

A COMPARISON OF ULTRASONOGRAPHY TO ARTHROSCOPY FOR IDENTIFICATION OF PATHOLOGIC CHANGE IN THE EQUINE STIFLE. A.M. Adrian^{1,2}, M.F. Barrett², N.M. Werpy, C.E. Kawcak², L.R. Goodrich². ¹Dick White Referrals, Six Mile Bottom, Cambridgeshire, CB8 0UH, UK, ²Colorado State University, Fort Collins, Colorado, 80525, USA

Introduction: Lameness secondary to stifle pain is common in equine patients. While arthroscopy is often considered the reference standard pre mortem for diagnosing meniscal damage, it is an imperfect reference as some meniscal lesions may be diagnosed only with ultrasound. Although descriptions of the arthroscopic and ultrasonographic boundaries of the normal femorotibial joint exist¹, there are few examples in the literature comparing the pathologic changes observed with each imaging modality.

Materials and methods: Retrospectively, the structures of the stifle joint were evaluated and graded for pathologic change by scoring arthroscopic and ultrasonographic examinations of 47 stifles in 37 horses. The presence and severity of the lesions were then compared between each modality.

Results: Medial meniscal lesions were detected more often with ultrasound than with arthroscopy. Conversely, arthroscopy was better for detection of medial cranial meniscotibial ligament tearing. Articular cartilage defects were best detected with arthroscopy, and periarticular osteophytes of the medial femoral condyle were best detected with ultrasound. Four patients had defects within one of the patellar ligaments, all of which were only characterized with ultrasound.

Discussion: The results of this study reveal that some structures of the equine stifle are better evaluated with ultrasound than arthroscopy, and vice versa. Additionally ultrasound allowed for evaluation of periarticular soft tissues, and significant lesions were found in the patellar ligaments in some stifles. A thorough ultrasonographic and arthroscopic examination should be performed to increase the likelihood of detecting lesions in the equine stifle. This practice should allow clinicians to have a more global appreciation of potential pathologic changes associated with stifle disease.

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ULTRASONOGRAPHIC MEASUREMENT OF ADRENAL GLAND-TO-AORTA RATIO AS A METHOD OF ESTIMATING ADRENAL SIZE IN DOGS.

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Introduction: Ultrasonography is useful to assess adrenal gland (AG) size in dogs. The thickness of the AG has been reported as the most sensitive measurement to detect variations in size and differentiating normal dogs from dogs with for pituitary-dependent hyperadrenocorticism.¹ However, the measurement range is very wide depending on the weight of the animal. To the authors' knowledge there is no information relating the adrenal size to some indicator of the body size. Aortic diameter has been previously used as a reliable landmark for ratio studies.² The aim of the present study was to establish an ultrasonographic measurement of adrenal gland-to-aorta ratio to estimate the adrenal size in normal dogs.

Material and methods: Client-owned dogs presented for abdominal ultrasonography for non-adrenal disease between February 2012 and December 2014 were studied. The maximum thickness of both AGs and the maximum aortic luminal diameter, both in longitudinal plane were measured. Three ratios were established: thickness of the left AG (LA) to aortic luminal diameter (Ao) ratio (LA/Ao), thickness of the right AG (RA) to Ao ratio (RA/Ao) and mean thickness of both AGs (mA) to Ao ratio (mA/Ao). The animals were divided in three groups for the body weight: <10 kg (small breed), 10-20kg (medium breed), >20kg (large breed); and for the age: <1year, 1-5 years, 5-10 years and >10 years. One-way ANOVA was used to assess the effect of age, gender and body weight in the adrenal/aorta ratios. A P-value < 0.05 was considered to be statistically significant.

Results: Two hundred and thirty-three dogs (112 males, 121 females) of various breeds, ranging from 3 months to 18 years of age and weighting between 0.8 and 39 kg were studied. There were no statistically significant differences between different groups of age and gender. Significant differences ($p < 0.05$) were found between body weights, being the smallest ratios for large breeds (LA/Ao= 0.58, RA/Ao= 0.65, mA/Ao= 0.61), followed by medium breeds (LA/Ao= 0.65, RA/Ao= 0.75, mA/Ao= 0.7), and the greatest ratio for the small breeds (LA/Ao= 0.8, RA/Ao= 0.86, mA/Ao= 0.83).

Conclusions: Adrenal/aortic ratio establishes the normal adrenal gland size based on body weight.

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EFFECT OF BODY WEIGHT, AGE AND SEX ON ULTRASONOGRAPHIC ADRENAL GLAND THICKNESS IN HEALTHY DOGS. A. Ansón, M. Soler, M. Martínez, A. Reyes, A. Agut. Department of Animal Medicine and Surgery, Veterinary Teaching Hospital, University of Murcia, Spain.

Introduction: Ultrasonography is useful to assess adrenal gland (AG) size in dogs. The AG thickness has been reported as the most sensitive measurement to detect variations in size and differentiating normal dogs from dogs with pituitary-dependent hyperadrenocorticism.¹ Measurements vary according to biological variations such as age, sex and body weight.² There is little information regarding the ultrasonographic AG thickness in dogs divided into multiples groups based on their body weight³ and age. The aim of the present study was to determine the relationship between AG thickness and body weight, age and sex.

Material and methods: Client-owned dogs presented for abdominal ultrasonography for non-adrenal disease between February 2012 and December 2014 were studied. The maximum AG thickness in longitudinal plane was obtained. Dogs were divided in groups for the body weight: <10 kg (small breed), 10-20kg (medium breed), >20kg (large breed); and for the age: <1year, 1-5 years, 5-10 years and >10 years. One-way ANOVA was used to assess the effect of age, gender and body weight in the AG thickness. ANOVA was also used to compare measurements between the different groups. A P-value < 0.05 was considered to be statistically significant.

Results: Two hundred and thirty-three dogs (112 males, 121 females) were divided in: 118 small breed, 63 medium breed and 52 large breed dogs. Regarding the age, there were 24 dogs < 1 year, 74 of 1-5 years, 83 of 5-10 years and 52 > 10 years. Gender had no significant effect on AG thickness. Statistically significant effect of the body weight and age on AG thickness was observed. AG thickness varied significantly with body weight, being the smallest value for small breeds (right AG 0.48 mm, left AG 0.45 mm), followed by medium breeds (right AG 0.57, left AG 0.50), and large breeds (right AG 0.62 mm, left AG 0.56 mm). Significant differences were found between age groups, being the smallest value for < 1year (right AG, 0.48 mm, left AG 0.40 mm), followed by 1-5 years (right AG, 0.52 mm, left AG 0.45 mm), 5-10 years (right AG, 0.54 mm, left AG 0.51 mm), and > 10 years (right AG, 0.56 mm, left AG 0.53 mm).

Conclusions: AG thickness correlates with body weight and age.

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USE OF VISUAL ARTS TO TEACH OBSERVATIONAL AND DESCRIPTIVE SKILLS FOR RADIOGRAPHIC INTERPRETATION. C. Beck¹, H. Gaunt², N. Chiavaroli³.

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Introduction: Veterinary students are often overwhelmed when faced with the task of radiographic interpretation and many report anxiety with this task. Radiographic interpretation is a perceptual and cognitive skill, and radiology training has often focused on the cognitive aspects of radiographic interpretation. Training of the features of visual observation that improve identification and objective description of abnormalities is often left to the explicit or hidden curriculum. Art has been used to train and improve visual observation in medical education¹ capitalising on the student's lack of familiarity with the specific artwork. In Veterinary Science specific training in visual observation for radiological interpretation using works of art has not been previously described. The objective of this pilot study was to explore the introduction and adaptation of the Visual Arts in Health Education Program for Medical and Dental students at the University of Melbourne² to DVM3 students as a means to increase visual observation and descriptive skills, to reduce anxiety and improve confidence of students with respect to radiographic interpretation.

Materials and methods: To improve the observational and analytical skills of students in order to raise the quality of their diagnostic skills, specifically with reference to radiographic interpretation, a Visual Arts in Health Education Seminar was given to 14 DVM3 students. Following the seminar the students evaluated the usefulness of the seminar. In the subsequent year the written radiology reports of these students in DVM4 were compared with the reports of a matched cohort.

Results: In comparing the DVM4 written radiology reports those who attended the seminar identified more abnormalities and which were described in greater detail than in the matched reports. 13/14 students reported that the seminar was either extremely or quite engaging and 13/14 reported that the cross disciplinary nature of the learning activity was either extremely or quite engaging.

Discussion: Specific training in visual observation and description is important in the training of students in radiology. The use of the Visual Arts program for DVM3 students makes explicit the importance of visual observation skills and objective description in radiographic contexts. In addition, the novel context allows students to practice these clinical skills in a relatively relaxed and non-stressful environment, contributing the alleviation of anxiety. Students who participated in this session demonstrated improved confidence and skill in radiographic interpretation.

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TRANSRECTAL ULTRASOUND OF THE EQUINE SACRAL PLEXUS. M. Beukers¹, L.C. Kranenburg², W. Bergmann³. ¹Division of Diagnostic Imaging, ²Department of Equine Sciences, ³Department of Pathobiology, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands.

Introduction: The transrectal ultrasonographic (US) appearance of the lumbosacral and sacroiliac regions of normal horses and horses with suspected sacroiliac pain has been reported, but information about the US appearance of segmental nerves of the (lumbo)sacral plexus is very limited.¹ The normal sagittal US appearance of equine peripheral nerves has been described as linear relatively hypoechoic structures with bright linear internal echoes and smooth hyperechoic borders.² No information on the abnormal appearance of the sacral nerves was found in the literature. The aim of this study was to describe normal and abnormal US features of the equine segmental nerve roots of the sacral plexus.

Materials and methods: Imaging data of horses that underwent a transrectal US of the lumbosacral and sacroiliac regions at Utrecht University between July 2009 and March 2015 were retrieved from the PACS. Transrectal US was performed using a 5-9 MHz linear transducer and left and right segmental nerves of the sacral plexus were imaged. Horses with abnormal findings of the segmental nerve roots were selected and compared to horses without clinical complaints. The ultrasonographic appearance (size, echogenicity and structure) of the right and left segmental nerves were described and compared to necropsy findings when available.

Results: Transrectal US studies were performed in seventy-five horses with various clinical complaints, and abnormal nerves were recorded in 3 horses. These 3 horses were clinically suspected of neuropathy. Ultrasonography revealed that one or multiple unilateral nerves of the sacral plexus had a reduced linear hyperechoic fascicular pattern. The abnormal nerves were thickened (6-11 mm thickness) and hypoechoic when compared to the contralateral side (3-5 mm thickness). In one horse there was a heterogeneously hypoechoic mass present adjacent to one of the nerves. In two horses necropsy revealed a unilateral neuritis, suggestive for polyneuritis equi. The heterogeneous hypoechoic mass in one horse consisted of fibrous tissue, nerves with severely swollen axons and lymphoplasmacellular infiltrates, compatible with chronic fibrotic neuritis in the context of polyneuritis equi.

Discussion: This study shows that transrectal US enables visualization and evaluation of the normal and abnormal segmental nerve roots of the sacral plexus in horses. A presumptive diagnosis of neuritis may be made when thickened and hypoechoic nerves, with a reduced hyperechoic fascicular pattern are visualized.

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EGAGROPILES (aka ENTEROLITHS) AND OTHER MINERALIZED BODIES IN CATS. W.E. Blevins, Editor and consultant, Veterinary Information Network; Diagnostic Imaging, Purdue University, Otterbein, IN 47970, USA

Introduction: Egagropiles are accumulations of hair into masses. They are seen mainly in cats, but other animals that lick themselves may have them. They vary in size and are frequently impregnated and encrusted with mineral giving them an egg shell appearance on radiographs. There are two case reports of egagropiles (enteroliths) in the literature.^{1,2}

Materials and methods: Case material seen on the Veterinary Information Network was used for this presentation.

Results: Seven cases of egagropiles in cats and one case in a dog were found. Other cases of abdominal mineralization that may mimic egagropiles were found.

Discussion: Egagropiles have a distinctive appearance in cats having a mineralized shell with an elongated appearance. They are frequently seen in animals with a partial obstruction aboral to the accumulation of egagropiles. When seen, exploratory surgery is usually indicated. Sequestered, necrotic peritoneal fat (a.k.a. Bates Bodies) has a similar radiographic appearance as egagropiles, but these are free floating in the peritoneal cavity and are clinically insignificant. Other mineralizations such as pancreatic liths or mineralized, fibrotic mucus can cause abdominal mineralized bodies.

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CARDIAC MAGNETIC RESONANCE IMAGING OF PATENT DUCTUS ARTERIOSUS IN THREE DOGS.

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Introduction: Patent ductus arteriosus is due to the failure of the ductus arteriosus muscle to constrict, leaving a passageway for blood flow in dogs.¹ Cardiac MRI (magnetic resonance imaging) with black and bright-blood angiography techniques are diagnostic methods that can be used to obtain an accurate depiction of the vascular canine thorax.²

Materials and methods: A four-month-old female Maltese, a 16-month-old neutered male Maltese and a 19-month-old female Spitz were involved. Three dogs were referred for heart murmur, and diagnosed with patent ductus arteriosus on radiography and echocardiography. Cardiac MRI was performed with 3T MR scanner with ECG-gating and breath-hold technique. Both black blood imaging for cardiac and vessel wall (using echo train spin echo) and bright blood cine acquisitions (using steady-state free precession imaging) were carried out.

Results: Black blood MR images clearly depicted the connection between the aorta and pulmonary artery, showing the course of the ductus from proximal descending aorta to the pulmonary artery, just proximal to the pulmonary bifurcation in all dogs. Also, it was found that one dog had a concurrent persistent left cranial vena cava not shown on echocardiography. The quantification of the stroke volume and shunt volume were feasible by using a stack of short-axis cine images.

Discussion: Cardiac MRI allows relatively complete assessment of cardiac and vascular morphology and extra-cardiac abnormalities. Also, MRI is particularly useful for quantifying stroke volume and shunt volume.

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ACCURACY OF USING CONTRAST ARRIVAL TIME AND INJECTION DURATION TO PREDICT TIME TO PEAK AORTIC AND HEPATIC ENHANCEMENT USING DYNAMIC COMPUTED TOMOGRAPHY J. Chau, A. Young, N. Dhand, M. Makara. University Veterinary Teaching Hospital Sydney, Faculty of Veterinary Science, University of Sydney, New South Wales, Australia.

Introduction: Multi-phase contrast CT of the liver has improved lesion detection and lesion characterization. This technique requires accurate synchronization of the CT scan with contrast enhancement of the hepatic arteries and liver parenchyma. The objective of the arterial phase is to synchronize image acquisition of the liver with the short time interval during which there is strong enhancement of the hepatic arteries but before contrast medium recirculates through the portal system. The goal of the hepatic phase is to scan the liver parenchyma during its maximum enhancement. Different techniques have been used in veterinary medicine to estimate the timing of the arterial and hepatic phase of enhancement, and some limitations to these techniques have been reported. We propose an alternative technique for estimating time to peak enhancement that takes into account patient variation due to cardiac output (contrast arrival time) and variation due to contrast injection technique pertaining to injection duration, which has been described in the human literature. Therefore, our aim was to measure the accuracy of estimating time to peak enhancement of the aorta and liver parenchyma, using contrast arrival time in the aorta and injection duration as predictors of time to peak arterial and liver parenchymal enhancement.

Materials and methods: A prospective clinical study of 18 dogs was performed using two injection techniques: fixed injection rate of 5ml/s and fixed injection duration of 20 seconds. A dynamic CT scan was performed at the hepatic hilus and regions of interest were drawn in the aorta and liver to evaluate the contrast bolus geometry. Multiple linear regression was performed to determine the proportion of variation in time to peak aortic and liver parenchymal enhancement that could be explained by time to contrast arrival in the aorta and injection duration; and to predict time to peak aortic and liver parenchymal enhancement based on these same variables for both groups.

Results: Contrast arrival time, injection duration and injection technique were significantly associated with time to peak aortic enhancement (p-values: <0.001, <0.001 and 0.014, respectively) and explained 96.1% of the variation in time to peak aortic enhancement. The regression equation for predicting time to peak aortic enhancement (in seconds) using a fixed injection rate technique was $[(0.825 \times \text{contrast arrival time}) + (0.807 \times \text{injection duration}) + 1.646]$; and for fixed injection duration technique was $[(0.825 \times \text{contrast arrival time}) + (0.807 \times \text{injection duration}) - 2.617]$. Estimation of time to peak liver enhancement using our predictor variables was not statistically different from that determined by the mean of time to peak liver enhancement.

Discussion: We conclude that contrast arrival time and injection duration are important predictors of time to peak aortic enhancement, and that the linear equation can be used for CT scan planning during multiphase contrast studies of the liver.

RADIOGRAPHIC FEATURES OF LOW GRADE CHONDROBLASTIC OSTEOSARCOMA IN THE ANTEBRACHIUM OF A KOALA. S.E. Davies¹, G.S. Allen¹, C.R. Howlett², R. Johnson³. ¹Veterinary Imaging Associates, Sydney, ²Vetnostics, Specialist Diagnostic Services Pty Ltd, ³South Penrith Veterinary Clinic, Penrith, Australia.

A 6-year-old male koala with a 6 month history of lameness with progression to paresis was presented to the South Penrith Veterinary Clinic for investigation. A firm swelling of the right antebrachium was identified and radiography was performed. Radiographic findings included a proliferative, expansile, partially mineralised mass at the proximal aspect of the right radius with a long zone of transition and lysis of the cranial cortex of the radius. Cortical mal-alignment consistent with pathologic fracture of the proximal radius was identified. Impingement of the radial mass on the adjacent ulna resulted in ulnar bowing. Radiographic findings suggested an aggressive aetiology. Biopsies of the lesion lacked evidence of malignancy and the radial lesion was classified as an osteochondroma. Four months later the koala was euthanized as the result of haemorrhage from a nasal mass that had subsequently developed. Radiographic findings at necropsy included enlargement and further mineralisation of the antebrachial mass, irregular lesion margination and effacement of radial and ulnar margins. Further histopathology of the antebrachial lesion classified the lesion as a low grade chondroblastic osteosarcoma suggesting initial biopsy had occurred during a pre-malignant phase of disease. Post-mortem histopathology of the nasal mass was consistent with an osteochondroma. The nasal mass was most likely a primary lesion, synchronously appearing with the mass in the radius rather than representing a metastatic lesion. 'Cranio-facial' tumours of mixed cartilage and bone have been reported in the koala^{1,2} without documentation of concurrent appendicular skeleton involvement. A theory of malignant transformation has been previously proposed based on histopathology of these lesions¹. This case report is the first to document appendicular skeletal chondroblastic osteosarcoma in the koala.

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MAGNETIC RESONANCE IMAGING OF MASTICATORY MUSCLES IN BASSET HOUNDS. R. Dennis¹, A. Lorek¹, J. Bass¹, S. Spencer². ¹Animal Health Trust, Newmarket, CB8 7UU, UK; ²Dick White Referrals, Newmarket, CB8 0UH, UK.

Introduction: Magnetic resonance imaging (MRI) can be a useful adjunctive test in the diagnosis of inflammatory myopathies such as masticatory muscle myositis in dogs. Regions of altered signal intensity are found in MR images of affected muscles. At the Animal Health Trust it has been observed that normal Basset hounds show apparent atrophy and MR signal changes of masticatory muscles in the absence of clinical signs. The purpose of this study was to describe these typical MR characteristics in order to help differentiate inflammatory myopathies from a breed variant.

