neoformans var grubii as causal agent. Treatment with fluconazole, short-term corticosteroids, clindamycin and trimethoprim-sulfamethoxazole was stabilized. Due to progressive neurological deterioration the dog was euthanized on the fifth day of therapy.

In the knowledge of the authors, it is the first case in Spain of meningoencephalomyelitis in a dog due to C. neoformans var grubii. Especially because it is a rare disease due to this type of climatology (warm and dry). Pigeon droppings can be the key to the large environmental niche of C. neoformans Grubii in urban areas; that can turn this disease in an emerging systemic mycosis.

**[P39]**

**Intracranial germinoma: Partial response to the treatment with vincristine and lomustine**

J. R. Pedregosa Morales¹, L. Giménez Millán¹, V. Domingo Roa¹, D. Ruiz Casanueva², C. Oliver Vázquez³, J. D. Barreiro Vázquez²

¹Hospital Veterinario Al Sur. Granada. Spain, ²Clinica Veterinaria Real. Celta. Spain, ³Hospital Veterinario Guadiamar. Seville, Spain, ⁴HVU Rof Codina. Universidad de Santiago de Compostela, Lugo, Spain

Germinal Cell Tumors (GCT) of the central nervous system (CNS) are uncommon tumors in humans and animals. In humans, CNS GCTs are classified as germinomas or non-germinomatous cell tumors. Canine CNS GCTs are mainly identified within the suprasellar region in young to middle-aged dogs (range 1-6 years). Treatment protocols for human CNS GCT have consisted of chemotherapy, radiation therapy, or a combination of both. We present a partial response to treatment with vincristine and lomustine in a case of a intracranial germinoma.

A 4-year-old male mixed dog was presented for a two days history of bilateral mydriasis and acute blindness. Cranial computed tomography was performed, where a homogeneous, broad-based, slightly hyper-attenuating extra-axial mass (2.0 cm DV x 3.5 cm LL x 3.6 cm RTCd) at the skull floor was detected. The mass showed homogeneous enhancement in postcontrast series. Presumptive diagnosis was an extraxial neoplasm (meningioma, lymphoma, ependymoma, granular and GCT). Due to financial issues chemotherapy was elected and vincristine (0.7 mg/m²) was initially administered IV. One week later, mydriasis and blindness had disappeared, and the mass had decreased in volume (0.9 cm DV x 2.5 cm LL x 2.6 cm RTCd). An alternating protocol with vincristine and lomustine (60 mg/m²) every 15 days was established. Three months later, the clinical signs reappeared and owners decided euthanasia. A germinoma was confirmed at necropsy.

To our knowledge, this is the first case of intracranial germinoma in a dog with chemotherapy partial response.

**[P40]**

**Interrupted aortic arch as a vascular malformation in a cane corso dog causing cervical myelopathy**

A. Czerwik¹, W. Sokolowski², J. Sobczyński³, N. Czubaj², A. Janiszewski², M. Wrzosek²

¹Department of Internal Medicine and Clinic for Horses, Dogs and Cats, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław; Poland, ²Department of Morphological Sciences, Faculty of Veterinary Medicine, Warsaw University of Life Sciences, Warsaw, Poland, ³Veterinary Clinic “Bemowo” Paweł Kowalczyk. Warsaw, Poland, ⁴Department of Internal Disease and Veterinary Diagnosis, Faculty of Veterinary Medicine and Animal Sciences, Poznan University of Life Sciences, Poznan, Poland

In veterinary medicine, vascular anomalies that result in myelopathy are not reported frequently. This is the first report of complete interruption of the aortic arch causing cervical myelopathy in a dog. The aim of this study was to present the neurological and diagnostic imaging work - up of this case.

A 3-month-old female Cane Corso was presented with a history of progressive ataxia and tetraparesis. The neuro-localization was a C1-C5 myelopathy.

Magnetic resonance imaging of the cervical vertebral column was performed using Siemens Magnetom Ci 0.35 T scanner. The sagittal and transverse images revealed marked dilatation of both vertebral arteries, with a particularly enlarged left artery. The vertebral arteries were continuous and anastomosed with a serpentine vascular structure within the ventral aspect of the vertebral canal at the level of the C2-C3, C3-C4 intervertebral space causing evident spinal cord compression. Two weeks later, dual - phase computed tomography angiography, using Siemens Sensation 16-slice scanner, was performed and showed an interrupted aortic arch, which perfused the caudal half of the body through retrograde flow in the left vertebral artery to the descending aorta. There was antegrade flow through the brachiocephalic trunk to the right vertebral artery.

This is an extreme form of coarctation and surgical arch reconstruction without extracorporeal circulation was impossible. Closure of the intraspinal arterial connection without restoration of the arch would lead to fatal hypoperfusion to the caudal half of the body. The dog was treated conservatively, and he showed no deterioration at the one month follow-up.
Persistent fontanelles and their clinical significance in chihuahuas

A.-M. Kiviranta1, C. Rusbridge2, A. K. Lappalainen1, J. T. Junnila3, O. Vapaavuori1, T. S. Jokinen1
1Department of Equine and Small Animal Medicine, Faculty of Veterinary Medicine, University of Helsinki, Finland, 2School of Veterinary Medicine, Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey, UK, 3Pharma Ltd, Helsinki, Finland

Anecdotally, persistent fontanelles (PFs) are common in adult Chihuahuas, but the clinical significance is unknown. The aim of this study was to describe the presence and location of full-thickness cranial bone defects located at cranial sutures, and called here as PFs, in Chihuahuas. Another aim was to assess if total fontanelle area (TFA) was associated with weight, age, sex, syringomyelia (SM), ventricular volume (VV), or Chiari-like malformation (CM)/SM - related clinical signs. Data included both Chihuahuas with (any age) and without (at least 3 years) CM/SM-related clinical signs. All dogs underwent head CT, and head and cervical spine MRI. Two evaluators, blinded for the signalment and other modality findings, assessed the CT images for the presence and location of PFs, and measured the TFAs. Furthermore, evaluators assessed the MR images for SM, and calculated CVVs. The study group comprised 50 Chihuahuas and the mean ± SD number of PFs per dog was 2.8 ± 3.0 (range 0-13). Of the total 139 PFs, 72 (52%) occurred dorsally, 49 (35%) caudally and 17 (12%) laterally. The frontoparietal suture was affected in 40/50 dogs (80%). Dogs with SM (P = .047), and CM/SM-related clinical signs (P = .003) had larger mean TFAs. Furthermore, lower body weight (P = .002), and increased VV (P = <.001) were associated with larger TFAs. There was no association with TFA and dog’s age (P = .331), or sex (P = .173). In Chihuahuas PFs are common. Chihuahuas with CM/SM-related clinical signs, and Chihuahuas with structural changes related to abnormal CSF flow having larger TFAs suggests that PFs are clinically significant.

Acute onset cervical scoliosis in two dogs with inflammatory central nervous system disease

L. Poed1, J. Fenn2, S. De Decker1
1Department of Clinical Science and Services, Royal Veterinary College, Hawkshead Lane, North Mymms, Hertfordshire, AL9 7TA, UK

Cervical scoliosis is an uncommon clinical sign in dogs, previously sporadically reported in dogs secondary to chronic spinal conditions such as syringomyelia. In large animals, it has been associated with unilateral muscle contracture, nutritional dystrophic myodegeneration and secondary to parasitic migration of Parelaphostrongylus tenuis within the dorsal gray column of the cervical spinal cord. This report describes two dogs that presented with an acute onset of marked cervical scoliosis. Magnetic resonance imaging revealed similar, focal asymmetrical intramedullary signal changes to the cranial cervical spinal cord gray matter, as well as contrast enhancement, without evidence of syringomyelia. Cerebrospinal fluid analysis revealed a neutrophilic pleocytosis in one case and a mononuclear pleocytosis in the other. Tests for infectious diseases were negative in both dogs. Both dogs responded positively to immunosuppression with corticosteroids, with resolution of the cervical scoliosis seen over several days.

In accordance with previous speculation in the literature, it is possible that the scoliosis in these dogs resulted from damage to neurons within the gray matter and subsequent asymmetrical loss of sensory input from neuromuscular spindles, altering muscle tone and causing the acute onset of signs.

These two cases present a previously unreported cause of acute onset, resolving cervical scoliosis in dogs. The characteristic findings in these dogs suggest that an acute onset of cervical scoliosis may be associated with a neuroanatomical localisation to the cranial cervical spinal cord gray matter, and that a diagnosis of inflammatory CNS disease should be considered.

Teaching an old horsevirus new tricks: Characteristics of Borna disease in people

K. Matiasek1, F. Liesche2, M. Rosati1, J. Schlegel2
1Section of Clinical & Comparative Neuropathology, Centre for Clinical Veterinary Medicine, Ludwig-Maximilians-Universität, Munich, Germany, 2Section of Neuropathology, Institute of Pathology, Technical University of Munich, Germany

Poorly documented reports on effects of Borna disease virus in people have caused serious doubts and, thereby, underestimation of its role as human pathogen. The awareness recurred after mammalian 1 orthoborna virus (BoDV-1) was identified causing a series of severe encephalitides. Since then, evaluation of brain samples from actual cases and pathological archives has documented a far more widespread occurrence amongst areas endemic for the equine disease. To compare disease characteristics and virus biology in people and horses, we evaluated for species-specific features of virus distribution, target cell selection and tissue changes using histological algorithms, immunohistochemistry and in situ RNA-labelling. Dissimilar to equine infection, BoDV-1 in early phases of human infection causes Guillain Barre-like polyradiculoneuritis. Thereby, virus is found in axons and Schwann cells, like-wise. Upon entering the central nervous system, infection evokes a lymphohistiocytic meningoencephalomyelitis with either diffuse distribution or accentuation in hippocampus or basal nuclei. The hippocampal affection is far weaker and less selective than in horses. Moreover, BoDV-1 in people infects astrocytes in addition to neurons. The latter feature classical intranuclear Joest-Degen inclusion bodies.

Dissimilar to equine infection, BoDV-1 in early phases of human infection causes Guillain Barre-like polyradiculoneuritis. Thereby, virus is found in axons and Schwann cells, like-wise. Upon entering the central nervous system, infection evokes a lymphohistiocytic meningoencephalomyelitis with either diffuse distribution or accentuation in hippocampus or basal nuclei. The hippocampal affection is far weaker and less selective than in horses. Moreover, BoDV-1 in people infects astrocytes in addition to neurons. The latter feature classical intranuclear Joest-Degen inclusion bodies.

Disease course in people, distribution and spectrum of infected cells are quite different to the situation in horses. Without radical antiviral therapy, the disease ends up fatally. In endemic areas, BoDV-1 infection turned out to be the most common cause of fatal encephalitis in people. If not transmitted by organ transplants, the way of infection remains obscure and requires further investigation of exposure of patients, their habits and risk factors.
ASSOCIATION BETWEEN MRI SPINAL CORD HYPERINTENSITY WITH CLINICAL AND MRI FINDINGS IN DOGS WITH CERVICAL SPONDYLOMYELOPATHY: 202 CASES

R. C. da Costa¹, M. Bonelli¹
¹Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Veterinary Medical Center, The Ohio State University, USA

Spinal cord signal changes (SCSC), primarily T2-weighted hyperintensities, are frequently observed in the MRI of dogs with cervical spondylomyelopathy (CSM); however, their association and importance remain unclear. Our objective was to investigate the association between SCSC and clinical and MRI findings in dogs with CSM. Records were retrospectively analyzed for clinical (breed, age, history, severity of neurologic signs ranging from 1 to 5) and MRI findings (presence of SCSC, location, direction, and severity of compression). Analyses used Fisher’s exact and Wilcoxon rank-sum test.

Out of 202 dogs included, 108 (53%) dogs had SCSC (43% giant, 56% large, 1% others) and 94 (46.5%) did not have SCSC (43% giant, 54% large, 3% others). Mean age of dogs with and without SCSC was 5.45 ± 0.28 and 4.89 ± 0.34 (P = 0.004). Mean neurological score was 3.2 in dogs with SCSC and 2.8 (P = 0.001) in those without SCSC. Dogs with SCSC commonly had a chronic history (85.5% vs. 76.9% for dogs without SCSC) (P = 0.148). Also, 59% of dogs with SCSC had severe compressions (vs. 22% of dogs without SCSC) (P = 0.007). Main compressive lesion was located at C5-6 or C6-7 in 79.8% of dogs with SCSC and 84.5% of dogs without SCSC. Compressions at C5-6 had less SCSC compared with C6-7 (P = 0.043). Direction (ventral, dorsal, lateral/bilateral, multidirectional) and cause of compression (32% intervertebral disc, 44.5% osseous, 23.3% combined) were not significant.

Presence of more severe neurologic deficits, as well as chronicity and severity of compressive lesion were associated with SCSC in dogs with CSM.

CHARACTERIZATION OF MAGNETIC RESONANCE IMAGING FINDINGS IN DOGS WITH OSSEOUS-ASSOCIATED CERVICAL SPONDYLOMYELOPATHY (92 CASES)

M. Bonelli¹, R. C. da Costa¹
¹Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Veterinary Medical Center, The Ohio State University, USA

Osseous-associated cervical spondylomyelopathy (OA-CSM) is a common form of CSM. Our aim was to characterize the magnetic resonance imaging (MRI) findings of OA-CSM in a large patient population. Records were reviewed retrospectively for dogs diagnosed with OA-CSM using high-field MRI. Dogs were excluded if they had concomitant intervertebral disc protrusion.

In total, 92 dogs were included: 70 (76%) were giant breeds and 22 (24%) large breeds (55% Great Danes). Mean and median age were 2.5 and 2 years, respectively, for giant-breed dogs; and 4.1 and 4 years, respectively for large-breed dogs. Seventy (76%) dogs were male and 22 (24%) female. Twenty-eight (30%) dogs had 2 sites of compression, 25 (27%) dogs had 3 compressions, 20 (22%) dogs had 1 compression, 14 (15%) dogs had 4 compressions, and 5 (5%) dogs had 5 compressions. Main site of spinal cord compression was C6-7 in 39 (42%) dogs, C5-6 in 38 (35%) dogs, C4-5 in 14 (15%) dogs, C2-3 in 4 (4%) dogs, C3-4 in 3 (3%) dogs. Main cause of compressive lesion was proliferation of articular processes in 73 dogs (70%). Spinal cord hyperintensity on T2-weighted images was present in 47 dogs (51%). Foraminal stenosis was present in 86 dogs (93%), 10/86 (12%) in one site, 76/86 (88%) in multiple sites.

Results show that OA-CSM occurs more commonly in the caudal cervical region in young, male, giant-breed dogs. Articular process proliferation was the main cause of compression. Most dogs had multiple sites of compression (78%) and multiple sites of foraminal stenosis (93%).

EVALUATION OF RETINAL DEGENERATION IN A MURINE MODEL OF GLAUCOMA USING MANGANESE-ENHANCED MAGNETIC RESONANCE IMAGING (MEMRI)

M. Bonelli¹, R. C. da Costa¹
¹Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Veterinary Medical Center, The Ohio State University, USA

Magnetic resonance imaging findings in dogs with disc-associated cervical spondylomyelopathy (60 cases)

M. Bonelli¹, R. C. da Costa¹
¹Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Veterinary Medical Center, The Ohio State University, USA

Cervical spondylomyelopathy generally affects giant and large-breed dogs and can be separated into osseous and disc-associated (DA-CSM) forms. Our aim was to retrospectively review the high-field magnetic resonance imaging (MRI) characteristics of a large population of dogs with DA-CSM. Dogs were excluded if they had concurrent osseous proliferation of the articular facets/dorsal laminae.

Sixty dogs were included: 57 (95%) were large breeds, with the majority (43/60) being Doberman Pinschers. Mean and median age at the time of diagnosis was 7.2 and 7.1 years, respectively (range 0.41-12 years). Forty-two (70%) were males and 18 (30%), females.

Main site of spinal cord compression was C6-7 in 32 (53%) dogs, C5-6 in 23 (38%) dogs, and C4-5 and C3-4 in 3 dogs each. Thirty-four dogs (57%) had more than one site of spinal cord compression. Main spinal cord compression was caused by intervertebral disc protrusion in 44 dogs (73.3%), a combination of intervertebral disc protrusion and ligamentum flavum hypertrophy in 11 dogs (18.4%), intervertebral disc protrusion and vertebral tipping in 2 dogs (3.3%), and ligamentum flavum hypertrophy in 3 dogs (5%). Foraminal stenosis was present in 48 dogs (80%) in at least one location. Spinal cord signal changes with T2-weighted hyperintensity was present in 38 dogs (63%).

Results show that most dogs affected with DA-CSM have compressions at C6-7 or C5-6 (92%), and slightly more than half have multiple levels of spinal cord compression. Foraminal stenosis and spinal cord hyperintensity were also frequently observed.
We assessed new potentially retinoprotective therapies. Quantitative MEMRI would be a valuable tool for efficacy of the retina in DBA/2 J mice: thinning of the retina and optic disc. MEMRI allows in vivo visualization of glaucoma-related degeneration. The degree of hypointensivity may be quantitated. DBA/2 J mice displayed hypointensive area located at the optic disc. Retinas in DBA/2 J mice were thinner than in the controls. Compared to the controls, the retina and optic nerve in both strains of mice. Retinas in DBA/2 J mice that spontaneously develop glaucoma, and in controls.

Eighteen-month-old female mice of DBA/2 J strain with advanced glaucoma (n = 5) and C57Bl/6J controls that do not develop any retinal pathology (n = 6) received a single intraperitoneal injection of manganese chloride solution (66 mg/kg body weight). Twenty-four hours later the animals were examined using 7 T magnetic resonance tomograph (BioSpec 70/30USR Bruker, Ettlingen, Germany). Planar surface coil (ID 10 mm) was placed over left eyes. Images were acquired with T1-weighted FLASH 3D (TR/TE = 48/4 ms, NA = 5, FA = 25°, spatial resolution 68μmx68μmx68μm, scan time 28 minutes). Manganese-enhanced T1-weighted images allowed visualization of the retina and optic nerve in both strains of mice. Retinas in DBA/2 J mice were thinner than in the controls. Compared to the controls, DBA/2 J mice displayed hypointensive area located at the optic disc. The degree of hypointensivity may be quantitated.