Materials and methods: 38 Basset Hounds (18 females, 20 males, age range 1y6m-12y5m) were identified that had undergone an MRI scan of the head for various reasons (AHT high field; DWR low field). The scan protocol routinely included transverse T2-W, T1-W and post contrast T1-W sequences and also included some or all of STIR, FLAIR, GRE and post-contrast T1-W with fat suppression, in various planes. The MR images were examined for changes in signal intensity and muscle bulk and the final diagnosis was recorded. The imaging findings were compared to those in dogs of several other breeds with a final diagnosis of masticatory muscle myositis or atrophy secondary to trigeminal nerve disease.

Results: In the vast majority of the Bassets the superficial part of the temporalis muscles and the dorsal aspect of the masseter muscles showed atrophy with bilaterally-symmetrical T2-W and T1-W hyperintense signal and reduced enhancement after contrast medium administration whilst pterygoid muscles appeared normal. The combination of pulse sequences suggested that the affected muscle areas contained adipose tissue with no evidence of inflammation. The abnormal area in the temporalis muscles often extended over the whole length of the muscle but was usually centred at the level of the attachment of the base of the pinnae, especially in younger animals. This distribution is different from cases of acute masticatory muscle myositis or other inflammatory myopathies in which changes tend to affect the whole masticatory muscle bulk including the pterygoid muscles, with marked contrast enhancement. In addition, the degree of muscle atrophy was milder and the fat infiltration greater in the Basset Hounds than in cases of chronic masticatory muscle myositis or trigeminal disease.

Conclusions: Atrophy and MR signal changes in the superficial parts of the temporalis and masseter muscles in Basset Hounds appear to be normal findings in this breed and should not be misinterpreted as evidence of an inflammatory myopathy. We speculate that the changes are possibly due to chronic mechanical irritation of these head muscles from the gravitational pull of the large and heavy ears. Awareness of these MR imaging characteristics will help to prevent over diagnosis of inflammatory myopathies in Basset Hounds.

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CT AND MR ANATOMY OF THE SALIVARY GLANDS OF THE CAT. V. Fromme, G. Oechtering, E. Ludewig. Department of Small Animals, Veterinary Faculty, University of Leipzig, 04103 Leipzig, Germany.

Introduction: Due to their high resolution and useful contrast resolution, CT and MRI are recommended methods for diagnosing pathological changes of soft tissues such as lesions of the salivary glands. To our knowledge, no studies about the CT or MR anatomy of the feline salivary glands have been published yet.

Materials and methods: Two groups of cats were examined. In a prospective trial, 16 cats euthanized for reasons unrelated to the study underwent a head CT (1 mm slice thickness) and 0.5 Tesla MRI scans (T2w, T2w SPIR, PDW, T1w). In a retrospective trial, the CT scans (0.8-1 mm slice thickness) of 25 cats and the MR scans (T2w, T1w, pre- and post-contrast) of 21 cats were re-evaluated. These scans were performed at our clinic between 2005 and 2013. No signs of salivary-gland-related pathologies were visible. All images were reviewed with respect to the following criteria: the presence, delineation and size of the salivary glands as well as the signal intensity. If present, anatomical landmarks surrounding the glands were also recorded.

Results: 94.3% of the parotid glands, 90.7% of the mandibular glands and 96.8% of the zygomatic glands could be delineated using CT. With MRI, 94.1% of the parotid glands, 99.2% of the mandibular glands and 88.9% of the zygomatic glands could be identified. In both groups the other small salivary glands could not be visualized either in CT or in MRI. Anatomical landmarks such as the external ear canal, the M. masseter, the M. pterygoideus medialis and the Bulbus oculi facilitate the identification. The mean density of the parotid gland, the mandibular gland and the zygomatic gland was 65 HU, 62 HU and 57 HU, respectively. The parotid gland was mainly isointense to muscle and hypointense to fat. The mandibular and zygomatic glands were hyperintense to muscle and hypointense to fat. Signal intensities were similar for T1w, T2w and T2 SPIR images. Sizes were comparable for both groups and modalities and measured about 17x6 mm (lateral to medial and dorsal to ventral, range: 13-23 mm x 3-10 mm) for the parotid gland, 8 x 17 mm (range: 4-12 mm x 11-24 mm) for the mandibular gland and 10x7 mm (range: 3-16 mm x 4-14 mm) for the zygomatic gland.

Conclusions: Landmarks were recorded and data regarding the density/signal intensity and the size of the parotid gland, the mandibular gland and the zygomatic gland could be gathered. The discrepancy between depicting the small glands and the above mentioned glands can be explained mainly by the lack of contrast to the surrounding tissue in CT and the low spatial resolution in low-field MRI. Advanced MRI techniques are expected to produce more detailed images and therefore those techniques could be used to also describe the small salivary glands.

THE USE OF COMPUTED TOMOGRAPHY IN ASSESSMENT OF AVIAN SINONASAL DISORDERS. K.A. Garrett, B. Doneley. Department of Radiology, School of Veterinary Science, The University of Queensland, Australia.

Introduction: Radiographic assessment of upper respiratory tract disorders in birds is complicated by the anatomy of the skull and sinuses. The superimposition of both soft tissue and bone makes radiographic interpretation extremely difficult. Computed tomography offers a more accurate means of assessing changes in the skull and sinuses. This paper outlines a case series of four birds presented for assessment of the suspected sinonasal disease.

Materials and methods: Four birds presented for assessment of suspected upper respiratory tract disease. A non-contrast skull CT was performed in each case, under general anaesthesia.

Results: On computed tomography the following diagnoses were made. Unilateral choanal atresia was diagnosed in one bird; extensive right sided sinusitis was appreciated in the second bird (and confirmed to be *Cryptococcus* on cytology). The third bird was found to have extensive neoplastic disease of the rhinal cavity and sinuses; biopsy showed this to be a squamous cell carcinoma. The fourth bird, a suspected traumatic injury to the facial sinuses, was normal.

Discussion: The avian skull presents a unique challenge to clinicians and radiologists alike. Its extensive sinus network and the complex arrangement of the skull bones do not lend itself to simple radiographic assessment. The use of Computed Tomography offers an opportunity to gain a superior assessment of diseases affecting the sinuses and skull in avian patients.

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THE USE OF ULTRASOUND TO ASSESS COELOMIC DISTENSION IN BIRDS. K.A. Garrett, B. Doneley. Department of Radiology, School of Veterinary Science, The University of Queensland, Australia.

Introduction: Radiographic assessment of the coelom in avian patients is enhanced by the presence of air contained in the air sacs. This inherent advantage of avian anatomy is often lost in the presence of organomegaly and/or ascites. Previously, the use of contrast media to differentiate the gastrointestinal tract from other organs within the coelom has been the mainstay of further imaging studies. This paper outlines a case series of birds presented to the Gatton UQ Veterinary Medical Centre for assessment of coelomic distension.

Materials and methods: Eight birds (six chickens and two parrots) were presented for coelomic distension. In each case, an ultrasound of the coelom was performed as part of the diagnostic process.

Results: One bird (a budgerigar) was diagnosed with a retained egg. One bird (an Alexandrine parrot) was diagnosed with dilated cardiomyopathy and resultant ascites. A third bird (chicken) was diagnosed with a left flank hernia, containing multiple loops of intestine. Two chickens were diagnosed with pyometra, with mild coelomic effusion. Three other chickens were diagnosed with egg yolk peritonitis.

Discussion: Although ultrasound has traditionally been avoided in avian medicine due to the presence of air sacs, in cases of coelomic distension ultrasound offers a rapid non-invasive technique for differentiating pathology within the coelom.

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THE EFFECT OF DIET COMPOSITION AND LUMINAL INGESTA ON INTESTINAL MUCOSAL ECHOGENICITY IN HEALTHY DOGS. L. Gaschen, L.A. Granger, O. Oubre, D. Shannon, F. Gaschen. Department of Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803, USA.

Introduction: The sonographic finding of hyperechoic mucosal speckles and striations in dogs has been associated with inflammatory bowel disease and lymphangiectasia. Administration of corn oil has been shown to make hyperechoic striations more visible in dogs with lymphangiectasia.¹ However, a lack of a healthy control group to investigate whether hyperechoic mucosal speckles and striations in dogs are a physiological variant or artifact due to recent food ingestion exists. This would be useful in a clinical setting where complete fasting may not happen prior to examination or where recent ingestion occurred and the presence of food could complicate image interpretation.

Materials and methods: Study population of 76 client-owned, clinically healthy dogs of all ages and breeds, having no history of gastrointestinal disease. Each dog was fasted for a minimum of 12 hours then fed two meals, one maintenance and one high fat (1ml/kg corn oil added), 1 week apart. Two high frequency ultrasound transducers, a curved and linear array, were used and compared. Static images of the three different jejunal segments and the one duodenal segment were reviewed by two radiologists, blinded to diet group and time point to assign a consensus score for mucosal echogenicity: Grade 1: anechoic mucosa, Grade 2: speckles present, Grade 3: speckles and striations present. The grades were compared statistically using univariate analysis to the following data points: fasted, immediate post-prandial (meals 1 and 2) and 60 minutes post prandial (meals 1 and 2).

Results: There was a significant increase in the mucosal echogenicity score at the 60-minute post-prandial time period within each diet ($p < 0.05$) and at 60-minutes between diets ($p < 0.001$) for both the duodenum and the jejunum. The findings were independent of transducer type.

Discussion: Intestinal echogenicity can be influenced by fat content in the diet and time after ingestion. Both low and high fat diets increase echogenicity at 60-minutes post-prandial and high fat diets can increase duodenal echogenicity immediately after ingestion. Hyperechogenicity at 60-minutes post-prandial for low and high fat diets may reflect physiologic lacteal dilation and can be identified in healthy dogs. The mucosal appearance described in these healthy dogs overlaps the ultrasonographic findings seen in dogs with lymphangiectasia and enteritis.

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DOUBLE-BLIND, PLACEBO CONTROLLED ULTRASONOGRAPHIC EVALUATION OF THE EFFECTS OF ANTIEMETIC DRUGS ON ANTRAL MOTILITY IN HEALTHY DOGS F. Gaschen¹, K. Bogard¹, E. Olson¹, R. Stout² and L. Gaschen¹. ¹Department of Veterinary Clinical Sciences, ²Department of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70808, USA.

Introduction: The effects of antiemetics on gastrointestinal (GI) motility are an important factor in the choice of the right drug. While antiemetics with prokinetic activity are desirable in vomiting dogs with paralytic ileus, they should be avoided in dogs with GI obstructions.

Materials and methods: The prokinetic effects of the most commonly used antiemetics were evaluated ultrasonographically in 14 healthy dogs after a 24 hour fast using a randomised, controlled, blinded crossover design. The study protocol was approved by the LSU Animal Care and Use Committee. Starting 24h before motility evaluation, metoclopramide (0.5mg/kg q8h), dolasetron (1 mg/kg q24h), maropitant (1 mg/kg q24h) or saline (negative control) were administered subcutaneously. Cisapride (0.75 mg/kg q8h), a prokinetic without antiemetic properties, was given orally as a positive control. Dogs were fed 1 h after they received their morning treatment. Contracted and relaxed cross-sectional antral surface were measured in triplicate using a 7.5 MHz convex transducer, and antral contractions (CF) were counted over 2 minutes. Measurements were made before the meal and at regular intervals for 7h postprandially (pp). Motility index (MI) was calculated by multiplying contraction frequency and amplitude. Results were evaluated using a mixed model repeated measures ANOVA with dog as a random effect, treatment and time as fixed effects, and significance set at $p < 0.05$.

Results: After placebo MI increased over the first 30 min. pp, then reached a plateau, and started to decrease 5 h pp. Compared to placebo, metoclopramide significantly increased MI in the fasted state and 0, 30 min, 1, 4, 5, 6 and 7 h pp. Dolasetron also significantly increased MI in the fasted state, and 0, 1 and 5 h pp. Maropitant significantly increased MI only in the fasted state. After cisapride MI was significantly higher than placebo in the fasted state, and 0 and 7 h pp.

Discussion: Of all tested drugs, metoclopramide caused the most pronounced and sustained increase in motility before and after a meal. All other drugs had some effect on fasted motility, however postprandial motility was mostly unchanged. Metoclopramide is the antiemetic drug with the highest prokinetic activity in the gastric antrum.

MRI-BASED MORPHOMETRIC ANALYSIS OF THE CANINE CAUDAL FOSSA IN RELATION TO CHIARI-LIKE MALFORMATION IN BRACHYCEPHALIC BREEDS.

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Introduction: Chiari-Like Malformation (CLM) is commonly recognised in several brachycephalic canine breeds, in particular the Cavalier King Charles Spaniel, and is associated with the development of syringomyelia. It can be a highly debilitating and distressing disease for both dogs and owners. This study aimed to investigate the differences in hindbrain and skull morphology between affected and unaffected brachycephalic dogs, and to evaluate possible associations between these differences and the presence of Chiari-Like Malformation. Correlation was also sought between the extent of cerebellar herniation and severity of clinical signs. Veterinary Ethical Review Committee approval for this project was obtained.

Materials and methods: Various morphometric measurements were derived from a T2 sagittal 'flexed-neck' sequence from MRI scans of 20 brachycephalic dogs, 13 of which were affected by CLM and 7 of which were normal. Two-sample t-tests were used to compare whether the differences between the two groups were in fact significant. Correlation between each of the measurements and the presence of CLM was investigated, as was correlation between the length of cerebellar herniation and the clinical severity.

Results: A total of 20 brachycephalic dogs were included in the study, of which 13 had cerebellar herniation, and 7 were classified as normal. The average difference between morphometric measurements of the two groups was not found to be statistically significant. No correlations were confirmed between any of the various measurements and the presence or absence of Chiari-like Malformation. The extent of cerebellar herniation and the severity of clinical signs did not show a monotonic relationship.

Discussion: The lack of a significant difference in the various measurements between affected and unaffected dogs contradicts what many previous studies have found. A key difference between previous studies and the present one is that this sample population consisted only of brachycephalic dogs. Chiari-Like Malformation has only been reported in brachycephalic breeds; therefore results yielded from comparisons within this more narrowly defined morphological group are likely to be more specific and less spurious. The lack of correlation between cerebellar herniation and severity of clinical signs reinforces results from previous studies. Further research is required to allow greater understanding of the aetiopathogenesis of this disease complex. Recognising the key morphological differences between affected and unaffected dogs may elucidate a risk morphology which predisposes individuals to development of this condition. Knowledge of risk morphology may allow for selection pressure away from these traits thereby reducing the prevalence of this disease within the population.

CHRONOLOGICAL LOW FIELD MAGNETIC RESONANCE APPEARANCE OF CANINE INTRASPINAL HEMORRHAGE MODELS J.M. Jeong¹, S.J. Park, Y.C. Jung, E.S. Jeong, K.C. Lee. ¹College of Veterinary Medicine, Chonbuk National University, Iksan, South Korea.

Introduction: Magnetic resonance (MR) appearance of canine intraspinal haemorrhage depending on time is not established. The purpose of study is to establish MR appearance of canine intraspinal haemorrhage in low field magnet.

Materials and methods: A total of 8 clinically normal beagle dogs, weighing approximately 10kg were used. After a base-line MR examination, intraspinal haemorrhage was produced. MR examination was performed on 1, 2, 3, 4, 5, 10, 15, 20, 25 and 30 day using low field MR (0.25 Tesla). The transverse images were acquired for image analysis. Sequences used were T2W, T1W, FLAIR, STIR, T2* GE. Images obtained were compared subjectively for signal change evaluation.

Results: Eight intraspinal haemorrhage dog models were created successfully in T12 ~L2 region. Time dependent MR appearance of intraspinal haemorrhage was summarized Table 1.

Table 1. Time dependent MR appearance of intraspinal haemorrhage

Spinal cord haemorrhage	T2W	T1W	FLAIR	STIR
hyperacute (~24hr)	hyper	mild hyper	hyper	hyper
acute (1~3day)	hyper	mild hyper	hyper	hyper
early (3+day)	hyper	mild hyper	hyper	hyper
late (7+ day)	hyper	mild hyper	mild hyper	hyper
chronic (14+ day)	hyper	mild hyper	mild hyper	hyper
Epidural haemorrhage	T2W	T1W	FLAIR	STIR
hyperacute (~24hr)	hyper	mild hyper	hyper	N/A
acute (1~3day)	hyper	iso	iso	N/A
early (3+day)	hyper	iso	iso	N/A
late (7+ day)	hyper	iso	iso	N/A
chronic (14+ day)	hyper	mild hyper	iso	N/A

No significant hypointense signal of haemorrhage was seen on GE image during examination.

Discussion: This appearance of canine intraspinal haemorrhage in low field MR has not been previously described. This result also may suggest that intraspinal haemorrhage may not follow the same changes as seen in intracranial haemorrhage. T2*-W GE imaging is less useful in haemorrhage detection based on the result from this study.

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PRACTICAL RESTRAINER EXPOSURE TO SCATTER RADIATION IN SMALL ANIMAL RADIOGRAPHY BY USING THERMOLUMINESCENT DOSIMETERS. E.

Jeong, Y. Jung, N. Kim, M. Kim, K. Lee. College of Veterinary Medicine, Chonbuk National University, Iksan, 561-752, South Korea.

Introduction/Purpose: Digital radiographic (DR) imaging is becoming more popular in veterinary practices. Due to DR system, repetitive radiography is done more easily for getting precise imaging than in the past. Exposure factors have tended to increase since DR image quality can be improved with increased exposure. Although there are variations in legislation relating to veterinary radiation protection throughout the world, the restrainers usually wear apron and thyroid shield in veterinary practice. The purpose of this study was to investigate the practical restrainer exposure to scatter radiation in small animal radiography by using thermoluminescent dosimeters (TLDs) located at personnel shielding inside and out in different body parts.

Materials and methods: A prospective study was conducted to investigate exposure dose of a radiation worker (172cm) in one veterinary hospital during 2 months by using TLDs. The lead equivalent (PbEquiv) protective devices were used including panorama mask (0.10 mm), thyroid shield (0.35 mm), lead coat (0.35 mm), hand protective (0.35 mm). TLDs were placed on radiation protective gear of five different body parts (thyroid, breast, gonad, eye, hand), inside and out.

Results: The study data were below: 1102 exposures, 235 patients (203 dogs, 28 cats, 4 others), mean kVp (62.1), mean mAs (7.8). Equivalent doses to the thyroid, breast, gonads, eye and hand outside lead protection are 1.93 mSv, 2.57 mSv, 0.95 mSv, 4.25 mSv and 4.71 mSv. And equivalent dose to the thyroid, breast, gonads, eye and hand inside lead protection are 0.08 mSv, 0.1 mSv, 0.11 mSv, 0.31 mSv and 0.46 mSv.

Discussion: The equivalent dose of eye outside lead protection was 4.25 mSv and it amounts to 25.5 mSv for one year. It exceeds 2011 International Commission on Radiological Protection (ICRP) statement on tissue reactions recommendation (20 mSv/y for averaged over 5 years). This study showed a reduction of scatter dose with the lead protective devices between 88 and 96% thus supporting the advice that protective gears should be worn at all times.

SEMI-AUTOMATED CT LUNG SEGMENTATION TECHNIQUE IN HEALTHY AND DISEASED FOALS. S.K. Joslyn, K.M. Lascola, R.T. O'Brien. College of Veterinary Medicine, University of Illinois, Urbana, Illinois, 61802, USA.