MEMRI allows in vivo visualization of glaucoma-related degeneration of the retina in DBA/2 J mice: thinning of the retina and optic disc cupping. Quantitative MEMRI would be a valuable tool for efficacy assessment of new potentially retinoprotective therapies.

**Clinical features of muscle cramps in 14 dogs**

T. Gagliardo¹, R. Ruggeri², A. Gallucci³, C. B. Cherubini³, M. baroni⁴, C. Falzone⁵, S. Trimboli⁶, A. Abul, G. Gandini¹

¹Department of Veterinary Medical Sciences, University of Bologna, Italy. ²Veterinary Professional Centre La Fenice, Cagliari, Italy. ³Dick White Referrals, Six Mile Bottom, UK. ⁴Valdinevole Veterinary Hospital, Monsummano Terme, Italy. ⁵Pedrani Veterinary Clinic, Zunigliano, Italy. ⁶Trimobili Veterinary Clinic, Messina, Italy.

Muscle cramps (MCs) are involuntary, painful muscle contractions, having an acute onset and short duration. In veterinary medicine, MCs are poorly mentioned and limited to dogs with hypocalcemia and hypoadrenocorticism. The aim of the study was to describe the clinical and the diagnostic findings in dogs exhibiting MCs. Cases were recruited by a call to veterinary neurologists working in selected referral practices. Medical records and videotapes of dogs showing MCs were collected and evaluated. The follow-up was obtained by telephone communication with the owner or the referring veterinarian.

Fourteen dogs were included in the study. The mean age at first MC was 7.5 years. The MCs frequency varied from ten episodes daily to one every three months. In the majority of the cases MCs were multiple in a day and only in 2 dogs occurred occasionally. The duration varied from few second to 15-20 minutes. Four dogs exhibited MCs without exercise, 8 when stressed or excited and for two dogs this information was not available. In 8 dogs these events were painful, while 6 dogs showed no pain. The cause of MCs was hypocalcemia in 11 dogs (in 9 cases due to primary hypoparatiroidism). In 3 dogs the cause was not identified. Eleven dogs were treated with calcium, owner reported that they no longer showed MCs. In 3 dogs, MCs disappeared without therapy.

In conclusion our results suggest that MCs not always appear as painful events. The main cause of MCs in our dogs was hypocalcemia consequent to primary hypoparatiroidism.

**Treatment of recurrent steroid responsive meningitis-arteritis in dogs using a combination of prednisolone and cytosine arabinoside**

C. Günther¹, F. Steffen¹, D. Alder², L. Beatrice³, C. Geigy⁴

¹Clinic of Small Animal Surgery/Neurology, Vetsuisse Faculty, University of Zurich, Switzerland. ²Neurology/Neurosurgery Service, Southern Counties Veterinary Specialists, Ringwood, UK. ³Division of Radiation Oncology, Vetsuisse Faculty, University of Zurich, Switzerland. ⁴Marigin-Zentrum für Tiermedizin, Feusisberg, Switzerland.

Relapses in steroid responsive meningitis-arteritis (SRMA) are frequently observed but specific treatment protocols to address this problem are sparsely reported. Standard treatment includes prolonged administration of glucocorticoids as monotherapy or in combination with immunosuppressive drugs. The aim of this study was to assess the safety and efficacy of cytosine arabinoside in combination with glucocorticoids for treatment of SRMA relapses in 12 dogs on a retrospective basis. Dogs with recurrent episodes of SRMA and treated with a combination of cytosine arabinoside and prednisolone were included. Information about clinical course, treatment response and adverse events were collected from medical records. Ethical approval was not required for this study.

All dogs (12/12) responded favorably to the treatment with clinical signs being completely controlled. One dog (8%) showed a further relapse. Adverse events of variable severity (grade 1-4/5) were documented in all dogs during treatment according to the veterinary cooperative oncology group grading. Mean treatment period was 51 weeks and within this time 3 dogs developed severe adverse events. Laboratory findings showed marked changes up to grade 4. Diarrhea and anemia were the most often observed adverse events (6), followed by dermatitis (4), alopecia (3) and pneumonia (3). Including blood chemistry changes (13), 50 adverse events were found in total.

Treatment with cytosine arabinoside and glucocorticoids resulted in clinical remission in 12/12 dogs but a high incidence of adverse events occurred requiring additional measures. All adverse events could be managed successfully in all cases.
Spinal stabilization using 3D printed patient-specific drill guides, PAX plates and novel drill stops

O. Gilman1, D. Ogden1, L. Escauriaza1, H. Vandenbergh1, D. Roper1, B. Oxley2, N. Granger1
1Bristol Veterinary Specialists at Highcroft, CVS Referrals, UK, 2Willows Veterinary Referrals, United Kingdom & Vet3D, UK

We report four dogs where a combination of 3D-printed patient-specific drill guides, polyaxial locking (PAX) plates and novel tubing drill stops were used to attempt spinal stabilization. The instabilities were secondary to discospondylitis (one thoracic, one lumbo-sacral) or congenital malformation (one thoracic ventro-dorsal wedge vertebrae, one thoraco-lumbar hemi-vertebrae).

Computed tomography (CT) allowed planning of safe drill and screw trajectories and guide manufacture using computer-aided design (CAD) software. In the thoracic malformation case, CT of a 3D-print of the spine, with pre-contoured PAX plates in-situ, permitted CAD planning of safe trajectories intersecting plate holes and subsequent guide design. Desired screw length was measured on 3D models, and tubing drill stops used to halt the drill at the planned depth. The PAX system was used for stabilization.

Complete implementation was possible in three of four cases. On the lumbo-sacral case drilling and screw placement was successful; however, once distraction was achieved the screws did not intersect with the plate holes. Polyethylene-methylmethacrylate (PMMA) was instead used for stabilization.

Guide and stop use facilitated safe drilling and screw placement with: (i) no breach of the spinal canal seen on post-operative CT; (ii) mean medio-lateral deviation of ±5.52° (SD 8.84°) compared to planned trajectories; and (iii) variation in screw depth of ±1.76 mm (SD 3.87 mm) compared to planned depth. CT 6-8 weeks post-operatively revealed no implant failure and good clinical outcome in all cases.

This technique of spinal stabilization shows promise, increasing safety of screw placement and eliminating potential side-effects associated with PMMA.

Acute neurological signs in dogs with pyometra: 3 cases

C. Maeso1, C. Morales1, P. Montoliu1
1Hospital Ars Veterinaria, Barcelona, Spain

Encephalomyelitis associated to infectious diseases in other systems has been described in humans. We report 3 dogs that presented for neurologic signs and were diagnosed with pyometra. A 7-year-old female Chihuahua was presented for focal seizures that appeared in clusters 3 days before presentation. Neurological exam disclosed depression and pelvic limb ataxia. Pyometra was detected on abdominal ultrasound (US). Ovariohysterectomy (OHE) was performed and 2 days later brain magnetic resonance imaging (MRI) disclosed a well-defined T2/FLAIR hyperintense lesion in the right hippocampus. Cerebrospinal fluid was normal. No additional seizures were observed after OHE.

A 6-year-old female Golden Retriever presented for acute left central vestibular signs. Brain MRI was normal. Abdominal US disclosed pyometra. OHE was performed, and progressive improvement of vestibular signs was observed during the following 15 days.

A 12-year-old female French Bulldog presented for acute onset of right circling, tetraparesis and ataxia. Pyometra was diagnosed on abdominal US. MRI disclosed subcortical white matter T2/FLAIR hyperintensity in the right frontal lobe. Anti-inflammatory doses of prednisolone were administered and tapered during 4 weeks. Progressive recovery of neurological signs was observed after OHE and no relapses were reported.

These 3 cases suggest a relationship between pyometra and acute onset of neurological signs, as other specific causes were ruled out and all dogs progressively improved after OHE without additional specific treatment.

Possible mechanisms include septic-associated encephalopathy (pro-inflammatory mediators causing neuronal dysfunction, altered blood-brain barrier and impairment of microvascular system), and para-infectious encephalopathy, an autoimmune demyelinating disorder associated to extraneural infections in humans.

SUBBOTIN analysis of 108 cases of meningoencephalitis of unknown origin in Russia, determination of survival, prognostic factors and the most effective treatment

A. Subbotin1, K. Bocharova1
1Veterinary Clinic “Bely Klik” Isakovskogo st. 2, Moscow, Russia

Meningoencephalitis of unknown origin (MOU) is a common neurological disease that has a global prevalence. A genetic cause is assumed, as well as the influence of environmental factors, which leads to autoimmune inflammation of the brain, meninges and the spinal cord.

The aim of the study is to describe the characteristics of MOU in Russian population of dogs, determine the breed predisposition, factors affecting life expectancy and the optimal treatment.

Inclusion criteria were MRI of the brain, exclusion of extracranial causes. In some animals analysis of cerebrospinal fluid, exclusion of infections and autopsy was made.

Strong predisposition has toy breed dogs such as Yorkshire terrier 37%, Chihuahua 28%, and Pomeranians 11%. According to the analysis of survival, Pugs 6.5% had the shortest lifespan (median 78 days). The analyzed symptoms did not affect survival time. The pattern, size, and area of the MRI abnormalities also did not affect the life expectancy. The majority of animals received polytherapy, we did not find a significant difference between poly- and monotherapy. For the treatment mainly used drugs in combination, such as Methylprednisolone or Prednisolone, Azathioprine, Cyclosporine, Cytarabine. Azathioprine had a statistically significant effect on life expectancy (median 2222 days). Cyclosporine also had a strong effect on life expectancy.
although smaller than azathioprine (median 1001 days). Analysis of the combined use of these drugs showed the best results. Overall, our results indicated that pugs have the shortest lifespan; azathioprine and cyclosporine are the most effective drugs for treating MUC either alone or in combination.

[P53]

A qualitative exploration of owner decision-making and use of adjunctive treatments in the management of canine idiopathic epilepsy

A. Pergande1, Z. Belshaw2, R. Packer1, H. Volk3
1Department of Clinical Science and Services, Royal Veterinary College, London, UK, 2Centre for Evidence-Based Veterinary Medicine, University of Nottingham, United Kingdom; PDSA Nottingham, UK, 3Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany

Idiopathic epilepsy (IE) is a common neurological condition in dogs, and veterinary-prescribed anti-epileptic drugs remain the mainstay of treatment. However, it is known that some owners choose to use alternative or adjunctive therapies. There has been little investigation into influences on owner decision-making regarding IE management. This study aimed to explore the use of adjunctive therapies by owners of dogs with IE in the United Kingdom (UK). Semi-structured interviews were conducted with UK-based owners of dogs with IE, whose diagnosis was consistent with a Tier I confidence level (International Veterinary Epilepsy Task Force 2015), or made following MRI. A purposive sampling frame was constructed to capture maximum variation of owner experiences. Interviews were transcribed and thematically analyzed to construct key themes. Ethical approval was granted by the Royal Veterinary College, UK. Twenty-one interviews were conducted. Almost all owners used adjunctive management techniques, such as herbal remedies, dietary modification, or ocular compression, but few discussed these with their vet. Many expressed increased motivation to perform their own research following negative experiences in a veterinary consultation. Fear of negative impacts of conventional medications, and desperation for seizure control, were additional motivators. Undisclosed use of adjunctive treatments in IE management appears widespread. This research suggests that in order to promote veterinary involvement in decision-making, owners should be actively engaged in discussion regarding risks and benefits of adjunctive treatments. It also demonstrates the need for greater empathy with owners, many of whose lives are negatively emotionally and socially impacted by their dog having IE.

[P54]

Serological prevalence of toxoplasma GONDII and Neospora caninum in dogs with suspected tier 1 (or higher) idiopathic epilepsy in a UK referral population

E. J. Suter1, T. Harcourt-Brown1
1Small Animal Referral Hospital, Langford Vets, University of Bristol, Langford House, Langford BS40 5DU, Bristol, UK

Idiopathic epilepsy is estimated to affect 0.62% of the UK dog population and extensive work has gone into its classification and diagnostic work up. The diagnosis of idiopathic epilepsy is typically one of exclusion and a three-tier system is proposed. Toxoplasma Gondii (T. Gondii) and Neospora Caninum (N. Caninum) are two protozoal infections which are ruled out during the epilepsy work up. The prevalence of dogs with suspected idiopathic epilepsy that test positive for protozoal infection is yet to be described in a UK population of dogs. The aim of this study is to look at, of dogs who fit tier 1 definitions for idiopathic epilepsy, what proportion of them will have a positive serology for either a T. Gondii or N. Caninum. We identified 206 who fit our inclusion criteria (seizures, with a normal inter-ictal phase and normal neurological exam and serologically tested for T. Gondii and N. Caninum) between 2009 and 2018. Within this group of dogs, we identified 21 dogs with serological changes. Previous titer guidelines were used to group dogs as exposed or having active infection for each protozoal disease, and a confidence interval of 95% of the proportion of dogs in each group was calculated. 1.9% (0.58-5%) of dogs were exposed (IFA titer >50) to N. Caninum and 0.97% (0.04-3.7%) were classed as active infection (IFA titer ≥800). 6.7% (4.0-11.1%) were exposed (IgG > 1:50) to T. Gondii and 0.48% (<0.01-2.9%) were classed as active infection (IgG >1:400 and/or IgM >1:64). Follow up data was obtained through telephone conversation with referring veterinarians. None of the exposed dogs had repeated serology and none of them developed new neurological signs which could be explained by a multifocal lesion within the central nervous system. The individuals with active infection for protozoan disease (n = 3) were treated with clindamycin and repeated serology documented a decrease in titers. They did not develop new neurological deficits, and all remained on anti-seizure medication after antibiotics were ceased.

There is little evidence from our study population that the ‘active’ dogs progressed to encephalomyelitis and thus the distinction used between active infection and exposure may not be relevant in this study. We conclude from this extremely low prevalence, that not measuring antibody titer levels for T. Gondii and/or N. caninum in dogs fitting tier 1 definitions for idiopathic epilepsy, carries a low risk of missing a diagnosis of protozoal encephalitis.

[P55]

Multiple site intradural intervertebral DISC extrusions in a dog

B. R.M. Salmelin1, J. H. Rose1, C. Rusbridge1, R. Fernandes1
1Fitzpatrick Referrals, Godalming, UK

Intradural disc extrusion (IIDE) is defined as intervertebral disc nucleus pulposus displacement into the dural sac and is considered rare with a prevalence of 0.5% in dogs. Identification of IIDE pre-operatively is challenging as the diagnostic imaging characteristics are difficult to distinguish from simple disc extrusion. Diagnosis is typically suspected intraoperatively when less than expected amount of extruded disc material is found, after identification of an abnormal appearance of the dura, and confirmed following durotomy.
This case report describes an 11-year-old male neutered dachshund presented on two occasions five months apart with history of acute onset progressive ambulatory paraparesis. At each visit high-field MRI and site-specific hemilaminectomy and durotomy were performed with removed intradural material confirmed as extruded nucleus pulposus on histopathology. High-field T2W images revealed a single focal mildly (60-65%) compressive intradural extramedullary hyperintense lesion initially on the left at L2-L3 and at second presentation at L3-L4 on the right. The lesions could not be identified as intradural in location pre-operatively despite the use of high-field MRI imaging. This patient was hypothesized to have a predisposition for intradural disc herniation due to suspected chronic adhesions of the ventral dural sac and the dorsal longitudinal ligament and anulus fibrosis. This report highlights that IIDE may occur in the same patient more than once. IIDE should be suspected on MRI if a focal compressive intradural extramedullary hyperintense lesion is found, or intra-operatively when less than the expected amount of disc material is found or when focal dural discoloration is present.

To the author’s knowledge, this is the first report describing the MRI findings in a dog with widespread lymphoma affecting the optic chiasma and optic nerves.

**[P57]**

**Diagnostic challenge-multifocal, intraventricular, poorly differentiated, malignant neoplasia in a Yorkshire terrier**

J. Zilli, J. Müller, H. Dohmen, A. Schänzer, K. Köhler, M. J. Schmidt

Institute of Veterinary Pathology, Justus Liebig University Giessen, Germany, Institute of Neuropathology, Justus Liebig University Giessen, Germany

An 8-year-old male Yorkshire terrier adopted as a rescued dog from Spain was referred with a one week-history of progressive vestibular signs. Neurologic examination showed clinical signs compatible with a left sided central vestibular localization. Magnetic resonance imaging revealed multifocal, ill-defined and heterogeneous mass lesions in all four ventricles associated with the choroid plexus, producing a mild mass effect on the brain stem and cerebellum. The lesions were T2-FLAIR hyper- to isointense and T1- isointense; mild contrast enhancement was present. In the T2* sequence, multifocal point-like susceptibility artifacts were observed. CSF examination revealed a mild increased protein concentration (305 mg/L), a moderate mononuclear pleocytosis with normal cell count and signs of hemorrhage. Due to the multifocal distribution of the lesions and to the dog’s origin from the Mediterranean Sea, an infectious disease was suspected. Neoplasia was considered less likely. The dog was euthanized because of poor prognosis and a necropsy was performed. At necropsy, all plexuses were defaced by distinctly vascularized, gray and firm masses. Histologically, a monomorphous, densely cellular round cell tumor, infiltrating the adjacent white matter, was observed. Immunohistochemically, the tumor partially expressed microtubule-associated protein 2 (MAP2) and was intensely positive for neuronal specific enolase (NSE). Mitotic count was high. The neoplasia stained negative for lymphocytic, melanocytic and a panel of some neuronal markers, suggesting a poorly differentiated tumor with neuroectodermal origin. In conclusion, MRI and necropsy findings highly correlated, and neoplasia should be considered as a clinical differential diagnosis for multifocal intraventricular, choroid plexus lesions.

**[P58]**

**Cerebrospinal fluid analysis in dogs with vestibular disease**

C. G. Danciu, B. Szladovits, A. H. Crawford, L. Ognean, S. De Decker

Faculty of Veterinary Medicine Cluj-Napoca, Cluj-Napoca, Romania, Royal Veterinary College, University of London, Hatfield, UK

Although vestibular disease is a common clinical presentation in dogs, little is known about the diagnostic value of cerebrospinal fluid (CSF) analysis in affected cases. This study evaluated the results of CSF analysis in dogs with vestibular disease.
Dogs with peripheral or central vestibular disease that had undergone magnetic resonance imaging of the head and CSF analysis were included in this retrospective study. After reviewing the medical records, included dogs (n = 102), with presumed central (n = 53) or peripheral (n = 49) vestibular signs were divided into one of the following groups: idiopathic vestibular disease, meningoencephalitis of unknown origin (MUO), brain neoplasia, ischemic infarct, intracranial empyema, metronidazole toxicity, otitis media/interna and neoplasia affecting the middle/inner ear. CSF result were recorded, which included total nucleated cell count (TNCC), total protein (TP) and cytology.

Sensitivity of TNCC to predict central vestibular syndrome was 50.9% with a specificity of 87.8% whereas TP had a sensitivity and specificity of 61.2%. TNCC was significantly influenced by the underlying diagnosis (P < 0.001). Dogs with intracranial empyema were more likely to have an increased TNCC compared to dogs with MUO (P = 0.030) and idiopathic vestibular syndrome (P = <0.001). Dogs with MUO were more likely to have increased TNCC than dogs with idiopathic vestibular syndrome (P = 0.003). Dogs with brain neoplasia and intracranial empyema were significantly more likely to have an increased TP level than dogs with ischemic infarct (P = 0.010, P = 0.044).

This study suggests that CSF analysis can provide clinically useful information in dogs with central vestibular syndrome, suspected intracranial empyema and MUO.

[P59]

Persistent urinary retention due to a severe generalized tetanus in a cat treated successfully with sphincterotomy

C. Tästensen1, S. Buchheim1, A. Steinmetz1, S. Gutmann1
1Department of Small Animal Medicine, University of Leipzig, Germany

Cats are more resistant to tetanus than other species. However, when infection occurs, cats more frequently develop the local form of tetanus. In this case report a cat with severe generalized tetanus and a complication of persistent urinary retention is described.

A four-year-old, male, domestic shorthair cat was presented in lateral recumbency with rigidity in all four limbs. The left forelimb showed a large infected wound with exposed parts of the radius and ulna. The patient received wound revision with osteoskisis after infection was under control, tetanus antitoxin, antibiotics (metronidazole, amoxicillin- clavulanic acid), sedatives (medetomidine, butorphanol), muscle relaxants (diazepam, methocarbamol, magnesium) and analgetics (buprenorphine, meloxicam). Supportive care included nutrition through a PEG-tube and bladder emptying through an indwelling catheter. Daily wound management was necessary. After seven days of treatment the cat’s status improved increasingly. Voluntary movement returned, the cat was able to walk three weeks after presentation. During hospitalization the cat developed complications including hyperthermia, bradycardia, bacterial cystitis and anemia due to chronic mycoplasma infection, so doxycycline was added. The cat had fully recovered except for persistent urinary retention. Further three weeks of treatment (alfuzosin, myocholine, diazepam, repeated catheterization) showed no improvement. Therefore sphincterotomy of the bladder neck and proximal urethra was performed. The catheter was left seven more days. Nine days after sphincterotomy the cat was able to urinate independently and was discharged eight weeks after presentation.

To the authors’ knowledge, this is the first report of persistent urinary retention due to a generalized tetanus successfully treated with sphincterotomy.

[P60]

Recurrence of clinical signs after surgery for intervertebral disk extrusion in French bulldogs

S. Kerr1, A. H. Crawford1, S. De Decker1
1Royal Veterinary College, University of London, Hatfield, UK

The most common spinal disorder in French bulldogs (FBs) is intervertebral disk extrusion (IVDE) for which recurrence of clinical signs is the most common surgical complication. This retrospective study evaluated the prevalence and risk factors for recurrence of clinical signs after surgery for IVDE in FBs.

FBs that had surgery for cervical or thoracolumbar IVDE between November 2010 and April 2018 with a minimum follow-up period of 6 months were included. The following criteria were collected: signalment, clinical presentation, location of IVDE, extent of surgery, presence of thoracic vertebral malformations and degree of kyphosis. Follow-up information was collected from the digital medical database and telephone interviews with referring veterinary surgeons.

84 FBs that had surgery for cervical (n = 30) or thoracolumbar (n = 54) IVDE were included. Prophylactic fenestrations were not performed in the majority of dogs. 43 dogs (51%) experienced recurrence of clinical signs, which was suggestive for a cervical lesion in 14 dogs and a thoracolumbar lesion in 29 dogs. The cause of clinical signs was confirmed as recurrent IVDE in 19 of these 43 dogs. Time until recurrence of clinical signs ranged from 29 days until 2 years, 4 months (median, 309 days). The only variable associated with recurrence of clinical signs was male gender (P = 0.038).

This study suggests a high rate of recurrence of clinical signs after surgery for IVDE in FBs. These results can potentially be explained by breed-specific factors, the fact that dogs with both cervical and thoracolumbar IVDE were included and that prophylactic fenestrations were not routinely performed.

[P61]

Bilateral brachial plexus in the dog

Z. Khan1, K. M. E. Faller1
1Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush Campus, Midlothian, EH25 9RG

A 10-year-old neutered male Patterdale Terrier was evaluated for five-day history of lethargy, pyrexia, cervical and thoracic limb hyperesthesia. Physical examination was unremarkable. Neurological examination revealed subdued mentation, low head-carriage,
ambulatory tetraparesis, reduced withdrawal reflexes in the tho-
racic limbs, mild proprioceptive deficits in the pelvic limbs and
marked hyperesthesia of the cervical region and thoracic limbs.
Lesions affecting the lower motor neurons or muscles of bilateral
thoracic limbs were suspected; inflammatory, infectious and neo-
plastic conditions were considered.

Complete blood count and serum biochemistry revealed a neutrophilic
leucocytosis and marked hypoalbuminemia. MRI of the cervical verte-
bral column and brachial plexi were obtained, revealing a focal ill-
defined tubular thickening in the region of the left brachial plexus and
diffuse edema of bilateral cervical, thoracic and axillary soft tissue
structures. Infectious disease testing was negative and no evidence of
primary or metastatic neoplasia was found on thoracic CT and abdom-
inal ultrasonography. An immune-mediated condition was considered
the primary differential.

Rapidly escalating analgesia was initially required to control the mar-
ked hyperesthesia. Following four days of medical treatment with
amoxicillin/clavulanate and corticosteroids, neurological examination
was normal with no evidence of hyperesthesia. A tapering protocol of
prednisolone over 6 months was implemented and 3 months follow-
ing completion of this protocol the patient was clinically normal with
no evidence of recurrence.

Bilateral dysfunction of brachial plexus is uncommon in the canine
population. To the authors’ knowledge; this is the third case of bilat-
eral brachial plexus neuritis reported in dogs and the first to achieve
complete resolution.

[62]

Use of high-definition video telescope for treatment of brain tumors
in 6 cases

N. Martínez Gallarte¹, S. Ródenas González¹²
¹Resonancia Magnética Veterinaria, Sevilla, Spain, ²Service of Neurology
and Neurosurgery of Animal Bluecare, Mijas (Málaga), Spain

The use of high-definition video-telescopes with an additional lighting
system (VITOM) has been sporadically reported in veterinary medicine
in spinal surgery. To the author’s knowledge the use of VITOM in
intracranial surgery has only been described in animals in one study of
transphenoidal surgery.

The aims of these case series are: to evaluate the use of the VITOM
system in a population of dogs and cats with brain tumors that under-
went intracranial surgery, to compare surgical findings and surgical
risks with a group of five cases that underwent similar intracranial pro-
cedures with no VITOM.

Six cases (2 cats and 4 dogs) assisted by VITOM were included: a cat
with skull neoplasia (osteochondroma) affecting the frontotemporal
bone and caudal fossa, 1 cat with fronto/temporal meningioma, 2 dogs
with olfactory/frontal meningioma, and 2 dogs with fronto-temporal
neoplasia (meningioma, glioma).

Control group (5 animals) assisted with no VITOM included: three
dogs and a cat with olfactory/frontal/temporal neoplasia (meningi-
omea/glioma) and a dog with a caudal fossa meningioma.

Intracranial procedures were: transfrontal, suboccipital and rostrotentorial craniotomies.

The use of VITOM provided significant magnification of the neural
structures and better illumination as well as excellent visualization of
the entire surgical field in comparison with the control group with no
VITOM. Mean surgical time was similar in both groups.

The results of this study support the use of VITOM in intracranial sur-
gery and in dogs with brain neoplasia to allow a better identification
of the structures minimizing the risk of injury and bleeding.

[63]

Diffusion- and perfusion-weighted imaging characteristics of an
intracranial abscess in a CAT

A. Nagendran¹, F. J. McConnell²
¹Small Animal Teaching Hospital University of Liverpool, Leahurst, Neston
CH64 7TE, UK

In conventional magnetic resonance imaging (MRI), cerebral
abscessation, cysts and neoplasia can be challenging to differentiate.
However, these diseases have very different prognosis and treatment.
The use of advanced magnetic resonance techniques, such as
diffusion-weighted imaging and perfusion-weighted imaging could be
utilized to improve our ability to diagnose these three different dis-
 ease. Here we report a case of an adult cat that had a progressive
clinical history to obtundation. Conventional MRI suggested a cerebral
abscess but cyst and neoplasia could not be reliably ruled out.
Diffusion-weighted imaging showed a highly restrictive diffusivity
within the mass-lesion. Dynamic susceptibility contrast imaging reve-
aled an absence in relative cerebral blood volume in the entirety of
the mass. These additional sequences significantly increased the con-
fidence in determining the imaging diagnosis of a cerebral abscess.
The median age at presentation was 6 years (interquartile range 3 to 8 years). Brachycephalic breeds represented 47.2% of the population, with the most commonly represented breeds being Boxers (15.2%) and French bulldogs (9.6%). In the majority (78.4%) of cases the neurological signs at time of MRI were consistent with a forebrain neurolocalization rather than a caudal fossa neurolocalization. In the remaining 21.6% of cases a primary lesion was identified to explain the neurological signs.

CCFA is an uncommon malformation which can be identified in dogs undergoing MRI of the brain. In this study the presenting neurological signs were not associated with the presence of CCFA. For this reason CCFA is likely to be an incidental finding and other causes for the neurological signs should be investigated.

Minimally invasive spine surgery in dogs: Evaluation of the safety and efficacy of a thoracolumbar approach to the spinal cord

J. Guevar1, N. Zidan2, A. Durand3, N. Olby2
1Vetsuisse Faculty, University of Bern, Department of Clinical Sciences, Division of Clinical Neurology, Bern, Switzerland, 2Department of Clinical Sciences, North Carolina State University, Raleigh, North Carolina, USA, 3University of Madison-Wisconsin, Madison, WI, USA

Minimally invasive spine surgery (MISS) offers a less invasive access to a target surgical area by minimizing iatrogenic trauma. It is currently used in human surgery to address most disorders affecting the spine. Interest is growing in veterinary surgery. The objectives of our study were to describe the safety and efficacy of a MISS technique to access the thoracolumbar vertebral canal in dogs. A prospective study was performed in 6 healthy research dogs.

Dogs were placed under anesthesia for MRI to evaluate vertebral column and spinal cord integrity. Minimally invasive surgery was performed at multiple sites. Access to the vertebral canal was achieved by means of foraminotomy, discectomy and lateral mini-corpectomy using minimally invasive access and a surgical microscope. Sequential neurological examinations, pressure algometry pain quantification and creatine kinase levels were evaluated before and after surgery for 7 days. MRI, computed tomography and histopathology were performed postoperatively to evaluate surgery impact on spinal cord, muscles and bone.

The vertebral canal was successfully accessed and the ventral aspect of the spinal cord identified at all sites. Clinically, no neurological deterioration was observed. Postoperative pain was not different compared to baseline except in one dog the day after surgery.

MISS is a safe and effective technique to access the vertebral canal and the ventral aspect of the spinal cord in dogs and is a valid surgical technique for focal and multifocal thoracolumbar spinal cord decompression. Findings support postoperative pain benefits.

Multifocal necrotizing poliencephalopathy resembling leigh’s disease associated with primary adipsia in a CAT. Clinical signs, magnetic resonance imaging and neuropathological

S. Maya2, M. Pumarola2, E. Fraga1, S. Durán1, S. Ródenas1
1Service of Neurology and Neurosurgery of Animal Bluecare, Mijas (Málaga), Spain, 2Unit of Murine and Comparative Pathology, Department of Animal Medicine and Surgery, Universitat Autònoma de Barcelona, Barcelona, Spain

This report describes the clinical signs, MRI image and neuropathological findings in a cat with multifocal poliencephalopathy resembling Leigh’s disease associated with adipsia. A 6-month-old female shorthair cat was referred for a chronic history (2 months) of adipsia, changes in behavior and ataxia. Complete bloodwork (including FIV/FeLV) only revealed severe hypernatremia. Serum bile acid levels, somatomedin C, thyroxine, cortisol and plasma/urine organic amino acids were normal. Brain MRI revealed bilateral symmetrical lesions at the level of the caudate, thalamic, and mesencephalic nuclei suggesting a metabolic/toxic/nutritional disease. Results of CSF analysis including PCR for Toxoplasma and Coronavirus were normal. Treatment with vitamins B1/B12 did not result in
M. Wrzosek
M. Wrzosek

4 month observation time confirmed suitability of the human GGS resembles approx. 7 years of the human spine growth (7-14 y.o.). The finding suggests that a porcine growing spine between the 2-6 m.o. and a necropsy and histologic examination was performed.

After this time all were euthanized and monitored for 4 months, with monthly neurological, radiological and MRI assessment. The collected data were subjected to statistical analysis. A correlation between weight gain and change in FA and ADC parameters was shown. The FA increased with increasing weight, and ADC decreases. No significant change was found within the FA and ADC values between the 3 loci of a spine.

Findings can be useful determining reference values for an undamaged spinal cord. Values of FA and ADC obtained in the porcine spine model might be extrapolated for the growing human spine model that could be useful for the experimental use.

The aim of this study was to assess the equivalence of the growing porcine spine model for the use in 2,3,4,5,6 month old pigs and compared with the respective child spine growth measurements.

A retrospective measurement of the porcine growing spine (8 pigs, Polish White) was performed, from the archive MRI recordings (1,5 Tesla scanner) (Philips, Ingienia). A T2-w (tra-, sag-, cor-) images were used in 2,3,4,5,6 month old pigs and compared with the respective reported data of a child spine growth measurements.

In 4 pigs (Polish White), 2 m.o., 18 kg a GGS was implanted. The study obtained the permission of the local ethics committee (12/2018). All animals were monitored for 4 months, with monthly neurological, radiological and MRI assessment. After this time all were euthanized and a necropsy and histologic examination was performed.

Finding suggest that a porcine growing spine between the 2-6 m.o. resembles approx. 7 years of the human spine growth (7-14 y.o.). The 4 month observation time confirmed suitability of the human GGS type Shila system for the growing porcine spine model. Macroscopic and histologic observations of the peri-implant tissue confirmed the presence of abrasive elements, a phenomenon that is observed in human growing patients.

Porcine model of growing spine: Changes in the diffusion tensor imaging parameters
K. Owsińska-Schmidt1, P. Drobot2, A. Czerwik2, J. Nicpoń2, M. Wrzosek2
1Centre of Experimental Diagnostics and Innovative Biomedical Technologies, The Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland, 2Department of Internal Medicine and Clinic for Horses, Dogs and Cats, The Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

The aim of this study was to verify if the parameters obtained using diffusion tensor imaging (DTI) change in the model of growing porcine spine. We also wanted to carry out if parameters of DTI change in individual sections of spinal cord.

The model organism was a healthy swine without spinal cord lesion. The permission of the bioethics commission for the conducted study was obtained. DTI parameters were measured in three weight groups: 30 kg (5 swine), 60 kg (5 swine) and 120 kg (1 swine). DTI was performed with a 1.5 Tesla magnetic resonance scanner (Philips, Ingenia). The measured were made in 3 sections: cervical, thoracic and lumbar segment of spinal cord, exactly between C4-5, Th12-Th13 and L4-L5 vertebrae and also in each case one segment cranially and one segment caudally from them. Values of fractional anisotropy (FA) and apparent diffusion coefficient (ADC) were obtained for each locus and compared. The collected values were subjected to statistical analysis. A correlation between weight gain and change in FA and ADC parameters was shown. The FA increased with increasing weight, and ADC decreases. No significant change was found within the FA and ADC values between the 3 loci of a spine.

Findings can be useful determining reference values for an undamaged spinal cord. Values of FA and ADC obtained in the porcine spine model might be extrapolated for the growing human spine model that could be useful for the experimental use.

Diffusion tensor imaging of canine spine before and after surgical decompression
K. Owsińska-Schmidt1, P. Drobot2, A. Czerwik2, J. Nicpoń2, M. Wrzosek2
1Centre of Experimental Diagnostics and Innovative Biomedical Technologies, the Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Science, Wrocław, Poland, 2Department of Internal Medicine and Clinic for Horses, Dogs and Cats, The Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Science, Wrocław, Poland

The aim of this study was the assessment of the diffusion tensor imaging (DTI) parameters in dogs with diagnosed spinal compression before and after the surgical decompression.
Six dogs, 4-8 y.o. (mean 6.2, median 6.5), 5-18 kg (mean 9.3, median 7), were qualified for the study. All animals were directed to the decompressive spinal surgery due to the intervertebral disc herniation (IVDH) (3xC2-3, Th11-12, L3-L4, L4-L5). DTI was performed with a 1.5 Tesla magnetic resonance scanner (Philips, Ingenia) directly before and 7 to 10 days after the surgery. Two DTI parameters: fractional anisotropy (FA) and apparent diffusion coefficient (ADC) were measured in three places: 1. compression sites, 2. one segment cranially and 3. one segment caudally from the spinal cord injury (SCI). The neurological status (Sharp and Wheeler 2005 score) before and after surgery was compared. The collected values were subjected to statistical analysis.