Introduction: Lung segmentation using CT volumetric data allows for quantitative assessment of normal and healthy lung parenchyma. It is used extensively in human medical imaging in both clinical and research settings. Given the consistency of the human body shape, automated techniques have been developed to facilitate fast and accurate lung segmentation, which excludes non-lung tissue (e.g. adjacent soft tissue). Veterinary patients vary in size and presentation. Furthermore, extensive disease processes seen in respiratory distressed foals, or even normal atelectatic lung, yields Hounsfield units comparable to adjacent soft tissue. This complicates both automated and manual segmentation processes that have a reduced ability to discern lung tissue from soft tissue in these circumstances. We present a semi-automated technique that utilizes level-set image segmentation and the bony rib cage as tools for successful lung segmentation.

Materials and methods: A total of 60 CT datasets from 6 healthy foals (collected for a separate CT clinical study), and 4 clinical foals with respiratory disease were used. Healthy foals were imaged multiple times from the age of 1 to 4 weeks. Clinical foals had a mean age of 2 weeks. A 16-slice GE Lightspeed Helical scanner was used to acquire slices (2.5mm) at 120kVp, 0.5sec rotation and 280mA using a detail reconstruction kernel. Datasets were imported into a DICOM viewer (OsiriX v5.8.4, Mac Pro with OS X 10.9) and then further processed using the MIAlite[®] segmentation software. Three phases of automated segmentation and deletion were used: Abdomen (threshold 30-130HU; smoothing factor 0.9), Mediastinum (threshold 25-195HU; smoothing factor 0.8); and Lung (-900-60HU; smoothing factor 0.5). The final lung segmentation allowed deletion of all other non-selected tissue leaving only lung parenchyma. Semi-automated technique was repeated twice for 10 datasets to assess repeatability. Manual segmentation was also performed, using manually placed regions of interest, in 10 CT data sets for comparison (total time and quantitative data).

Results: The average time for the semi-automated process was 9 minutes, compared to 62 minutes for the manual process. There were no significant differences in the histograms created from the semi-automated versus the manual segmentation technique. The histograms for the 10 datasets repeated by the semi-automated technique were identical. Subjectively all segmentations were deemed to be inclusive of all lung tissue with minimal to no external soft tissue.

Discussion: Using a semi-automated lung segmentation technique, supported by level-set image settings, allows for quick, repeatable and accurate lung segmentation in diseased and healthy foals. The level-set image segmentation, together with the natural barrier produced by the rib cage is thought to contribute mostly to the success of the semi-automated process.

OPTIMUM HOUNSFIELD THRESHOLD LIMITS FOR ACCURATE 3D PRINTED BONE MODELS. F.R. Bozelka, S.K. Joslyn, R.T. O'Brien. College of Veterinary Medicine, University of Illinois, Urbana, Illinois, 61802, USA.

Introduction: 3D printing (or “Rapid Prototyping”) from CT datasets is a rapidly growing utility in veterinary clinical, teaching and research settings. Despite the increased availability, there are significant stages of the process that require advanced software and technical skill to best replicate anatomic detail. Surgical planning is one application that requires accurate anatomical representation. Recent unpublished work by the authors has addressed optimised CT settings for accurate bone biomodel preparation. However, to date there published guidelines describing the optimum Hounsfield (HU) threshold limits used by computer aided design software for accurate anatomic detail of bone models. Threshold limits can be used to include more or less bone depending on the Hounsfield limit, which can affect the overall price of models. The aim of this project was to identify the minimum threshold limit to allow for the most accurate bone biomodels with respect to cortical bone thickness.

Materials and methods: A single cadaveric femur was dissected and scanned using a 16-slice GE Lightspeed Helical scanner in both exposed and water bath preparations. Slices were acquired in 0.625mm thickness, using 140kVp, 100mA and a Bone Plus reconstruction kernel. A small string was tied to the mid diaphysis to serve as a marker for anatomic measurements on the physical bone specimen and included subsequent 3D printed models. Datasets were imported into a DICOM viewer (OsiriX v5.8.4, Mac Pro with OS X 10.9). Digital models were created using a range of threshold settings from 100HU to 1000HU, at 100HU intervals, for each preparation. A total of 20 printed bone models were prepared using selective laser sintering (SLS). Cortical thickness measurements of the sectioned bone and models were obtained at 4 locations using precision calipers, as well as digital measurements made the DICOM viewing software. Positions of each measurement were matched using the string marker. Each model was also we re-scanned using the identical CT settings to allow for matched digital measurements. Results are presented as the HU threshold limit with the closest average percentage accuracy to the physical bone specimen measurements.

Results: The HU threshold limit providing the best accuracy for each preparation (exposed vs water bath), and each measurement tool (physical calliper or CT digital calliper) are listed:

Exposed, Physical Calliper	= 200HU @ 100.35% accuracy.
Exposed, Digital Calliper	= 500HU @ 100.73% accuracy.
Waterbath, Physical Calliper	= 400HU @ 99.99% accuracy.
Waterbath, Digital Calliper	= 300HU @ 100.98% accuracy.

Discussion: Given the water bath technique best represents pelvic limb soft tissue, we advise a threshold limit of no greater than 400HU to produce accurate bone models.

EARLY IMAGING FINDINGS IN JUVENILE DOGS WITH PRESUMED DISCOSPONDYLITIS. R.M. Kirberger¹. ¹Department of Companion Animal Clinical Studies, Faculty of Veterinary Science, University of Pretoria, Gauteng, 0110 Republic of South Africa.

Introduction: Discospondylitis is usually seen in older dogs and more so in larger breed males. Typical radiographic changes include various stages of vertebral end-plate lysis in the initial stage of the disease. The diagnosis is confirmed by isolating the causative organism from the blood, affected disc or focus of infection elsewhere. The author has seen several puppies that presented with only a narrowed disc space on initial radiographs.

Methods: Retrospective study of 10 puppies, seen in a period of 6 years, which had a diagnosis of discospondylitis. Signalment and other relevant data were retrieved. The various imaging procedures were recalled from the picture archiving system and re-evaluated by the author. All dogs had serial radiographic studies, five had vertebral diagnostic ultrasound and four had non-contrast CT studies.

Results: Puppies (median age 14.7 weeks, range 9-20 weeks), including only one small breed, presented with vertebral pain 1-2 weeks after spending time in hospital for a parvovirus infection (n=3), traumatic incident (n=2), bite wounds (n=2) and other causes (n=3). The earliest radiological sign was a narrowed intervertebral disc space in 28 discs which had accompanying thoracic or lumbar subluxation in 39% of discs, either initially or within the next two weeks. Six dogs involved the cervical vertebrae (C2/3 = 3), 1 cervico-thoracically, 5 the thoracic vertebrae (T11/12 = 2), 1 the thoracolumbar junction, 12 involved the lumbar vertebrae, 4 of which the L6-7 area and 3 the lumbosacral junction. Vertebral epiphyseal lysis was not an initial radiographic feature but affected the epiphyses in the later stages. Ultrasonographic changes included ventrally bulging hypoechoic material at the affected disc and loss of the typical normal disc reverberation artefact. Narrowing of the disc space was difficult to appreciate due to vertebral physis hampering interpretation. On CT transverse planes allowed better visibility of vertebral epiphyseal lysis than sagittal reconstructions. Focal ventrally bulging disc tissue could not be readily appreciated. However, CT volume rendered techniques (VRT) of early stage disc involvement viewed from ventrally displayed altered colouring indicative of inflammation or bone destruction in 3/3 cases. Diagnostic ultrasound and VRT images could detect disc region pathology prior to radiological changes in some dogs. Four disc and 3 urine samples cultured from seven dogs resulted in only two positive cultures (*Pseudomonas aeruginosa* and *Escherichia coli*).

Discussion: Juvenile dogs with presumed discospondylitis display different imaging findings than those seen typically in adult dogs. As these dogs had various antibiotics 1-2 weeks earlier for the primary problem definitive culture could not be obtained in most dogs. Vertebral diagnostic ultrasound, CT and VRT are useful modalities to confirm suspected very early discospondylitis cases.

ULTRASONOGRAPHIC FINDINGS FROM THE RIGHT, LEFT AND CRANIAL THORACIC APPROACH IN BOVINE SUFFERING FROM RETICULAR DIAPHRAGMATIC HERNIA. A. Kumar¹, V. Sangwan², J. Mohindroo¹, N. S. Saini¹, S. S. Singh¹. ¹Department of Veterinary Surgery and Radiology, ²Department of Teaching Veterinary Clinical Complex, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004, Punjab, India

Purpose: To compare diagnostic application of ultrasonography from the right, left and cranial thoracic approach in the diagnosis of reticular diaphragmatic hernia (RDH) in cattle and buffaloes.

Methods: The study included 26 animals; 21 buffaloes and 5 cattle, suffering from reticular diaphragmatic hernia. The ventral third of both sides of thorax from the 4th and 7th intercostal spaces (ICS) was prepared for the lateral thoracic approach. For the cranial thoracic approach, an area between the cranial side of forelimb at the level of distal humerus and brisket, on both sides, was also prepared for ultrasonography. The ultrasonography was done in a standing position using a 2 to 5 MHz multi-frequency curvilinear transducer. The transducer was moved dorso-ventrally at each intercostal space to visualize lungs, heart, herniated reticulum and its motility. The diagnosis in all the animals was confirmed by radiographic and surgical findings.

Results: Ultrasonography at the right fourth ICS observed lungs dorsally followed by thick echogenic structure ventral to it, obscuring the heart partially (n=14; 11 buffaloes and 4 cattle) or completely (n=11; 10 buffaloes and 1 cattle). Reticular wall was identified from its thick (10mm) echogenic structure with monophasic or biphasic motility (n=21; 16 buffaloes and 5 cattle) or no motility in 5 buffaloes. Amplitude of reticular contractions was markedly reduced in all the animals compared to that of the reticulum at the 6th ICS. The heart was visible from the right 4th ICS during the period of reticular contraction. Ultrasonography at the left fourth ICS recorded lungs dorsally followed by heart and a thick echogenic structure (reticulum) medial to it, at a depth of about 10-15 cm. Reticular wall with motility was appreciated in 19 animals (15 buffaloes and 4 cattle) only. The heart showed tachycardia and appeared to be compressed left laterally in all the animals. Ultrasonography using the right cranial thoracic approach detected herniated reticulum in 11 animals (9 buffaloes and 2 cattle) which had extensive herniation. Out of these, apparent reticular motility was seen in 8 animals (7 buffaloes and 1 cattle) only. However, through the left cranial thoracic approach, no herniated reticulum detected.

Discussion / Conclusion: As reticular herniation is usually present between the right thoracic wall and heart, a high frequency transducer is sufficient to diagnose RDH using the right thoracic approach. Using the left lateral approach, herniated reticulum was seen medial to heart and a lower frequency transducer was required. Both lateral thoracic approaches had comparable results. The right cranial thoracic approach is of limited diagnostic value and is only useful in bovine with extensive herniation.

RADIOLOGICAL EVALUATION OF THE INTRAMEDULLARY PINS AND THE PLATE-SCREW FIXATION FOR FEMORAL FRACTURE TREATMENT IN DOGS. Q.T.

Le, N.T.T Nguyen, N.Y Vu. Department of Veterinary Clinical Sciences, Nong Lam University, Ho Chi Minh City, Viet Nam.

Introduction: Femoral fractures in dogs typically result from vehicular trauma and account for approximately 42–45% of all long bone fractures.^{1,2} Treatment options include use of intramedullary pins and cerclage wires, bone plates, interlocking nails, and acrylic external fixators alone are reported to correct femoral fractures.^{1,2} The objective of this study was to evaluate and compare the outcomes of two surgical fixation methods; the use of intramedullary pins and wires technique (IM); and a plate-screw technique for treating femoral fracture in dogs in Ho chi Minh city, Vietnam.

Materials and methods: Twelve dogs (8-10 kg) with simple transverse femoral shaft fracture were divided into two equal groups. Group 1 was treated using the IM technique and group 2 by plate-screw technique. Femoral radiology of all dogs was undertaken pre-operatively and at 7, 14, 30, 60 and 90 days postoperatively to check local bone repair.

Results: Results showed that the IM technique had shorter operative duration (83.76 minutes) and cutaneous healing duration (9.17 days) compared to the plate-screw technique (105 minutes and 11.83 days). In contrast, radiographic evaluation indicated the bone union process, including periosteal, new bone bridge and new bone callus formation in IM-treated dogs were slower than those using the plate-screw technique in all observations. Dogs were able to bear weight on the injured leg an average of 12.2 days after treating with IM technique, approximately 3 days later than those of plate-screw one (average 9.3 days). According to postoperative Glasgow Composite Measure Pain Scale, the pain scores of IM-treated dogs were slightly higher than those of plate-screw-treated (2.63 vs 2.34). Neither technique influenced body temperature, heart rate or respiratory frequency in dogs after surgery.

Discussion: Although the plate-screw technique required longer operative duration, it provides better outcomes, including shorter recovery time and increased likelihood of returning to full function of the limb. This is confirmed by radiographic evaluation of the osteosynthesis. This indicates that the plate-screw technique should be applied as the routine treatment for dogs with femoral fractures.

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ULTRASONOGRAPHIC APPEARANCE OF THE NORMAL MAJOR DUODENAL PAPILLA IN DOGS J. Mortier¹, T.W. Maddox¹, S.M. Lillis^{1,2}. ¹The University of Liverpool, Neston CH64 7TE, United Kingdom. ²Murdoch University, Western Australia, 6150, Australia.

Introduction: The major duodenal papilla (MDP) is the portion of duodenum through which the common bile duct (CBD) and the pancreatic duct empty their respective secretions into the duodenal lumen. There is a paucity of reports in the veterinary literature describing ultrasonographic appearance of the MDP or duodenal papilla disease. The aim of this study was to describe the normal ultrasonographic appearance of the MDP, to determine an approximate normal size for the length, width and height of the MDP and assess the repeatability of transabdominal ultrasound for the required anatomical measurements of the MDP.

Materials and methods: Ultrasonographic examination of the MDP was performed in dogs undergoing routine investigation for disease not related to the hepatobiliary tract, pancreas and gastrointestinal system. All dogs were either sedated or anaesthetised. Ultrasound images were obtained by two experienced sonographers with the dogs in right or left lateral recumbency. Static ultrasound images of the MDP were obtained in two planes. Images for both planes were obtained three times each with repositioning of the ultrasound transducer for each new image. The MDP were measured in three planes by a single operator using a proprietary software program. All measurements were reviewed by a board certified veterinary radiologist. Intra-observer reliability of the measurements was determined by calculation of the intra-class correlation coefficients (ICC) for the repeated measurements. Associations between MDP size and the characteristics of the dogs (age, breed, weight, sex, presenting complaint, ultrasound findings and final diagnosis) were investigated with linear regression analysis.

Results: Forty adult dogs were included in the study. The MDP had a similar ultrasonographic appearance in all dogs examined. It appeared as a layered structure comprising a thin and even hyperechoic rim, a slightly thicker hypoechoic layer and an irregularly shaped hyperechoic centre. The hyperechoic outer layer, hypoechoic layer and hyperechoic inner layer were continuous with the duodenal serosa, duodenal muscularis and duodenal submucosa, respectively. This layering was not always conspicuous and appeared faint and/or interrupted in some dogs. The ICCs for repeated ultrasound measurements of MDP length, width and height were all above 0.85, indicating substantial intra-observer reliability. The mean (+/- standard deviation) for the MDP length, width and height were 15.2 mm (+/-3.5), 6.3 mm (+/-1.6) and 4.3 mm (+/-1.0), respectively. Increasing patient weight was significantly associated with increased values for all measurements ($P < 0.01$ for all), but no associations were identified for the remaining examined characteristics.

Discussion: This study described the ultrasonographic appearance and established an approximate size for the MDP in normal dogs. Further studies are planned to evaluate the correlation between ultrasonographic and histological appearance of the duodenal papilla.

COMPUTED TOMOGRAPHIC FEATURES OF CANINE INTRAVERTEBRAL GAS LESION C.K. Lim, H.G. Heng, A.E. Fauber. Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Purdue University, West Lafayette, IN 47907-2026, USA.

Introduction: Intravertebral gas lesion was first reported in humans in 1978 and is considered an uncommon finding. In humans, the pathognomonic computed tomography (CT) finding of intravertebral gas has been described as presence of a gas attenuating lesion with Hounsfield unit (HU) of -950 to -580 surrounded by a thin sclerotic rim within the vertebra. To date there have been no reported cases of intravertebral gas in dogs. The objectives of this study were to determine the prevalence of intravertebral gas based on CT, to describe the CT features as well as to discuss the possible causes, pathogenesis and its clinical significance.

Materials and methods: All CT studies of dog spines from the Purdue University Diagnostic Imaging Section from January 2010 to December 2014 were reviewed retrospectively by two board-certified radiologists (CKL, HGH) to identify the presence of intravertebral gas. These studies were acquired using either helical 4-slice or 64-slice CT scanners with 1.25mm slice thickness in transverse planes, collimator pitch 0.8, moderately edge enhancing algorithm with variable kVp and mAs according to the size of the dog. Computed tomographic features of intravertebral gas were defined based on consensus opinion with the appearance of true gas attenuation (< -580 HU) as the primary criteria. Intra-discal gas was not considered as intravertebral gas. Multiplanar reformatting was performed to characterize the shape, size, margin, and location of the intravertebral gas lesion.

Results: A total of 266 CT studies of the spine representing a variety of dog breeds were reviewed. Intravertebral gas was observed in only two dogs with the prevalence of 0.75%. Dog 1 had T12/T13 intervertebral disc extrusion of intervertebral disc causing extradural cord compression with concomitant suspect discospondylitis. Two irregularly-shaped gas attenuating lesions (up to 4.5mm x 3.0mm x 5.5mm; HU up to -1024) with sclerotic margins were noted within the caudal third of T12 vertebral body. A communication through a defect at T12 caudal vertebral end plate was seen between the lesion and T12/T13 intervertebral disc space. The caudal end plate of T12 vertebral body and the cranial end plate of T13 vertebral body were sclerotic with circumferential proliferative new bone. Dog 2 had C6/C7 subluxation after being hit-by-car. A single well-marginated and septated oval-shaped gas attenuating lesion (3.0mm x 4.5mm x 3.7mm; HU up to -823) with surrounding sclerotic margin was present within the cranial aspect of L1 vertebral body. No communication was seen between L1 intravertebral gas lesion and T13/L1 intervertebral disc space.

Discussion: Intravertebral gas lesions in dogs are rare and can be detected easily by CT. Besides spontaneous occurrence, trauma, direct passage of gas from adjacent intervertebral discs through degenerative changes of vertebral end plates and discospondylitis may also lead to intravertebral gas. The clinical significance of the detection of this lesion in dogs is uncertain at this juncture due to lack of reported cases.

FEASIBILITY AND ACCURACY OF COMPUTED TOMOGRAPHY-GUIDED INJECTIONS IN DOGS: A STUDY OF TRANSLAMINAR AND TRANSFORAMINAL LUMBOSACRAL EPIDURAL AND INTRAARTICULAR LUMBAR FACET JOINT INJECTIONS. A.Liotta¹, C. Sandersen¹, T. Couvreur², G. Bolen¹. ¹Faculty of Veterinary Medicine, University of Liege, Belgium; ²Department of Medical Imaging, Centre Hospitalier Chrétien, Liège, Belgium.

Introduction: In human medicine, spinal pain and radiculopathy are commonly managed by computed tomography (CT)-guided facet joint injections and by transformational or translaminar epidural injections. In dogs CT-guided lumbosacral (LS) epidural or lumbar facet joint injections have not been described. The aim of this study was to develop techniques and to assess their feasibility and accuracy.

Materials and methods: Two cadavers were used to establish the techniques and 8 cadavers to assess feasibility and accuracy. Contrast medium was injected and a CT scan was performed after each injection. Accuracy was assessed according to epidural or joint space contrast opacification. Feasibility was classified as easy, moderately difficult or difficult, according to the number of short-ranging CT scans needed to follow the insertion of the needle.

Results: A total of 6 translaminar and 5 transforaminal epidural and 53 joint injections were performed. Translaminar injections had a high success rate (100%), were highly accurate (75%), and easy to perform (100%). Transforaminal injections had an inferior success rate (75%), were accurate (75%), and moderately difficult to perform (100%). Success rate of facet joint injections was 62% and was higher for larger facet joints, such as L7-S1. Accuracy of facet joint injections ranged from accurate (37-62%) to highly accurate (25%) depending on the volume injected. In 77% of cases, injections were moderately difficult to perform. Possible complications of epidural and facet joint injections were subarachnoid and vertebral venous plexus puncture and periarticular spread respectively.

Discussion: CT-guided translaminar and transforaminal LS epidural injection and CT-guided intra-articular lumbar facet joint injections in dogs are feasible and variably accurate. Our study may be considered as a preliminary result and further studies are suggested to evaluate *in-vivo* feasibility and safety of our technique.

CLINICAL SAFETY OF COMPUTED TOMOGRAPHY-GUIDED LUMBOSACRAL TRANSFORAMINAL AND TRANSLAMINAR EPIDURAL AND FACET JOINT STEROID INJECTIONS IN DOGS. A. Liotta¹, M. Girod¹, D. Peeters¹, C. Sandersen¹, G. Bolen¹. ¹Department of Small Animals and Equidae, Fundamental and Applied Research for Animals and Health (FARAH), Faculty of Veterinary Medicine, University of Liege, Sart-Tilman, 4000, Belgium.

Introduction: To test the clinical safety of computed-tomography guided transforaminal epidural, translaminar epidural and facet joint steroid injections in dogs.

Materials and methods: Fifteen healthy Beagles were randomly assigned to three groups and underwent computed tomography-guided lumbosacral epidural transforaminal, epidural translaminar, and facet joint injections of 0.1mg/kg of methylprednisolone acetate, respectively. During the procedures, the heart rate, respiratory rate, oxygen saturation of haemoglobin, and rectal temperature were monitored and recorded. General clinical and specific neurological examinations of the lumbosacral region were performed 1 day, 3 days, 7 days and 10 days after the injections. In the presence of neurological abnormalities, a control neurological examination was performed 24 days after the procedure.

Results: Steroid injections were performed in 14/15 dogs. In 1/15, vascular puncture occurred and the steroid injection was not performed. No major or minor complications were reported during the procedure. Only mild transient hyperthermia and mildly altered patellar withdrawal, cranial tibial and perineal reflexes were occasionally and temporary noticed in dogs during clinical examinations following the procedure. Overall, altered reflex responses were observed in 11/14 dogs, during 27/65 clinical examinations.

Discussion: Computed-tomography guidance is a safe technique that allows to verify the position of the needle and to avoid injections into the vascular system during epidural and lumbosacral facet joint injection. Furthermore, this study demonstrates that steroid injections in the epidural and facet joint space are clinically safe and that their use can be suggested for clinical trials.

MRI FEATURES OF THE EQUINE THYROID GLAND. V.M.V. Machado¹, G.F. Viana¹, A. Hataka², M. Midon¹, J.N.P. Puoli Filho¹. ¹Department of Animal Reproduction and Veterinary Radiology, ²Department Veterinary Clinic, School of Veterinary Medicine and Animal Science, São Paulo State University, Brazil.

Introduction: In humans and pets, MRI provides important adjunctive anatomic information in thyroid diseases, especially in assessing advanced carcinomas at presentation. This modality may play a critical role in the detection of lymph node metastases and is critical in evaluating extension of DT into adjacent tissues. However, techniques have not yet been developed using MRI for thyroid gland (TG) evaluation in horses. This study aimed to characterize the TG equine by MRI in multiple pulse sequences.

Materials and methods: Six horses (twelve thyroid lobes) were selected as negative for thyroid disorders on clinical examination, laboratory (free thyroxine by equilibrium dialysis), ultrasound and cytology. Horses were positioned in lateral recumbency under general anaesthesia, maintained with inhaled isoflurane and oxygen. 0.25 Tesla field (Esaote® Vet-MR Grande) with four RF channels was used for all MRI examinations. The coil was positioned in the area corresponding to the C1 and C2 at the level of the larynx/trachea. The sequences included with slice thickness of 5 mm were: dorsal spin echo T1-weighted (T1W): (TR: 500, TE: 18), sagittal fast spin echo T2-weighted (FT2W): (TR: 4300, TE: 90) and sagittal STIR (Short Time Inversion Recovery): (TR: 2800, TE: 24). Sagittal fast gradient echo T1 weighted (Turbo 3D T1): (TR: 33,33, TE: 14, FA: 65) and dorsal fast gradient echo T2 weighted (3D HYCE): (TR: 10, TE: 5, FA: 30) were also included with slice thickness of 1.40 and 1.20 mm, respectively.

Results: T1W, STIR, Turbo 3D T1 and 3D HYCE presented iso- or slightly hyperintense to adjacent muscles. T1W and FT2W showed slightly more heterogeneous signal pattern than the other sequences evaluated. FT2W showed greater differentiation contrast between adjacent tissues of the selected region. In this sequence, the TG showed hyper or slightly isointense to adjacent muscle and hypointense to peri-thyroid fat. Turbo 3D T1 was the sequence that best defined the TG and adjacent structures. The sagittal plane has better defined the general appearance of the TG in all sequences. However the image artefact generated by blood flow of the carotid artery hampered the visualization of one of the thyroid lobes in some cases. The images acquired by Turbo 3D T1 presented less artefact influence.

Discussion: MRI can be used as a diagnostic tool for characterization of the TG and its surrounding tissues. Considering the low field MRI and general anaesthesia requirement for thyroid gland MRI in horses, the sequences Turbo 3D T1 and FT2W revealed best characterization of the thyroid gland and adjacent structures.

DIFFERENTIATION OF CANINE HEPATIC MASSES BY TRIPLE-PHASE COMPUTED TOMOGRAPHY. K. Nakamura¹, K. Nasu¹, S. Takagi¹, Y. Kagawa^{1,2}, M. Takiguchi. ¹Veterinary Teaching Hospital of Hokkaido University, Hokkaido, 060-0818, Japan. ²North Lab, Hokkaido, 003-0027, Japan.

Introduction: Recent studies indicate that triple-phase computed tomography (CT) is a useful tool in the differentiation of canine hepatic masses.^{1,2} The aim of this study was to investigate the diagnostic utility of triple-phase CT in the differentiation of canine hepatic masses.

Materials and methods: Sixty dogs with hepatic masses underwent triple-phase CT (arterial, portal and equivalent phase) and consequent surgical resection of the hepatic masses. Histopathological analysis classified the hepatic masses as hepatocellular carcinoma (HCC, n = 36), hepatocellular adenoma (HA, n = 17) and nodular hyperplasia (NH, n = 7). For qualitative assessment, the masses were categorised into four groups (hyper-, iso-, hypo-, and heterogeneous enhancement) based on comparative assessment with a normal liver. For quantitative analysis, the difference of enhancement in the contrast value (Hounsfield Units, HU) between the hepatic masses and normal liver was calculated. For cases with heterogeneous enhancement, areas with contrast enhancement were set as the region-of-interest. Data were represented as the median and interquartile range. For statistical analysis, Fisher's exact test followed by residual analysis and the Steel-Dwass multiple comparison method were used. A *P* value < 0.05 was considered statistically significant.

Results: Nodular hyperplasia was significantly associated with hyper-enhancement in the arterial phase and iso-enhancement in the later phases. A significant negative relationship was found with iso-enhancement in the portal phase for HCC. A significant enhancement pattern was not observed for HA. The difference in contrast values between hepatic masses and normal liver was significantly lower in HCC than in HA in the arterial phase (-14; -27.5-11.75 HU, and 25; 0.5- 41.5 HU) and the portal phase (-39.5; -61--18.75 HU, and -3; -23-13 HU).

Discussion: Previous studies have demonstrated that homogeneous hyper-enhancement in the arterial phase and contrast retention in the later phase, are characteristic findings of benign masses in the liver. In the present study, several cases of HA demonstrated a heterogeneous enhancement pattern in all three phases, which is similar to that of HCC, although qualitative analysis did not reveal any characteristic findings in HA. Quantitative assessment of the hepatic masses revealed that HCC had significantly lower contrast values than HA in both the arterial and portal phases. These data suggest that canine hepatic masses can be differentiated by triple-phase CT using both qualitative and quantitative evaluation.

3D-MORPHOLOGY OF THE ATLAS IN CLINICALLY SOUND TOY BREED DOGS WITH AND WITHOUT ATLANTOCCIPITAL OVERLAPPING. N. Ondreka¹, N. Ehrmann¹, M.J. Schmidt¹. ¹Small Animal Clinic, Department of Veterinary Clinical Sciences, University of Giessen, Germany.

Introduction: Atlantooccipital overlapping (AOO) is a congenital abnormality in toy and small-breed dogs resembling the human disorder basilar invagination. AOO is characterized by prolapse of the atlas toward or through the foramen magnum. The pathophysiology of AOO in dogs is unknown. More than one or even multiple factors might be important in the development of AOO. Based on studies in people and the observation of a large variety in the morphology of the atlas and its cranial articular facet (CAF) in dogs we hypothesized that abnormal atlas morphology may predispose to AOO.

Materials and methods: Computed tomographic (CT) scans of the craniocervical junction of Chihuahuas and Yorkshire Terriers were retrieved from the patient archive. To meet the inclusion criteria of this study the craniocervical junction had to be scanned with standardized positioning. Dogs with a known history of a craniocervical disorder were excluded from the study. 3D-models of the atlas were rendered using graphical software and manual segmentation based on the CT data. The dogs were divided into two groups according to the presence of AOO. A total of 19 measurements were obtained from the 3D-models including the size of the atlas, the relative position of the CAF, the depth of the CAF, and the atlas index (AI) defined as the width of the atlas divided by its height. Descriptive statistics were processed for all parameters. The influence of the breed and the presence of AOO on the morphological parameters were tested individually and combined using a two-way ANOVA. The significance level was set at $P < 0.05$.

Results: 14 Chihuahuas and 18 Yorkshire Terriers met the inclusion criteria resulting in a total of 32 dogs enrolled. The group with AOO comprised 10 Chihuahuas and 9 Yorkshire Terriers. Of 13 dogs without AOO 4 were Chihuahuas and 9 Yorkshire Terriers. There was no significant difference between the groups with and without AOO regarding the size of the atlas and the relative position and depth of the CAF of the atlas. The mean AI was significantly smaller in dogs with AOO with 1.44 ± 0.10 as compared to 1.54 ± 0.10 in the group without AOO ($P = 0.0147$). No significant influence of the breed was noted on any of the parameters except for the mean atlas width which was significantly wider in Yorkshire Terriers with 23.14 ± 2.23 mm as compared to 20.76 ± 2.53 mm in Chihuahuas. There was no combined effect of breed and presence of AOO on the parameters tested.

Discussion: The results of this study suggest a potential influence of the AI on the presence of AOO. Given the small number of cases and the multitude of other possible treats to be tested this result has to be interpreted with caution. The hypothesis of a CAF abnormality of the atlas resulting in AOO as known in people could not be confirmed in this pilot study.

COMPARISON BETWEEN COMPUTED TOMOGRAPHY AND MAGNETIC RESONANCE IMAGING IN 33 DOGS AND 12 CATS WITH ORBITAL MASS LESIONS. L.K. Wiesner¹, M. Kramer¹, N. Ondreka¹. ¹Department of Veterinary Clinical Sciences, University of Giessen, Germany.

Introduction: The aims of this study were to compare CT and MRI findings in dogs and cats with orbital mass lesions and to evaluate the sensitivity and specificity of both modalities in distinguishing malignant from non-malignant lesions.

Materials and methods: 33 dogs and 12 cats were enrolled. 22 animals were recruited prospectively, 23 were included retrospectively. CT and/or MRI scans of the head were performed pre- and post-intravenous contrast medium administration using standardized scanning protocols followed by histopathological or cytological examination and/or bacterial culture. CT and MRI studies were anonymized and evaluated by a board certified radiologist unaware of the final diagnosis. CT and MRI image sets were read independently and with an 8-week interval. Orbital masses were evaluated objectively based on size, Hounsfield units (HU) and signal intensity (SI). Subjective assessment included lesion margination, local tissue invasion, presence of osteolysis, homogeneity, degree of vascularisation, pattern of contrast enhancement, and presence of lymphadenopathy. The lesions were categorized as either being malignant or non-malignant and a tentative diagnosis of a specific tumour type was made. Characteristics of malignant and non-malignant masses were compared. Statistical analysis included chi-squared-test, Fisher's exact test or Wilcoxon-Mann-Whitney test for qualitative criteria and t-test and Wilcoxon-Mann-Whitney test for quantitative parameters. Sensitivity, specificity, positive and negative predictive values in the differentiation between malignant and benign lesions were calculated for CT and MRI. Method comparison between CT and MRI was performed by comparison of means and using Spearman's rank correlation coefficient or Fisher's exact test. The significance level was set at $P < 0.05$.

Results: Of 45 orbital mass lesions 23 were malignant and 22 were non-malignant. In 25 cases CT and MRI image sets were available for the same animal; 13 of these were malignant, 12 non-malignant. 13/13 and 12/13 malignancies were correctly determined to be malignant based on CT and MRI respectively. Sensitivity and specificity to distinguish between malignant and non-malignant orbital mass lesions were 95.7% and 85.7% for CT and 100% and 84.6% for MRI. The frequency of correct tentative diagnoses was 75% based on CT versus 69% based on MRI characteristics. Malignant orbital masses had a significantly higher proportion of irregular margination, local tissue invasion and osteolysis, a higher degree of post-contrast heterogeneity, vascularisation and lower attenuation values in CT ($P < 0.05$). MRI SI was not significantly different between malignant and benign lesions. Global agreement between CT and MRI in determining lesion dignity was 92%. Agreement for individual parameters was moderate to high.

Discussion: CT and MRI have a similarly high diagnostic value in determining the dignity of an orbital mass lesion. Malignant lesions are characterized by irregular

margination, local tissue invasion, osteolysis, post-contrast heterogeneity, a high degree of vascularisation, and higher attenuation values in CT.

ABDOMINAL AORTIC LESIONS IN 5 DOGS. S.L. Reese¹, N. Lester². ¹ College of Veterinary Medicine, Murdoch University, Western Australia, 6150, ²Perth Veterinary Specialists, Western Australia, 6017, Australia.

Introduction: Abdominal aortic lesions associated with infectious agents are rarely reported in veterinary patients.^{1,2} In people, abdominal aortic aneurysms due to infectious agents including bacterial and fungal organisms are termed 'mycotic' regardless of the pathogenesis.³

Materials and methods: Retrospective case series describing imaging findings in 5 dogs with known or suspected infectious disease and lesions of the abdominal aorta.

Results: Five dogs with a retroperitoneal mass effect identified radiographically. Abdominal aortic aneurysms were identified in 3 dogs by US, non-selective angiography or CT examination. Severe aortic wall thickening and peri-aortic granulomatous masses were identified on US in 2 dogs. Renal and ureteral involvement resulting in varying degrees of hydronephrosis and hydroureter was identified on US in 3 dogs, by excretory urography in 1 dog and by CT in 1 dog. Development of collateral venous return due to compression or invasion of the caudal vena cava causing prominent engorgement of the caudal superficial epigastric veins was confirmed by caudal vena cavagrams in 2 dogs. Multifocal discospondylitis was identified on CT in 1 dog. Two of 3 dogs with chronic granulomatous skin disease that progressed to involve the retroperitoneal space had intralesional hyphae of an oomycete of the genus *Lagenidium* isolated from tissues including the abdominal aorta (clinicopathological findings in these dogs are included in a previous report²); intralesional hyphae were identified in biopsies of granulomatous lesions in the third dog. One dog that presented for evaluation of a 'pulsating' caudal abdominal mass shown to be an aortic aneurysm with regional lymphadenopathy was suspected to have a *Lagenidium* infection based on serology. A heavy growth of enterococcus was cultured from urine obtained by cystocentesis in a dog following radiographic diagnosis of extensive discospondylitis; no further pathogens were isolated from urine or disc and lymph node aspirates after an 8 week course of enrofloxacin.

Discussion: Abdominal aortic aneurysms should be included in the differential diagnosis for retroperitoneal mass effects and an infectious aetiology should be considered. A definitive infectious agent can be difficult to isolate.

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TRACHEAL DIAMETER IN PUPPIES. M. Rizza¹, A. Liotta¹, F. Billen², G. Bolen¹.

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Introduction: Tracheal hypoplasia is often associated with brachycephalic syndrome and occurs most commonly in bulldogs and Bullmastiffs, but other non-brachycephalic breeds can be affected. Tracheal diameter is assessed by tracheal diameter on thoracic inlet distance ratio (TD/TI). Even if young dogs have been reported to have a smaller ratio, same values are routinely used for both young and adult dogs. The goals of this study were (1) to determine if there is a significant difference of the TD/TI between non-brachycephalic breeds, brachycephalic non-bulldogs breeds and bulldogs depending on age; (2) to investigate if there is a positive correlation between TD/TI and age and (3) to assess if there is an age limit to perform thoracic radiographs to diagnose tracheal hypoplasia in dogs.

Materials and methods: Seventy-seven puppies were prospectively recruited and classified in 3 categories (non-brachycephalic breeds (NBB), non-bulldog brachycephalic breeds (NBBB), bulldogs (B)). Thoracic radiographs in right lateral recumbency were obtained at 1, 2, 3, 6, 9, 12 months (M) and, for NBBB, also at 15M. Three measurements of TD/TI were performed on each radiograph by one reader. Statistical analysis tests (mixed linear regression and Pearson's product-moment correlation test) were performed ($P < 0,05$).

Results: Only 26 dogs completed the study with the majority of dogs being lost to follow up after 2 months of age. A significant difference of TD/TI was observed between the 3 breed categories for all age categories (for example: TD/TI means: NBB at 1M: 0.17 ± 0.023 and NBB at 12M: 0.19 ± 0.029 ; NBBB at 1M: 0.135 ± 0.024 and NBBB at 15M: 0.18 ± 0.016 ; B at 1M: 0.125 ± 0.022 and B at 12 M: 0.165 ± 0.018). In all dogs, a significant difference of TD/TI was obtained between all age categories except between 1M and 3M, 2M and 6M, and between 9M, 12M and 15M. No significant difference of TD/TI was obtained between French Bulldogs and English Bulldogs (TD/TI means: French Bulldogs = 0.144 ± 0.024 ; English Bulldogs = 0.140 ± 0.024). A positive correlation was observed between TD/TI values and ages (corr: 0.05 to 0.74).