The neurological status improved from the paresis grade 2 or 3, one or two points higher in all cases. ADC values measured at the SCI increased after the procedure compared to the pre-operative values ($P = 0.037$). Conversely, caudal from SCI, ADC values after surgery decreased ($P = 0.005$). The ADC value at the cranial to lesion site, as far as all three FA measurement values did not significantly changed.

Findings suggest that DTI is a reliable tool for the canine spinal cord condition assessment, as ADC parameters positively correlated with a clinical assessment. DTI values measurements may provide more objective spinal cord status assessment.

**[P71]**

Multifocal nephroblastoma in a 7-month-old female golden retriever. A case report

L. F. Becker1, S. Loderstedt2, S. Kohl1, I. Kiefer1, T. Flegel1

1Department of Small Animal Medicine, University of Leipzig, Leipzig, Germany

Nephroblastoma is a tumor in young dogs, mainly occurring intradural-extradural between Th10 to L2. To the authors’ knowledge, multifocal lesions involving extraneural structures are seldom and there is no report of multifocal nephroblastoma visualized in MRI and CT.

A 7-month-old female Golden Retriever was presented due to a sudden onset of non-ambulatory paraparesis. One day before presentation, the owner noticed difficulties in the pelvic limbs when walking and in getting up. No improvement was achieved after initial treatment with meloxicam and glucocorticoids given by the referring veterinarian.

Neurological examination revealed paraplegia, questionable deep pain perception, absent proprioception and reduced flexor reflexes in the pelvic limbs. Neuroanatomical localisation was L4-S3 spinal cord segment.

Intervertebral disc extrusion, spinal cord infarct, neoplasm and congenital malformation were considered as differential diagnoses and MRI, CT and CSF examination were performed.

MRI showed multiple T1w- and T2w-hypointense, contrast-enhancing, intradural-extradural structures at the level of L3 vertebral body, found as well as in spleen, kidneys, subcutaneous fatty tissue and intra-abdominally without clear allocation. CT was performed and showed additional lesions in the left nasal cavity, liver, mediastinal and abdominal lymph nodes. CSF revealed increased protein of 1.53 g/L and TNCC of 24/μL (72% mononuclear cells, 28% highly segmented neutrophils). Tru-cut-biopsies of kidney and spleen were sent for immunohistochemic investigation. Nephroblastoma was confirmed as the result.

Considering the severity of symptoms and poor prognosis, the owners decided for euthanasia. A full post mortem investigation was declined by the owner.

**[P72]**

Importance of stabilization surgery in dogs and cats with spinal epidural empyema: Clinical features, imaging findings and outcome in 7 cases

R. Jove1, C. Maeso2, S. Moya3, A. Escudero3, S. Rodenas1

1Service of Neurology and Neurosurgery of Animal Bluecare, Mijas (Málaga), Spain, 2Service of Neurology and Neurosurgery of Ars Veterinaria Hospital, Barcelona, Spain, 3Service of Neurology and Neurosurgery of Veterinary Clinic Aralar, Zaragoza, Spain

In veterinary medicine, surgical resolution with stabilization in animals with spinal epidural empyema (SEE) have been sporadically reported. The purpose of this retrospective study was to evaluate the clinical signs, imaging and surgical findings, and outcome in 6 dogs and 1 cat with SEE that underwent decompressive surgery with stabilization.

Medical records and imaging findings of dogs and cats with diagnosis of SEE and surgical resolution with stabilization were retrospectively reviewed. Physical and neurological examination, imaging findings, surgical resolution, bacterial culture, and outcome were assessed. Six dogs and one cat were enrolled in this study. In 3/7 cases SEE was secondary to a previous disk surgery. In 3/7 cases the origin of the SEE was undetermined and 1/7 due to a foreign body. Bacteria isolated from purulent material collected at surgery were Pseudomonas spp. (4), E coli, Staphylococcus intermedius and Enterococcus spp., with different ranges of sensitivity to antibiotics. Neurological signs ranged from paraplegia with deep pain perception to ambulatory paresis. Pain was present in all cases. Four patients underwent spinal MRI and 3 spinal CT. In 6/7 patients, stabilization was achieved with pins and methacrylate and in one patient with a locked plate. Successful outcome was achieved in 6/7 patients (6 months follow up). One dog was euthanatized because of worsening of clinical signs.

Results of this study suggest that patients with SEE with suspected or proven instability and spinal cord compression have good prognosis with early surgical intervention with decompressive surgery and associated stabilization and long-term antibiotic administration.

**[P73]**

Evaluation of a radiographic diagnostic method for canine atlantoaxial instability

Y. P. Chang1, P. Y. Chiu1, G. Hammond2, I. H. Liu2, C. H. Liu1

1School of Veterinary Medicine, National Taiwan University, Taipei, Taiwan, 2School of Veterinary Medicine, University of Glasgow,
This retrospective study aimed to establish a radiographic diagnostic method for canine atlantoaxial instability (AAI).

Firstly, six parameters regarding distance between atlas and axis on extension and flexion lateral radiographs were evaluated. Only certain small breeds were included. All parameters were compared between radiographs of 10 MRI-diagnosed AAI dogs and 30 MRI-excluded AAI dogs to select parameters with better diagnostic value. Secondly, the diagnostic performance of different combinations of selected parameters were analyzed. Based on the positive likelihood ratio (LR), each measurement was given a score. The total score of the combination of selected parameters were analyzed, to determine the combination with highest area under curve, named as AAI diagnostic system.

Thirdly, this diagnostic system was evaluated by using the radiographs of dogs in previous analysis, 10 dogs with clinical diagnosis of AAI, and 10 more MRI-excluded AAI dogs.

According to the area under curve, three parameters showed acceptable to outstanding discrimination in both extension and flexion radiographs. Furthermore, the combination of distance of atlantoaxial joint and distance between cranial border of atlas and cranial border of axis in both extension and flexion radiographs showed the best diagnostic performance. Further analysis for this diagnostic system revealed the optimal cut-off point was 6.5. When the total score is 7, its LR+ was >10, indicating AAI. When the total score is 4, its LR- was <0.1, ruling out AAI.

This study established a radiographic-based AAI diagnostic method, which can be used as an objective diagnostic tool for certain breeds.

Canine intracranial neoplasia: Epidemiologic and clinicopathologic characterization in a population of 240 dogs

S. Ortiz1,2, S. Añor1,2, R. García1,2, E. Blasco1, C. de la Fuente1,2, M. Pumarola3
1Department of Animal Medicine and Surgery, Veterinary School, Autonomous University of Barcelona, Barcelona, Spain, 2Fundación Hospital Clinic Veterinari, Cerdanyola del Vallès, Barcelona, Spain

The aim of this study was to characterize intracranial neoplasias diagnosed in dogs at our institution over the last eight years. The database of the histopathology service of a European veterinary faculty was reviewed to identify dogs diagnosed with intracranial neoplasm from January 2011 to December 2018. Owner permission was obtained for all necropsies and biopsies included.

A total of 240 intracranial neoplasias were included in the study. The canine population was composed of 240 dogs of 36 different pure breeds and 53 crossbred dogs. The mean age was 9.04 years and 55.27% were males. The most frequently represented breeds were French bulldogs (26.36%), crossbreds (22.18%), and Boxers (10.88%). Primary and secondary intracranial neoplasias were diagnosed in 86.67% and 13.33% of patients, respectively. Gliomas (42.92%) were the most common primary neoplasia in our population, and grade III oligodendroglioma (22.5%) was the most frequently diagnosed.

Meningiomas (31.25%) were the second more common primary tumors. Secondary neoplasias were identified in 13.33% of patients, and carcinomas (37.5%) were the most prevalent tumors. Oligodendrogloma was the most frequent intracranial neoplasia in French bulldogs (60.31%), and meningioma in crossbreds (43.39%). The most common location was supratentorial (83.05%), followed by infratentorial (8.89%) and multifocal (8.05%).

Primary neoplasias are more common than secondary brain neoplasias as reported in previous studies, but in our population, gliomas and not meningiomas are the most common primary intracranial neoplasms. The high prevalence of gliomas can presumably be caused by the increasing popularity of French bulldogs in our country.

Investigation of relation between increased intracranial pressure and MRI findings in dogs with brain glioma

N. Tanaka1,2, D. Ito1, C. Ishikawa1, N. Sekiguchi1, M. Kitagawa1
1School of Veterinary Medicine, Nihon University, Kameino, Fujisawa, Kanagawa, Japan, 2Grace animal hospital, Ogikubo, Suginami-ku, Tokyo, Japan

Increased intracranial pressure (ICP) is noteworthy finding and necessary information for treatment in cases with brain tumor. Because direct measurement of ICP would be invasive, suggestive methods to estimate ICP such as neurological signs and/or MRI findings had been reported. These non-invasive methods might give helpful idea of actual ICP, however there is no previous reports which compared with actual ICP. Therefore the purpose of this retrospective study is to compare actual ICP and MRI findings with neurological signs.

Ten brachycephalic dogs which were presented to Animal Medical Center at Nihon University and histopathologically diagnosed/suspected were included. All dogs underwent MRI and craniotomy for excision of brain tumor. Before craniotomy, ICP were measured using ICP sensor kit. On MRI, twenty one findings which were thought to be relating with increased ICP were evaluated and compared with measured ICP in each dog.

In five dogs, ICP was over 20 mmHg (mean 33.2) and those in remaining five dogs was under 10 mmHg (mean 4.8). Significant differences on MRI findings between dogs with elevated and normal ICP were caudal transtentorial herniation, deformation of interthalamic adhesion, effacement of the cerebral sulci and syringohydromyelia.

It has been reported that caudal transtentorial herniation, deformation of interthalamic adhesion, effacement of the cerebral sulci and syringomyelia might be findings of increased ICP, similar to our study. Therefore these MRI findings plus neurological symptoms including depressed consciousness and anisocoria would be reliable signs of increased ICP.
Neuronal migration disorders have been sporadically reported in cats. Cobblestone brain malformations (lissencephaly type II) are due to neuroglial overmigration into the arachnoidal space resulting in the formation of an extracortical neuroglial layer. A large number of structural proteins have been implicated in this malformation in humans. This report describes the clinical signs, MRI image and neuropathological findings of this disorder in a young cat. In humans, this malformation has been associated with hydrocephalus, hypoplasia of the cerebellum, brain stem and corpus callosum. A 9-months-old female shorthair cat was referred for a 3-months history of behavioral changes and epileptic seizures. Neurological examination was consistent with a prosencephalic lesion. Complete bloodwork including FeLV/FIV, CSF analysis and PCR for Toxoplasma and Coronavirus did not reveal abnormalities. Brain MRI revealed mild hydrocephalus and hypoplasia of the corpus callosum. There was worsening of neurological signs and the animal was euthanized.

Postmortem examination revealed grossly a generalized, bilateral and symmetrical disorganization of the cerebral cortex which adopted an irregular appearance reminiscent of a cobblestone street. The cerebral cortex showed a highly disorganized structure (areas with no recognizable lamination). In affected areas small breeches in the pial-glial limitans were present, with neuroglial tissue extending over the surface of the brain forming a type of rind. The cerebellar cortex had a moderate disorganization of its layered cortex. All these findings were confirmed by immunohistochemical techniques.

To the authors’ knowledge this is the first report of cobblestone brain malformation in a cat.

Clinical presentation, clinical findings, treatment and outcome in two cats with suspected paroxysmal dyskinesia-dystonia

C. Maeso1, Morales C1
1Service of Neurology and Neurosurgery of Ars Veterinaria Hospital, Barcelona, Spain

Paroxysmal dyskinesia-dystonia (PDD) are a group of hyperkinetic movement disorders well described in human and dogs. It is a heterogeneous group of disorders and little is known about these pathologies. The purpose of this case report is to describe clinical presentation, findings, and outcome of PDD in two cats.

A 1-year-old, neutered female domestic short-haired cat and a 2-year-old, neutered female sphynx cat were enrolled in this study. Both cats had self-limiting episodes similar to focal epileptic seizure, consistent with dystonic movements mainly in forelimbs, incoordination, preserved consciousness, and absence of autonomic signs, with a duration between 1-5 minutes. Physical and neurological examination, and diagnostic tests revealed no abnormalities (cell blood count, biochemistry, abdominal and cardiac ultrasound, magnetic resonance and cerebrospinal fluid analysis). Presumed diagnoses of PDD were made. Treatment in both cases consisted in a diet change, and in both cats, an improvement of frequency of these episodes were achieved. Another 2 cats were diagnosed as having PDD. They are not included because of concomitant disorders or lack of follow-up, however, they did not improve with phenobarbital treatment.

In the authors’ knowledge, PDD are not described in cats. Therefore, this is the first case report describing PDD in cats. Moreover, this study emphasizes the importance of recognizing PDD in cats presenting with apparent focal seizure. As in dogs, a change in diet could be recommended as the initial option in some cases. Further studies with more cases are necessary to define and understand this wide group of disorders in deep.

Symptomatic lateral ventricular cystic lesion in a young cat

D. Maud1,6, M. Manassero2, P. De Forne1, I. Valin4, M.-N. Ducerveau5, J.-L. Thibaud6
1Département des Sciences Cliniques, Ecole Nationale Vétérinaire de Toulouse, Toulouse, France, 2Service de Chirurgie, Ecole Nationale Vétérinaire d’Alfort, Maisons Alfort, France, 3MICEN VET, Créteil, France, 4Clinique BARON-VAlIN, Clinique vétérinaire de chirurgie pour Petits Animaux, Créteil, France, 5Hôpital Européen Georges-Pompidou, Aubervilliers, France, 6MICEN VET, Service de Neurologie, Créteil, France

A 1.5-year-old male neutered Persan cat was referred for chronic left head tilt with acute deterioration. Decreased mentation, asymmetrical left ataxia and head tilt, proprioceptive deficit on the left side with normal segmental reflexes were observed. MRI of the brain revealed a large, well demarcated fluid-filled structure within the lateral ventricles, closely associated with the left choroid plexus, with an intraventricular signal intensity similar to CSF. Discrete wall contrast enhancement was noted. MR signs of increased intracranial pressure were present, with caudo-tentorial brain herniation and cerebellar herniation. Trepanation and endoscopic-guided aspiration of the lesion, was performed prior to cystoperitoneal shunting. The fluid collected was similar to normal CSF. Choroid plexus cyst was suspected on the basis of the fluid analysis results and MRI findings. Clinical improvement was noted and marked decreased in lesion size was observed on the two-days post-decompression recheck MRI. Recurrence of the lesion was noted on the pre-cystoperitoneal shunting MRI, performed 3 weeks’ post-decompression. During anesthesia, the cat arrested. Successful cardiac resuscitation was performed but the cystoperitoneal shunting was postponed. Major cortical dysfunctions, slowly improving, have been observed.

This is the first report of a feline intraventricular cystic lesion. Differential diagnosis includes a choroid plexus cyst, arachnoid diverticula, cystic midline brain malformation, or an epidermoid cyst. Only two canine cases of intraventricular choroid plexus cysts have been reported and treatment consensus has not been currently reached. As expected, our case suggests that endoscopic-guided drainage on its own is not an adequate treatment for long-term management.
Clinical presentation, diagnostic findings and outcome of presumed idiopathic macrosaccadic oscillations in a dog

C. Maeso1, J. Mascort1, P. Montoliu1
1Service of Neurology and Neurosurgery of Ars Veterinaria Hospital, Barcelona, Spain

Saccadic oscillations have been widely reported in human medicine, including opsoclonus and macrosaccadic oscillations (MO). MO are horizontal saccades that occur in runs, building up and decreasing in amplitude, with an intersaccadic interval. Contrarily, opsoclonus lack intersaccadic interval. This case report describes presentation, findings and outcome in a dog with MO.

A 5-year-old female Brittany spaniel was referred for 2-weeks history of acute, non-progressive nervousness, involuntary eye movements and balance loss. Physical examination was unremarkable. Neurological examination revealed mild left head tilt, mild intention tremors and involuntary contractions of the jaw muscles. Fast, conjugate, horizontal spontaneous eye movements were elicited by head movements, being wide at first with gradual reduction in amplitude, consistent with MO. Neuroanatomic localization was cerebellovestibular system. Hematology, serum biochemistry and total T4/TSH were unremarkable. Brain magnetic resonance imaging and cerebrospinal fluid analysis revealed no abnormalities. The dog was discharged without treatment. On telephone follow-up 3 weeks after owners reported a clinically normal dog, with only a mild residual head tilt.

Due to the lack of abnormal findings and spontaneous resolution, an idiopathic etiology was suspected. No relapses have been reported after 4 months.

Only one dog suffering from MO has been previously described, which was diagnosed with neuronal ceroid lipofuscinosis. Another dog was reported with opsoclonus of presumed idiopathic origin. The dog presented here showed involuntary eye movements consistent with MO, absence of diagnostic abnormalities and spontaneous resolution. This case supports that idiopathic abnormal saccadic oscillations may occur in dogs with spontaneous recovery after 2-3 weeks.

Presumptive primary intradural adenocarcinoma in a cat

M. Gago1, J. Tabanez2, R. Fernandes2, J. Rose1,2, C. Rusbridge1,2, C. Driver1,2
1Fitzpatrick Referrals Ltd., Eashing, Godalming, Surrey, GU7 2QQ, UK, 2Lumbry Park Veterinary Specialists, Selborne Road, Alton, Hampshire, GU34 3HL, UK, 3Faculty of Health and Medical Sciences, University of Surrey School of Veterinary Medicine, UK

The aim of our report is to describe the presentation, treatment and survival time of a cat with a presumptive primary intradural adenocarcinoma.

A 10-year-old male neutered Russian Blue cat was presented with a 2 month history of right pelvic limb monoparesis that progressed to non-ambulatory paraparesis. Spinal MRI revealed a well-demarcated, compressive intradural lesion that was isointense on T2-weighted and T1-weighted sequences, at the level of T1. There was diffuse marked contrast enhancement post-gadolinium administration. A dorsal C7-T2 laminectomy and durotomy were performed and the mass resected with a good dissection plane. Histopathology was consistent with an adenocarcinoma which is typically an invasive, metastatic neoplasm in cats, with the presence of fine apical cilia originating a suspicion of pulmonary primary neoplasm.

Intradural extramedullary tumors are commonly either peripheral nerve sheath tumors (neurofibromas or schwannomas) or meningoimias. Full body CT with contrast did not identify an additional primary location (lungs, thyroid and anal glands). Biopsies of the nasal cavity and fine needle aspiration of the spleen and liver were unremarkable. Follow-up evaluation was performed at 3 and 14 months, revealed subtle ataxia with functional improvement. In humans with spinal metastatic carcinoma, 13.4% have unknown primary sites and survival is associated with aggressiveness and presence of visceral metastasis.

To the authors’ knowledge, this is the first report of an intra-dural extramedullary adenocarcinoma in a cat with unidentifiable primary site.
and proteinuria. High positive level of antibodies for LI was detected in ELISA assay. Treatment with meglumine antimoniate and allopurinol was initiated. One month later, the dog was clinically normal and blood analysis did not reveal abnormalities. This case report shows an unusual neurological presentation of polyneuropathy secondary to LI infection, with cranial and spinal nerves involvement, with a successful outcome only after the indicated treatment for LI.

**[P82]**

**Comparison of magnetic resonance imaging and computed tomography for evaluation of meningomyelitis of unknown origin in dogs**

C. Maeso, A. Costas, A. Escudero, S. Rödenas.

Service of Neurology and Neurosurgery, Ars Veterinaria Hospital, Barcelona, Spain, Service of Neurology and Neurosurgery, Valencia Sur Veterinary Hospital, Valencia, Spain, Service of Diagnostic Imaging, Valencia Sur Veterinary Hospital, Valencia, Spain.

Vetinary Clinic Aralar, Zaragoza, Spain, Service of Neurology and Neurosurgery, Animal Bluecare, Mijas (Málaga), Spain

Meningomyelitis of unknown origin (MMUO) with no involvement of the brain are uncommon in small animals. Advanced imaging techniques (MRI/CT) and CSF analysis are the main tools in the diagnosis of inflammatory diseases of the CNS.

To the authors’ knowledge, there are no studies in veterinary medicine comparing the sensibility between MRI and CT to detect inflammatory lesions in dogs with MMUO. The aim of this study was to evaluate a population of dogs with MMUO that underwent both procedures MRI and CT. The hypothesis was that MRI was more sensitive than CT to detect inflammatory lesions in dogs with MMUO.

A retrospective study was designed to compare the results of CT and MRI studies in dogs with presumptive diagnosis of MUO. Inclusion criteria was: only spinal cord clinical signs, inflammatory CSF. negative PCR of main infectious diseases in the area, MRI and CT (with contrast) performed of the affected spinal cord region in all dogs.

Eleven dogs met the inclusion criteria. In all dogs, a complete bloodwork, thoracic radiographs and abdominal ultrasound were performed with no significant abnormalities.

No abnormalities were observed on pre/postcontrast CT scans in any case. MRI revealed diffuse T2 hyperintense intramedullary lesions in 10/11 dogs. Contrast uptake on MRI was observed in 5/11 dogs. One dog with normal unenhanced MRI showed meningeal enhancement.

This study demonstrate that MRI is more sensitive than CT to detect inflammatory lesions of the spinal cord and should be considered the technique of choice in the diagnosis of MMUO.

**[P83]**

**Confounding clinical presentation, advanced imaging and histology between benign and malignant vertebral tumor in a French bulldog**

T. Troupel, J. Béguin, H. Vandenberghhe, L. J. Thibaud, N. Cordonnier, P. Moissonier, S. Blot.

Service of Neurology and Neurosurgery, Valencia Sur Veterinary Hospital, Valencia, Spain.

A 4-year-old female neutered French bulldog was presented for acute onset of painful ataxia of the hind limbs. Decreased postural reactions on both hind limbs with normal left hind limb spinal reflexes was consistent with a T3-L3 myelopathy and decreased right hind limb withdrawal reflex was consistent with a right-sided L7-S1 myelopathy or a right-sided sciatic neuropathy.

Magnetic resonance (MR) imaging of the thoraco-sacral spine revealed a T13-L1 intervertebral disc extrusion and a right-sided lesion on L7 suggestive of a neoplastic or degenerative process causing right-sided foraminal stenosis. Metastatic screening using computed tomography (CT) scan was negative. Surgical decompression was performed with a dorsal laminectomy of L7. Considering advanced imaging, surgical removal was likely to be incomplete. Histological examination was consistent with vertebral giant cell rich osteosarcoma. Surgical margins could not be evaluated.

A chemotherapy protocol was started, based on carboplatin followed by toceranib and alendronate. Three years after diagnosis, the dog presented with a normal physical examination. MR and CT scan demonstrated no evidence of the lesion and the absence of metastasis, respectively. This leads us to reconsider both the histological diagnosis of a malignant bone tumor and the degree of resection.

This case may be an example of the misdiagnosis of osteosarcoma for a benign osseous vertebral tumor or a cure in vertebral osteosarcoma. Clinicians must be aware that histology may fail in differentiating benign from malignant neoplastic osseous lesions, and therefore osteoid osteoma and osteoblastoma must be considered, especially in young dogs.

**[P84]**

**C-reactive protein as a prognostic indicator in canine intervertebral disc extrusion**

C. Atkins, P. Freeman.

Department of Veterinary Medicine, University of Cambridge, Cambridge, UK

Canine intervertebral disc extrusion (IVDE) is being increasingly recognized as a potential model for human disc herniation. In humans, systemic C-reactive protein (CRP) levels have been positively associated with pain severity and poorer post-operative outcomes. There are limited prognostic indicators of return to normal function in canine IVDE, with pre-operative neurological status being still the most reliable. Cases of surgically managed cervical, thoracolumbar or lumbosacral IVDE seen at Queens Veterinary School Hospital, University of Cambridge between 2013-2018, with recorded pre-operative CRP serum levels and follow-up data including time to clinical recovery were identified. All dogs with a co-morbidity which could affect serum CRP were excluded. Neurological status at presentation and discharge was
A case of a malignant parotid gland carcinoma after weaning off immunosuppressive therapy in a dog with suspected meningoencephalitis of unknown origin: clinical and imaging features

J. Prümmer1, M. Mololi2, O. Richard3, A. Maiolini1
1Division of Clinical Neurology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, 2Division of Clinical Radiology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, 3Institute of Veterinary Pathology, Vetsuisse Faculty, University of Bern, Bern, Switzerland

Parotid gland tumors are rare neoplasias in dogs that can infiltrate adjacent tissues and metastasize. This report describes clinical and imaging features of a malignant parotid gland carcinoma invading the skull and causing neurological signs. A 7-year-old female spayed Bearded Collie was presented for a subacute onset of neurological signs. A meningoencephalitis of unknown origin (MUO) affecting the cerebellum had been diagnosed ten months before and successfully treated with prednisolone and mycophenolate mofetil. General physical examination showed a large mass ventral to the right ear. Neurological examination revealed a right-sided head tilt, vestibular ataxia, right-sided Horner's syndrome, pathological nystagmus and reduced gag reflex. Neuroanatomical localization indicated either a right-sided extra-axial lesion involving multiple cranial nerves or a caudal brainstem lesion. CT and MRI of the head showed a right-sided retropharyngeal mass invading the caudal fossa and compressing the cerebellum and brainstem, adjacent to a second lesion of the right parotid gland. Multiple pulmonary nodules were detected on thorax CT. Due to the suspicion of a malignant, metastatic lesion, the dog was euthanized.

Post-mortem examination revealed a malignant parotid gland carcinoma developed after weaning off prednisolone and mycophenolate mofetil. Although a complete remission of the suspected MUO was achieved, this report raises questions on a possible connection between the immunosuppression and the development of malignancies.
One dog was treated with prednisone and omeprazole and was euthanized 3 days after the diagnosis. Three dogs had a ventriculo-peritoneal (VP) shunt placed. One dog improved initially but was euthanized 3 months later because of shunt complications. Two dogs are alive after 19 and 81 months with minimal clinical signs. All dogs with VP shunt placement had at least one VP shunt related complication.

The cause of generalized hydrocephalus in these young large-breed male dogs remains speculative but an idiopathic occlusion of the lateral apertures is strongly suspected. VP shunt placement appears to be the best treatment option. Dogs with VP shunt placement showed a volume reduction of the ventricular system, most significantly in the 4th ventricle with persistence of the syringohydromyelia without showing clinical signs for this condition.

**[P88]**

Cranio cervical junction abnormalities with atlantoaxial subluxation in a cat

E. G. Giza\textsuperscript{1,2}, M. Hebel\textsuperscript{1,2}, D. Niedzielski\textsuperscript{2}

\textsuperscript{1}Department of Internal Diseases and Diagnostics, Faculty of Veterinary Medicine and Animal Science, Poznań University of Life Sciences, Poland, \textsuperscript{2}The Veterinary Clinic dr n. wet. Dariusz Niedzielski, Wrocław, Poland

Cranio cervical junction abnormalities, including atlantoaxial instability, commonly affect toy breed dogs. In contrast, this type of malformation is rarely described in cats.

The aim of this study was to present diagnostic imaging findings in a 6-year old domestic shorthair cat presented with a moderate neck pain and spinal ataxia that occurred following a mild traumatic event. There were proprioceptive deficits in all four limbs, but more pronounced on the right side. Spinal reflexes were normal in the front limbs and hind limbs. The deficits indicated a C1-C5 neuroanatomical localisation and the patient underwent both the CT and MRI scans.

The first imaging finding was a bipartite atlas, with a 3.1 mm cleft in the midline and the right side of the dorsal arch. The C1 vertebra was shifted cranially and wedged into the foramen magnum causing compression of the neural tissue with vasomotor edema at the Atlanto-occipital junction. Moreover, the cerebellomedullary cistern was not visible on CT and MRI scans. The second malformation affected the odontoid of the axis, which was not normally fused with the body of C2 but was rather attached to it via fibrotic tissue (syndesmosis). There was severe atlantoaxial subluxation and the axis was inclined cranially into the cleft of the C1 dorsal arch.

Combined anomalies of both the occipital-cervical and atlantoaxial segments are relatively uncommon, especially in cats, and usually manifested by a more severe and persistent neurologic injury.

**[P89]**

Clinical, magnetic resonance imaging and cerebrospinal fluid findings in a population of dogs with meningomyelitis of unknown origin

S. Moya\textsuperscript{1}, C. Maeso\textsuperscript{2}, R. Mota\textsuperscript{3}, A. Escudero\textsuperscript{4}, E. Hidalgo\textsuperscript{5}, S. Ródenas\textsuperscript{1}

\textsuperscript{1}Service of Neurology and Neurosurgery, Animal Bluecare, Mijas (Málaga), Spain, \textsuperscript{2}Service of Neurology and Neurosurgery, Hospital Ars Veterinaria, Barcelona, Spain, \textsuperscript{3}Centro de Imagen de Montenegro, Oporto, Portugal, \textsuperscript{4}Centro Veterinario Aralar, Zaragoza, Spain, \textsuperscript{5}Service of Neurology and Neurosurgery, Universidad Católica de Valencia, Valencia, Spain

Meningomyelitis of unknown origin (MMUO) with no involvement of the brain is a common disease in dogs, and an underlying immune-mediated process is suspected. The aim of this retrospective multicenter study is to describe clinical, magnetic resonance imaging (MRI) and cerebrospinal fluid (CSF) findings, in a large population of dogs with diagnosis of presumptive MMUO.

Medical records, imaging and CSF findings of dogs with diagnosis of MMUO between 2015 and 2018 were retrospectively reviewed. Inclusion criteria were; neurological examination consistent with spinal cord lesion, MRI and CSF performed, and one of each at least consistent with MMUO and negative PCR of main infectious diseases in the area.

72 dogs met the inclusion criteria. Neuroanatomic localisation was; C1-C5 (51%), C6-T2 (8%), T3-L3 (33%), L4-S1 (2%) and multifocal (6%). Ambulatory paraparesis (72%) and spinal hyperesthesia (58%) were the most common clinical signs. Intraparenchymal lesions on T2 weighted images were present in 55/72 dogs and contrast enhancement in 14/55 dogs. Pleocytosis was not present in 30/72 (41%) all these dogs presented lesions on MRI. Mononuclear pleocytosis was the most common finding in dogs with pleocytosis. Proteins in CSF were increased in 63% of dogs.

Results of this case series study suggest that C1-C5 myelopathy, hyperintense lesions in T2 sequences on MRI, and mononuclear pleocytosis were the most common findings in these dogs. Moreover, an important number of cases of MMUO may display normal MRI or normal CSF.

**[P90]**

Transient vestibular paroxysms in five dogs

B. Lopes\textsuperscript{1}, A. R. Fraser\textsuperscript{1}, E. Ives\textsuperscript{2}, S. Hamilton-Bennett\textsuperscript{1}, D. Sanchez-Masian\textsuperscript{1}

\textsuperscript{1}Anderson Moores Veterinary Specialists, Winchester, UK

Transient vestibular paroxysms are poorly documented in veterinary medicine and may be analogous to spontaneous episodic vestibular syndrome (SEVS) in humans. Transient ischemic attacks (TIA) are a reported cause of SEVS and represent a clinical diagnosis, characterized by the sudden onset of a focal neurologic deficit due to a vascular origin, which achieves complete resolution in less than 24 hours. Magnetic resonance imaging (MRI) of the brain is typically normal in these cases.

A retrospective assessment of the medical records of dogs presenting with acute onset vestibular dysfunction was reviewed. Inclusion criteria included dogs presenting with a history of acute onset unilateral vestibular signs which resolved in <24 hours, no history of intoxication and no abnormalities on magnetic resonance imaging (MRI) of the brain.
Lameness in a young dog caused by a poorly differentiated tumor of neuronal origin: Imaging and histological findings

M. Antonakakis1, F. Taylor2, J. J. Minguez1, A. Wessmann1
1Neurology-Neurosurgery Department, Pride Veterinary Centre, Derby, UK, 2Oncology Department, Pride Veterinary Centre, Derby, UK

A 1-year-9-months Dachshund presented with a 5-month history of progressive, non-weightbearing left thoracic limb lameness unresponsive to conservative treatment. Neurological examination showed severe pain in the left axilla; with muscle wastage, absent postural reactions, and absent spinal reflexes in the left thoracic limb, localizing to C6-T2 spinal cord segments and associated nerve roots. MRI showed extensive left brachial plexus mass with marked extrathoracic extension along the C7, C8 and T1 nerve roots, mild transforaminal extension causing mild extradural mass effect, marked intrathoracic extension into the left sympathetic trunk; and cervicothoracic ganglion and severe cranial mediastinal and sternal lymphadenopathy. Nerve root cytology showed cells in a papillary like arrangement and a possible rosette arrangement. Ultrasound-guided tru-cut biopsy of the mediastinal mass showed a poorly differentiated neoplastic cell population, arranged in haphazard sheets and packets, and occasionally formed small pseudorosette-type structures supported by a scant amount of fibrovascular stroma. Immunohistochemistry stained positive for synaptophysin, and negative for chromogranin A, neuron specific enolase, and CD18, consistent with a tumor of neuroectodermal or neuroendocrine origin. A poorly differentiated embryonal tumor (peripheral primitive neuroectodermal tumor [pPNET]) is considered, originating in the nerve roots and metastasizing to the regional lymph nodes.

pPNET are scarcely reported in veterinary literature and not reported to present with extensive involvement of the brachial plexus and mediastinal masses. MRI findings and clinical signs are similar to confirmed spinal pPNET in children and adolescents. pPNET should be a differential diagnosis for a young patient presenting with painful progressive lameness in one limb.
from other facilities because of unmanageable convulsive seizures. A transection hook was designed for each dog with the length of the tip paralleling the frontal lobe cortical thickness determined by MRI. After rostroventricular craniotomy, electrocorticography (ECoG) was recorded in multiple points around the frontal lobe and MST was performed in the gyrus where epileptic discharges (ED) were recorded in ECoG. ECoG was repeated, and MST was performed until ED almost disappeared. Intermittent observations, and serial physical, neurological, and EEG examinations were performed postoperatively. The study was approved by the Institutional Research Committee.

Both dogs were followed-up for 7 years and showed no neurological abnormalities, except that one dog had transient hind-limb ataxia for 2 postoperative weeks and one seizure episode on postoperative day 1. ED was observed less frequently and not in the area where MST was performed a 27 months postoperatively.

This study suggested that MST may be a treatment option for epileptic dogs.

[Introduction]

Intercortical and intracortical volumetry assessment in correlation with EEG findings in dogs with idiopathic epilepsy: Preliminary results

P. Drobot1, K. Owsiriska-Schmidt2, A. Czerwik3, J. Nicpon2, M. Wrzosek1

1Department of Internal Medicine and Clinic for Horses, Dogs and Cats, Wrocław University of Environmental and Life Sciences, Wrocław, Poland, 2Center of Experimental Diagnostics and Innovative Biomedical Technologies; The Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

The aim of the preliminary study was the MR volumetric intercortical, and intracortical assessment in dogs with idiopathic epilepsy and its correlation with the EEG results. Positive result could be helpful in localization of the cortical epileptic foci.

Six mesocephalic dogs (one Alaskan Malamute, one Hungarian Vizsla and four mixed breed) with diagnosed idiopathic epilepsy were included in the study. The diagnosis was made in accordance with the IVETF recommendations. The age of the seizure onset varied from 12-60 months (mean: 39, median: 48). MRI examination was performed according to IVETF protocol for epilepsy patients on 1,5 T Philips Ingenia. Volumetric analysis of the cortex was made on T1-W 3D sequence in the transverse plane using the program Alteris-OsiriX v. 5.8. The lobes were measured and assessed for the asymmetry intercortically (between the dogs) and intracortically (between the lobes). In all dogs an EEG examination was performed, and all pathological discharges localization were recorded. Analysis of the result led to the correlation assessment between the functional epileptic focus and structural changes in brain lobes.