Discussion: As previously described, TD/TI was significantly different between NBB, NBBB and B, with the largest ratio being observed in NBB and the smallest ratio in B. However TD/TI were slightly different from previous reported values. TD/TI significantly changed with age up to 9M. Therefore, 9M of age seems to be the lower age limit to evaluate the definitive tracheal diameter in dogs. However, a positive correlation between TD/TI values and ages indicated that a dog with small trachea at 4 weeks is prone to have a small trachea during growth and at the adult age.

COMPARISON OF TWO RADIATION PROTOCOLS FOR FELINE INJECTION SITE

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Introduction: In the multimodality strategy to treat feline injection site sarcoma (ISS), radiation therapy (RT) is indicated postoperatively to increase progression-free-interval (PFI). However, in some cases PFI cannot be satisfyingly prolonged in spite of a full-course protocol, leading to the hypothesis that a subset of cats would have similar disease control with a more simple protocol consisting of fewer fractions. The aim of this retrospective bi-institutional study was to compare PFI of full-course and coarser fractionated RT-protocol in a cohort of cats.

Materials and methods: Cats with microscopic ISS receiving electron beam 6MV RT with either a 16X3Gy daily or 6X6Gy twice-weekly protocol were included. Medical records were reviewed for demographic and follow-up information. The Kaplan-Meier-method and Cox-regression-analysis were used to compare PFI between the protocols and to test the influence of clinical variables.

Results: Forty-nine cats were included. After surgery, 27 cats received 16 RT fractions and 22 cats 6 fractions. PFI was not significantly different between the two groups. When only first occurrence cases were included (n=35), median PFI was significantly longer in the full-course group compared with the coarser-fractionated group (time-not-reached versus 540 days; p=0,007). PFI did not change according to protocol in cats receiving multiple surgeries before RT (median, 395 days).

Discussion: There is a strong indication that cats with primarily occurring injection site sarcoma benefit from adjuvant full-course RT. Conversely, after multiple surgeries there might be no advantage of a full-course over a lesser fractionated protocol. Therefore, a hypofractionated protocol seems to be a valid alternative in such cases.

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PERICARDITIS INDUCED BLOOD FLOW CHANGES IN THE COMMON CAROTID ARTERY AND EXTERNAL JUGULAR VEIN IN CATTLE: B-MODE AND DOPPLER ULTRASOUND STUDY. V. Sangwan¹, J. Mohindroo¹, A. Kumar¹, C. S. Randhawa², S. S. Singh¹ ¹Department of Veterinary Surgery and Radiology, ² Department of Veterinary Medicine, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana – 141004, Punjab, India

Purpose: The common carotid artery (CCA) and the external jugular vein (EJV) are the direct and superficial blood vessels. Objective assessment of blood flow changes in these vessels may help in evaluating the pathophysiology, severity and prognosis of pericarditis in cattle. Therefore, the present study was undertaken to evaluate Doppler blood flow parameters of CCA and EJV in healthy non-gravid cattle and, further, to compare these values with that of pericarditis affected cattle. The Doppler blood flow parameters in pericarditis affected cattle were also assessed in relation to nature of pericardial contents.

Methods: Forty non-gravid cross bred cattle: 25 clinically healthy (Group I) and 15 suffering from pericarditis (Group II) were studied. The signalment of all the cows was recorded. The history, clinical signs, radiographic and B-mode ultrasonographic findings of Group II were recorded. For statistical analysis, Group II animals were further divided based on the nature of pericardial contents (echogenic and anechoic). The right CCA and EJV were examined in B-mode and Doppler ultrasonography using a 7 to 12 MHz linear multi-frequency transducer on Wipro Logiq 3 expert ultrasound machine. Doppler variables were: peak systole (PS) cm/s, end diastole (ED) cm/s, time average maximum (TA Max) cm/s, pulsatility index (PI), resistive index (RI), acceleration cm/s², time average mean (TA Mean) cm/s and heart rate were automatically determined by the machine software. The vessel diameter, from intima to intima, was determined using in-built electronic calliper which was further used by the machine software to calculate volume flow in mL/min.

Results: A significant decrease in the Doppler blood flow velocities (PS, ED, TA Max and TA mean) and an increase in the PI, RI, volume flow and the vessel diameter of EJV were recorded in Group II as compared to Group I. However, no significant difference was observed based on nature of pericardial contents. The CCA in Group II showed tachycardia and a significant decrease in the ED only.

Discussion / Conclusions: Cardiac tamponade and incomplete emptying of veins into the heart might be the reason for increase in the vessel diameter and blood volume of EJV. Stasis of blood might have led to decrease in all the velocities of EJV. Regurgitation of blood led to aliasing in the colour flow and spectral display. This might also be the reason for a highest percent increase in the PI of EJV. The Doppler blood flow parameters of healthy non-gravid cattle may be of use as a reference range. In pericarditis, the EJV was more severely affected than CCA. Nature of pericardial contents had no significant influence on the Doppler parameters of EJV and CCA.

COMPARISON OF CONTRAST-ENHANCED MULTIDETECTOR COMPUTED TOMOGRAPHY ANGIOGRAPHY AND CONVENTIONAL ANGIOGRAPHY FOR THE EVALUATION OF PORTOSYSTEMIC-SHUNT OCCLUSION VIA CELLOPHANE-BANDING

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Introduction: Diagnostic imaging modalities are frequently used to evaluate vascular anomalies of the portal system. Portography is the gold-standard for visualization of the portal system and diagnosis of a portosystemic shunt (PSS) in veterinary medicine. However portography is being replaced by other, less invasive imaging modalities such as ultrasonography, computed tomography angiography (CTA) and magnetic resonance imaging. To evaluate the success of shunt closure diagnostic imaging is essential to identify possible residual blood flow through the shunt vessel. The purpose of this prospective study was to compare the results of CTA with portography after surgical treatment of an extrahepatic PSS by cellophane banding.

Materials and methods: The study was conducted prospectively and approved by the local ethics committee. 20 dogs were re-evaluated 3-months after cellophane banding of a congenital, extrahepatic PSS by CTA and subsequent percutaneous splenoportography. CTA was planned and performed on the basis of a time attenuation curve created by a dynamic CT scan. Following the CTA splenoportography was performed using biplane image acquisition. CTA images were reviewed by two board certified radiologists and one radiology resident. Cine loops of splenoportography were assessed by one board certified cardiologist, one board certified radiologist and one radiology resident. In both imaging modalities the shunt vessel was classified as “open” or “closed” and the degree of portal vasculature development was recorded.

Results: Based on the splenoportography evaluation of the most experienced examiner six of the shunts were graded as open. Classification of the shunt vessel as “open” or “closed” showed a substantial to perfect agreement ($\kappa = 0.65 - 1.00$) for splenoportography and a slight to moderate agreement ($\kappa = 0.11 - 0.51$) for CTA between the observers. Sensitivity and specificity for the different observers lay between 0.50 – 1.00 and 0.57 – 0.85 for CTA. There was no significant correlation between the three CTA evaluations and the results of splenoportography based on the evaluation of the most experienced observer for the classification shunt “open”/“closed”. In splenoportography the portal vessels within the liver could not be graded in animals with incomplete shunt attenuation whereas there was a good contrast enhancement of the portal vasculature in all patients in CTA.

Discussion: Our results show that CTA, due to the varying results between the different observers, is not suitable to replace splenoportography for assessing a possible residual blood flow through a shunt vessel after cellophane banding. However, CTA appears to be more valuable in evaluating the portal vein and its branching in the liver due to the good visibility on computed tomography angiography images.

NEW CHALLENGES IN VETERINARY RADIATION PROTECTION – PERSONNEL, PUBLIC AND PATIENTS. Å. Søvik¹. ¹Department of Monitoring and Research, Norwegian Radiation Protection Authority, N-1361Østerås, Norway.

Introduction: Veterinary radiology is a rapidly evolving field, where numerous new techniques and modalities have been introduced over the last decades. While this has undoubtedly led to improved diagnosis and treatment for our veterinary patients, it also poses new challenges in the radiation protection of veterinary personnel, as well as veterinary patients and their owners.

Materials and methods: This presentation reviews new diagnostic and therapeutic procedures in veterinary radiology for which radiation protection of personnel, patients, and the public is a potential concern. Current regulations and guidelines for veterinary radiation protection in Europe are presented and the role of education and training of veterinary professionals is discussed.

Results: Three categories of veterinary radiological procedures are identified as of particular interest with respect to radiation protection – nuclear medicine, off-site applications and high dose procedures. In nuclear medicine, radioactive substances are used to diagnose and treat disease. Hence, both proper handling of the patient and proper waste management is necessary to minimize exposure and contamination of personnel, owners, and the environment. Consequently, most European countries require special licencing for veterinary nuclear medicine. However, there are substantial variations in regulatory requirements between countries, which have caused concern among both owners and veterinary personnel as to what is the correct level of protection. Mobile radiographic units are increasingly used in equine ambulatory practice. Frequently, owners/handlers are requested to participate in these off-site radiographic procedures. Hence, veterinarians should be able to assess and manage radiological risks in each individual situation, as well as to communicate the risk to owners to ensure their participation is based on informed consent. However, specific regulations or guidelines for off-site imaging are generally lacking, and there is little focus on the radiation protection challenges particular to off-site imaging in veterinary education. Procedures in which doses to personnel and/or patients are high enough to potentially cause deterministic effects, such as interventional radiology and radiotherapy, are also increasingly used in veterinary medicine. Here, a thorough knowledge of radiation physics, instrumentation and protection is essential for safe operation. However, in many European countries, there is neither formal requirement for specialist education of veterinarians performing such procedures, nor for the involvement of allied professionals, such as medical physicists.

Discussion: Improved competence in radiation protection, as well as updated guidelines and regulations adapted to state of the art veterinary radiology, are needed. It is essential that veterinary professionals, educators and regulators work together to in this effort. HERCA's Working Group on Veterinary Applications is one initiative from the European radiation protection authorities to improve veterinary radiation protection.

CAN THREE DIMENSIONAL ULTRASONOGRAPHY BE USED AS A PRACTICAL AND ACCURATE ALTERNATIVE METHOD FOR ESTIMATION OF RENAL VOLUME IN CATS? Y. Vali¹, M. Molazem¹, ¹Department of Radiology and Surgery, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

Introduction: Renal volumetric evaluation is one of the most important parts of the clinical practice and research. Although computed tomography (CT) volume estimation is presented as the most accurate method for feline renal volumetry¹, it can be replaced by safer, more time efficient and accurate method for volume estimation². The purpose of this study was to describe the accuracy of three dimensional ultrasound (3DUS) in comparison with CT for estimating feline renal volume.

Materials and methods: Ten kidneys related to five cats were evaluated by 3DUS and CT scan. Intravenous injection of non-ionic contrast medium was used in CT scanning for increased renal cortex intensity and consequently better hand-tracing. CT studies were reconstructed at 1mm and transferred to a workstation where the renal volume was calculated using hand drawn regions of interest. Three dimensional ultrasonography was performed using a multi-frequency 4D transducer (GE) and renal volumes were calculated by 4Dview® software. Spent time during evaluation of each renal volume by both methods was recorded from starting the scanning phase to the end of the volume extraction.

Results: Results showed significant lower time of 3DUS volumetry than CT scan. In addition, paired t-tests revealed no statistically significant differences between volumes measured using 3DUS and CT scan.

Discussion: Feline renal volume will be altered during several pathological conditions that can be good prediction for disease progression. According to previous studies³, the voxel count method is the best in vivo method for kidney volume estimation but disadvantages such as radiation, necessity of anaesthesia and time consuming features enhance the necessity of the alternative accurate three dimensional method. Findings from this study showed the accuracy of the 3DUS renal volumetry and also supported the use of 3DUS for estimating feline renal volume in future clinical and research studies.

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IS FELINE RENAL VOLUME RELATED TO SECOND LUMBAR VERTEBRA AS WELL AS RENAL LENGTH? Y. Vali¹, M. Molazem¹, ¹Department of Radiology and Surgery, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

Introduction: Renal diseases are common in cats, especially those which change the renal size primarily or secondarily, and diagnostic imaging is an important part of diagnosis in these patients. Modern computed tomography (CT) scanners allow high-resolution cross sectional evaluation of the kidneys especially in combination with contrast administration that ease volumetry of the kidneys. Thus, normal index presentation will be of value. Normal renal length has been described in relationship to the length of the second lumbar vertebra radiographically. This study was conducted as a pilot study for evaluation of the renal volume relationship to the vertebral body volume of the second lumbar vertebra as a basic foundation for further study regarding presenting a beneficial index for renal volume in cats.

Materials and methods: Ten kidneys of 5 anesthetized cats with no signs of renal involvements clinically and by laboratory tests were scanned after an intravenous bolus injection of iohexol, and their volumes determined after cortical enhancement by a hand-tracing option with 1mm reconstruction of the scans. Then the vertebral body of the second lumbar vertebra was calculated from obtained and reconstructed scans. Finally, the relationship of the renal volumes and vertebral volumes were evaluated statistically.

Results: Nonparametric correlation tests revealed significant direct correlation between renal volumes and second lumbar vertebral body volumes (p value <0.01) in evaluated kidneys.

Discussion: Feline renal volume will be altered during several pathological conditions that can be good prediction for disease progression. Statistical correlation between renal volume and second vertebral body in this study shows the benefit of presenting a standard index (ratio of renal volume and second lumbar vertebral body volume) for feline renal evaluation by the mean of computed tomography. Findings from this study supported the use of CT renal volumetry in future clinical and research studies.

MRI TRACKING OF IRON OXIDE-LABELLED COLLAGEN-EMBEDDED MESENCHYMAL STEM CELLS IN ARTIFICIAL CANINE STIFLE DEFECTS. K. John, K. Amort, M. Kramer, S. Arnhold*. Department of Veterinary Clinical Sciences, Clinic for Small Animals and Institute for Veterinary Anatomy*, Justus Liebig-University, Giessen, Germany.

Introduction: During the last decade, stem cell therapy has become increasingly important in veterinary medicine. However, the fate of the administered cells remains unclear. Mouse models have been used to track cells with magnetic resonance imaging. The purpose of the present *ex vivo* study was to prospectively evaluate the applicability of collagen-embedded cells in the treatment of canine stifle defects and investigate the influence of artefacts and surrounding anatomic structures on the detection of the iron oxide-labelled stem cells.

Methods: The study included 20 stifles of 10 dogs (>20 kg body weight) that were euthanized owing to diseases unrelated to the appendicular skeleton. The stifles were radiographically examined in order to exclude pre-existing lesions and then subdivided into four groups with five dogs each. Each group was randomly assigned different concentrations of iron oxide-labelled stem cells. After warming of the specimens to 34°C and creation of a pre-defined 5.6mm chondral and subchondral defect in the medial aspect of the lateral condyle, the defect was filled with a collagen scaffold containing iron oxide-labelled mesenchymal stem cells. After hardening of the collagen, the joints were closed with typical surgical techniques and flushed with sterile saline in order to avoid gas inclusion. All stifles were examined with a standardized protocol involving a 1-Tesla tomograph (Philips Gyroscan Intera, Best, Netherlands). The scanning protocol included T2-weighted (T2w) Turbo Spin Echo (with and without fat suppression), T2w gradient echo, and proton density-weighted sequences. Subjective assessments of the scans were completed with objective evaluations of the regions of interest (ROI) that were drawn around the collagen-filled defect (OsiriX Imaging Software Version 4.1.2, Pixmeo SARL, Bernex, Switzerland).

Results: The semiquantitative intensity measurements revealed a constant increase in signal intensity with decreasing concentrations of the iron oxide-labelled stem cells, which was consistent with the results of the T1w sequences and T2w spin echo sequences. T2 gradient echo sequences showed inconsistent data regarding the intensity of the defect. Therefore subjective ROI placement was performed to exclude susceptibility artefacts arising from gas. Subjective ROI placement showed a significant constant increase in signal intensity with decreasing concentration of the stem cells.

Discussion: The results showed successful *in situ* tracking of different cell concentrations of iron oxide labelled mesenchymal stem cells in chondral defects. A semiquantitative evaluation of the cell concentration using a ROI is applicable. However, artefacts due to small gas inclusions must be avoided to achieve precise intensity measurements. Further studies are necessary to evaluate the clinical use of iron oxide labelled collagen embedded cells for the treatment of chondral defects.

LOW-INTENSITY ULTRASOUND FOR CANCER THERAPY: PAST, PRESENT AND FUTURE. A.K.W. Wood¹, C.M. Sehgal². ¹Department Clinical Studies, School of Veterinary Medicine and ²Department of Radiology, School of Medicine, University of Pennsylvania. PA 19104. USA.

Introduction: This appraisal of the literature focuses on the role of low-intensity ultrasound in cancer therapy. Four of the major areas are covered: sonodynamic therapy, ultrasound mediated chemotherapy, ultrasound mediated gene delivery and antivascular ultrasound therapy.

Methods: The published studies have included *in vitro* observations of cancer cell suspensions & cultures, & treatment of an extensive range of implanted tumours in small laboratory animals. The treatment frequencies range from 1-3 MHz using continuous and pulsed ultrasound. Some studies used ultrasound alone with a sonosensitizer, while others used microbubbles along with ultrasound and therapeutic agents to enhance the biological effect of ultrasound. This review is centred on investigations where cancer cells or tumours have generally been insonated with an intensity of $\leq 5.0 \text{ W.cm}^{-2}$, corresponding to a root-mean-square pressure amplitude of about 0.3 MPa.

Results: Each technique consistently resulted in the death of cancer cells and retardation of tumour growth in small animals. The bio effects of ultrasound were primarily attributed to thermal actions and inertial cavitation (mediated by free radicals and other reactive chemical species). In each therapeutic modality, theranostic contrast agents composed of microbubbles played a role in both therapy and vascular imaging.

Discussion: Insonation of neoplasms with low-intensity ultrasound is easy to perform, the procedure is inexpensive and the bioeffects are localized to the tumour. The presence of sensitizing or chemotherapeutic molecules and microbubbles within the lumens allows easy targeting of the tumour neovasculature. The use of microbubbles for both therapy and vascular imaging is an important innovation as such a theranostic agent establishes a therapeutic-diagnostic platform which can monitor the success of anti-cancer therapy. In some situations the accessibility of the tumour to insonation is a limitation as the cancer cells may be contiguous with a gas-containing structure or bone and not easily reached by the ultrasound beam. Furthermore, the currently designed microbubbles have a limited loading capacity to deliver therapeutic agents at the required dosages. However, these limitations can be overcome by the use of intracavity transducers and better design of microbubbles. Co-administration of therapeutic agents along with the microbubbles could also be used to overcome the issue of insufficient payload. It remains to be shown whether injected agents including chemotherapeutics, genes or any other sonosensitizer are not directly altered by ultrasound in the presence of microbubbles; the lack of any significant direct insonation effect on these agents could potentially accelerate their clinical acceptance and introduction. Little attention, however, has been given to either the direct assessment of the underlying mechanisms of the observed bioeffects or to the viability of these therapies in naturally occurring cancers in larger mammals; if such investigations provided encouraging data there could be a prompt application of a therapy technique in treating cancers in companion animals and humans.

THYROID NEOPLASIA IN DOGS - THE ROLE OF SCINTIGRAPHY IN STAGING AND TREATMENT PLANNING. R.M. Zuber, L.N. Suri, A. Bernar. Gladesville Veterinary Hospital, 449 Victoria Rd, Gladesville, NSW, 2111, Australia.