Asymmetric ratio (cut-off point 6%) was found in three patients (50%): frontal and occipital in one case and frontal and temporal in two cases. There was no correlation found with EEG changes, where discharges were from the C3 lead in two dogs and in C4 lead in one dog. In the remaining subjects, no asymmetric ratio > 6% was demonstrated in the intracortical, nor intercortical measurements.

[Introduction]

Retrospective evaluation of idiopathic head tremors in dogs: Age of the disease onset, MRI and EEG findings

P. Drobot1, K. Owsiriska-Schmidt2, M. Wrzosek1

1Department of Internal Medicine and Clinic for Horses, Dogs and Cats, Wrocław, Poland, 2Center of Experimental Diagnostics and Innovative Biomedical Technologies; The Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

A retrospective analysis of 25 dogs referred with clinical symptoms of head tremors is presented. Dog’s breed, the mean age of the disease onset, MR of the head and EEG results were recorded and analyzed. All dogs underwent clinical and neurological examination. Complete blood cell counts and serum chemistry panels were obtained from each dog. Diagnostic testing included EEG examinations in 9 cases and MRI examination of the head based on an epileptic-specific protocol in 15 cases.

Amongst the 25 cases (11 female, 14 male), 8 were French Bulldog’s, 2 American Staffordshire Terrier’s, 3 mixed breed and each of one: English Bulldog, Labrador Retriever, Doberman, Dogo Argentino, Dog de Bordeaux and Hawaiian Dog. Age of the symptoms onset varied from 4 to 84 months (mean: 39,5; median: 48). Clinical examination, neurologic examination and blood test revealed no significant findings. Intercital EEG did not reveal any paroxysmal (epileptoid) discharges, or other pathological activity. In two cases (60, 84 months old) MR of the head revealed thalamus lesion. Both dogs first onset of head tremor symptoms appeared in the age over 60 months. In one of those dogs histopathology of the brain revealed oligodendroglioma grade III.

Upon the results analysis the brain imaging in dogs with idiopathic head tremors should be advised before diagnosis, in order to exclude the intracranial changes, especially in older dogs, with symptoms onset above the age of 60 months. Due to lack of EEG epileptoid discharges, the syndrome does not seem to be epilepsy origin related.

[Introduction]

Case report of a dog with necrotizing limbic encephalitis

C. Rotter1, K. Matiaszk2, A. Fischer3, C. Rusbridge1,4

1Fitzpatrick Referrals, Orthopedics and Neurology, UK, 2Comparative Neuropathology, Centre for Clinical Veterinary Medicine, LMU Munich, Munich, Germany, 3Centre for Clinical Veterinary Medicine, LMU Munich, Germany, 4University of Surrey, UK

A 4-year-old male entire Jack Russell Terrier was presented with a 5-day history of two generalized tonic-clonic seizures and clusters of focal seizures (salivation, involuntary lip and head movement) of up to 30 episodes on one day. Prior to the referral, phenobarbital at 1.5 mg/kg BID was prescribed without apparent reduction in seizure frequency.

On presentation the dog was obtunded, displaying an intermittent head turn to the right and mild ataxia of all four limbs. Menace response was decreased, visual tracking was absent on the left and nasal sensation was absent on the right. Rectal temperature was...
Myelopathy secondary to a spinal arteriovenous malformation in a mature dog

M. I. De Freitas 1, D. Housley 1, A. Caine 1, K. Baiker 1, D. Corbetta 1, G. B. Cherubini 1
1Dick White Referrals, Station Farm, London Road. Six Mile Bottom, Cambridgeshire CB8 0UH, UK

Spinal vascular malformations are rare in dogs, with only a few case reports in the veterinary literature. The aim of this report is to describe clinical, imaging and histopathological findings in a dog with spinal cord arteriovenous malformation.

A two-year-old, male neutered, crossbreed dog was presented for investigation into progressive, ambulatory paraparesis. The neurological examination was consistent with T3-L3 myelopathy. MRI scan of the thoracic and lumbar spinal cord segments revealed multifocal, small, well-delineated, pin-point to curvilinear, tortuous, signal voiding structures, which were extensively and randomly distributed throughout the subarachnoid space along the entire visible length of the spinal cord. An additional focal, solitary, poorly delineated, ovoid to elliptical, longitudinally orientated, tapering, T2W and T1W hyperintense strongly contrast enhancing, intramedullary lesion was identified extending from T9-T10 to mid-caudal T12. A CT scan of the spine revealed distension of anomalous vascular structures throughout the included section of the spinal cord. At the level of T11-T12 an intramedullary lesion was present which was strongly contrast enhancing in the arterial phase, consisting of a plexus of small tortuous anastomosing vessels. Due to progression of the disease despite medical treatment, the dog was euthanized.

Macroscopic and histopathological examination confirmed the presence of an intradural arteriovenous malformation affecting the thoracic spinal cord and leading to a marked, diffuse congestion and focal recurrent bleeds into the affected spinal cord tissue.

This is the first report of a dog with a spinal arteriovenous malformation.
corpectomy for intervertebral disc protrusion. Postural reactions and spinal reflexes were unremarkable however superficial nociception was absent in both pelvic limbs. Right pelvic limb radiographs showed absence of the ungual process of digit III and IV, and distal phalanx of digit III as consequence of mutilation. Spinal MRI revealed changes consistent with chronic spinal cord injury (T2WI intramedullary hyperintensity lateralized to the right-side) at the corpectomy site with minimal spinal stenosis. Sensory and motor nerve function studies of the tibial and peroneal nerves were unremarkable. Skin, muscle and nerve histology revealed demyelinating sensory neuropathy of the saphenous nerve with involvement of dermal and possibly epidermal nerve fibers. Mild inflammatory changes were present on the biceps femoris and tibialis cranialis muscles, and saphenous nerve. The patient had mild improvement with pregabalin (5 mg/kg, TID) and topiramate (10 mg/kg, TID) for one month; however complete resolution of the clinical signs was noticed on a 7-month follow-up with amantadine (3 mg/kg, SID) and nutraceuticals including L-carnitine (100 mg/kg/day).

Self-mutilating behavior was presumed to be secondary to paresthesia combined with abnormal sensation resulting in indifference to pain. Self-mutilating behavior post compressive spinal cord injury or consequence of a demyelinating sensory neuropathy were considered the main differential diagnosis and may represent a rare complication in dogs undergoing spinal surgery.

[P100]

Whole genome sequencing and rare variant association study in familial spontaneous epileptic cats

Y. Yu1,2, D. Hasegawa1, R. M. Buckley2, A. Fujiwara-Igarasih1, Y. Hamamoto1, R. Asada1, S. Mizoguchi1, T. Kuwabara1, F. Miocchi1, L. A. Lyons3

1Laboratory of Veterinary Radiology, Nippon Veterinary and Life Science University, Tokyo, Japan, 2Department of Veterinary Medicine and Surgery, College of Veterinary Medicine, University of Missouri, Columbia, USA

Familial spontaneous epileptic cat (FSEC) is the unique feline isolated colony with familial aggregation of epilepsy. FSECs show two types of seizures; spontaneous focal epileptic seizures with or without generalized seizures, and vestibular stimulation-induced seizures. The hypothesis is that rare variants may contribute to epilepsy risk. Whole genome sequencing (WGS) was performed for four FSECs with one or both seizure form(s) using illumine platform. WGS data was aligned to Felis_catus_9.0 and compared with other 191 domestic in the 99 Lives WGS database. Unique variants that were predicted as pathogenic and considered to have neuronal importance were chosen for rare variant association study. Genotyping was performed on 52 FSECs and 25 cats that were relatively genetically related to FSECs. Multiple testing correction was conducted. Ethical approval for this study was obtained. Ten unique variants were found and evaluated. The allele frequency distribution of HELB variant was significantly different between FSECs with spontaneous seizures and cats without spontaneous seizures that were derived from the FSEC colony and relatively genetically related colony. The genotype distribution of HELB variant was also statistically significant. Although complex genetic factors are considered to result in epileptogenesis in FSEC and we cannot exclude the possibility that this rare mutant variant was positively enriched due to the high consanguineous background rate, the variant found in the current study might be potential susceptibility alleles for causing spontaneous seizures in FSEC, a genetic isolated population. Further studies are needed to validate the pathogenicity and its association of epilepsy.

[P101]

Paradoxical vestibular syndrome in dogs: MRI findings and neuroanatomy review

S. Formoso1, C. Rico2, L. Alves1, P. Freeman1 S. Griffin2, I. Carrera2

1Department of Veterinary Medicine, University of Cambridge, Cambridge, UK, 2Willows Referral Service, Birmingham, UK

Paradoxical vestibular syndrome is an uncommon manifestation of cerebellar disease, characterized by vestibular signs contralateral to the side of the central lesion, and ipsilateral postural reaction deficits, hemiparesis or ataxia. For this syndrome to occur, the lesion must be unilateral and specific regions of the cerebellum must be affected including the caudal cerebellar peduncle, the flocculonodular lobe and the fastigial nucleus. Paradoxical syndrome has also been reported in rostral cerebellar infarcts, and the explanation of why this causes paradoxical clinical signs has not been explained in those cases. The aims of this study were to investigate which anatomical structures are affected in dogs with paradoxical vestibular syndrome, and to discuss the brain connections involved in paradoxical vestibular syndrome. Patients were searched retrospectively and inclusion criteria was complete neurological examination consistent with paradoxical vestibular syndrome, and MRI of the brain. MRI images were interpreted by 2 radiologists. Sixteen dogs with paradoxical vestibular syndrome were identified. The anatomical structures affected were the flocculonodular lobe and caudal cerebellar peduncle (7/16) and the rostral cerebellar cortex and fastigial nucleus (5/16). (The remaining four dogs had no macroscopic lesions). The presumptive diagnoses were 5 neoplasia, 5 cerebellar infarcts and 6 meningoencephalitis. As has been reported, lesions affecting the flocculonodular lobe and caudal cerebellar peduncle (archicerebellum) caused paradoxical signs. In addition, rostral cerebellar lesions (located in the paleocerebellum) cause similar signs, which may be explained by connection of Purkinje cells that project to the lateral vestibular nucleus, modulating the vestibulo-spinal tracts.

[P102]

Alpha-chloralose intoxication in three cats

J. Dietzel1

1Department of Small Animal Medicine, University of Leipzig, Leipzig, Germany

As has been reported, lesions affecting the flocculonodular lobe and caudal cerebellar peduncle (archicerebellum) caused paradoxical signs. In addition, rostral cerebellar lesions (located in the paleocerebellum) cause similar signs, which may be explained by connection of Purkinje cells that project to the lateral vestibular nucleus, modulating the vestibulo-spinal tracts.
Alpha-chloralose is an active substance used as rodenticide. It acts in partially inhibitory and partially excitatory on the central nervous system and has a decreasing effect on thermoregulation. Bait is usually layered out during the cold season to maximize the effect of induced hypothermia.

We present three domestic shorthair cats that were referred to our clinic between October and December 2018. All cats were known to be excellent mice hunter. One was witnessed eating mice that eventually died through ingested bait containing alpha-chloralose. The other two cats were highly suspected for alpha-chloralose intoxication due to clinical signs. All cats were presented in a comatose state, accompanied by severe hypothermia and generalized cluster seizures.

Initial diagnostic tests including complete blood count, blood chemistry, coagulation profile and blood gas analysis did not reveal any relevant abnormalities in any of the cats. Two cats got thoracic radiographs taken which were also unremarkable.

All cats went to the ICU, receiving intravenous fluid therapy, diazepam (0.5-1.1 mg/kg when needed) and levetiracetam (20 mg/kg TID). Additionally, each cage was equipped with a heating mat and infrared lamp. Two patients recovered completely within few days and discharged without further medication. Both remained seizure-free until today. The third cat, which was witnessed eating intoxicated mice, died twelve hours after ingestion due to cardiac arrest.

This case series is one of the few with witnessed ingestion of alpha-chloralose and a fatal end for one of the patients. Prior studies showed a mortality rate of only 6.5%.

**[P103]**

**Central osteoblastoma of the second thoracic vertebra in a cat**

F. Giebels¹, F. Forterre², U. Geissbühler³, M. Welle⁴, R. Pool⁵, A. Maiolini¹

¹Division of Clinical Neurology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, ²Division of Small Animal Surgery, Vetsuisse Faculty, University of Bern, Bern, Switzerland, ³Division of Clinical Radiology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, ⁴Institute of Animal Pathology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, ⁵Department of Veterinary Pathobiology, Veterinary Medicine and Biomedical Sciences, Texas A & M University, College Station, TX, USA

Osteoblastoma are primary bone tumors that rarely affect human and veterinary patients, with a predilection for the vertebral column. Osteoblastoma of a cervical vertebra has been previously described in one cat. We present the first report of a central osteoblastoma of the second thoracic vertebra (Th2) in a cat. An 8-year-old, male neutered cat was presented for progressive gait abnormalities. Neurological examination revealed a mild paraparesis and moderate proprioceptive ataxia of both pelvic limbs. Postural reactions were prompt in thoracic and delayed in pelvic limbs. Segmental spinal reflexes were unremarkable. No spinal hyperesthesia was detected. Neurological findings were consistent with a T3-L3 myelopathy.

MRI and CT of the thoracic vertebral column revealed a well-defined extradural contrast-enhancing mass lesion originating from the Th2 spinous process, extending cranially to the vertebral lamina of Th1 and severely compressing the spinal cord. The cat underwent surgical cytoreduction via dorsal laminectomy of Th1, allowing macroscopic en bloc removal of the mass, histopathologically diagnosed as central osteoblastoma.

After initial postsurgical improvement, the cat suffered an acute transient deterioration 3.5 weeks after surgery. At follow-up 32 weeks later, improved neurological status, resolution of the dorsal decompression, and a Th1/2 vertebral luxation with synostosis was diagnosed. A focal contrast enhancing lesion was still evident at the base of Th2 spinous process and lung metastasis was additionally suspected. Due to the current good quality of life of the cat no further treatment was initiated.

This case report contributes to the sparsely existing literature on feline vertebral osteoblastoma.

**[P104]**

**Thoracic vertebral canal stenosis in nine cats: Clinical features, diagnostic imaging findings, treatment and outcome**

S. Gillespie¹ and S. De Decker¹

¹Clinical Science and Services, Royal Veterinary College, University of London, Hatfield, UK

The aims of this study were to report the clinical presentation, imaging findings, treatment and outcome of cats with thoracic vertebral canal stenosis (TVCS).

Cases were retrospectively identified based on MRI and clinical findings consistent with a diagnosis of TVCS. For each patient we identified ten breed, age and gender matched controls with CT imaging for reasons unrelated to neurological disease. For each cat vertebral canal height was determined at three levels for each thoracic vertebra.

British Shorthairs were over-represented when compared to the hospital population. Median age at presentation was 9 years. All cats presented for a chronic, progressive, painful, ambulatory, T3-L3 myelopathy. Five cats were treated conservatively, three surgically and one was euthanized. All cats treated surgically demonstrated clinical improvement or stabilization. Of the conservatively treated cats, two deteriorated, one remained stable and one improved. Mild intervertebral disk herniation or ligamentum flavum hypertrophy was observed in all cats. Hypertrophy of articular processes or dorsal lamina was not observed in any cat. Compared to controls, affected cats had a lower vertebral canal height at multiple thoracic vertebral levels, being most prominent for British Shorthairs and Domestic Shorthairs (P < 0.05). Unaffected British Shorthairs had a lower thoracic vertebral canal height at multiple levels compared to control Domestic Shorthairs (P < 0.05).

TVCS should be considered as a differential diagnosis in older cats presenting with a progressive, painful T3-L3 myelopathy. Feline TVCS might be caused by relative vertebral canal stenosis in which the spinal cord cannot tolerate mild spinal cord compression.

**[P105]**

**Surgical intervention on an anaplastic oligodendroglioma by ultrasonic aspiration**
Intracranial neoplasms are the most common reason for acute onset of epileptic seizures in older dogs, with oligodendrogliomas being frequently observed in French bulldogs.

This case report presents a six-year-old male French bulldog, with acute occurring cluster seizures and MRI diagnosis of an intracranial mass involving the right cerebral hemisphere. The mass measured 19x19x20 mm at that time. Brain biopsy was performed and histopathological examination revealed an anaplastic oligodendroglioma. Despite the poor prognosis, the owners opted for surgical intervention.

We performed a right sided rostrotemporal craniotomy under optic navigation control (frameless optical neuronavigation system, Karl Storz). Tumor resection was performed by ultrasonic aspiration (Sonopet). Post-surgical MRI showed a mild contrast enhancing area of 4,5x3x2 mm in the former tumor region.

The patient remained in ICU receiving phenobarbital (2,5 mg/kg BID) and cephalzone (22 mg/kg BID) and was discharged three days post-surgery considered neurologically normal. Phenobarbital treatment was continued and Lomustine administered at a dosage of 60 mg/m² every five weeks. The patient experienced mild cluster seizures again and was euthanized two days later without further diagnostic imaging on day 168 post surgery.

In human medicine tumor resection is a mainstay in therapy of oligodendrogliomas, yet being only rarely performed in the veterinary field. This case describes surgical intervention on anaplastic oligodendroglioma performed via ultrasonic aspiration and illustrates the possibility of significant tumor reduction while ensuring gentle handling of healthy tissue. In combination with chemotherapy or radiation therapy, this technique could lead to a remarkable increase in median survival time.

A two-year-old female Beagle dog was scanned ante- and post mortem with CT and MRI. Arteries were filled with red polyurethane resin through the common carotid arteries post mortem (all procedures were approved in PEI/001/956-4/2013). Followed by freezing to −80°C, a neurocranial block was made and was embedded into a water-gelatin-mix. Using a special milling device and a Nikon D800 DSLR camera we obtained high-resolution (300 dpi, 24-bit color, 7360x4912 pixel) cryosections with 100 μm layer thickness. The RGB-images were post-processed in Adobe Photoshop CS3, and images from CT, MRI and cryosectioning were imported into Amira software. Image volumes were co-registered, then segmentation of different structures were carried out. Finally, surface models were created and refined using Amira and Meshmixer.

Cryosectioning resulted 1112 RGB-images in high-detail (pixel size was only 19.5x19.5 μm). Co-registration in Amira with CT and T1 and T2-weighted MRI-series made it possible to visualize the structures in any arbitrary plane, allowing direct comparison between different imaging modalities. Segmentation and 3D surface modeling of the arteries, veins, brain and skull was also performed. This altogether...
gave a unique possibility to show the canine brain’s macro-anatomical structures and compare with the result of the diagnostic imaging techniques.

In conclusion, images produced by this method could be the base of multimodal comparative canine brain atlas, and the upgraded technique of the cryomicrotomization could be used for future similar studies.

[P108]

Surgical treatment of Atlanto-axial subluxation using 3D-printed patient-specific drill guides for placement of transpedicular screws in 12 dogs

C. Toni1, B. Oxley1, S. Behr2
1Willows Veterinary Centre and Referral Services, Solihull, UK

The objective of this retrospective case series was to report outcome and complications following ventral atlanto-axial stabilization using 3D-printed patient-specific drill guides for placement of transpedicular screws in dogs with atlanto-axial subluxation.

Medical records of dogs treated with this technique between May 2016 and August 2018 were reviewed. Data including pre- and post-operative modified Frankel score, imaging modality performed and complications were collected. Screws placement was graded using a modified Zdichavsky classification based on post-operative computed tomography (CT). Telephone follow up was obtained for each dog.

Twelve consecutive cases were included. Modified Frankel score was 3 in 5/12 (42%) dogs and 4 in 7/12 (58%) on presentation. All dogs underwent pre- and post-operative CT scans. Of 61 bicortical screws placed, 57/61 (93%) were graded 1 and 4/61 (7%) were graded 2a. Post-operative CT revealed good alignment of C1 and C2 in all planes. Reversible perioperative adverse events were described in 5/12 (42%) dogs. Two out of twelve (17%) of dogs were euthanized shortly after discharge for conditions unlikely directly related to the surgical procedure performed. At short-term follow up (18 to 50 days after surgery) 8/10 dogs (80%) had improved neurological status. For the remaining 2/10 (20%) neurological status remained unchanged. All dogs were reported ambulatory and comfortable at telephone follow-up (median 405 days post-surgery, range 180-780 days).

In conclusion this technique is accurate and safe in dogs with atlanto-axial subluxation, with improved neurological status resulting in 10/12 dogs.

[P109]

What do people want to know about canine and feline epilepsy? Looking for answers using GOOGLE trends

M. Plonek1,2, B. Oxley1

1Centre for Experimental Diagnostics and Biomedical Innovations, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland, 2Ranzijn Dierenarts via Flexvet, Veterinary Clinic, Zaandam, the Netherlands

Google is currently the most popular search engine and enables fast and easy access to health—related information. Google Trends is a useful tool that allows the analysis and graphing of Google searches in various countries over time.

The aim of this study was to evaluate and interpret worldwide web search queries related to canine and feline seizures and epilepsy in English-speaking countries over the course of a five-year period and determine related topic searches.

Search terms included “dog seizure”, “cat seizure”, “dog epilepsy”, “cat epilepsy”. The results were retrieved as a number of relative normalized search volume numbers (RNSN) on a 100 point scale.

“Dog epilepsy” was the most searched term. There was an increasing trend of this search over time (2014 mean 42 RNSN vs 2019 mean 72 RNSN). A breakout of related topics (>5000% RNSN) included “cannabidiol drug”, “dog seizure aftermath” and “dog seizure triggers”.

In each studied year, the search for this term peaked between the 23rd-31st December (>69 RNSN).

In cats, the term “cat seizure” was less popular and remained at a steady search trend (2014 mean 51 RNSN vs 2019 mean 55 RNSN). Breakout related topics included “euthanasia” and “cat seizure while sleeping”. Peak periods for this search (>69 RNSN) were observed in July, October and December.

Studies assess Google search trends may enhance our understanding of the demand for information concerning specific aspects of animal seizures and epilepsy. The processing of such data may help veterinarians meet these information needs.

[P110]

Magnetic resonance imaging features of solitary vertebral masses in nineteen dogs and one cat

E. Hanot1, A. Caine1, G. B. Cherubini2
1Dick White Referrals, London Road, Six Mile Bottom, Cambridgeshire CB8 0UH, UK

The purpose of the study was to describe the magnetic resonance imaging (MRI) features of solitary vertebral masses in dogs and cats, and identify potential MRI features enabling differentiation between malignant and benign lesions.

The study included 19 dogs and 1 cat with a solitary vertebral mass, for which a definitive histopathologic/cytologic diagnosis was available. Medical records and MRI studies were retrospectively reviewed, and animals were divided into malignant and benign groups according to the final diagnosis. Specific imaging features (including intensity on different sequences, region of the vertebra affected by pathology, and presence of cortical destruction, sclerosis or fracture of the affected vertebra) were compared using a Fisher’s exact test.

The malignant group comprised fifteen dogs and 1 cat, and 4 dogs were included in the benign group. MRI features of the different histopathologic/cytologic types of masses are described. Involvement of the vertebral body, a hyperintense signal on T2-weighted, STIR and gradient echo sequences and evidence of cortical destruction were significantly associated with malignancy (P < 0.05). T2-weighted isointensity, STIR hypointensity and STIR isointensity were significantly associated with benign masses (P < 0.05). The presence of bone
Exercise induced metabolic myopathy in German hunting terrier dogs: Correlation between genotype and phenotype

F. Mühlhäusl1,2, A. Tiptold1, V. Lepori1, T. Leeb2, K. Matiasek4, A. Sewell2, M. Kornberg2
1Department Small Animal Medicine and Surgery, University of Veterinary Medicine Hannover, Germany, 2Anicura Veterinary Clinic for Small Animals Trier, 3Institute of Genetics, Vetsuisse Faculty, University of Bern, Bern, Switzerland, 4Section of Clinical and Comparative Neuropathology, Institute of Veterinary Pathology, Ludwig-Maximilians-University, Munich, Germany, 5Biocontrol, Laboratory for Veterinary Diagnostics Ingelheim

Fatty acid oxidation is a key process in mitochondrial energy production in eukaryotic organisms. Inherited disorders of involved enzymes, especially of the very long-chain acyl-CoA dehydrogenase (VLCDAD), can result in clinically heterogenous signs, which differ in the severity and age of onset in affected human patients. The adult-onset form of a VLCDAD-deficiency includes myopathic signs with lipid storage in muscle cells and rhabdomyolysis. Our present study identifies some MRI features that may help differentiate between malignant and benign solitary vertebral masses. Greater case numbers are needed in future studies.

Exercise induced metabolic myopathy in German hunting terrier dogs: Correlation between genotype and phenotype

Exercise induced metabolic myopathy in German hunting terrier dogs: Correlation between genotype and phenotype

Hypersexuality responsive to phenobarbital in a neutered male DSH cat

Hypersexuality manifests as biting knap, mounting, pelvic thrusting, penile erection and/or coital intermission. Temporal limbic structures play a significant role in the regulation of sexual arousal independently of testosterone. Moreover, thoracic spinal cord, second sacral, hypogastric and pudendal nerves contribute in erection/ejaculation. Hypersexuality has been reported as a sign of temporal lobe epilepsy (TLE) in humans, and experimentally in cats. A 6-year-old, vaccinated, male neutered DSH cat was presented due to polyphagia and hypersexuality manifested since he was adopted one-year before.

Physical and neurological examination were unremarkable, including absence of scrotal testicles and penile spines, indicative of testosterone absence. Differential diagnoses included TLE, inadequate neutering/cryptorchidism, primary behavioral problem, bladder neoplasia, myelopathy/neuropathy (eg, FIP), adrenal hyperplasia/neoplasia.

Hematology, biochemistry and TT4 were almost unremarkable. Blood serology for FIV, FeLV and FCoV was negative. Serum pre-and-post-hCG stimulation testosterone ruled out cryptorchidism (<0.3 nmol/L). Abdominal ultrasound revealed mildly enlarged colonic lymph-nodes, the cytology of which revealed mild reactive hyperplasia. Urinalysis and culture were positive to Enterococcus spp. MRI of brain and spinal cord, and CSF analysis were unremarkable. CSF PCR for Toxoplasma gondii, FPV, FCoV and Bornavirus was negative.

Attempts to treat hypersexuality as a behavioral issue, UTI (co-amoxylav), pain (meloxicam) and anxiety (diazepam) were unsuccessful. Thus, phenobarbital was prescribed in a low dose (1 mg/kg,PO, q12h) which eliminated the episodes of hypersexuality without sedating. Phenobarbital withdrawal resulted in hypersexuality re-establishment. One-year later the cat remained episode-free on phenobarbital. This is the first report to present a presumptive TLE characterized by hypersexuality in a neutered male cat.

A new frameless optical neuronavigation system for brain biopsies in eight dogs

S. Gutmann, C. Tästensen, I. Böttcher, J. Dietzel, T. Flegel
Department of Small Animal Medicine, University of Leipzig, Germany

Optical neuronavigation creates a virtual reality, so the surgeon can see the position of all instruments in relation to the head during the procedure in real-time. The STORZ biopsy device consists of a computer workstation with special software, infrared camera, patient tracker and reflective instruments. Eight dogs with forebrain lesions diagnosed on MRI were sampled: For biopsy planning a 3D-MRI scan (T1/T2; 1 mm) of the entire patient’s head was performed. Afterwards four pins were placed into the skull at following localizations: both zygomatic arches, paramedian over frontal sinus and occipital protuberance. Then a CT scan of the
skull was made. Both data sets were fused automatically. A patient tracker with reflective balls was attached to the skull using three self-tapping screws. The patient was registered by touching the patient tracker as well as the tip of each pin with a reflective instrument. Intracranial lesions were sampled free handed (2-4 samples) through a mini-burr hole of 3 mm diameter using a Sedan side-cutting needle with reflective balls. Diagnostic yield based on specific histopathological diagnosis was 100%. Biopsy samples indicated postictal edema (n = 1), inflammatory (n = 5), necrotizing encephalitis/ necrotizing leuencephalitis/ meningocerebralitis (unknown origin) or distemper virus encephalitis) or neoplastic (n = 2, oligodendroglioma) pathologies. Six dogs showed no neurological deterioration, one dog showed a mild temporary ataxia and one dog died after the biopsy procedure because of progression of a pre-existing foramen magnum herniation. The frameless optical neuronavigation system by STORZ is a relatively safe and effective tool to gain diagnostic brain biopsy samples in dogs.

[ABSTRACT]

**MYELO-CT imaging findings in four dogs with gross surgical confirmed compressive hydrated nucleus pulposus extrusion**

A. Farré Marine, A. Luján Feliu-Pascual
Aula Especialidades Veterinarias, Valencia, Spain

Compressive hydrated nucleus pulposus extrusion (HNPE) represents an atypical variety of disc disease in dogs characterized by sudden extrusion of hydrated, non-degenerated or minimally-degenerated nucleus pulposus material, leading to contusion and varying degrees of spinal cord compression. Magnetic resonance (MR) imaging is considered the diagnostic modality of choice showing extradural, typically “seagull”-shaped, compressive material of hydrated signal intensity (hyperintense in T2-weighted images) immediately dorsal to the affected disc space. The intervertebral disc space is often narrowed, with an ill-defined dorsal annulus and a reduced nucleus pulposus signal. Recently, contrast-enhanced computed tomography (CE-CT) appearance of compressive HNPE has been described as a hypodense extradural compressive lesion with rim enhancement immediately dorsal to the intervertebral disc space, with a sensitivity of 91% and a specificity of 100%. The aim of this case series collected between 2015 and 2019 is to retrospectively describe the myelo-CT findings in four dogs with gross surgical findings consistent with compressive HNPE (white or transparent water-like or gelatinous material). In all cases, the myelo-CT findings were similar to previously described MR including a focal extradural “seagull”-shaped compressive lesion dorsal to the annulus fibrosus combined with a narrowing of the affected intervertebral disc space. The extruded material tended to be hypodense in soft tissue window, although the presence of subarachnoid contrast might artefactually have contributed to this appearance. These results suggest that myelo-CT could be a useful diagnostic tool for compressive HNPE when MR is not available, although a greater number of cases is required to draw solid conclusions.

[**P115**]

Clinical presentation, MRI findings, histopathology and outcome in a cat with masticatory myositis

M. Armellini1, L. Sánchez1, A. Lorek1, G. D. Shelton2, L. De Risio1
1Animal Health Trust, Small Animal Clinic, Lanwades Park, Kentford, Suffolk, 2University of California, San Diego, Department of Pathology, Comparative Neuromuscular Laboratory/Biomedical Sciences

A four-year-old, spayed female domestic short-haired cat was presented with acute facial swelling and waxing-and-waning bilateral exophthalmos for two weeks while treated with meloxicam and amoxicillin-clavulanic acid. Bilateral asymmetric facial swelling, mild exophthalmos and third eyelid protrusion were detected on clinical examination. Hematology and serum biochemistry revealed eosinophilia and markedly elevated CK activity. MRI of the head revealed diffuse swelling of the temporalis, masseter and medial pterygoid muscles. These muscles were severely and heterogeneously hyperintense on T2-weighted and STIR images, compared to normal skeletal muscle. On post-contrast T1-weighted images they were strongly and heterogeneously enhancing and contained several irregular, non-contrast-enhancing areas. Fine needle cytology of the left temporal muscle revealed eosinophilic and macrophagic inflammation. Bacteriologic and fungal cultures were negative. IgG and IgM for *Toxoplasma gondii* were compatible with previous exposure. A canine ELISA system against masticatory muscle type 2 M fibers was positive at 1:4000 (reference interval < 1:100). Histopathology of the left temporalis muscle revealed moderately severe multifocal myositis. Based on the diagnostic investigation, a diagnosis of immune-mediated masticatory myositis was made. Treatment with tapering doses of prednisolone resulted in complete resolution of the presenting clinical signs. Five months following diagnosis, while on 0.4 mg/kg/day prednisolone, no relapse has occurred, the cat’s serum 2 M antibody titre is negative and the serum CK activity is within reference range.

To the authors’ knowledge, this is the first case report describing the MRI appearance and successful treatment of masticatory myositis in a cat.

[**P116**]

3T MRI characteristics and functional outcome in dogs with severe spinal cord injury following thoracolumbar disc herniation

N. D. Jeffery2, B. Boudreau1
1Department of Small Animal Clinical Sciences, Texas A&M University, College Station, TX, USA

Dogs that have lost ‘deep pain perception’ following acute thoracolumbar disc herniation have an uncertain prognosis for recovery. In this study we explored the relationship between pre-operative MRI features and recovery of ambulation in such ‘deep pain negative’ dogs following routine decompressive surgery plus extensive (4-vertebral length) durotomy.
Of 13 dogs for which we had the necessary data, 7 recovered to walk again and 6 did not (including one that developed progressive myelomalacia). The median length of the gap in CSF signal on the 'myelographic' midsagittal MR image was 4.75 vertebral lengths in dogs that recovered versus 8 in those that did not. The spinal cord of all dogs but one (that recovered) exhibited hyperintensity in the gray matter on transverse T2W and STIR images that extended for variable distances. In 4 dogs that did not recover there were also extensive regions of hypointensity in the gray matter and, in some individuals, the central canal, on many transverse T2W images; this pattern was not observed in any of the dogs that recovered to walk again.

MR imaging in this small sample of dogs with severe thoracolumbar spinal cord injury after disc extrusion suggests that regions of T2W hypointensity, suggestive of hemorrhagic necrosis or hematoma, in the gray matter or central canal are associated with a poor prognosis for recovery, even when treated by extensive durotomy. As suggested in previous studies a short gap in CSF columns on myelographic MR images suggests a good prognosis.

**[P117]**

**Median manubriotomy as a simple method to improve ventral access to C7, T1 and T2 vertebral bodies and corresponding intervertebral disc spaces**

I. Mateo¹

¹Hospital Veterinario Vetsia, Calle Galileo 3, Leganes, Madrid Spain

The approach to the ventral aspect of caudal cervical and first thoracic vertebrae is hindered by the manubrium and the depth of the access. The aim of the present study is the description of the technique used to improve access to C7, T1 and T2 vertebral bodies and corresponding intervertebral spaces, in 7 patients. With the animals positioned in dorsal recumbency, a ventral midline incision was made from the mid-cervical area to the second sternebra. The sternoccephalicus muscles were divided to the manubrium and the superficial and deep pectoral muscles were disinserted from the manubrium with monopolar electrocautery. Subsequently a median manubriotomy was performed. Small Gelpi retractors were used to keep the manubrium open throughout the procedure, allowing visualization of deeper structures of caudal cervical spinal. Care was taken to avoid penetration to the pleural cavity and to respect the external jugular vein in its union with the brachiocephalic vein. With both sides of the manubrium retracted, an incision between sternohyoideus muscles was made to expose the trachea. Then, the approach to the ventral aspect of the cervical spine was continued in the standard manner. Gelpis Sletz retractors are recommended to retract longus colli muscles.

The procedure improved notably the visualization of the ventral aspect C7, T1 and T2 vertebral bodies, thus allowing a comfortable drilling for ventral slot (5 cases with disc extrusions or protrusions) or implant placement (2 cases). No patient suffered complications during or after the surgical procedure. There was no significant increase in perioperative pain.

**[P118]**

**Analysis of treatment and monitoring protocols of cytarabine arabinoside in canine patients**

M. K. E. Feldner¹, K. D. Foss¹, D. W. Hague¹, D. J. Schaeffer²

¹Department of Veterinary Clinical Medicine, ²Department of Comparative Biosciences, College of Veterinary Medicine, University of Illinois at Urbana-Champaign, Urbana, IL, USA

Cytosine arabinoside (CA) is a chemotherapeutic used as an immunosuppressant or anti-neoplastic agent. It is useful in the treatment of diseases of the central nervous system based on its ability to cross the blood brain barrier. Side effects such as myelosuppression, GI disturbance, and hepatotoxicity have been reported. Therefore, it is critical to monitor patients that receive CA. The purpose of this study is to collect and compare data about CA treatment protocols in veterinary medicine.