Introduction: This report outlines the use of planar and SPECT Tc^{99m} imaging in staging and planning treatments for a group of dogs presented with thyroid neoplasia between January 2014 and March 2015.

Methods: Twenty three dogs were presented with a probable diagnosis of thyroid neoplasia. The dogs underwent a physical examination, sedation with Acepromazine (0.02mg/kg BW), Butorphanol (0.1mg/kg BW) and Medetomidine (0.01mg/kg BW), were given 50-120Mbq of Tc^{99m} intravenously and imaged 30 minutes later. Planar scans of the cervical and thoracic areas were acquired using a PICKER 3000 triple headed gamma camera with LEHR collimation. Subsequent to this a SPECT study was acquired of the neck and thorax on 10 dogs with the following parameters: 128 matrix, 30 seconds/step for 20 steps per detector- total acquisition of 10 minutes. The results of these studies were then assessed to assist in treatment planning for the patients. The criteria applied in developing a treatment plan were based on our previous publication on radioiodine therapy for treatment of thyroid carcinoma in the dog¹.

Results: The scintigraphy studies all confirmed the presence of thyroid disease in these dogs. Metastatic disease was diagnosed in 8 cases using either planar or both planar and SPECT methodologies.

Radioactive Iodine treatment: Eleven dogs were selected for I¹³¹ treatment on the basis of positive uptake in the tumour of Tc^{99m} and most were deemed to have fixed tumours or the presence of metastatic disease. Three dogs died subsequent to therapy and 8 were still alive at the cessation of the study which was conducted over 14 months.

Surgical treatment: Six dogs were selected for surgery on the basis of the tumour being mobile and no metastatic disease detected, or they had a scan with negative uptake with Tc^{99m} or had undergone an attempt at excisional surgery prior to the scintigraphic examination. One dog was euthanized at 4 months post-surgery and the remainder were alive at the end of the study. One had undergone post-surgery chemotherapy.

Medical management: The owner of one hyperthyroid dog elected to manage with Carbimazole and it was euthanized after 10 months. Three dogs were treated with chemotherapy and euthanized after 4 and 10 months.

No treatment: Two dogs were not treated; one was still alive at 11 months and another euthanized at 10 months. One dog had very minor uptake on scan post-surgery and it was elected to wait another two months to repeat scan to see if I¹³¹ therapy justified.

Conclusion: The use of planar and SPECT imaging with Tc^{99m} was a valuable tool in staging and treatment planning in dogs with thyroid carcinoma.

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DIAGNOSIS OF 'OCCULT' HYPERTHYROIDISM IN CATS USING THYROID SCINTIGRAPHY. R.M Zuber, D. Gopinath, J.C. Jovani, Gladesville Veterinary Hospital, 449 Victoria Rd, Gladesville, NSW, 2111, Australia.

Introduction: This study aimed to investigate the outcomes of thyroid scintigraphy using pertechnetate and treatment in cats with clinical signs of hyperthyroidism and reference range total thyroid hormone (TT4) (occult hyperthyroidism). This was a retrospective study using medical records of 961 cats that presented to Gladesville Veterinary Hospital (GVH) for thyroid scintigraphy over a five year period. Thirty-five cats met the criteria, 29/35 had a scintigraphic diagnosis of hyperthyroidism.

Materials and method: Criteria for inclusion included a suspicion by the referring veterinarian of hyperthyroidism based on clinical signs, reference range serum TT4, performance of thyroid scintigraphy using pertechnetate and access to a follow-up history of at least six months after the scintigraphy and treatment if indicated. During the period of this study, thyroid scintigraphy was performed by the following method. The patient was sedated with Acepromazine Maleate (0.04mg/kg) and Butorphanol (0.1mg/kg) administered subcutaneously. A syringe containing a standard dose of 30 MBq pertechnetate was imaged for 120 seconds using a Low Energy All Purpose collimator. This dose was administered to the patient intravenously and a further image of the syringe, after injection, was acquired for 120 seconds. Twenty to 30 minutes following this administration, the cat was further sedated using Ketamine (10mg/cat) intravenously and a 120 second image of the region of the thyroid gland was acquired. Regions of interest were drawn around the pre and post injection syringes, the thyroid gland and over an area of the cat's body, usually the ventral neck, representative of background activity. A Single Head 400AC Gamma camera was used to acquire the images and NuLear Mac Software was used to analyse the data from the images.

Results: Fifty of these cats presented with clinical signs of hyperthyroidism and reference range TT4. Of these, 37 cats displayed a pertechnetate uptake ratio that was indicative of hyperthyroidism. Twenty-nine of these cats had adequate follow-up records. These cats were treated for hyperthyroidism using one of three methods including administration of I^{131} , dosing with methimazole or carbimazole and surgical thyroidectomy. In this group, all 29 cases were alive with no clinical signs of thyroid disease six months following treatment, indicating that the diagnosis of hyperthyroidism was correct and the disease had resolved in response to treatment. Six of 35 cats displayed a thyroid uptake ratio we interpreted to be negative for hyperthyroidism. These cats were not treated for thyroid disease, and all 6 had resolution of the signs that triggered the suspicion of hyperthyroidism and maintained stable body weight 6 months after testing.

Discussion: In our study, thyroid scintigraphy and calculation of a thyroid uptake to background ratio was a reliable technique for diagnosing occult hyperthyroidism in the cat.

COMPARISON OF 1, 2, AND 3MM SLICE THICKNESS IN COMPUTED TOMOGRAPHY AND THE INFLUENCE ON THE ASSESSMENT OF MEDIAL CORONOID DISEASE IN DOGS. R.T. Zweifel, M. Kramer, A. Hartmann, K.H. Amort. Department of Veterinary Clinical Sciences, Clinic for Small Animals, Justus Liebig-University, Giessen, Germany.

Introduction: Elbow dysplasia is a common inherited disease causing lameness and progressive osteoarthritis in mostly young medium and large breed dogs. Medial coronoid disease is the most frequently observed primary lesion. Although radiography is the common screening technique computed tomography (CT) is essential for breeding cases with appeal and in clinical cases. Up to now no standard scanning protocol has been validated. The purpose of the present prospective study was to evaluate the influence of CT slice thickness (1, 2, 3mm) on the assessment of medial coronoid disease.

Materials and methods: The study included CT scans of 58 elbow joints in 29 dogs. All dogs were presented at the Clinic for small Animals, University of Giessen because of front limb lameness. Clinical examination revealed suspected medial coronoid disease and the dogs underwent CT and arthroscopy. CT scans were conducted with a 16 slice CT (Philips Brilliance, Netherlands) and a slice thickness of 1mm (104 mAs, 140 kV, pitch of 1, high resolution bone filter). After scanning scans were reconstructed in additional 2 and 3mm slice thicknesses. All scans were blinded and assessed independently by two observers (Intern and Diplomate ECVDI). The assessment included: sharpness and density of the MCP; detection, location, position and number of fragments; the detection and course of fissures; lesions at the trochlea; sclerosis.

Results: The outline of the medial coronoid process in 1mm slices was sharp in 91% (observer 1) and in 79% (observer 2) of the elbows. In 2mm slices the outline was sharp in 39.3% and 56.3% respectively. In 3mm slices the outline was rated as unsharp in all cases by observer 1. Observer 2 rated 12.5% as sharp and 87.5% as unsharp in 3mm slices. Fragments were detected 55.3% of the elbows in 1mm slices while in 2mm slices 42.8% and in 3mm 33.9% of the medial coronoid processes were rated as fragmented. The more fragments were present the better was the detectability in 2mm and 3mm slices. Comparing 1mm and 3mm slices single or two fragments were more likely to be overlooked in 3mm slices. There were substantial differences in the position of the fragments with different slice thicknesses and the contour of the

Discussion: The results of 3mm thick slices differ significantly from those of 1mm. The results imply a limited assessment of the medial coronoid process in 2 and 3mm slices which is most likely due to slice thickness artifacts and the size of the anatomy. As a multitude of changes was not assessable in 3mm thick slices we recommend to use at least 1mm slices for the CT scan of the canine elbow when coronoid disease is suspected.

PREVALENCE OF OCCUPATIONAL INJURY SYMPTOMS AMONG VETERINARY RADIOLOGISTS AND EVALUATION OF THE REPORTING ENVIRONMENT ERGONOMICS. A. Anson, S. Kneissl. University of Veterinary Medicine, Vienna, 1220, Austria.

Introduction: The reported prevalence of occupational injury symptoms among human-patient radiologists ranges from 38% to 58%, including musculoskeletal or eye-related problems as the most common issues. The prevalence of occupational injury has been related to poor compliance of the reporting environment. In human medicine, the best ergonomic reporting practice has been defined as being able to modify monitor, desk, chair and armrest height, chair back support, ambient light, and temperature. The objective of this study was to determine the prevalence of health symptoms related to working as a radiologist and to assess compliance of the reporting environment. We hypothesized that veterinary radiologists experience similar prevalence of occupational symptoms and disorders as their colleagues in human-patient radiology.

Methods: A comprehensive web-based questionnaire was developed and distributed among veterinary specialist radiologists. Eligible participants were all radiologists (specialists and residents) working at the time of the survey. The survey was sent to a total of 117 veterinary radiologists throughout USA and Europe. The questionnaire was divided into three components as follows: (a) occupational injury symptoms (b) compliance of the reporting environment and, (c) demographic information. The type and prevalence of the occupational health issues as well as the availability of ergonomic facilities and frequency of their application were assessed by a total of 76 questions.

Results: Of the 117 veterinary radiologists invited to participate, 47 responded (40%). There were 28 females and 17 males (2 did not list their gender), aged between 26 and 60 years (mean 40.9) and worked a mean of 36.5 hours/week with a mean of less than 1 hour/week of sports. The majority of the radiologists had 5-10 years of experience at a digital radiology. 81% of the participants reported radiology associated occupational injury. Musculoskeletal disorders (81%) and eye problems (74%) were the commonest radiology associated occupational injury. The most frequently reported musculoskeletal symptoms were back (81%) and neck pain (74%), followed by shoulder (66%) and wrist pain (49%). Among the eye problems, the commonest issues were visual fatigue (74%) and dry eyes (68%). Brain-related problems were less frequently (70%) and included headache (70%), sleeping disorders (51%) as most frequently symptoms. No reporting environments conformed completely to best ergonomic practice. The most common available facilities were adjustable chair height and ambient light. Where those facilities were available, 61% of radiologists made personal ergonomic adjustments of the chair height prior to starting a reporting session, and only 30% of them adjusted the ambient light. Other facilities were less commonly available at the working places and when available less than one third of the radiologist performed prior adjustments.

Conclusion: There is a high prevalence of occupational injury symptoms amongst radiologists similar to that occurring in human-patient radiologists. Poor compliance of the reporting environment with a low level of ergonomic awareness, low rates of making ergonomic adjustments and too little sports may be implicated.

SCORING SYSTEM FOR EXPERIMENTALLY INDUCED IMMUNE ARTHRITIS IN RATS. W. Atamaniuk¹, I. Felcenloben², T. Piasecki, M. Nowak, A. Chełmońska-Soyta.

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Introduction: Rheumatoid arthritis is an autoimmune disease concerning human beings and animals. Numerous experimental researches on rodents use different score system based mainly on Larsen classification. The aim of this study was to evaluate accuracy of an author's score system used in experimentally induced RA in rats.

Materials and methods: Sixteen female, 6-week-old, inbred Wistar rats were used. Twelve experimental animals were immunized twice. Seven to eight days after the second immunization, periarticular swelling of hind paws was observed in 4 rats and these animals were qualified to group FD (fully developed collagen induced arthritis - CIA). The remaining eight rats presented soft swelling of the hind paws and were assigned to the ES group (early stage of CIA). Radiographs were taken for both ankle joints after euthanasia of rats. The following radiographic abnormalities were considered: A – soft tissue swelling; B – narrowing/widening of joint space; C – subchondral bone erosions: 0 – normal; 1 – indistinct focal osteolysis in some joint areas; 2 – well visible osteolysis in some joint areas; 3 – total bone erosion in a joint area, D – joint degeneration, N – normal ankle joint. After that, histology exam was conducted to confirm findings.

Results:

Group ES

Rat	1	2	3	4	5	6	7	8
L	A0	AB1	A0	A0	A0	A0	A0	N
R	A0	AB2	A0	AB0	A0	A0	A0	A0

Group FD

Rat	1	2	3	4
L	AB3	AB3D	AB3D	AB3D
R	AB3D	AB2	AB3D	AB0

Histologically, in group ES the most noticeable was the thickening of the cartilage and significant proliferation of chondrocytes in the cartilage. In group FD, cartilage surface was uneven in numerous areas, which indicates the process of cartilage degradation.

Discussion: There is no clear distinction between stages of rheumatoid, collagen induced arthritis in rats. Standard classification of radiographic changes in RA based on Larsen scale seem to be not satisfactory since it describes erosive changes only. The presented study was a part of large immunology project, in which authors tried to apply the authors scoring system.

COMPARISON OF THE SUBGROSS ANATOMY OF CANINE AND HUMAN LUNG WITH RESPECT TO TERMINOLOGY USED IN VETERINARY IMAGING. C. Beck, B. Bacci. Veterinary Hospital, Faculty of Veterinary and Agricultural Sciences, University of Melbourne, Werribee, Victoria, Australia.

Introduction: Imaging is routinely used to evaluate pulmonary parenchymal diseases in human and veterinary medicine. Veterinary radiologists commonly look to human radiologists for guidance in terminology to describe changes seen within the pulmonary parenchyma on imaging.¹ Caution must be used in transferring certain terminologies from human to canine imaging due to the differences in human and canine subgross lung anatomy.

Materials and methods: The gross and subgross anatomy of the human and canine lung was compared through a literature search. Subgross anatomy and thin slice CT images of normal human and dog lung were compared.

Results: The human lung consists of the secondary pulmonary lobule. Secondary pulmonary lobules in the periphery of the human lung are relatively large and are margined by interlobular septa. The secondary pulmonary lobule is irregular in shape and is approximately 1-2.5 cm on a side. It is well delineated by connective tissue septa. The canine lung is characterised by the absence of secondary pulmonary lobules, it has only ill-defined haphazard intraparenchymal supportive tissue strands and an extremely membranous pleura. The secondary pulmonary lobule can be identified on thin slice CT of the human lung. Due to the absence of a secondary pulmonary lobule in the dog a similar structure is not visible on thin slice CT of the canine lung.

Discussion: Recognition of lung abnormalities relative to the structures of the secondary pulmonary lobule is fundamental to the interpretation of human thin section CT scans.² Pathologic alterations in secondary pulmonary lobular anatomy visible on thin section CT scans include interlobular septal thickening and diseases with peripheral lobular distribution, centrilobular abnormalities and panlobular abnormalities. It has been suggested that these terms be investigated for use in veterinary imaging.¹ In light of the absence of the secondary pulmonary lobule in canine lung and thus the absence of lobular septae human radiological terms that describe alterations to the secondary pulmonary lobule are inappropriate in imaging of the canine lung.

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STIFLE INTRA-ARTICULAR LIPOMATOUS LESION IN A DOG C. Bergamino¹, A. Liotta², N. Barthelemy², E. Ramery², G. Bolen². ¹Diagnostic Imaging Unit, UCD Veterinary Hospital, University College Dublin, Belfield, Ireland. ²Faculty of Veterinary Medicine, University of Liège, Department of Small Animals and Equidae clinic, Fundamental and Applied Research for Animals & Health (FARAH), 4000 Liège, Belgium.

Introduction: In human medicine, intra-articular lipomatous lesions are rare. Main differential diagnoses include intra-articular lipoma and *arborescens* lipoma, which are considered respectively a neoplastic fatty mass and a villous lipomatous proliferation of the synovial membrane. The present case describes clinical and imaging features of a canine stifle joint lipomatous lesion.

Materials and methods: A 7 year-old female Labrador Retriever was presented for chronic and intermittent left pelvic limb lameness, which had got worse over the 3 previous weeks. On clinical examination, the dog was not lame. Palpation revealed a bilateral stifle joint swelling, more marked on the left side. The tibial compression test was positive only for the right stifle. The dog underwent radiographic, computed tomography (CT) and ultrasound (US)- examinations of both stifles followed by US-guided fine needle aspirations.

Results: Radiographs showed an adipose ovoid mass at the cranio-medial aspect of the left distal femur, with cranio-medial displacement of the patella and marked bilateral peri-articular degenerative joint disease. Pre- and post- contrast CT studies revealed an ovoid, well defined, mildly heterogeneous, septated fat attenuating mass (-70HU) in the left stifle joint. On US the mass had smooth regular margins and an echogenic homogeneous aspect. Cytology revealed a few well-differentiated adipocytes. Imaging and cytology were consistent with intra-articular lipomatous lesion, most likely true intra-articular lipoma. Other differential diagnoses include *arborescens* lipoma and much less likely liposarcoma. The owners refused the excisional surgery. The dog is not lame anymore (owner information via a phone call) and currently receives chondroprotectors.

Discussion: In human medicine, final diagnosis of intra-articular lipomatous lesion is based mainly on magnetic resonance imaging (MRI). True lipoma is considered to have smooth, well-defined margins, while a nodular “finger-like” appearance is believed to be pathognomonic of lipoma *arborescens*. In this case MRI was not performed, but imaging features make intra-articular lipoma the most likely differential diagnosis. Indeed, the typical “finger-like” appearance was not found in this case, but instead a well-defined smooth bordered, slightly heterogeneous, septated mass. Lipomatous origin of the mass was confirmed by cytology. Clinically, complete resolution of clinical signs, observed by the owner, supports the diagnosis of benign lipomatous lesion and rules out a malignant lesion such as liposarcoma. However, the mass was not excised and final histologically diagnosis is not available. In summary, to the authors’ knowledge, this is the first description of intra-articular lipomatous lesion in dogs.

CT AND MRI FEATURES OF THE CERVICAL SEMISPINALIS TENDON OF THE HORSE. L.M.C. Bueno¹, G.F. Viana¹, L.C. Silva¹, V.M.V. Machado¹. Department of Diagnostic Imaging, Faculty of Veterinary Medicine and Animal Science, State University of Sao Paulo, Botucatu, s/n, Brazil.

Introduction: Some commonly used practices in the training of horses, such as hyperflexion of the neck, may contribute to the occurrence of disease of the cervical spine. The semispinalis tendon can be observed both on the left and right sides adjacent to the nuchal ligament; permeating the tendons, observed the semispinalis capitis muscles¹. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) of the horse nuchal region has been reported illustrating nuchal anatomic features and anatomic variations,^{2,3} the latter considered to be the gold standard modality for musculoskeletal evaluation.³

Materials and methods: MRI & CT were performed in two horses from the experimental farm of Sao Paulo State University. The MRI study was performed using Esaote® Vet-MR Grande 0,25T, maintained with inhalation isoflurane and oxygen. The MRI coil was positioned over the atlanto-occipital joint. The sequences of 3mm slice thickness were: spin echo T1w, (TR:566, TE:18) in the sagittal plane and 3D HYCE(TR: 10, TE:5) in dorsal plane. Helical CT was performed using a Shimadzu SCT-7800TC model; cross-sectional images in continuous mm slices of the neck were acquired. Reconstructions in sagittal and dorsal planes and three-dimensions (3D) were performed.

Results: The dorsal funicular portion of the nuchal ligament was hyperintense on sagittal and transverse images (FSE-T1; 3D HYCE) and extended from its insertion on occipital tuberosity to C2. Decreased signal intensity was observed in the semispinalis capitis tendon from its insertion on occipital plane (FSE-T1; 3D HYCE). The semispinalis capitis muscle was hypointense and the nuchal laminar ligament insertion at C2's dorsal aspect showed an homogeneous signal isointense relative to muscle (FSE-T1; 3D HYCE). Computed tomography revealed a hypoattenuating nuchal ligament and semispinalis tendons in transversal and dorsal reconstructed images

Discussion: The use of CT and MRI to evaluate cervical areas in the horse can complement radiography and ultrasound, which may have inconclusive images. Additionally, CT can provide anatomic features and MRI was proven useful to evaluate cervical region in the horse.^{2,4}

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CLINICAL SIGNIFICANCE OF INCREASED SIGNAL INTENSITY OF TYMPANIC BULLA ON MAGNETIC RESONANCE IMAGING. J. Jeong¹, J. Yoon², Y. Lee¹, J. Chang¹, D. Chang¹. ¹Department of Veterinary Medical Imaging, College of Veterinary Medicine, Chungbuk National University, Cheongju, ² College of Veterinary Medicine, Seoul National University, Seoul, Korea.

Introduction: Magnetic resonance (MR) imaging is a sensitive technique for detection of material in the middle ear.¹ Materials in the middle ear can be observed in dogs undergoing MR imaging for investigation of neurologic signs that appear to be unrelated to otitis media.² The aim of this study was to evaluate the signal characteristics and clinical significance of materials in the canine middle ear.

Materials and methods: Retrospectively, medical records at Chungbuk National University Veterinary Medical Centre between January 2013 and February 2015 were searched for canine patients that underwent MR examination with the findings of hyper-intense signal material within the tympanic bulla. Signalment, neurological examination and MR characteristics were evaluated.

Results: Increased signal within the tympanic bulla was identified in 12 dogs. Both bullae were affected in 2 dogs, making a total of 14 affected bullae. Among 12 dogs, only 2 patients showed MR findings related to vestibular signs. The most common incidental findings were iso-intense in T1-weighted images and hyper-intense in T2-weighted images within tympanic bulla. Contrast enhancement of the lining of the tympanic bulla or heterogeneous material was observed in most of the tympanic bullae.

Discussion: There was no apparent correlation between the signal characteristics of the material in the middle ear and the diagnosis or clinical signs. Also, it is considered that increased signal in the middle ear of dogs without vestibular sign is a common occurrence. It may reflect subclinical otitis media or fluid accumulation unrelated to their clinical signs. It is suspected that low incidence of clinical significance of tympanic bulla material in this study was due to prior detection of tympanic bulla material with alternative imaging modality such as CT or radiographs in case of patients with vestibular signs.

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ULTRASONOGRAPHIC APPEARANCE OF PSEUDO-PLACENTATIONAL ENDOMETRIAL HYPERPLASIA IN A DOG. L.Y. Ma¹, H.G. Heng², C.C. Lin, F.P. Cheng¹, K.S. Chen¹. ¹Department of Veterinary Medicine and Veterinary Medical Teaching Hospital, College of Veterinary Medicine, National Chung Hsing University, Taichung 402, Taiwan. ²Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Purdue University, West Lafayette, IN 47907, USA.

Introduction: Pseudo-placentational endometrial hyperplasia (PEH) is characterised by segmental endometrial hyperplasia resembling maternal tissues beneath the normal canine zonary placenta.¹ This report described the ultrasonographic appearance of PEH in a dog which has not been described previously.

Methods: A 5-year-old, clinically normal female intact Miniature Schnauzer from a breeder had been in oestrus 2 months previously and had a natural mating, but the dog was non-pregnant or non-pseudo pregnant at the time of presentation. Ultrasonography of the reproductive system was performed and followed by ovariohysterectomy.

Results: Ultrasonographic examination revealed a focal, circumferential thickening of the wall of the right uterine horn. The layering of the wall was reserved, but the mucosal layer was markedly thickened with hyperechoic linear striations perpendicular to the mucosal surface. The surface of the thickened mucosal layer adjacent to the lumen was hyperechoic. A small amount of anechoic fluid was present in the lumen. Ovariohysterectomy revealed a segmental mass 2.5 cm in diameter present in the distal aspect of the right uterine horn. Dissection of it showed a lemon-like appearance of the thickened mucosal membrane. Well-developed corpora lutea and follicular cysts were observed on both ovaries. Histopathologic examination of the mass revealed endometrial hyperplasia similar to a maternal placenta without foetus and foetal membranes. A diagnosis of PEH was confirmed.

Discussion: Pseudo-placentational endometrial hyperplasia has been referred as deciduoma, endometrial hyperplasia in pseudocyesis, or maternal placental-like endometrial hyperplasia.^{1,2} PEH in dogs has been reported to occur spontaneously or to be caused by bacterial infection during the luteal phase.² The dog presented here was also in the luteal phase, which was consistent with the characteristics of PEH. This study described a unique ultrasonographic appearance of PEH that may facilitate the diagnosis of PEH clinically in the future.

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THREE DIMENSIONAL ULTRASONOGRAPHIC BENEFITS VS. COMPUTED TOMOGRAPHY AND TWO DIMENSIONAL ULTRASONOGRAPHY IN EVALUATION OF OSSEOUS CHORISTA. M. Iranmanesh¹, M. Molazem¹, Y. Vali¹, A. Borhanikia².

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Introduction: Osseous chorista (heterotopic or intraocular bone formation) is a frequent finding in aged guinea pig patients which often is described mistakenly as clouding in the inner eye or increased corneal opacity by the owners. This pathologic condition that is also reported in humans and other mammals may occur uni or bilaterally in guinea pigs.

Material and Methods: A 3-year-old female guinea pig was referred to Diagnostic Imaging Department of Small Animal Hospital, University of Tehran with request of ultrasonographic examination of both eyes by a private practitioner. Clinical observation and history taking before sonography revealed peripheral slow growing cloudiness around both eyes. Conventional B-mode ultrasonography and three dimensional ultrasonography were performed without anaesthesia although the patient had undergone general anaesthesia for further investigation by computed tomography.

Results: CT scan revealed a bony tissue growth from the stroma of the ciliary bodies bilaterally (ring-like bony tumour on the base of the iris), more severe on the left side. Due to this space occupying lesion, exophthalmos and exposure keratitis were evident. Two dimensional ultrasonography and obtaining scans from several angles were limited due to patient discomfort but three dimensional ultrasonography scanning was obtained rapidly and further evaluation revealed the highly reflective lesion in the anatomical location of the ciliary bodies without any abnormalities in other ocular structures. Follow up ultrasonography after 1 month by three dimensional ultrasonography revealed no significant change.

Discussion: Although CT scan is helpful in diagnosis and follow up the extension of the osseous chorista, it is not capable of investigating secondary consequences such as glaucoma, keratitis and spontaneous haemorrhage. Therefore, ultrasonography will be more beneficial in follow up progression. In addition, lack of necessity for anaesthesia for sonographic evaluation makes the procedure more desirable. Meanwhile, three dimensional ultrasonography allows perspective images of the internal structures of the eye and can be more beneficial in examining the small size patients with small eyes and probably superior to two dimensional sonography for evaluation of the osseous chorista and its ocular consequences.

CORRELATION OF ULTRASONOGRAPHIC FINDINGS AND CYTOLOGIC OR HISTOPATHOLOGIC DIAGNOSES OF LIVER DISEASE IN DOGS RAISED IN KOREA. S.Y. Kim, H.J. Kim, Y.B. Kim, J.H. Yoon and M.C. Choi. College of Veterinary Medicine and the Research Institute for Veterinary Science, Seoul National University and BK21 PLUS Program for Creative Veterinary Science Research, Seoul, 151-742, Korea.

Introduction: Ultrasonographic evaluation is an integral part of the assessment of liver disease in dogs and cats. This retrospective study was performed to describe and evaluate ultrasonographic characteristics of hepatic disorders and to pursue any relationship with cytological or histopathologic diagnoses.

Materials and methods: 115 dogs with hepatic disorders. Medical records were reviewed and analysed for patients that had undergone both abdominal ultrasonographic procedures and ultrasound-guided fine-needle aspiration (FNA) or surgical biopsy of hepatic lesions from March 2011 to February 2015 at the Seoul National University Hospital for Animals.

Results: Total 115 dogs, 110 cases with FNA and 5 cases with biopsy, were available for this investigation. The age of dogs ranged from 1 to 18 years with the gender distribution of 53 females (38 spayed) and 62 males (53 neutered). In breed distribution, 97 were purebred dogs and 18 were mixed breed dogs. The ultrasonographic appearances of hepatic disorders could be classified into 10 types, depending on the distribution and echogenicity of hepatic lesions as well as diffuse parenchymal changes. Among 115 cases, 24 (20.87%) had diffuse hyperechogenicity with the highest frequency, followed by 22 (19.13%) with marked masses. Of 115 cases, 76 (66.1%) were benign and 39 (33.9%) were malignant lesions according to cytological or histopathologic results. Each ultrasonographic appearance had variable cytological or histopathologic diagnoses. However, marked masses and multiple hypoechoic nodules were significantly associated with malignancy including 16 epithelial cell tumours with the highest frequency (43.24%), whereas diffuse hyperechogenicity or hypoechoic nodules were more often associated with benignity including 46 vacuolar hepatopathy with the highest frequency (63.01%).

Discussion: Based on our results, it may be considered that the ultrasonographic examination for liver could be able to provide the information necessary for liver disease more frequently as well as benign and malignant lesions in prioritizing differential diagnoses.

MAGNETIC RESONANCE CHARACTERISTICS OF BRAIN INFARCTION ACCORDING TO PHASE IN CANINE BRAIN ISCHEMIC STROKE MODEL. D. Noh¹, Y. Kim², H. Choi, Y. Lee, K. Lee¹. ¹College of Veterinary Medicine, Kyungpook National University, Daegu 702-701, ²Royal Animal Medical Centre, Seoul 135-960, Republic of Korea.

Purpose: This study described the magnetic resonance imaging (MRI) findings of hyperacute, acute, subacute, and chronic phase in a canine ischemic stroke model.

Materials and methods: 14 beagle dogs with occlusion of the middle cerebral artery using allogenic embolus were included in this study. T2-weighted imaging (T2WI), T1-weighted imaging (T1WI), fluid-attenuated inversion recovery (FLAIR) sequence were performed for hyperacute (3 hours), acute (3 days), subacute (8 days) and chronic (35 days) phase. In hyperacute phase, 3 dogs were randomly selected. Diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) mapping were performed in subacute and chronic phase. Histological examination was performed to confirm brain infarcts.

Results: 26 brain lesions of 12 dogs with histologically confirmed ischemic brain infarction were included in this study. One dog with 2 lesions died 5 days after induction of brain infarction. Lesions of brain infarction were on the caudate nucleus (11/12), thalamus (7/12), internal capsule (6/12), cerebral lobe (4/12), putamen (3/12). On MRI of all phases, the lesions were T2WI and FLAIR hyperintense but intensity on T1WI changed according to the phase. On T1WI, the infarcts were hypointense (2/2) in hyperacute phase, hypo- (11/26) or isointense (15/26) in acute phase, hyperintense (24/24) in subacute phase, hypointense (19/24) or hyperintense (5/24) in chronic phase. Decreased or increased lesion volumes were observed during acute to subacute phase because of reduction of oedema or spread of infarction, respectively. Median shift were seen in all 4 dogs with cerebral lobe infarcts in acute phase and resolved in subacute phase. Ischemic brain lesions on DWI were commonly hyperintense (22/24) in subacute, hypo- (17/24) or hyperintense (7/24) in chronic phase. ADC maps were hyperintense in subacute and chronic phase. 8 dogs had cavitated lesions with hypointense on T2WI (3/8), FLAIR (5/8), and DWI (8/8) in subacute phase. In the chronic phase, all 11 dogs had cavitated focal lesions which were hypointense on FLAIR and DWI and hyperintense on ADC map, supporting neuronal necrosis.

Discussion: MRI is useful for diagnosis of ischemic brain infarction phase or detection of early stage neuronal necrosis. T1WI and DWI provide supplemental information to evaluate phase. DWI is superior to detect neuronal necrosis lesions from the subacute phase of infarction.

BODY FAT ASSESSMENT BY COMPUTED TOMOGRAPHY AND RADIOGRAPHY IN NORMAL BEAGLE DOGS. H. Yang, M. Kim, S. Yoon, Y. Hwang, T. Oh, K. Lee. College of Veterinary Medicine, Kyungpook National University, Daegu 702-701, Republic of Korea.

Purpose: This study was performed to establish a method for assessment of body fat contents in computed tomography (CT) and abdominal radiograph and to determine correlation between 9-point body condition score (BCS) and body fat quantification values acquired from CT or radiographs in dogs.

Methods: 38 adult beagle dogs (9 female and 29 male) assessed BCS 2–7 were studied. Subcutaneous fat thicknesses (S_t) at the level of 3rd and 6th lumbar vertebra (L3 and L6) were measured from the highest level of each spinous process to the skin-air interface on right lateral radiographic view. On CT, regions of interest were drawn on the body area (B_a) and peritoneal line at the level of L3 and L6. Total (T_a), subcutaneous (S_a) and visceral fat areas (V_a) were obtained by using an attenuation range of –135 to –105 Hounsfield units. Ratios of subcutaneous fat thickness (rS_t) and fat area (rT_a , rS_a , and rV_a) to the length of the midbody of L6 were calculated. We investigated five different criteria of measuring fat: V_a/S_a , V_a/T_a , T_a/B_a , V_a/B_a and S_a/B_a . rS_t , rT_a , rS_a , and rV_a were compared with BCS and S_t was compared with fat areas.

Results: rS_t , rT_a , rS_a , and rV_a had statistically significant correlations with BCS at the level of L3 and L6. There was significant correlation between rS_t and ratios of fat areas (rT_a , rV_a , and rS_a) at the level of L3 and L6. In female dogs, however, there was no interaction between rS_t and rV_a . On CT, there was stronger relationship between BCS and rT_a and between BCS and rV_a at the level of L3 than those at the level of L6. In contrast, rS_a had higher correlation with BCS at the level of L6 than at the level of L3. T_a/B_a , V_a/B_a , and S_a/B_a showed a statistically significant correlation with BCS and upper limit of T_a/B_a , V_a/B_a , and S_a/B_a was 15.1%, 6.3%, and 8.9%, respectively.

Conclusion: Results indicated that there was a significant association between S_t measured on radiographs and fat areas measured on CT. Visceral and subcutaneous fat area could be estimated separately on CT. L3 level is more suitable location for evaluating total fat area or visceral fat area and L6 is more suitable for evaluating subcutaneous fat area by CT. Findings suggested that upper limit of T_a/B_a , V_a/B_a , and S_a/B_a in normal beagle dogs was 15.1%, 6.3%, and 8.9%, respectively.

MRI OF MULTIPLE LESIONS OF THE NUCHAL STRUCTURES IN SHOW JUMPER HORSE – CASE REPORT. V.M.V. Machado¹, A.C.S. Aguiar¹, L.M.C. Bueno¹, G.F. Viana¹. Department of Animal Reproduction and Veterinary Radiology¹. School of Veterinary Medicine and Animal Science, São Paulo State University. Brazil.

Introduction: Neck pain can lead to lameness and poor performance in horses. The anatomy of this region is very complex. MRI has been used to describe the occipitoatlantoaxial ligaments in people and recently in dogs¹. This case report aims to highlight the importance of MRI to evaluate nuchal structures lesions in horses.

Materials and methods: A 7yo Westfalen mare with history of stiffness in flexing the neck, swollen left cervical region and no neurologic signs was referred to the Department of Veterinary Radiology for MRI scan of cervical region. Previously, the diagnosis of bursitis of nuchal bursa, nuchal ligament desmopathy and an enthesophyte in C2 was reported on ultrasound study. MRI exam was performed using an Esaote® Vet-MR Grande with 0.25 Tesla field. The horse was positioned in lateral recumbency, with the neck and head in neutral position; general anaesthesia was maintained with isoflurane and oxygen. Dorsal, sagittal and transverse images were acquired; the sequences included STIR (Short Tau Inversion Recovery-Fat Suppression), FSE-T2 (Fast Spin Echo). Additionally, Acquisition Gradient Echo sequences (SST1-3D; 3D HYCE; TURBO-3D) were acquired.

Results: MRI revealed heterogeneous hypersignal on sagittal and transverse images of the dorsal funicular portion of the nuchal ligament (FSE-T2; 3D HYCE) extended from its insertion on the occipital tuberosity to C2. Cranial bursa distension and hyperintense signal (FSE-T2; 3D HYCE) was present on sagittal and transverse images along the ventral aspect of the funicular part of the nuchal ligament. Hypersignal (STIR; SST1-3D) and irregularity of occipital tuberosity in topography of the nuchal funicular ligament insertion. Heterogeneous signal of the semispinalis capitis tendon from its insertion on occipital plane (FSE-T2; 3D HYCE) was more evident on the left side. Hypersignal in semispinalis capitis muscle and heterogeneous signal of nuchal laminar ligament insertion at C2 dorsal aspect (FSE-T2; 3D HYCE). These features are compatible with nuchal funicular ligament desmopathy and enthesopathy, significant cranial bursitis, tendon semispinalis capitis tendinitis, semispinalis capitis myositis, occipital enthesopathy and nuchal laminar ligament enthesopathy.

Discussion: Even though some lesions could be detected by other imaging modalities MRI scan provided more detailed information of these lesions. Additionally MRI revealed other lesions that were not detected previously. MRI can help diagnose subtle changes in soft tissue and allow a better visualization of complex regions such as nuchal region.

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DIFFUSE OSTEOPENIA IN A GOLDEN RETRIEVER WITH MULTIPLE MYELOMA S. Martig¹, J. Mackie², K. Brenner¹. ¹Centre for Animal Referral and Emergency (CARE), Collingwood, 3066 VIC, Australia; ²Vepalabs, Woolloongabba, 4102 QLD, Australia.

Introduction: The most commonly described radiographic abnormality in cases of canine multiple myeloma is polyostotic, multifocal, geographic ('punched out') lytic bone lesions. We present a case of a dog with diffuse osteopenia and multiple myeloma.

Case: A female, neutered, 12 year old Golden Retriever was presented for evaluation following a transient episode of altered mentation. Clinical examination revealed hepatosplenomegaly and discomfort upon deep palpation of the distal femora. The clinicopathologic abnormalities documented included: anaemia 24 L/L (Ref. 38-60 L/L), hypoalbuminemia 12 g/L (Ref. 30-42 g/L) and hyperglobulinaemia 121 g/L (Ref. 21-42 g/L). A presumptive diagnosis of hyperviscosity was established and bone marrow aspirated from the iliac crest confirmed the presence of a plasma cell neoplasm.

Imaging Diagnosis and Outcome: Abdominal ultrasound examination confirmed hepatomegaly with normal parenchyma and splenomegaly with multiple hypoechogenic nodules. Lateral radiographs of both femora were acquired. Findings were similar on both legs. The endosteal border of the diaphysis was scalloped. Prominent trabecula-like structures were present in the femoral diaphysis. The findings were consistent with diffuse osteopenia of the femur. The owner elected to treat the dog with prednisolone and 48 days later, the dog was euthanized due to substantial clinical deterioration. Samples of the femoral diaphysis were acquired post mortem, fixed in formalin, decalcified, and examined histologically. At least 50% of cells in the bone marrow were small to medium sized round cells consistent with plasma cell neoplasia (myeloma). The bone present appeared within normal limits, without obvious evidence of significant remodelling. However, osteoporosis could not be ruled out on this basis as it is characterised by a reduction in the quantity of bone, the quality of which is normal.