Diplomates and candidates of the American College of Veterinary Internal Medicine (ACVIM) neurology, oncology, and small animal medicine listservs were contacted and asked to fill out a 26-question online survey about the administration, monitoring, and side effects in dogs being treated with CA. Survey data was compared to retrospective record data of dogs treated with CA at the study institution.

Results from the survey indicate a significant difference in the dose utilized in treatment protocols (P < 0.01). Despite variation in dosage, results show a majority of veterinarians perform similar monitoring procedures prior to the first dose of CA. However, after completing the first dose, monitoring procedures varied significantly (P < 0.01).

Analysis of both the retrospective and survey data suggest that intravenous administration is associated with a higher risk for side effect development.

Based on these results, there is variation in CA treatment protocols amongst veterinarians. Additionally, route of administration may affect the side effects that are observed. Additional research is required to further investigate how route of administration can alter patient outcomes.

**[P119]**

**Clinical and MRI findings in two cats with globoid cell leukodystrophy**

A. S. Colverde³, C. Falzone⁴, T. Gagliardo³, G. Gandini⁴

³Clinica Veterinaria Pedrani, Via Calderiero 13, 36 030 Thiene (VI), Italy, ⁴Clinica Veterinaria Pedrani, Via Calderiero 13, 36 030 Thiene (VI), Italy

The aim of the study was to describe neurological symptoms and MRI findings in two cats with histological confirmed Globoiud Cell Leukodystrophy.

We considered cats with progressive neurological signs and MRI changes due to Globoiud Cell Leukodystrophy, as per histological confirmation.
Two not related male, 5-month-old cats, were referred for progressive neurological signs reflecting multifocal central nervous system involvement and characterized by intentional head tremor, paralysis with absence of deep pain perception on pelvic limbs and weakness-dystonia with reduced flexor reflex on forelimbs; menace response was also bilaterally decreased. MRI scans were performed with a 0.25 T-unit and included FSE T2 and T1 weighted sequences on sagittal and transverse planes; T1WI were repeated after intravenously paramagnetic contrast medium administration (0.1 mmol/kg gadolinium). Diffuse and irregular intramedullary T2-weighted hyperintensities were found on the thoracolumbar area; no obvious morphological and signal changes were detected on pre and post-contrast T1WI. In one patient mild cerebellar volume reduction was found. CSF examination showed mild pleocytosis (13 cells/ul) and marked protein increase (300 mg/dL) in one patient and mild albumino-cytologic dissociation in the second (protein: 62 mg/dL).

Due to the progression of the neurological signs, both patients were euthanized. Histological examination of the brain and spinal cord showed myelin loss and perivascular big macrophages containing PAS positive substance, compatible with Globoid Cells Leukodystrophy. Globoid Cell Leukodystrophy should be considered as a differential diagnosis in young cats showing progressive multifocal neurological signs with predominant involvement of the spinal cord and irregular-diffuse T2 intramedullary hyperintensities on MRI exam.

**Evaluation of the involvement of TH17-cells in the pathogenesis of canine spinal cord injury**

A. Kämpe1, A. Knebel1, R. Carlson1, K. Rohn2, A. Tipold1

1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany, 2Institute for Biometry, Epidemiology and Information Processing, University of Veterinary Medicine, Hannover, Germany

Interleukin-17(IL-17) producing helper-T-cells (Th17-cells) play a central role in protection against infections and in autoimmune diseases. However, the involvement of Th17-cells is also discussed in the pathogenesis of pain and in secondary inflammatory reactions.

To investigate a possible role of the adaptive immune system in the pathophysiology of intervertebral disc herniation (IVDH) and spinal cord injury (SCI), we analyzed the influence of Th17-cells in blood and cerebrospinal fluid (CSF) of sixty-two dogs suffering from IVDH and examined, if Th17-cells might have an effect on the course of this disease. Isolated lymphocytes were analyzed after stimulation by using multicolor flow cytometry to measure the amount of Th17-cells. Serum and CSF samples were analyzed by Enzyme-linked immunosorbent assays (ELISA) simultaneously. Highly significant differences (P < 0.0001) could be determined between three sampling time points: preoperative, postoperative after clinical improvement and after six months and in comparison to the healthy control group (animal experiment number: 33.8-42 502-05-18A290).

Last follow-up examinations of Th17-cells were comparable to the control group, preoperative Th17-cell-levels were decreased. Compared to healthy controls IL-17 measured in serum was significantly higher (P < 0.0001) in dogs with IVDH. However, there was no considerable difference between IL-17 levels in CSF amongst all groups (rso = 0.0482).

In conclusion, a high activity/usage or consumption of IL-17-producing-cells is suspected in acute IVDH. The decreased amount of Th17-cells recovers postoperatively. These findings may indicate an involvement of Th17-cells in the pathogenesis of IVDH and emphasize the importance of these cells in the interaction of pain and an immune reaction.

**Investigation of a TH17 cell-mediated immune response in dogs with idiopathic epilepsy**

A. Knebel1, A. Kämpe1, R. Carlson1, K. Rohn2, A. Tipold1

1Department of Small Animal Medicine and Surgery, University of Veterinary Medicine, Hannover, Germany, 2Institute for Biometry, Epidemiology and Information Processing (IBEI), Hannover, Germany

Th17 cells and their proinflammatory cytokine interleukin-17 (IL-17) seem to be associated with the development of chronic inflammatory and autoimmune diseases. We investigated whether a Th17-cell mediated influence can be identified in some dogs with idiopathic epilepsy (IE).

Th17 cells were identified and quantified by flow cytometry in blood of dogs with IE (n = 57) and IL-17 was measured in CSF (n = 35) and serum samples (n = 33) using an ELISA. Ten healthy beagles formed the control group. Results were correlated with clinical parameters for example, seizure frequency, seizure severity or response to treatment. Th17 cells were also randomly controlled in dogs with IE in a follow up study. The study was conducted in accordance with the ethical guidelines of the University of Veterinary Medicine Hannover (experiment number 33.8-42 S02-05-18A290).

Elevated levels of stimulated Th17 cells/μL were observed in ten dogs with IE (17.54%). There was a positive correlation between stimulated Th17 cells of dogs with IE and seizure severity (P = 0.0460). IL-17 levels in CSF and serum samples of dogs with IE were significantly increased compared to the control group. However only one correlation with clinical data or sampling time points could be observed: a negative correlation between IL-17 values in CSF samples and the amount of AEDs given to treat dogs with IE.

In conclusion, in single dogs with IE and severe seizures increased Th17 cell numbers were detected in blood. In these individual cases an autoimmune reaction against brain structures could be a potential cause for seizures and anti-inflammatory treatment could be indicated.

Clinical, magnetic resonance imaging and histologic findings of canine thoracolumbar discal cyst
Several types of extramedullary cysts have been reported in dogs; discal cysts remained poorly described and not fully proven in veterinary medicine. The purpose of this prospective study was to report clinical, magnetic resonance imaging (MRI) features and histologic findings of thoracolumbar discal cysts in dogs. Medical records and MRI of dogs presented from 2014 and 2019 with compressive myelopathy due to thoracolumbar cystic lesions communicating with the intervertebral disc were reviewed. All dogs should have had a neurologic examination, an MRI exam suggestive of discal cyst, surgical removal and histological confirmation of the cyst.

Eight dogs were included with 2 mixed large size breed dogs, 2 German Shepherds, 1 Labrador, 1 Pitt Bull, 1 Czechoslovakian Wolf dog, 1 Siberian Husky. The mean age at time of presentation was 8.5 years; 7 patients were male and one female. The neurological signs often were severe and started acutely (<48 hours) in all but two dogs, that had a more subacute onset (3 to 7 days). MRI showed compressive thoracolumbar myelopathy due to a round to oval shaped epidural space-occupying lesion communicating with the intervertebral disc, iso/hypointense on T1WI and mostly hyperintense on T2WI, with a variable contrast-enhancing wall, highly suggestive of a cystic structure. Histology confirmed the cyst, showing a wall made of dense fibrous connective tissue and mainly chondroid cells. All dogs dramatically improved after surgery. Despite rare, discal cysts should be considered amongst the differential diagnosis in dogs with acute thoracolumbar myelopathy and can be successfully surgically treated.

Cerebrospinal fluid velocity in healthy dogs

M. A. Christen1, D. Schweizer1, H. Richter2, M. Dennler2
1Division of Clinical Radiology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, 2Clinic for Diagnostic Imaging, Vetsuisse Faculty, University of Zurich, Switzerland

Cerebrospinal fluid (CSF) circulates from intracranial to spinal CSF spaces driven by the expansion of intracranial vessels. Alteration of CSF flow velocity can be seen in a variety of diseases, including obstructing of CSF spaces. This may result in secondary disorders such as hydrocephalus or cystic lesions within the forebrain or spinal cord. Phase-contrast magnetic resonance imaging (PC-MRI) is a non-invasive method to measure CSF flow velocity and to detect abnormalities in flow pattern. There is a lack of data on CSF flow velocity and pattern in dogs. Aim of this study is to measure CSF flow in a group of healthy dogs to evaluate the normal CSF flow. In this prospective study six adult healthy Beagle dogs were examined in a 3 Tesla magnetic resonance imaging system. CSF flow velocity was measured perpendicular to the flow at the level of the mesencephalic aqueduct, foramen magnum and at level of C1-C2 in transverse orientation. Ethical approval for the study was obtained.
Magnetic resonance spectroscopy findings in a beagle dog with genetically confirmed Lafora disease

N. Alisauskaite¹, M. Dennler², K. Beckmann¹, N. Zölch³
¹Neurology Service, Department of Small Animal Surgery, Vetsuisse-Faculty of Veterinary Medicine, University of Zurich, Zurich, Switzerland; ²Clinic for Diagnostic Imaging, Department of Diagnostics and Clinical Services, Vetsuisse-Faculty Zurich, Zurich, Switzerland; ³Forensic Medicine and Imaging, Institute of Forensic Medicine, University of Zurich, Zurich, Switzerland

Lafora disease (LD) is an autosomal recessive degenerative disease primarily affecting the central nervous system in various species, including people and specific dog breeds, such as beagles. In beagles it is caused by mutation in NHLRC1 gene, leading to intracellular accumulation of polyglucosan bodies (Lafora bodies) primarily in the somatodentritic compartment. Cortical atrophy was demonstrated in humans and dogs in MR imaging. In humans, magnetic resonance spectroscopy (MRS) of the brain reveals reduced N-acetyl-aspartate (NAA) relative to brain metabolites - creatine (Cre), choline (Cho) and myo-Inositol (mI), in patients suffering from LD compared to controls. MRS findings in dogs suffering from LD are lacking.

A 6-year-old female beagle was presented with history of a single generalized tonic-clonic seizure and multiple episodes of reflex myoclonus. Neurological examination was unremarkable. 3-Tesla MRI and MRS with voxel positioning in the thalamus were performed and compared to 12 healthy beagles’ results. Signal-to-noise ratio and full width at half maximum were comparable between investigated dog and controls. MRI examination of the head and CSF analysis were unremarkable. MRS revealed decreased levels of glutamate-glutamine complex (Glx), NAA and increased phosphoethanolamine (PE) relative to water and Cre compared to the value range in controls. Additionally, NAA/Cho ratio demonstrated the most pronounced difference compared to healthy beagles. Genetic test confirmed LD.

In this case MRS showed abnormalities with absent changes in conventional MRI. Reduced NAA reflects neuronal loss and is comparable to MRS findings in humans suffering from LD. Reduced Glx levels might be associated with antiepileptic drug administration.
Multimodal diagnostic approach for the improvement of diagnostic accuracy of canine neuromuscular neosporosis

V. Alf1, F. Tirrito2, F. Giebels3, J. Tabanez4, E. Mercuriali5, C. Falzone6, K. Matiasek1, M. Rosati1
1Section of Clinical and Comparative Neuropathology, Ludwig-Maximilians-University, Munich, Germany, 2Division of Clinical Neurology, Vetsuisse Faculty, University of Bern, Switzerland, 3Fitzpatrick Referrals, Godalming, Surrey, UK, 4Institute Veterinario di Novara, Novara, Italy, 5Clinica Veterinaria Pedrani Diagnostica Piccoli Animali, Zugliano, Italy, 6Centro Traumatologico Ortopedico Veterinario, Arenzano, Italy, 7Section of Neurology, Centre for Clinical Veterinary Medicine, Ludwig-Maximilians University, Munich, Germany, 8Neurology Referral Service, Tierklinik Haar, Haar, Germany, 9Neurology Referral Service, Tierklinik Haar, Haar, Germany, 10Department of Clinical Veterinary Sciences, University of Helsinki, Helsinki, Finland, 11North Downs Specialist Referrals, Bletchingley, UK

Neospora caninum can cause multisystemic infections in dogs that serve as intermediate and/or definitive host in the cycle of the parasite. Infestation taking place in the nervous system can involve brain, spinal cord, nerve roots, peripheral nerves and muscles. Antemortem diagnosis can be difficult and delay negatively reflects on the final outcome. Here we retrospectively compare the diagnostic utility of different tests in dogs with clinical signs of neuromuscular neosporosis. 11 cases of confirmed N. caninum infection were reviewed. Diagnostic modalities comprising serology, PCR and histopathology of muscle and nerve biopsies were compared. Age of onset was between 2 months and 9 years (mean 22.5 months). 8/11 patients showed neuromuscular signs only while 3/11 showed also CNS involvement. Serology was performed in 9/11 with 6/9 showing titers >1:160. PCR on muscle samples detected N. caninum DNA in 8/11. Histopathology revealed inflammatory myopathy in 9/11, necrotizing myopathy in 2/11 and tachyzoites in 8/11. Nerve biopsies showed signs of neuropathy in 5/7. All three tests were performed in 9/11 with confirmation in 3/9 from all tests, 4/9 from two tests and 2/9 from one test. Diagnosis of N. caninum infection should rely on a multimodal diagnostic approach and negativity of one single test should not allow for exclusion. In this case series, muscle and nerve biopsies combined with PCR from muscles increased the chances of parasite identification. Serology alone appears less reliable especially if performed at a single time point. Poor outcome was associated with delayed diagnosis.
Prognostic value of GFAP and NSE in dogs with meningoencephalitis of unknown origin

B. C. Elias¹, L. A. Gomes¹, S. F. M. Bhatti², L. Van Ham², E. Cox³, I. Cornelis²
¹Department of Small Animal Internal Medicine, Department of Veterinary Clinics, Universidade Estadual de Londrina, Londrina, Paraná, Brazil, ²Small Animal Department, ³Department of Parasitology, Virology and Immunology, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

To date, little is known about prognostic factors for dogs diagnosed with meningoencephalitis of unknown origin (MUO). The aim of this study was to evaluate the short-term prognostic value of two biomarkers, Glial Fibrillary Acidic Protein (GFAP) and Neuron-Specific Enolase (NSE), in CSF and serum in dogs diagnosed with MUO.

Twenty-seven dogs were retrospectively included in this study, 5 dogs in the control group (CG) and 22 dogs in the MUO group (MG). The dogs in the CG were all adult, healthy research Beagles. The diagnosis of MUO was made based on neurological examination findings, brain MRI, CSF analysis, and exclusion of infectious diseases. GFAP and NSE were measured by ELISA in CSF and serum at time of MUO diagnosis.

The NSE and GFAP concentrations in CSF and serum in the MG were significantly higher compared to the CG (P = 0.008 and P = 0.013, respectively). When a cut-off value of 250 ng/mL of NSE in the CSF and 150 ng/mL in the serum was used, a sensitivity of 75% and specificity of 100% for mortality at 3 months was observed in both tests. When a cut-off value of 3.5 ng/mL of GFAP in CSF was stipulated for mortality at 3 months, 69% sensitivity and 100% specificity was observed.

In conclusion, NSE and GFAP are expressed in CSF and serum in dogs diagnosed with MUO, with a significant difference between both groups. Although results appear promising, large scale studies are necessary to confirm the presented findings.

Automated in vivo MR morphometry for detection of age-dependent brain changes in the course of glaucoma in DBA/2J mice

M. Fiedorowicz¹, M. Welniak-Kamirska¹, J. Orzel¹,², P. Bogorodzki¹,², P. Grieb³
¹Mossakowski Medical Research Centre, Polish Academy of Sciences, Warsaw, Poland, ²Faculty of Electronics and Information Technology, Warsaw University of Technology, Poland

Magnetic resonance imaging enables fast acquisition of high resolution images of the brain. These images can be processed automatically to accurately evaluate a number of brain structures. Moreover, this approach allows tracking of changes of brain morphology in the same individuals enabling tracing of developing pathologies. This approach was used to track glaucoma-related brain pathology in DBA/2 J mice that spontaneously develop glaucoma and in control animals to differentiate these changes from ‘normal’ aging.

Brain morphology was evaluated in DBA/2 J, DBA/2 J-Gpnmb+/SjJ and C57Bl/6 female mice aged 3, 6, 9, 12 and 15 months. The animals were anesthetized with isoflurane (4% in oxygen - induction, 1.5-2% - maintenance) and placed in 7 T small animal-dedicated magnetic resonance tomograph (BioSpec 70/30USR; Bruker BioSpin, Ettlingen, Germany). High resolution structural imaging was performed with TurboRARE T2 sequence. Data were preprocessed with N4 intensity non-uniformity correction algorithm implemented in Slicer 3D and processed using SPM software and custom-made MATLAB scripts. For the volumetric analysis we employed National University of Singapore in vivo mouse brain electronic atlas. Study was approved by the local ethics committee.

Significant differences were noted in the brain volumes of the tested strains. Significant differences were noted for several cortical structures, in particular visual and auditory cortex. Relative visual cortex volume declined in DBA/2 J mice in an age-dependent manner. Automated atlas-based morphometry allowed detection of early signs of neurodegeneration in the murine model of glaucoma. It is a useful tool for in vivo evaluation of brain morphology and tracking of pathological changes.