Discussion: Bone lesions in human beings with multiple myeloma include osteopenia, osteolytic lesions and pathological fractures. Osteolytic lesions are the most commonly reported lesions in dogs and cats; however, not all focal resorptive lesions are histologically filled with tumour cells.¹ This case provides an example of diffuse bone resorption which may reflect the humoral activity of the neoplastic plasma cells rather than replacement of cortical bone with neoplastic cells. To further characterise the association between multiple myeloma and osteopenia in dogs, consideration could be given to quantitative analysis of bone density as described in human studies.²

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ATLAS BASED SEGMENTATION IDENTIFIES HIPPOCAMPAL ATROPHY IN

EPILEPTIC DOGS. M. Milne¹, B. Moffat², T. O'Brien³, S. Long¹. ¹Faculty of Veterinary & Agricultural Science, University of Melbourne Victoria 3030, ²Department of Radiology & ³Department of Medicine, University Melbourne, Parkville, VIC 3050, Australia.

Introduction: Many dogs diagnosed with idiopathic epilepsy are refractory to medical therapy. It is possible some of these dogs have subtle structural brain disease not readily identified by subjective observation of brain MRI scans. This study aimed to investigate whether hippocampal atrophy, an MRI finding seen with hippocampal sclerosis, could be identified in dogs diagnosed with idiopathic epilepsy.

Methods: Computer-assisted atlas based segmentation was used to segment the hippocampal formation from brain MRI scans and calculate left and right hippocampal volumes of 74 dogs diagnosed with idiopathic epilepsy and 25 matched normal controls. The presence of hippocampal atrophy in epileptic dogs was evaluated using three methods: 1) comparison between normal and epileptic dogs of the distribution of hippocampal volume, and hippocampal volume adjusted for intracranial volume, using unpaired Student's t-test 2) comparison of hippocampal asymmetry ratios between normal and epileptic dogs using Mann-Whitney U Test 3) establishment of a robust lower 95% reference limit for adjusted hippocampal volume in normal dogs and identification of epileptic dogs with adjusted hippocampal volume falling below that reference limit.

Results: Mean (+/-SD) volume of the left and right hippocampal formation was 600 mm³ (+/-109) and 594 mm³ (+/-126) respectively in normal dogs, and 577 mm³ (+/-116) and 566 mm³ (+/-111) respectively in epileptic dogs. There was no significant difference between groups (P= 0.389 and P= 0.304 respectively). Adjusted left and right hippocampal formation volumes were 590 mm³ (+/- 55) and 582 mm³ (+/- 62) for normal dogs, and 581 mm³ (+/-89) and 570 mm³ (+/- 75) for epileptic dogs, with no significant difference between groups (P= 0.556 and P= 0.486 respectively). Median hippocampal asymmetry ratios were 1.050 for normal dogs and 1.054 for epileptic dogs, with no significant difference between groups (P=0.963). The robust lower 95% reference interval for adjusted left hippocampal volume was 494 mm³ (90% CI: 463, 523); for adjusted right hippocampal volume was 478 mm³ (90% CI: 443, 513). 18 epileptic dogs had one (n=10) or both (n=8) adjusted hippocampal formation volumes below the lower 95% reference interval.

Discussion: Group-wise comparison of normal dogs and dogs diagnosed with idiopathic epilepsy did not provide detectable difference in hippocampal volume, however use of a lower 95% reference limit for adjusted hippocampal volume identified hippocampal atrophy in 18 of 74 dogs (24%). This implies that hippocampal sclerosis is likely to occur in dogs with idiopathic epilepsy, however as the incidence hippocampal sclerosis in epileptic dogs may be low, careful selection of analysis techniques in future research is required. Further studies may concentrate on correlating T2 weighted signal change in the hippocampus with hippocampal volume, and correlation of hippocampal atrophy with histopathologic change consistent with hippocampal sclerosis.

THE INTRAHEPATIC HEMODYNAMIC CHANGES ASSESSED BY DYNAMIC CT SCANNING IN A CANINE PORTAL HYPERTENSION MODEL. K. Morishita, A. Hiramoto, A. Michishita, S. Takagi, M. Takiguchi. Department of Veterinary Clinical Sciences, Graduate School of Veterinary Medicine, Hokkaido University, Hokkaido, 0600818 Japan.

Introduction: The liver receives a dual blood supply from the portal vein (PV) and the hepatic artery (HA). It was known that if the blood inflow from the PV was reduced associated with portal hypertension, the blood flow from the HA was increased to compensate the reduction in the total blood supply. These hemodynamic changes were investigated as non-invasive method to determine the severity of the liver disease in human medicine. However, there is no such study in veterinary medicine. The purpose of this study was to clarify the utility of dynamic CT scanning to evaluate the hemodynamic changes in a canine portal hypertension model.

Materials and methods: Four normal beagles were used. Catheterization of the PV was performed by laparotomy and the outer end of the catheter was fixed subcutaneously in the abdominal wall. Intra-portal injections of 15 mg/kg microspheres at five-day intervals induced acquired port-systemic shunts related to portal hypertension. Dynamic CT scanning was performed before and after establishing the model. Iodinated contrast medium (600 mg/kg) was administered intravenously at a rate of 5 ml/sec. The images were taken at the level of the porta hepatis just after the start of the injection with 2sec intervals for a total of 60 images. The regions of interest were set within the hepatic vein (HV) and the hepatic parenchyma, the time-intensity curve was analysed for three parameters; arrival time (AT), time to peak (TTP), time to peak phase (TTPP).

Results: After establishing the model, the onset of opacification in the liver became heterogeneous. AT and TTPP of the hepatic parenchyma were shortened significantly when compared to Pre-microsphere injection ($P < 0.05$ and < 0.01 , respectively). TTPP of the HV was also shortened ($P < 0.05$).

Discussion: The variability in the time of onset of opacification in the liver may depend on the degree of obstruction at the intrahepatic PV branches. Changes in the time parameters could be due to reduced portal supply and increased arterial blood supply, which leads to the early enhancement of both the hepatic parenchyma and the HV. These results showed that dynamic CT scanning may be valuable to evaluate the arterialization of hepatic blood flow.

REPEATABILITY OF CONTRAST-ENHANCED ULTRASONOGRAPHY (CEUS) OF DUODENUM IN HEALTHY DOGS. K. Nisa, M. Shinohara, S.Y. Lim, H. Ohta, M. Takiguchi. Laboratory of Veterinary Internal Medicine, Graduate School of Veterinary Medicine, Hokkaido University, Hokkaido, Japan.

Introduction: Contrast-enhanced ultrasonography (CEUS) with microbubble as contrast agent has provided a unique method in visualizing and quantifying tissue perfusion. In veterinary medicine, few studies of bowel perfusion analysis by CEUS have been conducted but its application in daily practice has not yet been established. Duodenal perfusion analysis may provide a non-invasive modality to evaluate gastrointestinal (GI) disorders in dogs. Repeatability study is necessary to determine the most reliable perfusion parameters in detecting changes related to GI disorders. To our knowledge, repeatability studies of duodenal CEUS have not yet been reported.

Materials and methods: Five healthy beagles (age 1-4 year, body weight 9-12 kg) were enrolled for this study. Contrast agent (Sonazoid[®]) was administered using intravenous bolus method (0.01 ml/kg) to image duodenum. CEUS was performed three times within one day (4-hour-interval) and in two different days (1-week-interval) to evaluate intraday and interday variability, respectively. Tissue perfusion was measured using off-line software to create time-intensity curve (TIC). Perfusion parameters including time parameters [wash-in 30% (WI-30), wash-in 70% (WI-70), time-to-peak (TTP), wash-out 70% (WO-70), wash-out 30% (WO-30)] and intensity parameters [peak intensity (PI), area-under-curve (AUC), peak-phase-rate (PPR)] were derived from the TIC. Intraday and interday coefficient of variation (CV) of perfusion parameters were determined.

Results: Both time and intensity parameters were relatively stable with intraday and interday CV for most parameters being less than 20%. CV for all time parameters except WO-30 were less than 20% (range, 12.11% to 17.87%), while CV for intensity parameters ranged from 8.30% to 22.46%.

Discussion/Conclusion: Sources of variation in this study could have been attributed to contrast injection steps, location of manually drawn ROIs, and starting time of each cine loop. Time (WI-30, WI-70, TTP, WO-70) and intensity parameters (PI, AUC, PPR) of duodenal CEUS were relatively stable and could be reliable in evaluating changes in tissue perfusion related to GI disorders in dogs.

RADIOGRAPHIC VERSUS ULTRASONOGRAPHIC DIAGNOSIS AND SURGICAL MANAGEMENT OF DOUBLE DIAPHRAGMATIC HERNIA IN COW. N. S. Saini, A. Kumar, V. Sangwan, S. K. Mahajan, A. Anand. ¹Department of Veterinary Surgery and Radiology, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004, Punjab, India.

Introduction/Objectives: Diaphragmatic hernia is a congenital or acquired disorder which has been observed less commonly in cattle compared to buffaloes. Normally single hernia ring is seen in the right side of the diaphragm and occurrence of two or more hernia rings is rare in buffaloes and is not reported in cattle. The present case study reports radiographic versus ultrasonographic findings of double diaphragmatic hernia and its successful correction under general anaesthesia and intermittent positive pressure ventilation.

Methods: An adult non-gravid cattle aged 5 years and weighing approx. 250 Kg was presented with clinical signs of total anorexia, weakness, recurrent tympani and reduced mucus coated black faeces. Haematology revealed neutrophilic leukocytosis and anaemia. Radiographic examination was done in right lateral recumbency. For ultrasonographic examination, 3rd to 7th intercostal spaces (ICS) from the right and left sides was shaved and examined in standing position.

Results: Clinical and haematological findings were inconclusive, however neutrophilic leucocytosis and anaemia were observed. Radiographic examination in right lateral recumbency revealed poor diaphragmatic line and a sac like structure cranial to the diaphragm with one potential foreign body, partially superimposing cardiac silhouette suggestive of diaphragmatic hernia. From the right side, reticular wall with poor motility was seen, ultrasonographically, between the right thoracic wall and heart up to 3rd ICS. Lungs appeared displaced dorsally and heart could not be scanned from the right 4th ICS on the right side. From the left side, two reticular wall like structures (one between the left thoracic wall and heart and another medial to heart) were seen up to 4th ICS, suspecting it to be double diaphragmatic hernia. Surgical intervention consisted of two stage surgery; first rumenotomy to evacuate rumen contents and 24 hours later cranio-ventral midline laparotomy under general anaesthesia and intermittent positive pressure ventilation.

Discussion / Conclusions: In bovine, the multiple diaphragmatic hernia rings have been reported; however, there is no published report in cows that describe multiple diaphragmatic hernial rings. Multiple hernia rings pose diagnostic challenge for the clinicians. In the present case report, radiographically, diaphragmatic hernia was diagnosed but double rings could not be identified. This could be because radiograph of the reticulum was done in lateral recumbency and radiographic examination in dorso-ventral view in adult cattle is not feasible. On ultrasonographic scanning from the right and left side at 3rd to 7th ICS, the herniation of the reticulum within thoracic cavity was easily identified and helped in diagnosing double reticular diaphragmatic hernia which was later confirmed on laparo-rumenotomy. Double diaphragmatic hernia was repaired under general anaesthesia with intermittent positive pressure ventilation. It is concluded that the ultrasonography is comparatively better diagnostic aid than radiography for the diagnosis of double diaphragmatic hernia in cattle.

CARDIOTHORACIC RATIO IN THOUS (*CERDOCYON THOUS*). L.C. da Silva, F.G. de Oliveira, R.R. Bastos, C.R.Teixeira, V.M.V. Machado. Department of Animal Reproduction and Veterinary Radiology, School of Veterinary Medicine and Animal Science, São Paulo State University, Brazil.

Introduction: Heart diseases are often described in the literature and, when early diagnosed, they have effective treatment, providing to the patient best survival and quality of life. Diagnostic imaging methods are able to provide important information for chest diseases. The correct patient positioning is essential to prevent any asymmetries in densities between the thorax and displacement of the normal structures contours. The cardiothoracic ratio is well established in human medicine, constituting the main instrument for cardiac volume estimate. It is calculated by dividing the maximum heart diameter for the largest diameter of the rib cage. The *Cerdocyon thous* (cachorro-domato), genus canidae, are widely distributed in Brazil and, with advances in veterinary medicine, these animals are being studied, in order to obtain better treatment and maintenance of the species. There are few studies in the cardiac evaluation by radiography in these animals, and there is no description in the literature about the cardiothoracic ratio in this species. The objective of this study was to standardize the calculation of this index, to improve maintenance of these animals, contributing to the preservation of the species.

Materials and methods: A retrospective study was performed using five healthy *Cerdocyon thous* captive, with no cardiopulmonary disorders. All animals were chemically restrained and submitted for thoracic evaluation, using digital radiographic equipment (GE[®] DR-F). Radiographs were evaluated on right lateral and ventrodorsal incidences. It is known that for the realization of cardiothoracic index, the patient should be at maximal inspiration. It was recommended in this study that the animals were in inspiration. It was calculated the ratio of transverse diameter maximum of the heart by the maximum diameter of the rib cage, in ventrodorsal incidence. The system used for the measurements of the cardiothoracic ratio was DICOM Synapse[®].

Results: The results for cardiothoracic ratio in *Cerdocyon thous* were: animal 1: 0.48; Animal 2: 0.53; Animal 3: 0.49; Animal 4: 0.42; Animal 5: 0.5. Thus, the average value obtained in cardiothoracic ratio in *Cerdocyon thous* was 0.48, with a standard deviation of 0.04.

Discussion: The cardiothoracic ratio is well established in human medicine, being the main instrument for cardiac volume estimation. The standardization of this index is very important for cardiac evaluation of *Cerdocyon thous*, aiding early diagnosis of cardiac abnormalities and providing the possibility of an appropriate treatment if necessary. Recommend new studies for cardiac evaluation of this species, requiring a larger number of animals and suggests the correlation between this study and other examination procedures for cardiac evaluation. Additionally, is suggested to perform the cardiothoracic ratios in this specie, using other radiography projections.

CORRELATED IMAGING OF THE SUBDISCAL SPACE IN TWO DOGS WITH NEW BONE FORMATION ALONG THE SPINE. C. Strohmayr¹, I. Walter², S. Kummer², S. Breit, S. Kneissl¹. ¹Diagnostic Imaging, ²VetCore Facility, University of Veterinary Medicine, Vienna, 1210, Austria.

Introduction: In this abstract the subdiscal space is defined as the region between two adjacent vertebrae, bordered dorsally by the ventral aspect of the vertebral body and ventrally by the ventral longitudinal ligament. Correlated imaging of the subdiscal space may provide important clues about the pathogenesis of new bone formation along the spine (NBFs). Therefore, the aim of the present study was to examine in detail radiographic images and corresponding histological sections from the subdiscal space.

Methods: Radiographs and computer tomographic images of post mortem specimens from a 14 year old, male castrated German Shepard crossbred (Th13/L1) and a 10 year old, female castrated German Boxer (Th12/13; L5/6) were compared to corresponding macroscopic and microscopic (haematoxylin & eosin/aniline blue/collagen I+II immunohistochemistry) sections.

Results: In the Boxer NBFs resulted in severe ankylosis of a few or several vertebrae. NBFs at the level of the subdiscal space consisted of spongiform and cortical substance and showed different stages of endochondral ossification. Interestingly, vertebral cortex and disc depth were mainly preserved. In contrast to the Boxer the characteristic radiographic features of the crossbred were (a) bony bridges, shaping the spine to bamboo-like appearance with reduced size at mid vertebra and increased size at the level of the subdiscal space, (b) interrupted vertebral cortex at the site of the metaphysis, and (c) blurred vertebral endplates with increased radiographic opacity. Moreover discs were mostly not well demarcated by the process, preserving and enlarging the symphysis between two adjacent vertebral endplates. All specimens mainly showed regions of remodelling (collagen I+II, aniline blue positive) at the disco-vertebral junctions.

Discussion: In the two dogs distinctly different pathomorphologies were observed in subdiscal space¹: synostosis in the Boxer and symphysis in the crossbred. In the crossbred the NBFs showed typical features of inflammatory and degenerative disease, since the vertebral bodies together with the NBF increased the bony surface and thus broadened the symphysis. Hypothetically, morphologic substrate of NBFs could be periosteal hyperostosis in the Boxer and osseous metaplasia of syndesmophytes in the crossbred. In the Boxer bone proliferation and remodelling could potentially represent secondary processes due to fracture healing or pseudarthrosis. Longitudinal studies are needed to assess the subdiscal space in different stages of pathogenesis and to understand whether these entities are confluent in end-stage diseases.

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EVALUATION OF THE EQUINE NUCHAL LIGAMENT AND TENDONS OF THE SEMISPINALIS CAPITIS CRANIALIS MUSCLE USING MRI. G.F. Viana¹, V.M.V. Machado¹, L.M.C. Bueno ¹, M. Midon ¹, J.N.P. Puoli Filho¹. Department of Animal Reproduction and Veterinary Radiology¹. School of Veterinary Medicine and Animal Science, São Paulo State University, Brazil.

Introduction: Disorders of the occipitoatlantoaxial region are not uncommon in horses. Magnetic resonance imaging (MRI) has proven to be an excellent imaging modality for the characterization of the structures involved in these joints ^{1,2}. However, the MRI appearance of the normal nuchal ligament (NL) and tendons of the semispinalis cranialis capitis muscle (TSCCM) has not been evaluated in live horses. This study aimed to characterize the NL and SCCM equine by MRI in multiple pulse sequences, thereby contributing to the early and accurate diagnosis of desmopathy, desmitis and tendinitis that can affect these structures.

Materials and methods: Four horses with no radiographic or ultrasonographic evidence of bone, ligament or tendon pathology of the occipitoatlantoaxial area were selected. They were positioned in lateral recumbency under general anaesthesia, maintained with inhaled isoflurane and oxygen. A 0.25 Tesla field (Esaote® Vet-MR Grande) with four RF channels was used for all MRI examinations. The coil was positioned over the occipital bone and C1 and C2. The 4mm slice thickness sequences performed were: sagittal spin echo T1-weighted (T1W), dorsal fast spin echo T2-weighted (FT2W) and dorsal gradient echo T2-weighted (GET2W). Dorsal fast gradient echo T1 weighted (Turbo 3D T1) and dorsal fast gradient echo T2 weighted (3D HYCE) were also included with slice thickness of 1.0 and 1.1 mm, respectively.

Results: The TSCCM presented hypointense relative to NL and adjacent muscles. The NL presented iso- or slightly hyperintense relative to adjacent muscles. The dorsal plane 3D HYCE sequence best represented the extent and insertion of the NL and TSCCM. In this sequence, the insertion of the TSCCM on the occipital bone had a discrete and homogeneous hyperintense signal. A slightly heterogeneous hypointense line separating the two portions of the NL was also observed.

Discussion: Magnetic resonance imaging of the occipitoatlantoaxial region was feasible for the NL and TSCCM identification in all horses. The dorsal 3D HYCE provided better characterization of these structures, its insertions and surrounding tissues. This study will contribute to better assessment of the changes involved in the NL and TSCCM in horses.

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